

***Remedial Investigation & Interim Remedial
Measures Work Plan***

**Former Packaged Lighting Systems, Inc.
Brownfield Cleanup Program
NYSDEC Site No. C336079**

**Village of Walden
Orange County, New York**

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Chazen Project No. 41115.00



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I certify that this Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER10).

QEP: Mr. Dan Stone, PE

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1.0 INTRODUCTION

This Remedial Investigation and Interim Remedial Measures Work Plan (Work Plan) outlines the components of supplemental site investigation activities which will be implemented to evaluate and delineate the nature and extent of any historic environmental impacts identified at the Former Packaged Lighting Systems, Inc. Site ("site") in accordance with the New York State Department of Environmental Conservation (NYSDEC) Brownfields Cleanup Program (BCP). The Estate of Hy Hilzen's application for the BCP was approved by the NYSDEC, and the site's BCP number is C336079. This Work Plan is presented to supplement data collected and reported in a 2010 Phase II Environmental Site Assessment report and also proposes Interim Remedial Measures (IRMs) that will be conducted during the investigation phase.

The property is a 3.0 ± acre former commercial/industrial property located at 29 Grant Street in the Village of Walden, Orange County, New York. The current zoning for the property is I-1, Industrial Park. The site is situated along the southern side of Grant Street, approximately 500 feet east of the intersection of Grant Street and New York State Route 208 in the Village of Walden, Orange County, New York. The site is bounded to the north by Grant Street, to the west by an active railroad line, to the east by two residences along Elm Street and to the south by a commercial/industrial facility (Ampac Paper). The adjacent properties are of mixed use, including industrial and commercial use as well as residential. The site is identified on the Orange County Real Property Tax Map as Section 309, Block 14, Lot 4. A map illustrating the site location is attached as Figure 1.

The main structure on the property consists of a vacant commercial/industrial use building that was last occupied by Packaged Lighting Systems, Inc., a specialty stage lighting design company. The site includes three additional commercial buildings that have also been vacant since 2008. All site buildings are in various states of disrepair.

The dates of construction for the site buildings range from the mid-1800s through the 1960s. The site has a history of industrial use dating back to the mid-1800s.

The primary site contaminant is the chlorinated volatile organic compound (VOC) trichloroethylene (TCE), which was detected in shallow groundwater at the site during a 2010 Phase II subsurface investigation. Based on the investigations conducted at the site thus far, it appears that the historic source of the TCE may have been from floor drains that released to the ground or possibly a dry well infrastructure, although TCE has not been documented as a chemical used in the former site operations. Other detected contaminants include low-level concentrations of metals in soil, which appear to be attributable to soil disturbance and casual slag disposal and possibly to an historic on-site foundry operation, and low-level concentrations of polycyclic aromatic hydrocarbons (PAHs) also attributed to former site uses. The contaminants that exceed regulatory standards are identified herein as Contaminants of Concern (COC).

This Work Plan outlines the approach to further characterize the extent of known soil and groundwater impacts and geologic conditions such that remedial alternatives can be developed and assessed. Areas to be investigated include the suspect TCE source area and associated impacted groundwater area. The site will also be investigated for the full target compound list (TCL) of contaminants that consists of VOCs, semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and metals. The distribution, persistence, and fate of the full target compound list of contaminants and their

impact, if any, on the intended future commercial use of the site and the environment will be the subject of this remedial investigation.

Based on past Phase II soil and groundwater sampling data, the TCE groundwater impacts appear to be localized and linked to a historic floor drain (FD) system near the southeastern side of the Main Building comprised of two drains and a possible dry well. TCE concentrations are highest near this FD area, and decrease sharply towards the east of the FD area, in the suspected down-gradient direction.

Implementation of several site interim remedial measures (IRMs) are proposed concurrent with the remedial investigation, including closure of two existing underground storage tanks (USTs), and closure of up to six floor drain/dry well systems including removal of any associated impacted soil. After these IRMs are completed, it is expected that residual low-level TCE may diminish to trace concentrations through attenuation or through the implementation of additional treatment.

Upon completing the work proposed herein, Chazen will present the Remedial Investigation findings and the IRM completion data and findings to NYSDEC. If contaminated media remain on the site following completion of the IRMs in concentrations exceeding applicable site cleanup standards, a remedial alternatives analysis will be prepared to assess measures to protect human health and the environment within the context of the planned commercial/restricted residential development of the property.

1.1 Work Plan Organization

This Work Plan contains historic site information, summarizes findings of previous investigation activities, and outlines the proposed on-site investigation activities. Background information is included to provide the rationale of the proposed activities (Sections 2.2, 2.3 and 2.4). Subsequent sections describe the approach that will be undertaken to complete the remedial investigation and alternatives analysis. Details of the sampling activities (e.g., media, sample location, frequency, and analyses) are provided in the Field Sampling Plan (FSP) attachment to this Work Plan.

- Section 2.0 – Site Description and History – describes the physical and environmental setting of the site with a summary of previous investigations.
- Section 3.0 – Work Plan Objectives, Scope and Rationale – describes the objectives and rationale for the scope of the investigation including the IRMs and soil and groundwater investigation activities. Details of the proposed sampling are described in the Field Sampling Plan attachment to this Work Plan.
- Section 4.0 – Data Reduction and Reporting - details the data assembly, data reduction/evaluation, and remedial alternative evaluations.
- Section 5.0 – Schedule – provides a sequencing schedule for the proposed field work, data reduction and subsequent reporting.
- Section 6.0 – FSP, QAPP, HASP, CPP, CAMP - outlines the Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), the Citizen Participation Plan (CPP), and Community Air Monitoring Plan (CAMP). The above-listed plans are included in the appendices of this document.

1.2 Project Organizational Structure

This project will involve the coordinated efforts of The Chazen Companies (Chazen), its subcontractors, and key government contacts. The key personnel to the project are listed below.

Chazen Project Principal – Daniel Stone – Mr. Stone, P.E., is a principal partner of The Chazen Companies and is responsible for establishing contracts for services to be performed and will provide corporate level input for problem resolution. Mr. Stone is the Qualified Environmental Profession and Professional Engineer (PE) for this project.

NYSDEC – John Miller – Mr. Miller is the NYSDEC Project Manager and point of contact for the Department of Environmental Conservation from the Albany NYSDEC Central Office, and will be responsible for the State approval of this Work Plan and Interim Remedial Measures.

Chazen Project Manager – Emily Pereira – Ms. Pereira is the primary contact with the NYSDEC. She will be responsible for task-specific budgeting and scheduling. She will monitor the overall activities, confirm implementation of established protocols, and schedule and coordinate investigation and reporting phases of the project.

Chazen Field Operations Leaders — Will Olsen and Eric Orlowski. Mr. Olsen and Mr. Orlowski are experienced project geologists who will be responsible for executing the scope of work. During field activities, they will be the liaison among field staff, subcontractors, and on-site representatives from NYSDEC and NYSDOH.

Chazen Quality Assurance Officer (QAO) – Russell Urban-Mead, CPG – The QAO will assist the project manager in the development of the sampling and analytical portion of the FSP. The QAO, or a designee, shall conduct periodic field and sampling audits as needed, and interface with the analytical laboratory as needed.

Chazen Health and Safety Officer - Kim Cuppett, CHMM – The Health and Safety Officer will be responsible for review and approval of the site-specific Health and Safety Plan and ensuring that throughout the duration of the field activities all aspects of the Health and Safety Plan will be complied with. Ms. Cuppett will have authority to stop work should unacceptable health and safety risks occur.

Subcontractors - Subcontractors will be selected based on competitive pricing and qualifications. All subcontractors will be required to comply with necessary Federal and State training regulations and comply with all applicable regulations for safely performing the job. Subcontractors working on the site will be responsible for preparing their own site-specific Health and Safety Plan (HASP). Chazen will provide necessary additional information regarding the subcontractors used on this project as prescribed by NYSDEC.

Site Representative –Christopher Coleman, Esq. – Mr. Coleman will be the point of contact for the Former Packaged Lighting Systems, Inc. site.

Contact information for key project personnel is provided in the following table. Qualifications for the Chazen personnel are provided in Appendix G.

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2.0 SITE DESCRIPTION AND HISTORY

A summary of background information for the site follows and contains a site description, site history, the area geology and hydrogeology, and known and suspected areas of concern. This information provides the basis for developing the sampling approach. This section of the Work Plan also summarizes data and reports from relevant documents obtained from the NYSDEC.

2.1 Site Location

The Former Packaged Lighting Systems, Inc. site is a 3.0 ± acre industrial property situated on the southern side of Grant Street, approximately 500 feet east of the intersection of Grant Street and New York State Route 208 in the Village of Walden, Orange County, New York. The current zoning for the property is I-1, Industrial Park. A map illustrating the site location is attached as Figure 1.

2.2 Property Uses (Historic, Current and Future)

The site has a history of industrial use dating back to the mid-1800s. From 1885 to 1894, the site was operated by the Rider Engine Company, a manufacturer of steam engines. From 1900 to 1939 the facility operated under the name Rider-Ericsson Engine Company, and continued manufacturing steam engines. From the 1920s until 1967, the facility was operated by Spence Engineering, a manufacturer of steam regulators and valve mechanisms. From 1968 until 2008 the facility was used by Packaged Lighting Systems, Inc., which designed unique lighting systems for New York City theaters. Figure 2 is an aerial of the site that shows the property and the site buildings.

The subject property has four commercial buildings: the Main Building, the Lab Building, the Paint Building, and a garage (see Figure 2). The dates of construction for the site buildings range from the mid-1800s through the 1960s. The main site building ("Main Building") is situated on the north-northwestern portion of the site. This building is L-shaped and comprised of multiple additions added over the years. It has an approximate area of 38,000 square feet and includes offices, two residential apartments, showroom, storage areas, utility rooms, a former degreasing room, parts steam cleaning room, warehouse and loading areas/garages. The ground level of the northern portion of the building was most recently converted into self-storage units by the late property owner although the self-storage facility was never put into use.

A rectangular structure, referred to in prior reports as the "Lab Building," is situated south of the Main Building along the west-central boundary of the site parcel. This building is a single-story metal-framed building with an area of approximately 1,400 square-feet constructed in 1962. It was reportedly used as a warehouse and research laboratory. Visual inspection of the interior of the Lab Building suggests that it was last used to house offices for one or more medical practices.

A two-story structure situated southeast of the Main Building has been referred to as the "Paint Building," that was last used to house a paint booth. The 1,784 square-foot Paint Building was constructed circa 1900. A dilapidated detached single-car garage structure is located south of the Paint Building in the southern parcel area.

The proposed future commercial/restricted-residential use of the property includes the refurbishing and re-use of portions of the existing structures to create commercial office/apartment space and to house a

public transit facility (i.e., bus and train station). The public transit facility would support a commuter rail line in Walden associated with the existing adjacent railroad. The redevelopment of the site will create local jobs and spur commercial activities in the community. It is also anticipated that the establishment of a train/bus station at this property will lead to the development and possibly adaptive re-use of other nearby properties and buildings, ultimately linking the Main Street corridor to this proposed transportation depot via a pedestrian-friendly thoroughfare.

2.3 Environmental Setting

This section provides information on the site geology, soils, hydrogeology, surface water resources, and land uses in the site vicinity.

2.3.1 Geology

A review of the *Surficial Geologic Map of New York (Lower Hudson Sheet, 1989)* indicates that surficial soils in the northern portion of the site are mapped as recent deposits consisting of fine sand to gravel typically confined to valley floodplain areas. Soils on the southern portion of the site reportedly consist of lacustrine silt and clay.

The *United States Department of Agriculture (USDA) Soil Conservation Service's Soil Survey of Orange County, New York* maps two different soils types on the property: Canadaga Silt Loam (Ca) and Pittsfield gravelly loam, 3 to 8% slopes (PtB). Ca soils are described as deep, nearly level, poorly drained and very poorly drained soil formed in glacial lake deposits dominated by clay, silt and very fine sand. This soil type is present on the western and southern portions of the property. PtB soils are described as deep, well drained, gently sloping soil formed in glacial till deposits derived from limestone and schist. This soil type present on the northern portion of the site comprising the majority of the developed areas of the parcel, with the exception of the far west end. Information from the 2010 Phase II ESA indicated that soils on the site consist of 12 to 18 inches of disturbed dark organic loam underlain to a depth of 12 feet by undisturbed dense clayey till and lenses of small gravel.

Bedrock in the area of the site is presumed greater than 60 inches below grade according to the above-referenced Soil Survey and Surficial Geologic Map and is mapped on the Geologic Map of New York (Lower Hudson Sheet, 1970). The bedrock formation is mapped as Middle Ordovician-aged rocks of the Normanskill consisting of shale, argillite and siltstone.

2.3.2 Hydrogeology

The area is supplied with municipal water, so on-site groundwater contamination is not expected to be used and the vicinity is not near a water supply area. No water supply wells are known to exist on-site or in the immediate vicinity of the property. Based on the limited 2010 Phase II sample data, the impacted shallow groundwater area appears to extend generally to the east, and the contaminant concentrations sharply decrease with movement eastward away from the source area. Impacts to off-site shallow groundwater formations are not known but are not expected given the decrease in detection away from the drain system area. The Village of Walden well field and groundwater supply recharge area are located substantially upstream of the Village in the Tin Brook watershed headwaters area. The Tin Brook flows west-northwesterly discharging into the Wallkill River, and the well field is located on the

upstream side of the Brook relative to the location of the property and the Village of Walden. Therefore, no impacts to this well field and recharge area are expected to be related to this proposed BCP site.

No hydrogeologic information was available for properties which surround the subject site. Based on a review of available information, shallow groundwater flow in the area of the site is expected to flow northeastward, towards the Tin Brook.

2.3.3 Surface Water Resources

No surface water bodies are present on the site. The closest surface water body to the site is the Tin Brook located approximately 500 feet to the northeast of the site. The Tin Brook flows west-northwesterly discharging into the Wallkill River. The Wallkill River is located approximately 2,000 feet to the west of the site.

2.3.4 Land Uses Within 1,000 Feet of the Site

The site is located in an I-1 zoned area (Industrial Park). The adjacent properties are of mixed use including industrial and commercial use as well as residential. Adjacent property locations and uses are detailed the table below. No agricultural land was identified in the surrounding area.

Tax Parcel ID	Location	Parcel Address	Use
Section 309, Block 14, Lot 4	Subject Property	29 Grant Street	Vacant (Former Packaged Lighting Systems)
Section 309, Block 14, Lot 2	North	33 Railroad Avenue	Vacant Industrial (former Walor Auto Body and Glass)
Section 309, Block 13, Lot 4.1		Grant Street & Elm Street	Vacant Commercial
Section 309, Block 13, Lot 4.2		46 Grant Street	Residence
Section 310, Block 4, Lot 9.22	South	30 Coldenham Road	Industrial (Ampac Packaging)
Section 309, Block 14, Lot 5	East	68 Elm Street	Residence
Section 309, Block 14, Lot 6		72 Elm Street	Residence
Section 310, Block 4, Lot 1		1 Sherman Avenue	Residence
Section 310, Block 4, Lot 10	East	83 Elm Street	Residence
Section 310, Block 4, Lot 11		79 Elm Street	Residence
Section 310, Block 1, Lot 1.21		3 Elm Street	Hoshin Black Belt Academy
Section 309, Block 14, Lot 3	West	East of Orange Avenue	Railroad

2.4 Environmental History

2.4.1 Summary of Previous Investigations

The primary site contaminant is the chlorinated VOC compound TCE, which was discovered in shallow groundwater at the site during a Phase II subsurface investigation. Based on the investigations conducted at the site thus far, it appears that the historic source of the TCE may be from floor drains or possibly to dry well infrastructure, although TCE has not been documented as a chemical used in the former site operations. Other detected contaminants include low-level concentrations of metals and PAHs in soil, which appear to be attributable to active site use and possibly an historic on-site foundry operation.

A summary of findings from previous environmental investigations at the site is as follows.

A Phase I Environmental Site Assessment (ESA) was completed by Team Environmental Consultants, Inc. (Team) on December 30, 2008. The Phase I ESA identified the following recognized environmental conditions (RECs):

- One 10,000-gallon heating oil underground storage tank (UST) that has been inactive since the 1990s but is still in place between the Main Building and the Lab Building.
- One 500- to 1,000-gallon UST within the eastern central area of the Main Building. This tank was likely originally an exterior UST until building additions extended over the UST. It is still in place and the use/contents are unknown.
- Two former 275-gallon fuel oil aboveground storage tanks (ASTs), reportedly located adjacent to the Paint Building.
- Five interior floor drains with unknown discharge points. At least two of the floor drains were identified in the southeastern area of the Main Building and known to have been associated with a parts steam cleaning station, and one floor drain in the central area of the Main Building in a room was known to be associated with degreasing activities. The 2010 Phase II report suggests that the floor drain in this central degreasing room discharges to a sealed sump within that room which has no identifiable discharge to the environment.
- Underground infrastructure, including but not limited to, USTs, gas piping and an “underground gas machine” that date back more than a century.
- Industrial site operations dating to the late 1800s, including machine shops, a foundry and coal storage.
- Historic on-site rail spur extended from the adjacent railroad to a former on-site coal storage building in the western area of the site underneath and south of the current Lab Building.

A Phase II ESA was completed in November 2010 by William L. Going & Associates to investigate the REC areas identified in the 2008 Phase I ESA. The Phase II included a magnetometer survey of the exterior areas of the site south of the Main Building and in the southern yard area to identify potential buried anomalies such as tanks or drums. A ground penetrating radar (GPR) survey was conducted of exterior areas east of the Main Building to locate potential buried anomalies. Specifically, the areas surveyed included the location of a gasoline UST identified on historic Sanborn Fire Insurance Maps, and an exterior storm drain near the rear shipping and receiving area of the Main Building which may have received discharge from interior floor drains. These GPR surveys revealed evidence of electrical

conduits and historic water pipes, but did not reveal evidence of buried drums or tanks other than the known 10,000-gallon heating oil UST.

As part of the Phase II work, an attempt was made to inspect the building floor drains with a camera snake; however, most of the floor drains were plugged, blocking exploration efforts. The dimension of the interior UST diameter was measured indicating that the tank is either 500- or 1,000-gallons capacity. The tank was observed to be empty during this inspection and suspected to be associated with a historic building heating system in use before current structures covered this location.

Additional Phase II ESA activities included the installation of nine test pits and five soil borings. Most borings were installed within test pits. The test pits revealed that shallow soils consist of organic loam mixed with historic debris including metal slag. Groundwater was encountered at between 4 and 8 feet below ground surface across the site. Soil and groundwater samples were collected from some test pits/soil borings, and analyzed for VOCs, semi-volatile organic compounds (SVOCs) and priority pollutant metals.

Some metals were detected in site soils, likely associated with metal slag and scrap metal in the disturbed soil found across the site.

Although the Phase II data collection did not comply fully with DER-10 data quality criteria (e.g. DUSR and QAQC samples), the findings were helpful and informative and Chazen recommends that the data be included in and considered in reporting of the proposed Remedial Investigation. VOCs were detected in groundwater in the Phase II groundwater samples. The most elevated concentrations were reported near the south side of the Main Building, adjacent to an area of identified floor drains in the former parts steam cleaning room. Groundwater in this area of the site contained TCE at a concentration of 340 ug/L (parts per billion (ppb)). TCE concentrations in groundwater samples east, and apparently downgradient, of the Main Building ranged from 54 ug/L to 2.7 ug/L. These data suggest that TCE concentrations decrease to levels below the 5 ug/L standard before reaching the eastern presumed downgradient property boundary. A groundwater sample collected from a test pit on the southeastern-most corner of the property contained a trace concentration of TCE at 1 ug/L. The sampling locations are shown on Figure 2.

2.4.2 Known and Suspected Areas of Concern

Three areas of concern (AOCs) have been identified and will be addressed at the site during the proposed Remedial Investigation:

AOC 1: The area of the Main Building and Lab Building containing the 10,000-gallon fuel oil UST, a 48-inch diameter (either 500- or 1,000-gallon) interior fuel oil UST, six floor drains and one suspected three-foot diameter cistern is considered Area of Concern No. 1. The 10,000-gallon UST is located on the western area of the site between the Main Building and Lab Building and based on 2010 Phase II findings contains approximately 5,000-gallons of liquid. A test pit and soil boring were installed near the UST during the 2010 Phase II. A soil sample from this area did not contain petroleum-range compounds. A trace concentration of TCE was detected.

The 500- or 1,000-gallon UST is within the eastern area of the Main Building. The six floor drains are located in the following areas: two within the parts steam cleaning room on the southeastern end of the Main Building; one in the warehouse area north of the parts steaming area; one in a garage area on the eastern portion of the Main Building; one centrally within the Main Building in the degreasing room; and one centrally located in the Lab Building. Except for the drain in the degreasing room which was confirmed to discharge to a closed interior concrete sump; the discharge points of the remaining drain systems are not known and are suspected to be to dry wells either beneath the building or on the exterior sides of the building near the floor drains. The suspected cistern is located in an electronics room in the north-central area of the Main Building.

AOCs 2: The active yard area east and south of the Main Building and possibly containing buried dry well structures and a historical gasoline tank is defined as Area of Concern No. 2. TCE groundwater impacts have been identified as the area south of the Main Building near the parts steam cleaning room, suspected to be the TCE “source” area, and under yard areas east of the Main Building. The highest concentration of TCE identified on the site from data collected to date is 340 ug/L, south of the Main Building near former boring SB-2, with concentrations decreasing in the apparent downgradient direction at the eastern area of the site with concentrations of 30 ug/L (SB-5) and 2.7 ug/L (SB-4). No historical gasoline tank was identified during the 2010 Phase II investigation.

AOC 3: The vacant yard area south of the site structures is defined of Area of Concern No. 3. This area contains a dilapidated garage and historically was the location for a rail yard spur and a coal storage/warehouse building. The former rail spur extended southeastward from the main rail line under the Lab Building toward the coal storage warehouse. The former coal storage/warehouse building was located south of the existing Lab Building on the southwestern area of the site, in the vicinity of former TP-1 and proposed boring SB-7.

In addition, approximately ten, one- and five- gallon containers of paint and paint thinner are located within the Paint Building. These are proposed to be removed during RI/IRM activities.

2.5 Conceptual Site Model

The Conceptual Site Model takes into consideration sources of contamination, fate and transport processes, potential receptors, exposure pathways, and exposure points. Contaminated media associated with the site include soil and groundwater. Soil gas and indoor air will be evaluated.

Chazen’s conceptual site model views the site as a relatively level property with a central building that has been expanded over time with multiple additions and some independent out buildings. Floor drains and sumps were constructed over time in select locations in the building. A small outdoor fuel oil UST became engulfed by expanding buildings and may have been abandoned in place over time as refueling of the location became impractical. A large fuel oil tank situated between the Main Building and the Lab Building was the likely eventual main source of heating fuel for most structures. TCE was likely released to the subsurface via one or more of the floor drains, with floor drains near the parts cleaning area most suspect. Soils across the site were disturbed over time by storage and management of coal and slag materials in association with general leveling and stabilizing of existing soils. The TCE detection is relatively low-level and associated with steam cleaning, and therefore not associated with free-phase releases. The dissolved-phase TCE is unlikely to have penetrated deeply into the shallow aquifer

formation because of silty-clay soils on the site. The direction of shallow groundwater flow is east/northeast toward the Tin Brook.

The table below provides a summary of the contamination sources, migration pathways and potential receptors based on existing data gathered in the field and from laboratory analysis. Lead and PAHs have not been detected in prior groundwater samples so the composition of disturbed soils is not treated below as a significant contaminant source.

Media	Known or Suspected source of contamination	Type of Contaminant (General)	Contaminants of Potential Concern (COPCs)	Primary or Secondary Source Release Mechanism	Migration Pathways	Potential Receptors
Subsurface Soil	Floor Drain system in former parts steam cleaning room	Solvents	TCE	Discharges to ground or suspected dry well	Infiltration/percolation	Human: direct contact from intrusive activities in impacted area
Ground water	Impacted soil (primary)	Solvents	TCE	Infiltration/Percolation and saturation of soil	Groundwater flow/utility trenches	Human and ecological receptors are not expected to be exposed
Indoor Air	Impacted soil or groundwater near or under buildings	Solvents	TCE	Volatilization of impacted soil and/or groundwater	Migration into buildings partitioning to air	Human: Inhalation
Sub-Slab Soil Vapor	Impacted soil or groundwater near or under buildings	Solvents	TCE	Volatilization of impacted soil and/or groundwater	Migration into buildings partitioning to air	
Surface Water/ Sediment	No discharge mechanism or pathways are currently expected to exist	NA	NA	Contaminants in groundwater are expected to attenuate prior to potential discharge points (i.e., Tin Brook)	NA	Human or Ecological Receptors are not expected to be exposed
Building	No continuing sources of contamination	NA	NA	Site operations have ceased	NA	NA

3.0 WORK PLAN OBJECTIVES, SCOPE AND RATIONALE

3.1 Interim Remedial Measures Objective and Rationale

The IRM objective is to address identified source areas already recognized on the site likely to be sources of VOC/SVOCs migration. The following IRMs are proposed either during or after investigation phases to remove suspect or known source areas:

- Before RI: Removal and proper disposal of one- and five- gallon containers of paint and paint thinner within the Paint Building (approximately 10 containers).
- After RI: Removal of the exterior 10,000-gallon fuel oil UST located between the Main Building and Lab Building;
- After RI: Removal of the interior 500- or 1,000-gallon fuel oil UST located in the eastern portion of the Main Building;
- After RI: Closure of the existing floor drains (six) and subsequent removal of any identified dry well systems;
- After GPR survey/RI: Excavation of the exterior “gasoline tank” identified on historical Sanborn fire insurance maps as being east of the Main Building (Figure 2); if identified through site investigation activities;
- After RI: Excavation of impacted soil, if any, during the UST and dry well closures; and

3.2 Investigation Objective and Rationale

The remedial investigation objective is to define the nature and extent of contaminant impacts to soil and groundwater, soil vapor and indoor air for use in fate/transport assessment, and to gather additional geologic and groundwater information for use in evaluating and designing appropriate remedial methods, if needed.

Investigation objectives will be met through the collection and field screening and laboratory analysis of soil, groundwater and sub-slab soil vapor samples for contaminants of concern. Media will be most carefully evaluated beyond the perimeter of known source areas where IRMs are proposed to avoid re-assessing locations already identified for mitigation. The FSP (attached as Appendix A) provides a detailed discussion of sample location/frequency and laboratory analyses. The conceptual site model described above will be refined as data are collected, and the new data will be evaluated to assess the potential necessity for further studies and, if needed, to develop appropriate remedial action responses relative to NYSDEC BCP objectives.

The field work outlined below, including project documentation, will be completed in accordance with the FSP, HASP, CAMP and QAPP which are described later in this Work Plan and also provided as appendixes. All components of this Work Plan and associated Appendices have been prepared to be consistent with the general requirements of the NYSDEC Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10, May 2010).

In order to meet the project objectives, the following tasks will be implemented:

- Before IRMs: Conduct soil and groundwater sampling to fill data gaps and define the conceptual site model for the trichloroethylene (TCE) source area using shallow borings/wells. Soil samples will be field screened for VOCs using a photoionization detector.
- Before IRMs: Conduct vapor intrusion assessment. Install sub-slab vapor sample points inside the building near floor drains to concurrently assess whether VOC impacts exist near floor drains and further define areas of TCE contamination across the southeastern portion of the building. Collect IAQ samples in representative indoor areas and collect one outdoor air sample. IAQ data will be compared to the appropriate NYSDOH decision-making matrices.
- Before IRMs: Collect a liquid sample and install sub-slab vapor sampling point adjacent to the three-foot diameter covered cylindrical tank (a suspected water cistern) within the north-central area of the Main Building.
- Before IRMs: Conduct a ground penetrating radar survey of the area east of the Main Building to assess for the potential presence of the historic gasoline UST and at the undeveloped southern portion of the property to scan for potential anomalies associated with historic site operations.
- Before IRMs: Install and sample shallow soil borings in the yard areas (AOC-2 and AOC-3) to assess site soils. The 2010 Phase II identified the upper 18 inches of soils to be disturbed by prior practices and casual slag disposal across the site. Install one upgradient soil boring and monitoring well in AOC-1.
- After IRMs: Collect shallow groundwater samples from all installed monitoring wells.
- Analyze all samples for relevant contaminants of concern (COCs) and additional physical and biological parameters to provide sufficient data to evaluate proposed remedial technologies.

Specific samples will be collected from each sampling area, as specified in the FSP. Samples will be analyzed for the contaminants of concern related to the source material, as defined in the FSP. Samples will be shipped to a New York State Environmental Laboratory Approval Program (NYS ELAP) certified laboratory for analysis. Level B deliverables will be generated so that data are sufficient to make decisions regarding the need for further investigation.

The Estate of Hy Hilzen is implementing this work to assess the existing environmental site conditions, confirm the nature and extent of TCE groundwater impacts, and ultimately to perform environmental restoration returning this site to a viable community resource.

3.3 Ecological Investigations

The site is located in an industrial park zoned area. The northern portion of site ground surface is primarily occupied by the site buildings or paved, and there are some intermittent areas of vegetation primarily consisting of grass lawn areas. The southern portion of the site is an open grassy field. No surface water bodies are present on the site. A review of Federal and State-mapped natural resources has not identified wetlands, floodplains, natural communities, rare plants or animals or wildlife management species within the site area. The US Fish and Wildlife Service List of Federally Listed Endangered and Threatened Species and Candidates Species for Orange County, New York includes

three endangered and two threatened species. In addition, one proposed species is listed. The endangered species include the Indiana bat, Dwarf wedge mussel and Shortnose sturgeon. The threatened species include the bog turtle and Small whorled pogonia (perennial plant). The proposed species includes the Atlantic Sturgeon. The site does not provide habitats for these species. Given that the sturgeons and mussel are aquatic species, and there are no waterways present on-site, these species are not likely to be present on the subject property. Given the historic industrial use of the property and the more recent commercial use of the property, it is not expected that other listed species are present on the property.

4.0 DATA REDUCTION AND REPORTING

4.1 Remedial Investigation

Following completion of the field work, IRMs, and laboratory analysis, laboratory analytical data will be submitted to a third party data validator who will conduct data validation and prepare a Data Usability Summary Report (DUSR) for the laboratory data. So-validated analytical results from each of the investigated media will be compiled and compared to applicable standards, criteria, and guidance (SCGs). This information will be evaluated to refine the existing conceptual site model for contaminants of concern. Should this evaluation reveal significant data gaps, then a determination will be made whether to proceed with collection of additional data. It is anticipated that the NYSDEC, Chazen, NYSDOH, and the Estate of Hy Hilzen would discuss identified data gaps and negotiate the proposed remedy (e.g., data collection via additional field work).

Once completed, the findings and recommendations will be assembled into a Remedial Investigation/IRM (RI/IRM) Report. The RI/IRM Report will be prepared according to DER-10 Section 3.14 and will supplement information presented in the 2010 Phase II report. The RI/IRM Report will address any remaining data gaps and in doing so will complete the remedial investigation process:

4.1.1 Interim Remedial Measures

The planned site IRMs include the removal of the two fuel oil USTs (10,000-gallon exterior tank and 500- or 1,000-gallon interior tank); removal of exterior gasoline UST identified on historical mapping, if confirmed to exist; closure of the building floor drain systems; and excavation of impacted/source soils if encountered during tank and floor drain system removal activities. Wells for potential future pilot tests may be placed in excavation areas prior to backfilling to be used for a pilot test if groundwater sample data suggest that in future in-situ remediation is necessary to eliminate any significant threats to the environment. Implementation of these IRMs is central to the Remedial Investigation report since close-out of these matters will influence the appropriate Alternatives Analysis.

4.1.2 Data Reduction – Soil

Soil samples identified in this Work Plan and Field Sampling Plan, which will be collected under the BCP, will be used to supplement the 2010 Phase II investigation samples. Collectively, the laboratory analytical data and field screening measurements will be reviewed, compiled into data tables, and laboratory data will be compared to soil SCGs. The 6 NYCRR Part 375 soil cleanup objectives will be used for soil SCGs. Soil samples that exceed the SCGs will be plotted on a site plan to assist in the visualization of the distribution of contaminants. As the site has been developed for commercial/restricted-residential use, the SCOs for commercial and restricted-residential sites will be used; however, if site soil meets more stringent objectives (e.g., residential or unrestricted), then those SCOs will be used to minimize limitations on future site use. The data will be used to further define the conceptual model of the site. Although data collected during the Phase II site assessment were not collected under Level B deliverable and DUSR quality control conditions, the field record will be considered as valuable contributing data.

4.1.3 Data Reduction – Groundwater

Groundwater samples identified in this Work Plan and Field Sampling Plan, which will be collected under the BCP, will be used to supplement the 2010 Phase II investigation samples. The laboratory analytical data will be reviewed, compiled into data tables, and compared to groundwater SCGs. The Part 703 groundwater quality standards will be used for groundwater SCGs. Groundwater samples that exceed the SCGs will be plotted on a site plan to assist in the visualization of the distribution of contaminants. The data will be used to further define the conceptual model of the site. Although data collected during the Phase II site assessment were not collected under Level B deliverable and DUSR quality control conditions, the field record will be considered as valuable contributing data.

4.1.4 Data Reduction – Soil Vapor and Indoor Air

Soil vapor and IAQ samples identified in this Work Plan and Field Sampling Plan will be collected under the BCP, to define the horizontal extent of TCE within the building and assess potential site impacts from floor drain areas, if necessary. The laboratory analytical data will be reviewed and compiled into data tables. The State of New York does not have SCGs for soil vapor. Sub-slab soil vapor and IAQ data will be compared to NYSDOH matrices identified in the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006).

4.1.5 Water Well Survey

As the site and surrounding properties lie within a community receiving water from a municipal water supply system, no potable water well survey will be conducted. The boundaries of the municipal water supply service area will be confirmed with the municipal Water Department. If the Water Department indicates that downgradient properties within 0.25 mile of the site are not served by the public system, then contacting the New York State Department of Health or obtaining tax records for such parcels will be conducted to investigate where the nearest private wells may exist. The water wells for the community are located a significant distance from the project site in the nearer the headwaters of the Tin Brook.

4.1.6 Fate and Transport

Laboratory data will be combined with the groundwater flow direction data to define the anticipated fate of identified COCs. Natural attenuation parameter data will be collected to further characterize the contamination and define the data set. The results will be used to evaluate appropriate remedial alternatives.

4.1.7 FWRIA

The site does not provide habitats for these listed species, as presented in Section 3.3. Given the site and area usage, a Fish and Wildlife Resources Impact Analysis is not expected to be needed for this project. If the investigation reveals evidence of site contamination that has migrated off of the site to surface water and/or ecologically sensitive areas, then a Fish and Wildlife Resources Impact Analysis decision key, from Appendix 3C of DER-10, will be completed to determine if further evaluation is needed.

4.2 Alternatives Analysis

Once the data interpretations are completed, remedial alternatives to address soil, groundwater and/or soil vapor contamination may need to be developed unless the IRMs are recognized to provide an effective remedy for the site. The Alternatives Analysis would be prepared according to DER-10 Section 4.3 and will include the following components:

1. Present remedial action goals
2. Present remedial action objectives
3. Identify general response actions
4. Identify and screen remedial technologies for media and contaminants that exceed SCGs
5. Develop alternatives for remaining technologies
6. Analyze remedial alternatives relative to the following criteria
 - Overall protectiveness of public health and the environment
 - Conformance with SCGs
 - Long-term effectiveness and permanence
 - Reduction of toxicity, mobility, or volume with treatment
 - Short-term effectiveness
 - Implementability
 - Cost effectiveness
 - Land use
 - Community acceptance
7. Recommend a remedy for the site

5.0 SCHEDULE

This Work Plan details several task items that will be completed prior to the development of a remedial program for the site. The following tasks and the anticipated timeframe to complete are as follows:

- Perform GPR survey to seek the alleged gasoline tank and advance borings adjacent to the suspected cistern to confirm absence of a VOC release by this structure within 30 days of approval of this plan (weather pending).
- Soil, Groundwater and Soil Vapor/Indoor Air Sampling – Installation and sampling from borings/wells and soil vapor locations will be initiated within 60 days of approval of this plan (weather pending).
- Concurrently, perform Interim Remedial Measures – Remove two fuel oil USTs; remove historical gas tank and other GPR anomalies, if identified; close building floor drains and remove dry wells, if identified; excavate impacted/source soils if identified in UST and floor drain system areas; install injection wells for potential future pilot study if groundwater monitoring data suggests in-situ remediation is necessary. IRMs anticipated to be completed within 90 days.
- Concurrently, complete the first phase of subsurface investigation as proposed in this Work Plan and submit an interim findings summary report within 90 days of completing field work and receipt of all laboratory analytical data.
- Remedial Investigation/IRM/Alternatives Analysis Report – To be completed within 90 days after NYSDEC completes review of the interim findings and determines that no further sampling is warranted.

6.0 FSP, QAPP, HASP, CPP, CAMP, AND IRM WORK PLAN

6.1 Field Sampling Plan

The FSP details the scope of the investigation, sampling rationale, proposed locations, analytical requirements and general methods to be used. The FSP is included as Appendix A of this document.

6.2 Quality Assurance Program Plan

The QAPP is specific to the project activities conducted during remedial investigation and interim remedial measures at the site, and has been developed specifically for this project. The plan describes protocols and procedures necessary to assure that specific tasks and actions are planned and executed in a manner consistent with quality assurance objectives. These protocols and procedures will be implemented during remedial investigation and IRM activities at the site as described in the QAPP. Chazen's Quality Assurance Program Plan (QAPP) is included as Appendix B of this report.

6.3 Health and Safety Plan

A Health and Safety Plan (HASP) for remediation investigation and interim remedial measures has been developed and will be followed to protect the health and safety of Chazen workers. The HASP provides specific guidelines and establishes procedures for the protection of personnel performing anticipated investigation and remedial activities. The HASP includes a Contingency Plan to be implemented in the event of a threat to human health or the environment. The HASP developed for this site is provided in Appendix C.

6.4 Citizen Participation Plan

Citizen Participation is seen as essential link between the public, the Estate of Hy Hllzen, and the State of New York for the project. The Citizen Participation Plan (CPP), in part, describes the objectives and means for the public to obtain pertinent information. The CPP is a necessary element of proposed interim remedial measures, remedial investigation activities, and remediation. The inclusion of all interested parties ensures participation in the decision making process. The CPP, previously provided to the Department, is included as Appendix D of this Work Plan.

6.5 Community Air Monitoring Plan

The intent of the Community Air Monitoring Plan (CAMP) is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant release as a direct result of investigative and remedial work activities that will be performed outside.

The New York State Department of Health (NYSDOH) has established an air monitoring plan for VOCs and particulate levels at the perimeter of a work area involving ground-intrusive activities. The Community Air Monitoring Plan for Ground Intrusive Activities, established by the NYSDOH, requires that certain measures are employed on a work site when ground-intrusive activities are occurring. The CAMP is included as Appendix E of this report.

6.6 Proposed Interim Remedial Measures

6.6.1 Summary of Proposed IRMs

The planned site IRMs include:

- The excavation of two identified fuel oil USTs;
- The excavation of a gasoline UST which was noted on historical Sanborn Fire Insurance mapping and additional buried anomalies, if identified through GPR screening;
- Cleaning and closure of floor drains and drainage systems;
- Excavation of impacted/source soil in the UST and dry well areas, if encountered; and
- Removal and proper disposal of one- and five- gallon containers of paint and paint thinner within the Paint Building (approximately 10 containers).

An IRM is defined by the NYSDEC as a discrete set of planned actions for both emergency and non-emergency situations that can be conducted without the extensive investigation and evaluation of a remedial investigation and feasibility study (RI/FS). IRMs are designed to be a permanent part of the final remedy. Additional IRMs may be proposed if field or analytical evidence of defined areas or quantities of contamination is revealed during the course of the remedial investigation. Groundwater impacted by TCE has been identified on the site. The contaminant of concern at the site primarily consists of the VOC TCE. The source of TCE in groundwater at the site is suspected to be a floor drain system associated with a parts steam cleaning room near the southeastern side of the Main Building. The closure of on-site floor drains and associated dry wells (if identified) and impacted soil excavation will be an IRM to mitigate the source soils from further impacting groundwater and to mitigate the potential for contaminant vapors to enter existing and any future site structures. Because dry wells are also considered Class V Underground Injection Control (UIC) by the United States Environmental Protection Agency (USEPA), their closures would be conducted in accordance with USEPA guidance documents and would include the USEPA-required 30-day notification closure plan. Closure sampling would be conducted in accordance with USEPA requirements and general conformance with DER-10 Section 5.5 for "Underground Storage Tank Closure."

Additional IRMs will include the permanent closure of the 10,000-gallon fuel oil UST located on between the southwestern side of the Main Building and the northern side of the Lab Building; the permanent closure of the 500- or 1,000-gallon fuel oil UST located inside the Main Building at the eastern area; and removal of any identified buried anomalies observed through GPR screening, including removal of the potential historical "gasoline tank," if located. While the 2010 Phase II data do not suggest a release from on-site petroleum tanks, soil excavation of impacted soils in these areas is planned, if encountered. Confirmatory sampling for tank closures will be conducted in general accordance with DER-10 Section 5.5. Proposed sampling protocol is presented in the FSP. A 10-day notification will be provided to DER prior to the tank closures. Given that the site does not appear to be currently listed on the NYSDEC's petroleum bulk storage (PBS) database, the tanks will be retroactively registered with the NYSDEC prior

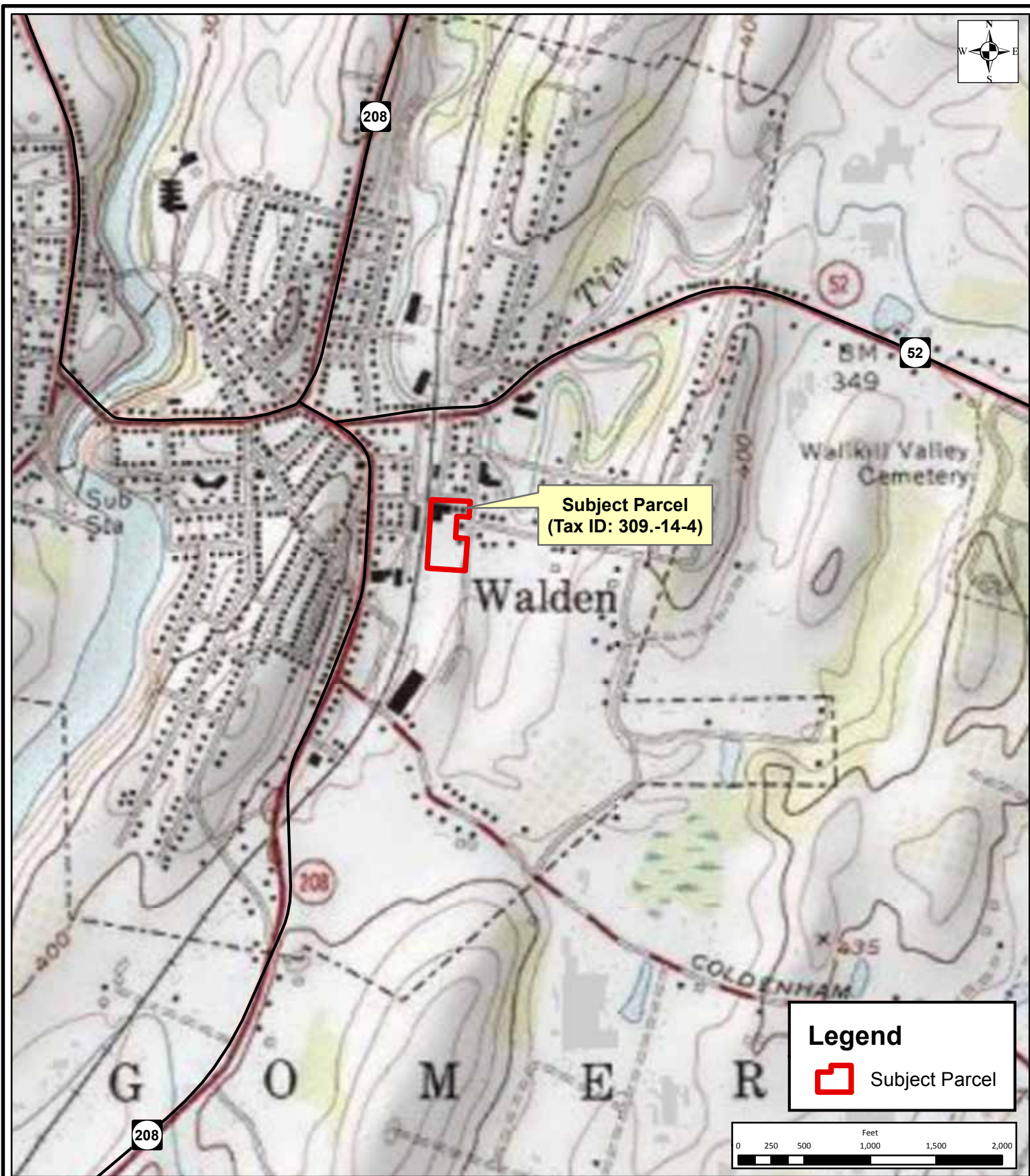
to removal. After removal, the new PBS Application will be prepared to reflect the “closed-removed” status of the tanks.

Because IRMs are performed as a component of remedial investigation activities, they will be conducted in accordance with the FSP, HASP, CAMP and QAPP prepared for this RI/IRM Work Plan.

6.6.1 Proposed IRMs Schedule

The GPR screening, and RI activities (i.e., soil, groundwater and vapor intrusion sampling) will be conducted upon receipt of NYSDEC approval (weather permitting). After completion of these tasks, the PBS Application will be prepared to retroactively register the petroleum USTs and the 10-day closure notification will be submitted to NYSDEC. If dry wells are identified, the 30-day notification closure plan will be prepared and submitted to the USEPA prior to removal of identified dry wells. It may take up to 8 weeks to complete the IRM tasks.

FIGURES



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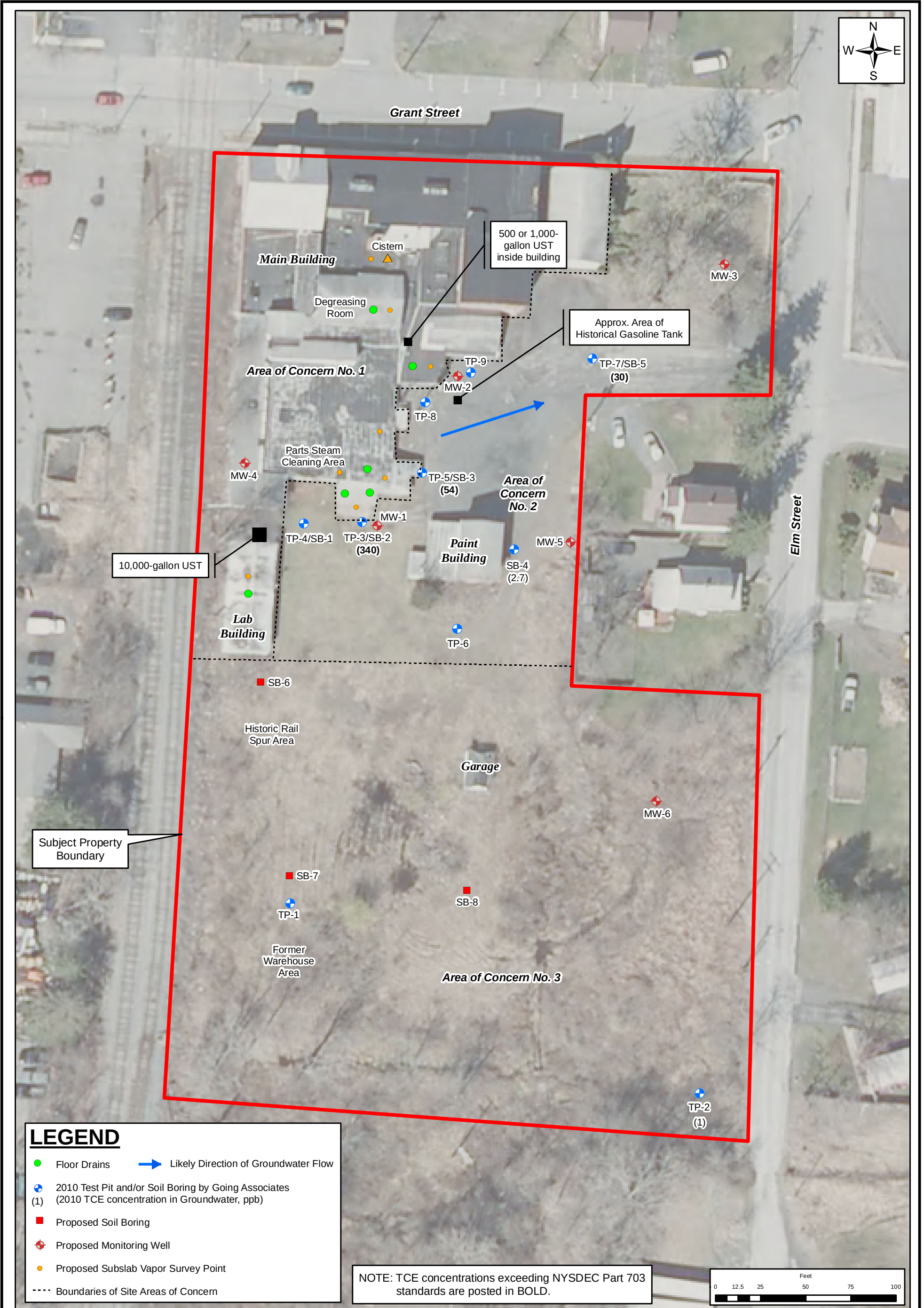
Former Packaged Lighting Systems, Inc. Site

Figure 1 - Site Location Map

29 Grant Street
Village of Walden, Orange County, New York

Source: U.S.G.S. Topographic Map Dated 1978, Photo Revised 1980: USGS Ref. Code: Walden - 41074-E2-TF-024; Village of Walden 2007 Tax Parcel Data; State of New York DOT 2008 Roads dataset.

Drawn:	EJO
Date:	October 2011
Scale:	As Shown
Project:	41115.00
Figure:	1



Appendix A
Field Sampling Plan

Field Sampling Plan
Former Packaged Lighting Systems, Inc.
Brownfield Cleanup Program
NYSDEC Site No. C336079

Village of Walden
Orange County, New York

October 2011



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1.0 INTRODUCTION

This Field Sampling Plan (FSP) is a component of the Remedial Investigation and Interim Remedial Measures (RI/IRM) Work Plan prepared to supplement information collected as part of a 2010 Phase II investigation and to satisfy guidance outlined in the New York State Department of Environmental Conservation DER-10 procedural document governing remedial work at Brownfield Cleanup Program sites. This FSP describes the scope of field activities to be performed to acquire supplemental data that will guide the extent and selection of remedial action necessary to eliminate any significant threats to the environment or public health at the site. The property was entered into the BCP because of the detection of volatile organic compound (VOC) in shallow groundwater.

All field work outlined below, including project documentation, will be completed in accordance with the Health and Safety Plan (HASP), Quality Assurance Program Plan (QAPP), and Community Air Monitoring Plan (CAMP) contained as appendices in the Remedial Investigation and Interim Remedial Measures Work Plan (Work Plan).

To meet the project objectives outlined in Section 3 of the Work Plan, the following tasks will be implemented and are described in this FSP:

- Perform a geophysical survey across active yard areas and the southern pasture to search for a gasoline underground storage tank (UST) noted on a Sanborn map, other USTs, and other potentially hazardous buried objects;
- Conduct vapor intrusion assessments in the main site building and the lab building.
- Investigate and close six floor drains. The subslab vapor intrusion data will be used to screen floor drains which can simply be closed with concrete, versus those warranting more detailed investigation and closure. Floor drains near areas where subslab sampling identifies a VOC detection will be cut out, allowing investigation of soil beneath the floor drains and tracing of any drains to discharge locations including potential dry wells. Any discovered dry wells will be excavated with appropriate end-point sampling and clean fill replacement.
- Conduct soil and groundwater sampling to complete characterization of trichloroethylene (TCE) source area(s), if any, and distribution on the site.
- Collect a liquid sample from the cistern near the north end of the Main Building and review the sub-slab vapor sample from this location to evaluate the potential for VOC releases from this cistern;
- Perform Interim Remedial Measures (IRMS) including:
 - o the removal of two heating oil USTs and, if located, one gasoline UST;
 - o closure of six floor drains either by simple concrete closure or full excavation;
 - o removal or stabilization of any other buried source area(s), and;
 - o excavation of impacted soil around USTs and floor drain/drywells including collection of post-excavation confirmatory sampling and analysis;

- Position chemical-oxidation injection ports in each tank or dry well excavation to, if necessary, allow future treatability tests if groundwater data indicate that in-situ remedies are warranted;
- Sample shallow soil in the area of historical on-site rail spur;
- Conduct a level run survey among groundwater monitoring wells to determine relative groundwater elevations and directions of groundwater flow.

Sampling details and laboratory analyses for all proposed samples are listed in the following sections. Table 1 details the proposed sample matrix for the Field Sampling Plan and Figure 2 depicts proposed sample locations.

Analytical results will be compared to SCGs defined in the Work Plan document. Figure 2 shows the three general Areas of Concerns (AOCs) recognized at this site. These AOCs consist of the following:

- The entire building complex with a cistern, six floor drains and two heating oil USTs (AOC 1)
- The active yard area including a reported former gasoline UST location and the Paint Lab (AOC 2) and
- The southern mowed pasture area containing a 1-car garage and the location of a former rail spur and warehouse (AOC 3).

This FSP was prepared using Section 3.0 of the DER-10 Technical Guidance for Site Investigation and Remediation (DER-10) as guidance and considering existing data already collected at the site.

2.0 PREPARATORY WORK

Prior to the implementation of the RI/IRM tasks, available site plans and any other available historic mapping will be reviewed to identify location of utilities on and near the site. These will be marked on site to limit occurrences of damage during intrusive site work and to identify potential utility conduit contaminant migration pathways.

The Call-Before-You-Dig hotline will also be contacted to assess site perimeter locations of utilities in the vicinity of planned excavations, borings and wells. Finally, a private utility markout firm will be utilized to mark out private and historic on-site utilities prior to conducting any ground intrusive activities.

3.0 SITE SURVEY

Sampling locations will be recorded by triangulation off building corners and other reference points, and shown on a site map following completion of the field sampling activities.

Groundwater elevations will be established from site wells based on existing survey elevation data (if available) and level run data to evaluate directions of groundwater migration.

4.0 GEOPHYSICAL SURVEY

The proposed geophysical survey is a non-invasive method to estimate whether unrecognized USTs or other subsurface anomalies remain on the site which may be contaminant sources. Chazen will use Ground Penetrating Radar (GPR) which is well-suited to identify shallow features, identifying subsurface anomalies ranging in depth from inches to tens of feet depending on the frequency of the GPR transmitter and geologic conditions. The range of penetration at this site will be limited by the shallow water table depth and by previously-noted heavy incidence of slab and other scrap residue comingled into the uppermost site soil horizon. Notwithstanding, the GPR survey may identify larger subsurface anomalies and Chazen has proposed broader site screening coverage than prior investigators. The southern portion of the site will be brush-hogged prior to conducting the GPR survey.

A GPR site screening will be conducted throughout AOC 2 and AOC 3 without site disturbance except for mowing of vegetation on AOC 3 to allow traversing of the site with the GPR equipment. The GPR screening will be performed by personnel walking over the subject area with portable electronic equipment. The GPR screen will be conducted in accordance with the procedures outlined in the QAPP.

5.0 VAPOR INTRUSION INVESTIGATION

The vapor intrusion investigation will be performed following field sampling techniques detailed in the NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006). The sub-slab data and indoor air quality data will be evaluated using the relevant decision matrices in the NYSDOH document.

More sub-slab vapor points are proposed than might be strictly suggested by the NYSDOH guidance document both because the site buildings consist of multiple building additions with potentially isolated foundation footings, but also because the sub-slab vapor samples will be used to assess whether environmental releases have occurred by six floor drains in the Main Building and Lab Building (AOC 1). One or more of these floor drains are the suspected source of TCE which has been detected in shallow groundwater during the Phase II site assessment in the vicinity of SB-2. Inspection of Figure 2 shows that the sub-slab vapor assessment samples are proposed near floor drains in the parts steam cleaning room on the southeastern area of the Main Building, in the warehouse area north of the parts steam cleaning room, in the eastern portion of the Main Building, in the degreasing room centrally located in the Main Building, and by a drain centrally located in the Lab Building.

Two indoor air quality samples will be collected in the Main Building and one in the Lab Building for review along with the sub-slab vapor data. The indoor air samples in the Main Building will be collected in the former parts steam cleaning area and in the former degreasing room. One outdoor air sample will be collected in an upwind direction to document ambient atmosphere conditions on the day of indoor and sub-slab sampling. All vapor and air quality samples will be analyzed for VOCs via EPA Method TO-15.

6.0 SOIL INVESTIGATION

Soil sampling will be performed as detailed in the Quality Assurance Program Plan (QAPP).

6.1 Soil Sampling Locations

Soil borings will be installed near previously-identified source areas, in the active yard area east and south of the Main Building (AOC 2), and across the southern vacant yard area (AOC 2) to further define known TCE impacts and to assess the degree of soil disturbance and historical structures. The purpose of the soil boring samples is to:

- 1) gather data on site geology,
- 2) delineate contamination,
- 3) identify or rule out other potential source areas and
- 4) gather data to support remedial decisions.

The TCE source area is currently identified near the southern-most margin of the Main Building based near former SB-2 (see Figure 2).

Geologic data will be gathered via collection of continuous soil samples (see Section 6.2 for details on planned drilling) from the proposed shallow borings. Existing data from the 2010 Phase II investigation indicate that clayey till is present beneath 18 inches of disturbed soil. The Phase II did not identify evidence of free-phase TCE and concentrations in shallow groundwater are not extreme, so no deep borings are warranted.

Contamination delineation of soil borings will be performed by field screening soil samples with a Photoionization Detector (PID) and then submitting critical samples for laboratory analysis (see Section 6.3 for details on planned screening and sampling). Samples collected from the following depths (i.e., vertical locations) will be submitted for laboratory analysis to assess the TCE impacts:

- top of groundwater and;
- where field screening indicates the highest level of impact.

If field screening does not identify VOC soil impacts, only one sample will be collected, at a location matching the top of groundwater (i.e., "smear zone") and for laboratory analysis. Laboratory analyses are presented in Section 6.3.4.

Soil sampling boring locations are shown on Figure 2 and described as follows.

- Four borings will be installed in the AOC-2 active yard area located east and south of the Main Building. These will be advanced to a maximum estimated depth of 12 feet below ground surface. These proposed borings are identified on Figure 2 as MW-1, MW-2, MW-3 and MW-5. The shallow borings will be finished as groundwater monitoring wells.
- Five borings will be installed in the AOC-3 southern vacant yard area south to characterize degrees of historic soil disturbance. These proposed soil borings are identified on Figure 2 as MW-6, SB-6, SB-7, and SB-8. The Boring names follow the sequence of borings advanced during the recent Phase II site assessment. Boring SB-6 is positioned along a historical on-site rail spur and SB-7 is situated at an historical coal storage/warehouse building. The maximum estimated depth of these soil sample borings is 8 feet.

- One soil boring will be installed in an upgradient location within the Main Building (AOC-1) and used for soil characterization as well as for installation of an upgradient shallow groundwater monitoring wells. The maximum anticipated boring depth is 12 feet.

6.2 Boring Installation

Soil borings will be advanced using a direct push rig. Continuous soil samples will be collected to characterize soil and obtain samples from each sample location. Methods described in the QAPP will be followed for the installation of borings. It is expected that the driller will have multiple tooling available for use. Field decisions will be made as to the most appropriate tooling to use at a given location to collect continuous soil samples.

Soil cuttings generated from each boring will be placed in labeled drums and handled in accordance with the QAPP.

6.3 Soil Sampling

This section describes soil field screening, sampling methods, and analytical analysis for contamination and remediation parameters. Methods described in the QAPP will be followed for the collection of soil samples.

6.3.1 Soil Sample Field Screening

Soil samples will be field screened for VOCs using photoionization detector (PID). The QAPP describes use of the PID screening method that allows for field quantification of VOCs.

6.3.2 Soil Sampling Method

In each boring, the soil sample with the most elevated field screening readings will be submitted for laboratory analysis. If there is evidence of contamination at multiple depths within a boring, additional samples may also be packaged for laboratory analysis but this eventuality is judged to be unlikely. If no impacts are identified through field screening, only one sample will be submitted for laboratory analysis, collected from the top of groundwater/smear zone.

Soil samples will be collected following applicable methods outlined in the QAPP. Representative soils will be placed in the appropriate jars for chemical testing, and detailed on Table 1. Samples that may be submitted for laboratory analysis will be placed immediately into laboratory-supplied jars. Sample containers will be labeled with the date and time of sampling, sample identification and site location and packed in a cooler with ice.

Table 1 outlines sample collection frequency, sample containers for each analysis.

6.3.3 Soil Sampling Parameters for Contamination Delineation

Soil samples will be packed on ice and shipped to a New York State Environmental Laboratory Approval Program (NYS ELAP) certified laboratory for analysis. Analyses will be performed on soil to evaluate soil quality and delineate contamination. These analyses are included in Table 1.

- Soil samples from all borings will be analyzed for TCL VOCs using EPA Method 8260.
- Soil samples from MW-1 will be submitted for the full target compound list (TCL) of contaminants to obtain representative soil data within the suspected source area. The full TCL list consists of VOCs via EPA Method 8260, SVOCs via EPA Method 8270, pesticides via EPA Method 8081, PCBs EPA Method 8082, and target analyte list (TAL) metals. This boring is also downgradient of the 10,000-gallon fuel oil UST.
- Soil samples from well MW-2, directly downgradient of the 500- or 1,000-gallon fuel oil UST will be analyzed for SVOCs via EPA method 8270, in addition to VOCs.
- Shallow soil samples from AOC 3 (MW-6, SB-6, SB-7, and SB-8) will be analyzed for SVOCs and TAL metals to assess degrees of shallow soil disturbance and any impacts from the historical rail line and coal storage/warehouse building.

Level B deliverables will be generated by the laboratory so that data are sufficient to make decisions regarding the need for further investigation.

6.3.4 Soil Sampling for Characterization of In-Situ Remediation Parameters

If significantly TCE-impacted soil must be left in place due either to building constraints, shallow groundwater depth or excavation depths, additional treatability analyses will be performed on one or more soil samples to assess remedial options. Because we judge it unlikely that these samples will be necessary, these analyses are not included in Table 1. The boring/depth of these samples will be determined in the field based on location (source or plume area), soil type, and extent of contamination.

- Iron analysis (via HACH 8146 for Ferrous Iron and EPA 200.7 for Ferric Iron) will be conducted. These analyses will be conducted on two soil types in the source area and on two soil types in the impacted area.

7.0 GROUNDWATER INVESTIGATION

This section describes sample locations and depths for the groundwater investigation, which are summarized in Table 1. Sampling will be performed following field sampling techniques detailed in the Quality Assurance Program Plan (QAPP).

7.1 Monitoring Well Locations

Monitoring wells installed in AOC 2 are situated east and south of the Main Building to allow delineation of TCE contamination and gather data to support remedial decisions. One upgradient well, MW-4, will be installed in AOC 1 and an additional, more southerly, downgradient well will be installed in AOC 3 near the southeastern site boundary (MW-6).

Additional information regarding the rationales for sampling in the source and east yard areas follows.

- 1) Contamination delineation will be performed by collecting groundwater samples and submitting them for laboratory analysis (see Section 7.3 for details on planned sampling).

Samples will be collected from both shallow and deep wells, if necessary. Groundwater from shallow wells (i.e., to an estimated maximum depth of 12 feet bgs) represents the impacted shallow groundwater horizon identified during the 2010 investigation. The TCE concentrations previously identified do not suggest the presence of free-phase solvent, so no deep groundwater monitoring wells are currently proposed.

- 2) Data to support remedial decisions will be collected by submitting selected groundwater samples for additional analysis (see Section 7.3.3 for details on planned sampling).

Locations of monitoring wells are shown on Figure 2 and described as follows.

- AOC 1- One shallow monitoring well (i.e., to an estimated maximum depth of 12 feet bgs) will be installed at the upgradient site margin and upgradient of the suspected TCE source area. This well will be placed inside of the Main Building near the southwestern wall and is identified on Figure 2 as MW-4.
- AOC 2- Four shallow monitoring wells (i.e., to an estimated maximum depth of 12 feet bgs) will be installed east and south of the Main Building in the active yard area. These wells are identified on Figure 2 as MW-1, MW-2, MW-3 and MW-5. Well MW-1 will be positioned near the suspected source area. Wells MW-3 and MW-5 will be positioned in locations adjacent to the eastern property boundary downgradient of the suspected source area and this will also be used to assess potential off-site impacts.
- AOC 3 – One shallow monitoring well (i.e., to an estimated maximum depth of 12 feet bgs) will be installed in the southern vacant yard area near the southeastern property boundary providing an additional downgradient data point near the eastern site boundary (MW-6).
- Should field screening of soil indicate the presence of free-phase solvent in any boring not currently proposed for conversion to a well (i.e., interior borings near floor drains and southern yard area borings), wells will be installed at these boring locations and added to the groundwater investigation.

7.2 Monitoring Well Installation

Well construction methods and materials are specified in the QAPP. Monitoring wells will be installed within soil boring annulus' and consist of 1- or 2-inch diameter Schedule 40 polyvinyl chloride (PVC) with 0.02-inch (20-slot) screen slot size. Well screens pre-packed with sand pack may be used. A 2-foot thick layer of bentonite will be installed above the top of any installed screen. Sand or native material will then be used to backfill the annular space above the bentonite.

The top 2 feet of each borehole will be finished as a monitoring well filled the surrounding annular space filled with a bentonite and concrete seal. A protective casing will be installed in concrete at the ground surface to prevent damage, provide security, and to provide a seal to prevent surface runoff from entering the well. The protective casing may be flush mounted or stick up above the ground depending on the location.

Following installation and prior to sampling, wells will be developed in accordance with the specifications outlined in the QAPP by purging approximately 10 well volumes of water until

temperature, pH, turbidity, and specific conductivity are stabilized. Development and purge water generated from each well will be placed in labeled drums and handled in accordance with the QAPP.

7.3 Groundwater Sampling

Prior to sampling, each groundwater monitoring well will be accessed and gauged with an “M scope” to determine the depth to groundwater. Gauging will be conducted at all wells prior to initiating any groundwater sampling or field-testing procedure. In so doing the gauging data will represent static conditions at a specific “moment in time.” All gauging data will be recorded in the sampler’s field book as outlined in the QAPP.

Following the gauging data collection, the wells will be purged to allow collection of representative groundwater samples. The purge method will be a low flow procedure designed to limit the drawdown inside the well. This low flow method minimizes the stress on the groundwater system by setting the intake velocity of the sampling pump to a flow rate that limits drawdown. Each monitoring well will be purged until temperature, pH, turbidity, oxidation reduction potential (ORP), and specific conductivity are stabilized as defined in the QAPP.

7.3.1 Groundwater Sampling Method

All groundwater samples will be collected following applicable methods outlined in the QAPP. Groundwater samples will immediately be placed into appropriate laboratory-supplied bottles for physical and chemical testing. The samples will be labeled with the date and time of sampling, sample identification and site location and then packed for shipment to the laboratory in a cooler with ice. Table 1 outlines sample collection frequency, sample containers for each analysis.

7.3.2 Groundwater Sampling Parameters for Contamination Delineation

Groundwater samples will be packed on ice and shipped to a NYS ELAP certified laboratory for analysis. Analyses will be performed on groundwater to evaluate groundwater quality and delineate contamination. These analyses are included in Table 1.

- Groundwater samples from all wells will be analyzed for VOCs using EPA Method 8260.
- Groundwater samples from the suspected source area well (MW-1, one downgradient area well (MW-3), and one well outside the known impacted area (MW-4), will be submitted for the full target compound list (TCL) of contaminants to obtain representative groundwater data throughout the source area and site. The full TCL list consists of VOCs via EPA Method 8260, SVOCs via EPA Method 8270, pesticides via EPA Method 8081, PCBs EPA Methods 8082, and TAL metals. MW-1 is also positioned downgradient of the 10,000-gallon fuel oil UST so sampling results can be used to assess the likelihood of any release from the 10,000 gallon fuel oil UST.
- A groundwater sample downgradient of the 500- or 1,000-gallon fuel oil USTs (MW-2) will also be analyzed for SVOCs.

Level B deliverables will be generated by the laboratory so that data are sufficient to make decisions regarding the need for further investigation.

7.3.3 Groundwater Sampling for Characterization of InSitu Remediation Parameters

If significantly TCE-impacted soil must be left in place due either to building constraints, shallow groundwater depth or excavation depths, additional analyses may be performed on shallow groundwater to assess remedial options. As these analyses are judged unlikely to be necessary, these analyses are not included in Table 1. Data are needed for the source area, impacted area, and up gradient and down gradient of the impacted areas. Very essential data needed for the source area consist of the following:

- Iron (via HACH 8146 for Ferrous Iron and EPA 200.7 for Ferric Iron), Manganese (EPA Method 200.7), Chloride (SM4500 Cl C,E), Sulfate/Sulfide (Sulfate by EPA 300.0, sulfide by EPA 9030/9034), Nitrate (Ion Chromatography [IC] Method E300), Alkalinity (SM2320B), and total organic carbon (Method 415.1) analyses will be conducted on the suspected source area well (MW-1), one downgradient area well (MW-3), up gradient well MW-5 and down gradient well MW-6.

8.0 INTERIM REMEDIAL MEASURES AND RELATED SAMPLING

Initial IRMs include the closure of the exterior 10,000-gallon fuel oil UST, interior 500- or 1,000-gallon fuel oil UST and the suspect "gasoline tank," if identified. Additional IRMs will include the closure of building floor drains; removal of dry wells, if identified; and excavation of impacted soil from UST and dry well areas, if encountered. Details of the IRMs are provided in the Section 6.6.1 of the RI/IRM Work Plan. IRM sampling is detailed below.

8.1 UST Excavation & Sampling

Following identification and removal of site USTs, subsurface soil and groundwater will be sampled as follows. Media samples will be collected following methods described in the QAPP.

- Soil samples will be collected from UST excavation side walls, one from each of the four sides of the UST. Sample locations will be biased towards visibly impacted soil.
- If groundwater is present in the UST excavation, a grab sample of groundwater will be collected and a soil sample will be collected from a 2-foot depth interval that captures 1' above to 1' below the water table interface.
- If groundwater is not present in the UST excavation, then one soil sample will be collected from the bottom of the excavation. In addition, the excavation will be extended in search of groundwater and one sample will be collected in the shallowest depth of unconsolidated saturated soil. Based on the 2010 Phase II, it is anticipated that groundwater will generally be encountered at approximately 8 feet below grade; therefore no excavation is likely to be extended much beyond 10 feet.

- Given the proximity of the 10,000-gallon UST to the Main Building and Lab Building, and the presence of the 500- or 1,000-gallon UST underneath the concrete slab within the Main Building, one soil sample at each location may need to be collected from beneath the UST piping extending from the tanks into building foundation areas. The depth interval of the piping sample will be approximately 0 to 0.5' beneath the piping, depending on site conditions. These samples are proposed in recognition that site constraints may block the ability to fully excavate and remove some of the pipe connection lines to these USTs.
- UST post-excavation samples will be analyzed for TCL VOCs and TCL SVOCs. These endpoint samples will not be subject to Level B laboratory analytical deliverables.
- Analytical data from the 2010 Phase II investigation collected from downgradient locations of these tank areas did not identify VOCs or SVOCs indicative of a petroleum release; however, soil borings and groundwater monitoring wells have been proposed on the presumed down gradient sides of each tank to further investigate the potential for VOC releases in addition to evaluating the extent of site TCE impacts. The borings and wells by the USTs will be sampled and analyzed for TCL VOCs, TCL SVOCs.

If the 10,000-gallon fuel oil UST located between the Main Building and Lab Building cannot be removed without destabilizing either adjoining building, it will be closed in place and subsurface sampling will be conducted via shallow soil borings. If this occurs, a boring will be advanced through the bottom of the tank to allow collection of an end-point sample in this manner. If the interior 500- or 1,000-gallon fuel oil UST cannot be removed from within the building due to equipment access limitations, or structural limitations, it will also be closed in place and similar subsurface sampling will be conducted via a shallow soil boring. Site conditions suggest soil borings can be successfully advanced within the buildings, but if limitations are encountered, these will be discussed with NYSDEC and alternate soil and groundwater sample locations will be identified. Soil sample depths and analyses for soil and groundwater samples would be the same as those presented for UST excavation samples.

8.2 Floor Drain System Closure Sampling

If sub-slab vapor data adjacent to floor drain locations identify no VOC impacts, floor drains will be simply sealed with cement by removing metal grates and filling the floor drain with a cement mix to prevent future use.

If sub-slab vapor data indicate VOC impacts next to the floor drains, then the floor around the drains will be saw cut so the full drain assembly can be removed. Any soil identified as contaminated on the basis of visual, olfactory or PID field screening will be excavated to end-point clean satisfaction, and close-out soil samples will be collected from beneath the drain for laboratory analysis of TCL VOCs, SVOCs, PCBs and TAL Metals. If contaminated floor drain soils are associated with a discharge pipe, it will be followed to an eventual discharge line, likely to be an on-site dry well. Any formal dry well will be removed in accordance with USEPA protocols for Class V UICs. Following identification and removal of a site dry well, subsurface soil and groundwater will be sampled as follows.

- A sample of liquid or sludge remaining in the dry well structure will be sampled for characterization of TCL VOCs, SVOCs, PCBs and TAL Metals.
- Soil samples will be collected from the dry well excavation side walls. Given that the likely capacity of on-site dry wells is less than 100-gallons, two composite sidewall samples will be collected for laboratory analysis. If impacts are encountered, then sample locations will be biased towards visibly impacted soil.
- If groundwater is present in the dry well excavation, a grab sample of the groundwater will be collected and a soil sample will be collected from a 2-foot depth interval that captures 1' above to 1' below the water table interface.
- If groundwater is not present in the dry well excavation, one soil sample will be collected from the bottom of the excavation. In addition, the excavation will be extended to a maximum depth of 10' bgs in search of groundwater and one sample will be collected of the shallowest depth of unconsolidated saturated soil.
- Dry excavation samples will be analyzed for TCL VOCs, TCL SVOCs PCBs and metals. These endpoint samples will not be subject to Level B laboratory analytical deliverables.
- If soil impacts are identified, a soil sample will be collected from the most impacted soil to confirm the dry well as a source area and will be analyzed for TCL VOCs, TCL SVOCs, PCBs and Metals. Impacted soils will be temporarily stockpiled on-site and a waste characterization sample(s) collected for analysis per the requirements of the selected disposal facility.

These Media samples will be collected following methods described in the QAPP.

If dry wells are identified inside the building beneath the concrete slab and cannot be removed, then they will be closed in place and subsurface sampling will be conducted via shallow soil borings. Limitations to drilling and excavating in the building interior will be discussed with NYSDEC, and soil and groundwater sample locations will be proposed after the dry well locations are confirmed. Sample depths and analyses for soil and groundwater samples would be the same as those presented for dry well excavation samples.

8.3 Suspect Cistern Investigation Sampling

A liquid sample will be collected from the suspected cistern centrally located in the Main Building in the electronics room. In addition, a sub-slab vapor sample will be collected adjacent to this structure.

The liquid sample will be analyzed for TCL VOCs, SVOCs, pesticides, PCBs and TAL metals. The sub-slab vapor sample will be analyzed for TO-15 VOCs.

If impacts are identified through liquid and vapor sampling, the structure may be permanently closed through excavation and in-place closure. Closure sampling will follow sampling protocol for a dry well.

TABLES

Table 1
Analytical Methods/Quality Assurance Summary Table
Former Packaged Lighting Systems, Inc.

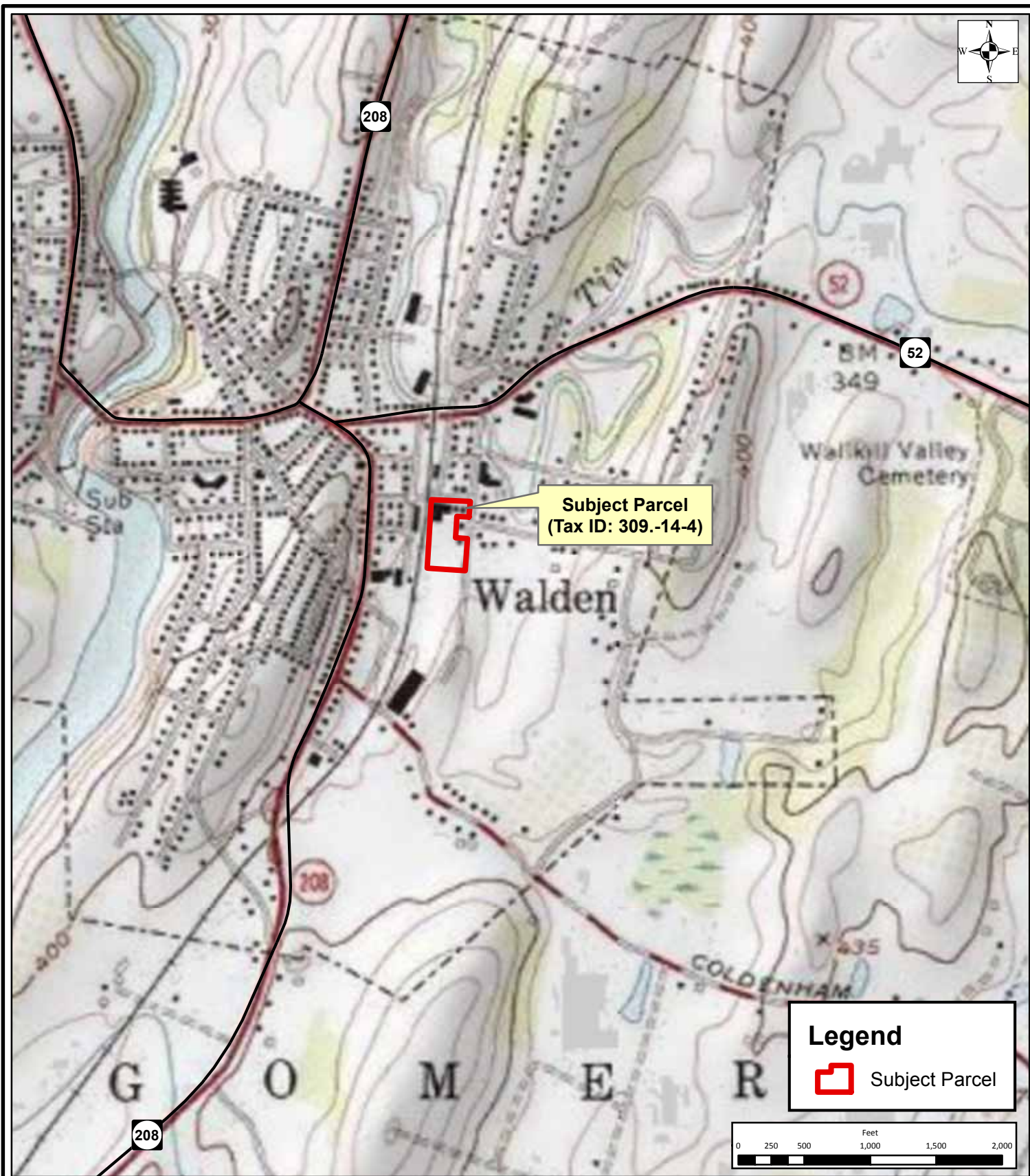
Area of Concern	Sampling Objective	TCL VOCs (8260) ¹	TCL SVOCs (8270) ^{1,2}	Pesticides (8081)	PCBs (8082) ³	TAL Metals ⁴	VOCs (TO-15)	Disposal Facility Characterization
AOC - 1	RI – Upgradient soil boring/monitoring well southwestern area of Main Building (MW-4)	1 soil 1 groundwater	1 soil 1 groundwater	1 soil 1 groundwater	1 soil 1 groundwater	1 soil 1 groundwater		
	IRM - 10,000-gallon Fuel Oil UST and piping closure ⁶	5 Excavation soil 1 Piping soil 1 Excavation groundwater	5 Excavation soil 1 Piping soil 1 Excavation groundwater					1
	IRM - 500- or 1,000-gallon Fuel Oil USTs and piping closure ⁶	5 Excavation soil 1 Piping soil 1 Excavation groundwater	5 Excavation soil 1 Piping soil 1 Excavation groundwater					1
	RI –Vapor Intrusion Assessment Supporting also 6 Floor Drain and Cistern Assessments						8 Sub-slab Vapor 3 Indoor Air 1 Outdoor Air	
	RI- Suspected Cistern	1 liquid	1 liquid	1 liquid	1 liquid	1 liquid		
	IRM – 6 Floor Drain Closures							TBD
AOC-2	RI -Active Yard Area East and South of Main Building (MW-1, MW-2, MW3- and MW-5)	4 to 8 soil 4 groundwater	2 soil 2 groundwater	1 soil 1 groundwater	1 soil 1 groundwater	1 soil 1 groundwater		
	IRM – Historical Gasoline UST closure (if identified) ⁶	5 Excavation soil 1 Piping soil 1 Excavation groundwater	5 Excavation soil 1 Piping soil 1 Excavation groundwater			5 Excavation soil 1 Piping soil 1 Excavation groundwater		
	IRM -Dry Wells (if identified)	3 to 4 excavation soil per excavation (up to 18 to 24 if six dry wells) Up to 1 excavation groundwater per excavation (up to 6 total if 6 dry wells)	3 to 4 excavation soil per excavation (up to 18 to 24 if six dry wells) Up to 1 excavation groundwater per excavation (up to 6 total if 6 dry wells)		3 to 4 excavation soil per excavation (up to 18 to 24 if six dry wells) Up to 1 excavation groundwater per excavation (up to 6 total if 6 dry wells)	3 to 4 excavation soil per excavation (up to 18 to 24 if six dry wells) Up to 1 excavation groundwater per excavation (up to 6 total if 6 dry wells)		Up to 6
AOC-3	RI -South Vacant Yard Area	5 soil 1 groundwater	5 soil 1 groundwater			1 soil		
Range of Primary Sample Quantities		34-71	31 to 64	5	11 to 35	9 to 42	12	3 to 9
Quality Assurance Samples ⁷								
Field Duplicates		2-3 soil 2 groundwater/liquid	2 to 3 soil 1 groundwater	1 soil 1 groundwater	1 to 2 soil 1 groundwater	1 to 2 soil 1 groundwater		
Trip Blanks		3-4						
Equipment Blanks		3	3	2	3	3		
Matrix Spike/Matrix Spike Duplicate		6-8	6 to 8	4	5 to 6	5 to 7		
Range of Sample Quantities (including QC)		49-91	43 to 79	13	21 to 47	19 to 55	12	3 to 9

Notes:

1. TCL = target compound list ; VOCs = volatile organic compounds
2. SVOCs = semi-volatile organic compounds
3. PCBs = polychlorinated biphenyls
4. TAL metals = target analyte list
5. TCLP = toxicity characteristic leaching procedure (for waste characterization). TCLP as used in this table includes the analysis for VOCs, SVOCs, pesticides, and metals for waste characterization.
6. If groundwater is encountered, excavation soil samples will be collected from excavation side walls from a 2-foot depth interval that captures 1' above to 1' below the water table interface. If groundwater is not encountered, then excavation side wall samples will be collected as will one soil samples from the bottom of the excavation. In addition, the excavation will be extended to a maximum depth of 12' bgs in search of groundwater and one sample will be collected of the shallowest depth of unconsolidated saturated soil. One sample will be collected from beneath tank piping.

7. Quality assurance field samples will be collected in accordance with the New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) at the following frequencies:
Field Duplicates – 1 field duplicate for every 20 samples collected.
Trip Blanks – 1 trip blank for each shipment of water samples for volatile organic compound analysis.
Equipment Blanks – 1 equipment blank per day, up to 3 maximum.
MS/MSD – 1 per matrix (2), 1 per 20 samples and 1 per every seven days of sampling (up to 2)

FIGURES



THE
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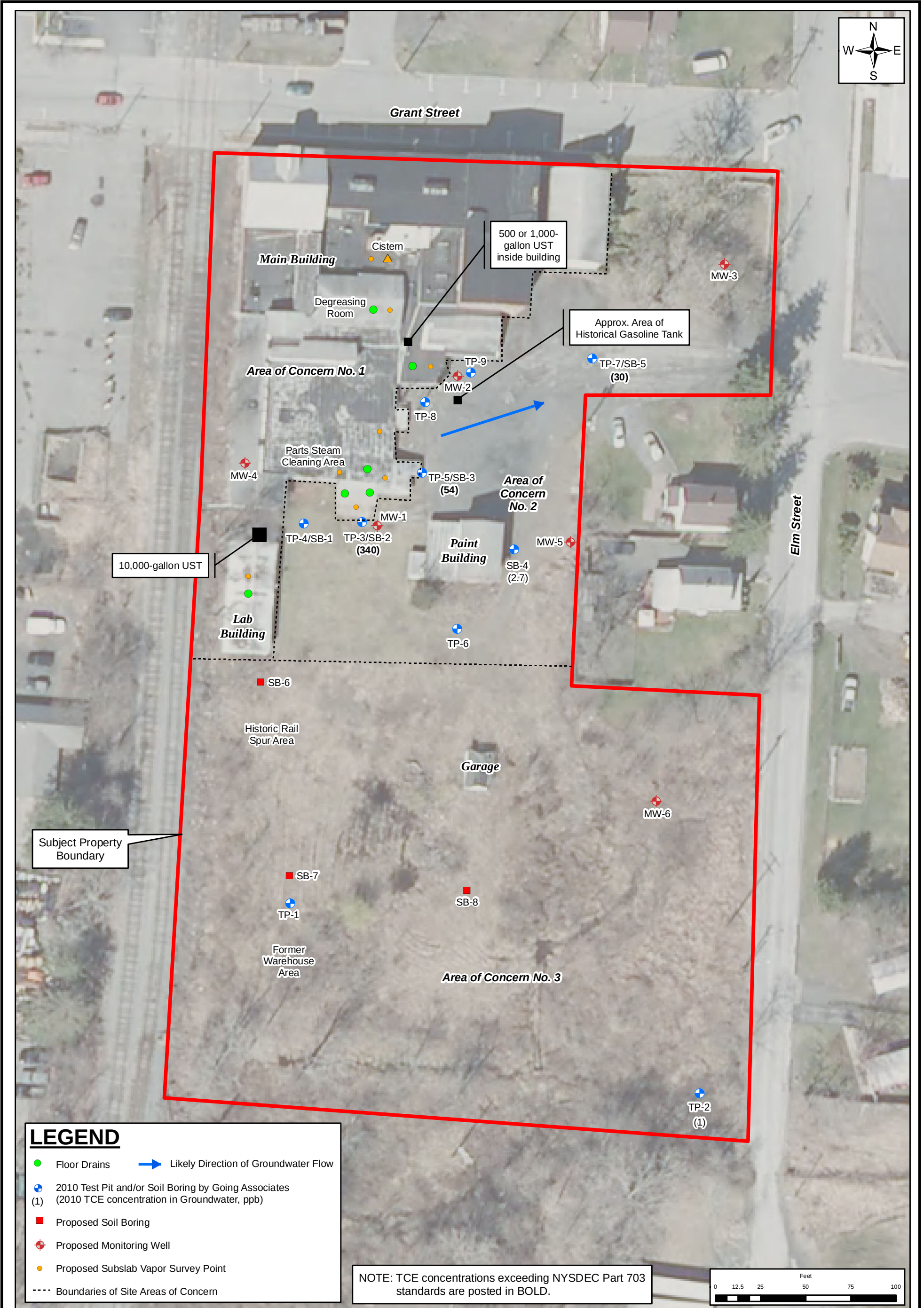
Former Packaged Lighting Systems, Inc. Site

Figure 1 - Site Location Map

29 Grant Street
Village of Walden, Orange County, New York

Source: U.S.G.S. Topographic Map Dated 1978, Photo Revised 1980: USGS Ref. Code: Walden - 41074-E2-TF-024; Village of Walden 2007 Tax Parcel Data; State of New York DOT 2008 Roads dataset.

Drawn:	EJO
Date:	October 2011
Scale:	As Shown
Project:	41115.00
Figure:	1



SOIL BORING LOG FORM

		21 Fox Street Poughkeepsie, NY 12601 Phn: (845) 454-3980 Fax: (845) 454-4026		PROJECT: LOCATION: CLIENT: PROJECT NO.:			Test Boring No.:																							
					Total Depth: 16 ft.																									
Contractor: Drill Rig: GeoProbe 54DT Driller: Inspector:				Start Date: 2/26/2011 Finish Date: 2/26/2011 El. Datum: G.S. Elevation:		Northing: Easting: Longitude: Latitude:		Borehole Dia.: 2.125 in. Water Depth: 10 ft. Rock Depth: NA ft. Well Depth: 15 ft.																						
Depth (Ft)	Elevation (Ft)	SPT Blows	Spoon No.	Recovery(in)	PID (ppm)	Groundwater	Group Symbol	Stratum and Field Descriptions:	Well Diagram	Field Notes, Well Notes, Comments:																				
1	-1		1							Benseal @ granular bentonite seal from 0 to 3.5' bgs. 1-inch diameter solid PVC riser from 0 to 5' bgs. No. 1 silica sand pack from 3.5 to 10' bgs. Native material collapsed into borehole 10 to 16' bgs. 1-inch diameter 0.010-slot PVC screen from 5 to 15' bgs. Bottom of Well: 15' bgs																				
2	-2																													
3	-3																													
4	-4		2																											
5	-5																													
6	-6																													
7	-7																													
8	-8		3																											
9	-9																													
10	-10																													
11	-11																													
12	-12		4																											
13	-13																													
14	-14																													
15	-15																													
16	-16																													
17	-17																													
18	-18																													
19	-19																													
20	-20																													
Boring terminated at 16' bgs, refusal not encountered. Groundwater encountered at approximately 10' bgs. NOTE: Following collection of the 12 to 16 foot interval soil sample, 2.5-inch diameter casing was driven to 15' bgs to permit well installation.																														
METHODS: HSA- Hollow Stem Auger, RWH- Rotary Wash, SSA- Solid Stem Auger, CPT- Cone Penetrometer, DP- Direct Push									DRILLING INFORMATION																					
SAMPLE TYPES: AS-Auger, WS-Wash, SS-Split Spoon, SC-Soil Core, RC-Rock Core, GS-Grab, ST-Shelby Tube, PS-Piston									Method: DP																					
STANDARD 1. Samples classified in accordance with ASTM D-2488 unless otherwise noted.									Sample Type: SC																					
NOTES: 2. Test Boring Log Page 1: 0 - 20 feet. Each subsequent page: Additional 25 feet.									<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th></th> <th>Casing</th> <th>Sample</th> <th>Core</th> </tr> <tr> <td>Type:</td> <td></td> <td>SC</td> <td></td> </tr> <tr> <td>Diam.:</td> <td></td> <td>1.5"</td> <td></td> </tr> <tr> <td>Weight:</td> <td></td> <td>NA</td> <td></td> </tr> <tr> <td>Fall:</td> <td></td> <td>NA</td> <td></td> </tr> </table>			Casing	Sample	Core	Type:		SC		Diam.:		1.5"		Weight:		NA		Fall:		NA	
	Casing	Sample	Core																											
Type:		SC																												
Diam.:		1.5"																												
Weight:		NA																												
Fall:		NA																												
ADDITIONAL 1. SAA = Same as Above																														
NOTES: 2. NOSOI = No Obvious Signs of Impacts																														
3. bgs = below ground surface																														

Appendix B

Quality Assurance Project Plan

Quality Assurance Program Plan

Former Packaged Lighting Systems, Inc.
Brownfield Cleanup Program
NYSDEC Site No. C336079

Village of Walden

October 2011



Prepared for:

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1.0 PROGRAM DESCRIPTION

This Quality Assurance Program Plan (QAPP) describes protocols and procedures necessary to ensure that specific tasks and actions undertaken by The Chazen Companies (Chazen) are planned and executed in a manner consistent with the Quality Assurance (QA) objectives. This QAPP also details responsibilities for compliance with these requirements.

The QAPP provides guidance and specifications for:

- Organizational structure within The Chazen Companies
- A method for determining Data Quality Objectives
- All routine calibration and sampling procedures conducted by The Chazen Companies
- Chain of Custody requirements and Analytical Procedures
- Data Reduction, Validation, and Reporting
- Internal Quality Control and Internal Auditing
- Specific Routines to Assess Data Quality
- Preventative Maintenance
- Performance Reporting

This document will support all work performed by Chazen in the areas of soil and groundwater Remedial Investigations, Interim Remedial Measures and Alternatives Analyses, environmental site audits, Remedial Design (RD) and long-term environmental monitoring.

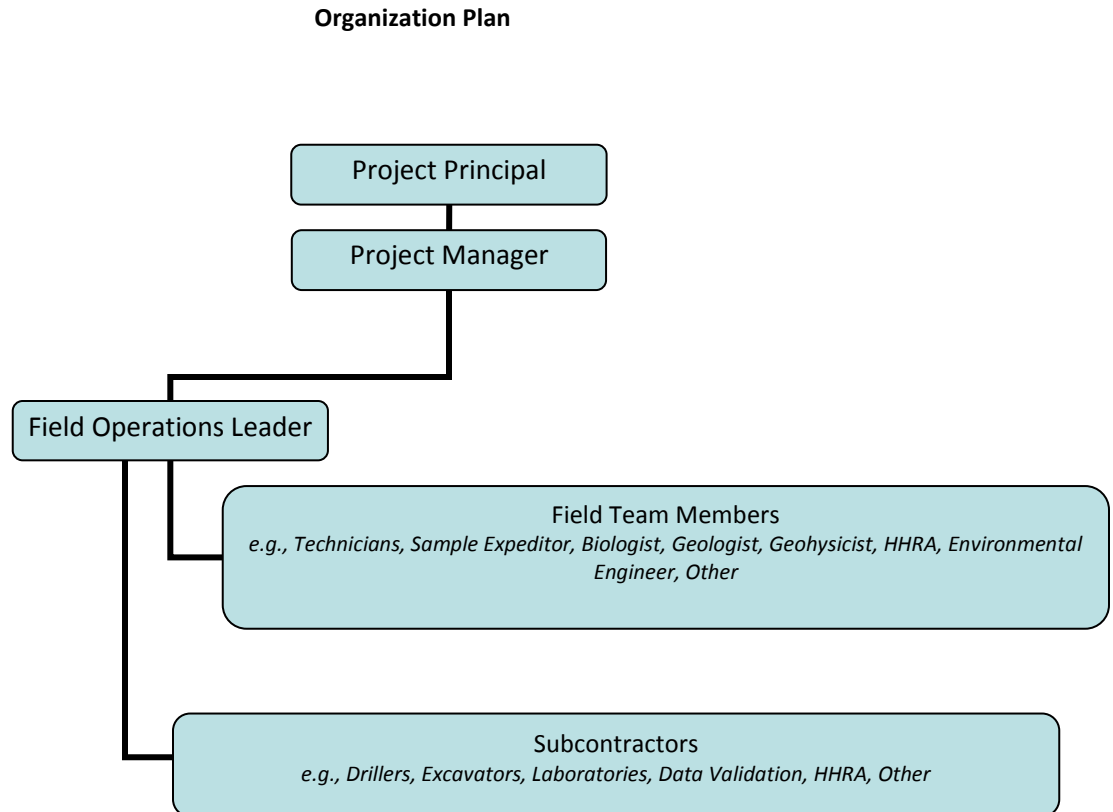
The format for this QAPP is based on “Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final”, 1988 (EPA/540/G-89/004), “Data Quality Objectives for Remedial Response Activities (Development Process)”, 1987 (EPA/540/G-87/003), and on “NYSDEC Technical and Administrative Guidance Memos” (TAGMs) including TAGM 4007 titled “Phase II Investigation Generic Work Plan”. Other TAGMs are referenced throughout the QAPP. The QAPP will also reference all portions of the Work Plan relevant to the particular site.

The QAPP is divided into 14 sections as described in the document “Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final”, 1988 (EPA/540/G-89/004).

2.0 PROGRAM ORGANIZATION

2.1 Company Organization

The Chazen Companies assigns a specialized team of experts to each project. These individuals act together to meet the needs of the project. Each project is assigned a Project Principal and Project Manager who oversee the components of the project. A typical organization chart is shown below.



2.2 Specific Responsibilities

Principals: Principals of The Chazen Companies are responsible for establishing a contract for the services to be performed, for committing the corporate resources necessary to conduct the program work activities, and for supplying corporate-level input for problem resolution.

Project Manager: The Project Manager is responsible for the management and quality of the project. The Project Manager is named in the Site Investigation Work Plan and may be the Director of Environmental Services or his/her designee (e.g. Assistant Project Manager). The Project Manager will be responsible for establishing protocols to be used during the investigation and remedial activities, and

establishing sampling methods. He will provide oversight and technical guidance during field activities and report preparation, maintain quality and consistency, and monitor the overall work progression.

The duties and responsibilities of the Project Manager include:

- General supervision of project execution to ensure that the project objectives are met on schedule and on budget.
- Assisting in project activities.
- Financial management.
- Identifying project staff, equipment, and other resource requirements.
- Conducting project progress meetings with the client and the technical reviewers.
- Final review of project deliverables prior to issue.
- Implementation of subcontracting, as required.

Field Operations Leader: The Field Operations Leader named in the Work Plan is usually a member of the Senior Environmental staff at The Chazen Companies and is responsible for the coordination and execution of the field activities, data reduction, and interpretation. Assigned responsibilities include:

- Organization of personnel, equipment, and materials to meet the objectives of the field tasks.
- Direction of field activities in accordance with the Work Plan and project QAPP.
- Coordination of subcontractor activities including verification and adequacy of subcontractor QA/QC programs.
- Assisting in project activities.
- On-going Quality Control (QC) during performance of work.
- Field and laboratory data reduction and interpretation.
- Execution of corrective actions for identified QA/QC problems.
- Supervision of field team.
- Supervision of deliverable preparation.

Technical Reviewer/Quality Assurance Manager: The Technical Reviewer(s) named in the Work Plan is (are) generally peer reviewers, the Director of The Chazen Companies or the managing Principal. Technical reviewers review field data and methodology and act as Quality Assurance Managers. The Technical Reviewer(s) will be responsible for the overview of tasks and procedures, which affect the quality of work performed during the investigation. The Technical Reviewer/Quality Assurance Manager is responsible for:

- Verification of the Quality Assurance Program through evaluation and overview of program tasks.
- Identification of problems affecting quality and recommending corrective actions.
- Reporting to the Project Manager on the status and adequacy of the overall QA program.
- Consultation on data analysis and interpretation.
- Technical review of the project.

Field Team Member: Field Team Members involved in the field investigation, geophysical survey, location and elevation survey, or other field activities are responsible for the on-site execution of planned field activities. Field team members named in the Work Plan are assigned responsibilities which may include:

- Completion of all field activities in accordance with the Work Plan.
- Field supervision of subcontractor activities.
- Monitoring of, and adherence to, health and safety requirements in accordance with the HASP during field activities.

2.3 Personnel Qualifications and Training

The Project Manager and the Quality Assurance Manager review the assignment of technical staff and the project management plan with regard to the appropriate qualifications in the technical areas relevant to the Project and any associated QC techniques. Training, if required, is specified and implemented prior to project start-up.

Site-specific training is provided to all members of the field team and includes:

- General briefings covering the QA program and Project plans;
- Detailed briefings on specific methods required by the Work Plan and QAPP;
- Specific briefings on individual QA and QC procedures and activities.

All employees of Chazen involved with hazardous waste investigations are required to attend an OSHA-approved 40-hour health and safety course prior to working on hazardous waste sites. In addition, these employees are required to annually attend an 8-hour refresher health and safety course and to participate in a medical surveillance program.

2.4 Analytical Laboratory and Other Support Services

The subcontractors for analytical services will be determined prior to the initiation of the field investigations. Data validation, if required, will be performed by The Chazen Companies or by a qualified firm.

The responsibility for implementing the laboratory QA Program resides with the laboratory subcontractor's Laboratory Analytical Task Manager. The Laboratory Analytical Task Manager is responsible for the following:

- Following the Project QC Plan.
- Supporting the Chazen Project Manager and Quality Assurance Manager.
- Maintaining sufficient instruments, space resources, and personnel to perform the analyses as necessary.
- Handling/receiving samples in a manner consistent with New York State and Federal guidance as outlined in the Work Plan/QAPP.
- Implementing corrective action to account for analytical problems or QC deficiencies.
- Maintaining appropriate instrument controls/calibration.
- Reviewing all sampling and analyses, instrument blanks, sample blanks, and other QA/QC information to ensure that it meets the desired quality standards.
- Providing QA/QC checks at the proper frequency and maintaining an awareness of the laboratory condition to detect conditions which might jeopardize controls of the various analytical systems (e.g. improper calibration, improper sample storage conditions, and equipment maintenance intervals).

- Providing in-house QC audit documentation for sample storage, labeling, preservation, transportation, and disposal in accordance with Analytical Services Protocol (ASP).

Consistent with New York State Department of Health's (NYSDOH) discontinuance of the Contract Laboratory Protocol (CLP) accreditation process, dated January 28, 2009, the selected laboratory is not required to be CLP-accredited.

3.0 QUALITY ASSURANCE OBJECTIVES

Quality Assurance (QA) is a management system that ensures that all information, data, and decisions generated during a site investigation or feasibility study is technically sound and properly documented. Quality Control (QC) is the functional mechanism through which the quality assurance objectives are achieved. The overall objective of the QA/QC program is to establish procedures such that data obtained from the field and laboratory analyses are of adequate quality to satisfy the project objectives.

3.1 Data Quality Objectives

Data quality objectives (DQOs) are stated qualitatively and quantitatively, where applicable, in the Work Plan for a site investigation or feasibility study. DQOs specify the required quality of data necessary to support decisions related to the program including site screening, characterization, assessment of health risk, and ultimately, to the remedial actions that may take place on a site.

The basis of DQOs is that the quality of data is dependent upon the intended use of the collected data. DQOs are established based upon site-specific conditions and project objectives and are applicable to all data collection activities.

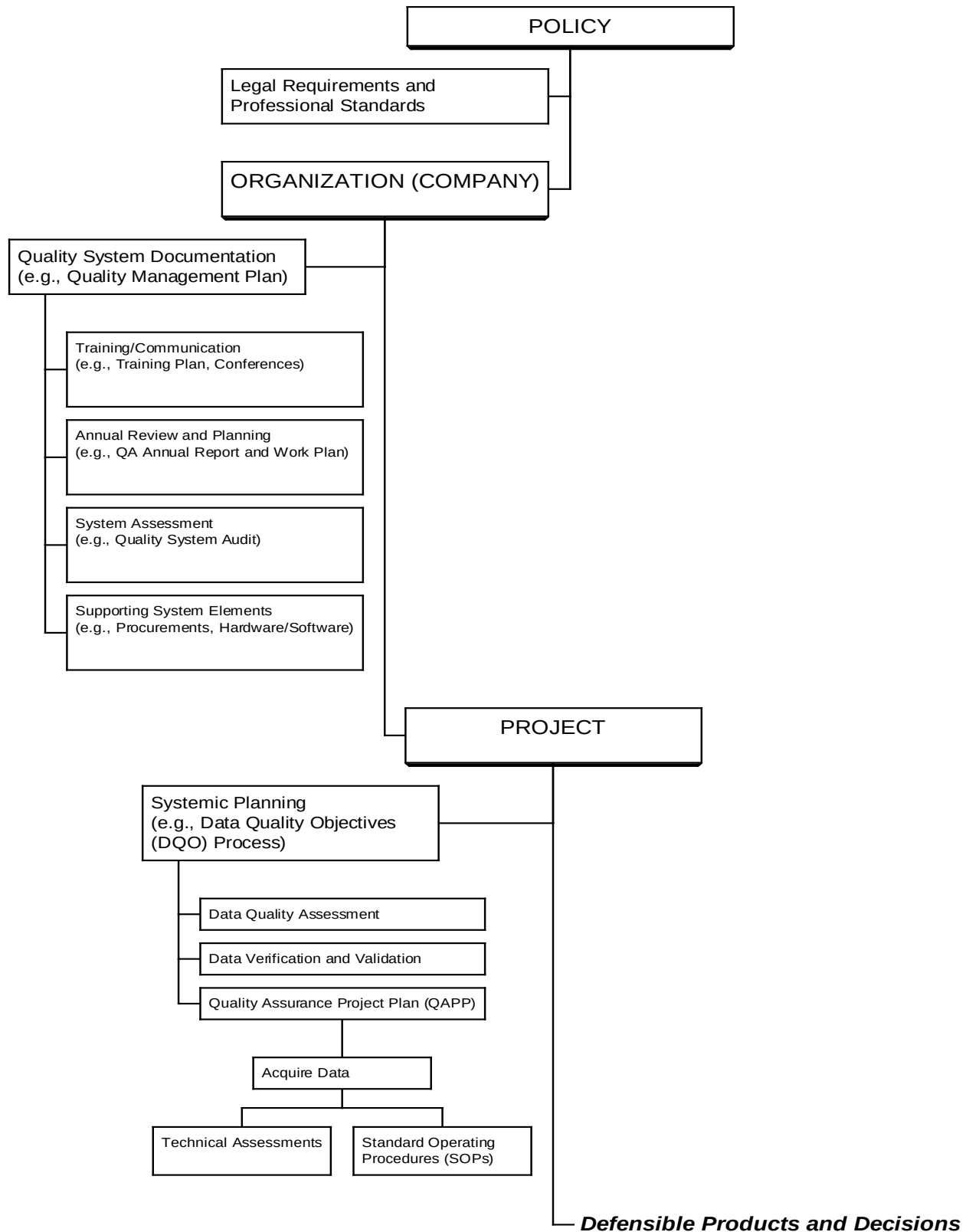
Data quality objectives are developed through an iterative process by which all the DQO elements are continually reviewed and re-evaluated to meet the overall project objectives. This process can be summarized as follows:

Stage 1: Defines the types of decisions which will be made during site remediation by identifying data users, evaluating available data, developing a conceptual model, and specifying goals for the project. Stage 1 results in a specific identification as to why new data are needed.

Stage 2: Identifies the data necessary to meet the objectives established in Stage 1. It also stipulates criteria for determining data adequacy. During Stage 2, sampling approaches and analytical options are evaluated to determine timely or cost-effective approaches.

Stage 3: Is the final design of the data collection program. The design of the data collection program results in the specification of the methods by which acceptable data will be obtained to make decisions.

QUALITY SYSTEM COMPONENTS AND TOOLS



3.2 Data Quality Characteristics

Data quality characteristics will be addressed as they pertain to a proposed investigation. Based on the DQOs selected, data will be assessed and evaluated for:

- Precision
- Accuracy
- Representativeness
- Completeness
- Comparability
- Reporting Limits

The manners in which these characteristics will be assessed and evaluated are described in the following sections.

3.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. The duplicate results for each precision check event will be compared to determine the range of the measurements as an indication of the precision associated with the measurement. In addition, the laboratory will analyze matrix spike/matrix spike duplicate samples to monitor the precision of the analytical methods.

Precision will be determined by calculating the relative percent differences (RPD) between the duplicate samples. The RPD for each sample will be calculated using the following equation:

$$\%RPD = \frac{D_1 - D_2}{\left(\frac{D_1 + D_2}{2}\right)} \times 100\%$$

where,

RPD Relative Percent Difference

D₁ First Sample Value

D₂ Second Sample Value (duplicate)

The RPD data will be used to evaluate the long term precision of the analytical/measurement methods. The laboratory will also calculate RPD values on the results of the matrix spike/matrix spike duplicate samples. These RPD values will be compared to RPD values provided in the current NYSDEC ASP protocols.

Procedures to be employed to maximize the precision of the data to be collected include:

- written methods and procedures documented in the project QAPP;
- multiple techniques will not be used to generate or collect the same data;
- all sampling and analytical personnel will be trained and required to follow the Work Plan and QAPP procedures;

- the Field Operations Leader will provide oversight during this investigation to monitor the adherence of project staff to these plans.

3.2.2 Accuracy

Accuracy measures the bias in a measurement system and is a determination of the closeness of the measurement to the true value. Sources of error include the physical sampling process, decontamination procedures, sample preservation and handling, homogeneity of the sample matrix, and sample preparation and analysis techniques used by the laboratory. Accuracy will be measured using blank and spike samples. The levels detected in the blanks and the difference between the reported and known concentrations for spikes will be used to assess the accuracy of the results.

The results of sample spiking will be used to calculate the Percent Recovery (%R), which will be used as the quality control Parameter for accuracy evaluation. Percent Recovery is calculated by the following equation:

$$\%R = \frac{\text{Observed Value}}{\text{Theoretical Value}} \times 100\%$$

Surrogate standard determinations will be performed on all samples and blanks. All samples and blanks will be fortified with surrogate spiking compounds before purging or extraction as specified in current USEPA SW-846 protocols.

Procedures employed to maximize the accuracy of the data to be collected include:

- written methods and procedures documented in the project FSP;
- all sampling and analytical personnel will be trained and required to follow the procedures specified in these plans, use of standard methods and known procedures to generate accurate data;
- adherence to strict decontamination procedures of sampling equipment;
- frequent calibration against known standards of field and laboratory equipment.

Calculations performed with analytical data are also checked for accuracy and precision by the Project Manager, Field Operations Leader or their designees, and reviewed by the QAM.

3.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent an analytical result from the matrix being sampled. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program.

Procedures employed to maximize the representativeness of the data to be collected include:

- written methods and procedures documented in the project FSP;
- avoiding use of multiple techniques to generate or collect the same data;
- all sampling and analytical personnel to be trained and required to follow the procedures specified in the project plans;
- Field Operations Leader to provide oversight during the investigation to monitor the adherence of project team members to these plans.

In addition, the sampling locations and number of samples to be collected (as specified in a Work Plan) will be selected to provide data representative of the media and potential contaminants of concern at locations where releases would be expected to be detected if present.

3.2.4 Completeness

Completeness is defined as the percentage of data collected judged to be valid and useful to the objectives of the project. Completeness is the amount of valid data obtained from a measurement system expressed as a percentage of the number of valid measurements that should have been (i.e., were planned to be) collected according to the Work Plan. The completeness objective will be 100% valid data for samples collected or analyzed. If this objective cannot be met due to unforeseeable problems, the problems will be addressed in the data usability report. Any data deficiencies will be evaluated in terms of their impact on project goals, and corrective action will be taken, if needed.

Procedures employed to maximize the usefulness and completeness of project data include:

- real-time field screening to focus on potential contaminant source regions;
- soils and groundwater samples for laboratory analysis for confirmation purposes;
- sample handling and shipping procedures which protect samples from breakage;
- communication with the laboratory to ensure their awareness of sample holding times;
- the availability of backup instruments or equipment for field measurements;
- collection of minimum-recommended sample volumes, which frequently include sufficient volume for re-analysis if a problem occurs in the laboratory;
- monitoring of field activities by the Field Operations Leader so as to allow for potential re-sampling or other measures to ensure that the required samples are collected.

3.2.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Methods will be employed during this investigation to ensure that the data generated can be compared to other relevant data sets of similar quality. The analytical results of QA/QC samples and internal laboratory QA/QC samples will be reported along with the results of field sample analyses. Standard sample analysis and reporting methods will follow NYSDEC ASP protocols.

3.2.6 Reporting Limits

Formulae for determining the reporting limits specific to each parameter analyzed are provided by the laboratory.

3.3 Quality Assurance Reports

The Quality Assurance Manager will prepare status reports to summarize QA/QC issues related to the collected data. The objective of the status report is to verify that the work being performed on the project adheres to all of the project plans, and that the collected data meet the previously described goals for precision, accuracy, and completeness.

3.4 Problem Resolution

The successful execution of a field investigation requires that a system be in place for reporting and responding to unexpected events as well as correcting problems or mistakes when they occur. The system described below includes internal systems for decreasing the risk of such occurrences and the procedures for reporting such events.

Procedures designed to minimize the possibility of problems throughout this project include:

- The use of standard methods
- Development of written project plans
- Team member supervision and training
- Project meetings
- Clear definition of the project objectives and team member responsibilities

To ensure that the approach to data collection is applied in a uniform manner, all project team members will be trained in the methodologies and procedures detailed in all project documents including the Work Plan, Field Sampling Plan (FSP), QAPP, and Health and Safety Plan (HASP). Copies of these plans will be available to all team members for individual use and reference. In addition, the Project Manager and Field Operations Leader will review these plans with the project team prior to the start of field activities.

Training in the use of the procedures required in the plans will be provided to all designated team members as determined necessary by the Quality Assurance Manager. The Project Manager and/or Field Operations Leader will hold regular project meetings with team members to communicate changes in procedures or scope; to discuss and assign upcoming tasks; to address potential problem areas in tasks yet to be conducted; and to communicate ways that past problems encountered in the project were remedied. These meetings will be scheduled by the Project Manager or Quality Assurance Manager, as necessary, during this investigation.

Should an event occur that cannot be readily resolved or appears to have gone unnoticed, the Project Manager will be notified. The project Quality Assurance Manager and the site owner may also be notified. The notification will include a completed Problem Resolution Form (PRF) (shown below).

PROBLEM RESOLUTION FORM NO. _____	
Originator: _____	Date: _____
Contract/Task Involved: _____	
Description of Event: _____ _____	
Sequence of Response Actions (Date, Person, Action Taken): _____ _____	
Description of Final Response: _____ _____	
Final Response Approved By: _____	
Project Manager: _____	Date: _____

The PRF will be available for use by all project team members. The user of the form will provide a mechanism for reporting and responding to specific events which require a more formal quality control review to ensure proper resolution of the problem.

The Project Manager and/or Quality Assurance Manager will be responsible for ensuring that each issue identified in a PRF is resolved. The Project Manager, after a review of the issue with the Field Operations Leader and Quality Assurance Manager, will work with the Field Operations Leader to assign responsibility for remedying the problem and for establishing procedures, if necessary, to ensure that the problem is not repeated. The steps of the problem resolution process are:

1. Identify and describe the event or problem
2. Investigate and determine the cause
3. Determine a response action to remedy the situation
4. Implement the response action
5. Monitor the effectiveness of the action to verify that the situation has been remedied

The PRF form is designed to document and track the resolution of the event from its initial reporting to the final solution. The form is completed by the person reporting the problem and includes a description of the event, possible cause(s), and recommended solution(s). The form will then be used to document the sequence of events resulting in an effective resolution. Final approval of the response action as described on the PRF will be documented by the signature of the Project Manager and Quality Assurance Manager.

Completed PRFs and copies will be maintained in the field office and in CHAZEN's project file for future reference. Copies of PRFs (if utilized) will also be forwarded to the client and to any affected regulatory agency, if warranted.

The analytical laboratory will also use a system for on-the-spot and formal problem resolution procedures. The specific laboratory procedures will be consistent with the requirements of USEPA-SW-846 and are defined in the laboratory's Quality Assurance Program Plan.

3.5 Data Quality Requirements

Site specific data requirements are presented in the Work Plan, FSP, or associated documents for a particular project or investigation. There are five general analytical levels of data quality. These levels are described as follows:

Level I: Field screening utilizing portable instruments. These data may include pH, temperature, and specific conductance measurements of water samples, and ambient air and soil screening measurements with photoionization, flame-ionization, O₂, lower explosive limit (LEL), or other meters.

Level II: Field analyses utilizing more sophisticated portable analytical instruments. These instruments may be set up in a mobile laboratory on site. There is a wide range in the quality of data that can be generated. Data quality depends on the use of suitable calibration standards, reference materials, sample preparation equipment, as well as the training of the operator. Results from Level II data are available in real-time or within several hours of sample collection.

Level III: These data include analytical laboratory data utilizing USEPA-approved procedures. All analyses are performed in an off-site analytical laboratory following SW-846 protocols. Level III is characterized by rigorous QA/QC protocols and documentation.

Level IV: Analytical laboratory analysis supported by a rigorous QA program and documentation. These data are typically used for definitive site characterization, risk assessment, engineering alternative selection and design, and litigation activities. Level IV methods may include pre-approved non-standard methods for specific constituents or detection limits. All analyses are performed in an off-site analytical laboratory.

Level V: These data include physical property and engineering material analysis by approved standard or non-standard methods including analysis of non-standard sample matrices (e.g. wastes, biota). All analyses are performed in an off-site laboratory. The following table presents a summary of analytical levels appropriate to data uses.

Summary of Analytical Levels Appropriate to Data Uses

<i>Data Uses</i>	<i>Analytical Level</i>	<i>Type of Analysis</i>	<i>Limitations</i>	<i>Data Quality</i>
Site Characterization. Monitoring during implementation.	Level I	Total organic and inorganic vapor detection using portable instruments, Field test kits	Instruments respond to naturally occurring compounds	If instruments are calibrated and data are interpreted correctly, can provide indication of contamination
Site Characterization. Evaluation of alternatives. Engineering design. Monitoring during implementation.	Level II	Variety of organics by GC; Inorganics by AA; XRF Tentative ID; Analyte-specific; Detection limits vary from low ppm to low ppb	Tentative ID Techniques and instruments mostly limited to volatiles, metals	Dependent on QA/QC steps employed. Data typically reported in concentration ranges.
Risk assessment. PRP determination. Site characterization. Evaluation of alternatives. Engineering design. Monitoring during implementation.	Level III	Organics and inorganics using EPA Procedures can be analyte specific RCRA Characteristics tests	Tentative ID in some cases Can provide data of same quality as Levels IV, NS	Less rigorous QA/QC
Risk assessment. PRP determination. Evaluation of alternatives. Engineering design.	Level IV	HSL organics and inorganics by GC/MS; AA; ICP Low ppb detection limits	Tentative identification of non-HSL parameters. Some time may be required for validation of packages	Goal is data of known quality. Rigorous QA/QC.
Risk assessment. PRP determination.	Level V	Non-conventional parameters. Method specific detection limits. Modification of existing methods. Appendix 8 parameters	May require Method Development or Modification. Mechanism to obtain services requires special lead time.	Method specific

Reference: EPA Document No. 540 G-87 003, 1987, "Data Quality Objectives for Remedial Response Activities"

4.0 ENVIRONMENTAL SAMPLING / TESTING PROCEDURES

An essential aspect of any field investigation is assurance that sample collection is conducted in a manner that will provide high-quality, representative data. This section of the QAPP provides a description of sampling techniques, procedures, and equipment used during field sampling programs. These techniques and procedures conform to guidelines outlined in the EPA document "A Compendium of Superfund Field Operations Methods", and with NYSDEC Technical and Administrative Guidance Memorandum (TAGM) Nos. 4007, 4008, 4015, 4019, 4032, and 4051 and others, where applicable.

4.1 Site Specific Sampling and Testing Rationale

The Work Plan provides the sampling rationale for every investigation, including the rationale for the following tasks:

- sampling of environmental media,
- determination of constituents to be measured in each environmental media,
- sampling locations,
- sample depths and types,
- number and frequency of samples to be collected.

The specific details of a field investigation such as sampling locations, target depths, analytical methods, and a reference map are detailed in the project Work Plan.

4.2 Documentation

During the implementation of any investigation, field activities will be documented in field log books. The field log book is a controlled document, which records all major on-site activities during the investigation. The log book is a bound notebook with pages that cannot be removed without cutting or tearing pages. Each page of the log book will be numbered consecutively and signed at the bottom of the page with the signature or initials of the person who completed the page. All entries will be made in ink and errors crossed-out with a single line and initialed and dated.

Field data for all tasks completed during this field program, as well as general observations, pertinent conversations, and unexpected occurrences will be documented in field log books. At a minimum, the following information will be recorded:

- Names of personnel on-site (including all subcontractors);
- Date and time of arrival and departure;
- Daily objectives;
- Site name, location, and project number;
- Field observations;
- Weather conditions;
- Site sketch with description of sampling points;
- Health and Safety monitoring data;
- Field calibration, decontamination procedures, and performance frequency;
- Well bailing or pumping procedure and equipment;
- Well specifics including static water level, depth, and volume of water removed;

- Type and quantity of monitoring well construction materials used;
- Surveying data;
- Sample identification numbers;
- Sample point names and descriptions;
- Sample collection procedures and equipment;
- Sample preservation used;
- References to maps or sketches of the sampling site;
- Results of any field measurements, such as pH, water temperature, specific conductivity, and field screening results;
- Notes on conversations with site personnel, observers, or subcontractors;
- Problems encountered and the manner of their resolution;
- General observations that may support the data; and
- Summary of daily activities completed.

4.3 Pre-Sample Planning

The quality of sample collection is maintained by specifying the technique used for both the medium/matrix to be sampled and the analytes of interest. For example, groundwater samples intended for SVOC analyses are collected in amber glass containers; groundwater samples for VOC analyses are collected in Teflon-capped glass vials with “zero” headspace to minimize diffusive and evaporative losses; and groundwater samples for inorganic analyses are collected in polyethylene bottles. Sample containers provided by the analytical subcontractor are prepared in a manner consistent with USEPA protocol.

Acquisition of environmental samples also requires specialized techniques to preserve sample integrity and to ensure that a representative portion of the source is collected. Media-specific sample collection techniques and sample preservation are specified in the following sections. Field programs are designed and implemented using the EPA’s “Compendium of Superfund Methods”, NYSDEC Sampling and Analysis Protocols, and NYSDEC TAGMs 4007, 4008, 4015, 4019, 4031, 4032, 4046, 4048, and 4051 as primary references.

4.3.1 Sample Labels and Records

Sample labels will be prepared using a pre-determined labeling system. Each sample may require several containers depending on the intended analysis to be performed. At the time the sample is collected, a sample data record sheet and field logbook entries will be completed. The sample documentation may include:

- A plan of the site with the sample location and sample numbers indicated
- A description of the sample site
- Physical descriptors of the sample site, if appropriate (e.g., stream width, groundwater depth, etc.)
- Photographs of the sample site showing the sampling equipment and/or unusual conditions (orientation of photograph must be shown on sketch map, and photo number recorded in field notebook)
- Chain of Custody documentation (see Section 5)

Identification of samples collected during the field investigation will be accomplished using alphanumeric Sample Identification codes indicating sample type, sample identification, depth of sample (if applicable), and designation of duplicate samples. An explanation of the Sample Identification codes system for soil, groundwater, and sediment samples is shown below:

Sample Identification Code System

Digits	Identification	Description	Code/Example	
1, 2	Site Code	Two letter code to identify the site	DS	Dutchess Steel
3, 4	Sample Type	Two letter code to identify sample media	SB	Test Boring Soil Sample
			SS	Surface Soil
			BW	Screened-auger Groundwater Sample
			MW	Monitoring Well Groundwater Sample
			SW	Surface Water
			SD	Sediment Sample
			TB	Trip Blank
			EB	Sampler Blank
			SV	Sub-Slab Vapor Sample
			TP	Test Pit Soil
			PW	Test Pit Water
			WT	Waste Sample
			DL	Drum Liquid
			DS	Drum Solids or Sludge
			IA	Indoor Air Sample
			OA	Outdoor Air Sample
			GP	Geoprobe® Soil Sample
			CD	Septic System/Sump Sludge Sample
			CL	Septic System/Sump Catch Basin Liquid Sample
			CB	Catch Basin/Storm Drain Sediment Sample
5, 6, 7	Sample Locator	Three numbers to identify sample site name or location	MWX22	Monitoring Well Groundwater Sample from Well 22
8, 9, 10	Depth of Sample Below Reference Surface		SB-XX0	SB samples collected from 0 to 2 feet below ground surface (bgs)
			SB-XX1	SB sample depth is assumed to be the top of a 2-foot, split-spoon sample
			X25	MW sample depth is assumed to be the bottom of the well screen measured in feet bgs
			128	All samples obtained from the ground surface or from drums or containers will be designated XXX
11, 12			XX	Duplicates will periodically be sent to the lab with the XX designation to preserve duplicate anonymity, according to Section 9.2.
			XF	Sample collected for field analysis or future reference

			XD	Duplicate sample
			MS	Matrix spike
			MD	Matrix spike duplicate
			XS	Laboratory split sample

4.3.2 Sample Container Requirements and Sample Preservation

Sample integrity will be maintained by using special containers and preservation methods keyed to both the medium/matrix to be sampled and the analytes. Sample containers and preservation methods specified in NYSDEC protocols are summarized in the table below. Any changes to these protocols required by a Specific project will be detailed in a site-specific Work Plan.

4.3.3 Preparation of Sample Containers

Sample containers will be provided by the laboratory and are prepared according to USEPA protocols. The bottles will be equivalent to I-Chem series 300. QC records for the bottles used will be maintained by the laboratory. The preparatory procedures used by the vendor providing the laboratory with sample containers are detailed below.

4.3.3.1 Volatile Organic Analyte (VOA) Containers

(40-mL glass vials and 2-oz or 4-oz glass jars)

1. Wash vials, septa, and closures in hot tap water with laboratory grade non-phosphate detergent.
2. Rinse three times with tap water.
3. Rinse three times with ASTM Type II water.
4. Oven dry vials, septa, and closures.
5. Remove vials, septa, and closures from oven.
6. Place septa in closures, Teflon side down, and place on vials. The attendant must wear gloves and the vials cannot be removed from the preparation room until sealed.

4.3.3.2 Semi-Volatile Organic Analyte (SVOA) Containers

(1-liter amber glass bottles and 4-ounce glass jars)

1. Wash containers, closures, and Teflon® liners in hot tap water with laboratory grade non-phosphate detergent.
2. Rinse three times with tap water.
3. Rinse with 1:1 nitric acid.
4. Rinse three times with American Society for Testing and Materials (ASTM) Type II water.
5. Rinse with pesticide-grade methylene chloride.
6. Oven dry.
7. Remove containers, closures, and Teflon® liners from oven.
8. Place Teflon liners in closures and place closures on containers. The attendant must wear gloves and the containers cannot be removed from the preparation room until sealed.

4.3.3.3 Metals Containers

(1-liter, 500, 250, 120 and 60-milliliter (mL) clear and 1-liter amber polyethylene bottles)

1. Wash bottles, closures, and Teflon[®] liners with hot tap water and laboratory grade non-phosphate detergent.
2. Rinse three times with tap water.
3. Rinse with 1:1 nitric acid.
4. Rinse three times with ASTM Type II water.
5. Air dry in contaminant-free environment.
6. Place liners in closures and place closures on bottles. The attendant must wear gloves and the bottles cannot be removed from the preparation room until sealed.

4.3.3.4 Sample Preservation

Samples are preserved according to the protocol established for the selected analytical method. Unless the proper sample container preparation and sample preservation measures are taken in the field, sample composition can be altered by contamination, degradation, biological transformation, chemical interactions, and other factors during the time between sample collection and analysis.

Steps to maintain the in-situ characteristics required for analysis may include storage of samples at 4°C, pH adjustment, and chemical fixation. Specific sample and container preservation requirements are detailed in Table 3 above. Where pH adjustment is performed, the pH will be checked in the field with pH paper to ensure the required pH level is achieved. If pre-preserved sample containers are provided by the laboratory, extra preservation material should be available in the field in case it is needed to achieve the target pH.

Table 3 - Summary of Required Containers, Preservation Requirements and Holding Times

Parameter	Matrix	Required Container	Minimum Volume Required for Analysis	Preservation Technique	Holding Time (2)
Volatile Organics (3)	Water	Glass vials with Teflon faced septa and screw cap. (Two 40 ml vials per sample)	50 ml	Cool (4°C) Preserved with acid (HCl to pH<2)	7 days
	Soil	2-2oz or 1-4oz wide-mouth glass jar with Teflon-lined cover.	10 grams	Cool (4°C)	7 days
Semi-Volatiles, Pesticides, PCBs (3), or Total Petroleum Hydrocarbons	Water	1-L Amber glass jar with Teflon lined screw cap.	1,000 ml (1 Liter)	Cool (4°C)	Extraction within 5 days of sampling. Analysis within 40 days of extraction
	Soil	8-oz wide mouth glass jar with Teflon-lined cover	50 grams	Cool (4°C)	Extraction within 5 days of sampling. Analysis within 40 days of extraction
Metals (Total and Dissolved) (1) (4)	Water	Polyethylene bottle (one 1 L bottle)	100 ml	(Dissolved metals only - field filtered using 0.45 micron filter) Cool (4°C) Preserved with acid (HNO ₃ to pH<2)	180 days
	Soil	8-oz wide mouth glass jar with Teflon-lined cover	10 grams	Cool (4°C)	180 days
Total Petroleum Hydrocarbons Fingerprint Analysis	Water	Glass jar with Teflon lined screw cap (one 1 L bottle)	1,000 ml (1 Liter)	Cool (4°C)	28 days
	Soil	8-oz wide mouth glass jar with Teflon-lined cover	50 grams	Cool (4°C)	28 days
Total Cyanide	Water	Polyethylene bottle (one 1 L bottle)	100 ml	Cool (4°C) Preserved with base (NaOH to pH>12)	180 days
	Soil	8-oz wide mouth glass jar with Teflon-lined cover	10 grams	Cool (4°C)	12 days
Mercury (Total and Dissolved)	Water	Polyethylene bottle (one 1 L bottle)	100 ml	(Dissolved metals only - field filtered using 0.45 micron filter) Cool (4°C) Preserved with acid (HNO ₃ to pH<2)	26 days
	Soil	8-oz wide mouth glass jar with Teflon-lined cover	10 grams	Cool (4°C)	26 days
Biochemical Oxygen Demand	Water	Polyethylene bottle (one 1 L bottle)	100 ml	Cool (4°C)	24 hours
Bicarbonate	Water	Polyethylene bottle (one 1 L bottle)	100 ml	Cool (4°C)	14 days
Carbonate	Water	Polyethylene bottle (one 1 L bottle)	100 ml	Cool (4°C)	14 days
Chemical Oxygen Demand	Water	Polyethylene bottle (one 1 L bottle)	100 ml	Cool (4°C) Preserved with acid (H ₂ SO ₄ to pH<2)	26 days
Chloride	Water	Polyethylene bottle (one 1 L bottle)	100 ml	None Required	26 days
Sulfate	Water	Polyethylene bottle (one 1 L bottle)	100 ml	Cool (4°C)	28 days
Total Dissolved Solids (TDS)	Water	Polyethylene bottle (one 1 L bottle)	100 ml	Cool (4°C)	7 days
Total Suspended Solids (TSS)	Water	Polyethylene bottle (one 1 L bottle)	100 ml	Cool (4°C)	5 days

Reference: EPA Document No. 540 P-87 001, 1987, "A Compendium of Superfund Field Operations Methods"

NOTES: (1) Metals analysis will be conducted on unfiltered samples. If filtered samples are analyzed, unfiltered samples must also be collected and analyzed. If turbidity presents a problem, the samples will be handled according to NYSDEC "Guidelines for Handling Excessively Turbid Samples" following approval by the Division of Hazardous Waste Remediation (DHWR). (2) Holding times are calculated from VTSR (Verified Time at Sample Receipt). Samples must be received by the lab within 48 hours of collection. (3) TCL = Target Compound List. (4) TAL = Target Analyte List.

4.4 Decontamination Procedures

Standardized procedures for decontamination have been established to reduce the likelihood of cross-contamination between samples and sampling locations. Equipment to be decontaminated includes: backhoes, drilling equipment, and sampling equipment.

All decontamination procedures will comply with the personal protection requirements detailed in the site Health & Safety Plan (HASP). Personal protection levels will depend on the nature of the contamination and the specific decontamination method. Specific decontamination methods for exploratory and sampling equipment are described in the following sections.

4.4.1 Heavy Equipment

Heavy equipment such as drill rigs and backhoes may need to be steam cleaned with a portable high pressure steam cleaner upon arrival at the site and prior to demobilization. During the course of investigation activities, it is only necessary to decontaminate equipment that comes in contact with soils and/or groundwater (i.e., drill rods, bits, backhoe bucket, etc.).

Prior to initiation of drilling activities at the site, a temporary steam cleaning area will be established, if necessary, for the decontamination of the drill rig and associated tools and augers. When selecting the steam cleaning location, the following items will be considered:

- Free from traffic;
- Away from any proposed test boring or monitoring well locations;
- Readily accessible to the investigation area; and
- Free of known surficial contamination.

The decontamination area will consist of a controlled area or structure to contain all wash water and eliminate the possibility of drilling equipment coming in contact with the underlying surficial soils and/or pavement during steam cleaning. Site-specific decontamination area construction requirements may be detailed in the Work Plan.

All equipment will be placed on clean pallets or racks prior to and after steam cleaning. Potable water will be used for the steam cleaning activities. The equipment to be steam cleaned includes: drill rods, augers, bits, tools, and split-spoon samplers. Decontamination wastewater and soils will be initially drummed into 55 gallon steel containers or other appropriate holding vessels pending laboratory analyses.

4.4.2 Drilling Equipment

Drilling equipment that is exposed to soil and/or groundwater will be steam cleaned between sampling locations. The purpose of this decontamination is to ensure that potential contaminants are not transferred between sampling locations.

4.4.3 Sampling Equipment

Contaminated tools and sampling equipment will be placed in a plastic pail, tub, or other container with a Liquinox[®] (or equivalent) soap and water solution. The tools will be brushed off, rinsed, and

transferred to a second soap and water solution bath. Tools will be rinsed with potable water and finally rinsed with de-ionized water. Tools such as wrenches, split-spoons, etc., may be decontaminated between exploration locations with a high-pressure steam cleaner instead of washing. Sampling equipment such as reusable bailers or submersible pumps will be wrapped in aluminum foil after cleaning to prevent contamination before their next use. Control and disposal of decontamination fluids are discussed in Section 4.4.4

4.4.4 Control and Disposal of Decontamination Materials

In general, The Chazen Companies is responsible for collecting, controlling, and staging hazardous material generated during field investigations. Disposal arrangements will be made for the client, if required, for particular work assignments. Specific procedures for handling contaminated environmental materials and contaminated personal protective equipment will be presented in the Work Plan and/or the HASP.

Contaminated soil and water will be handled according to NYSDEC TAGM 4032 and TAGM 405 (draft) unless otherwise specified in the Work Plan. These documents describe alternatives for disposal of these materials and requirements for handling.

4.4.4.1 Soil Disposal

NYSDEC TAGM 4032 on disposal of drill cuttings distinguishes between soils from inactive hazardous waste sites (IHWS) and soils from investigations near or adjacent to inactive hazardous waste sites. On-site soils from IHWS are presumed to be hazardous while soils from areas off-site are presumed to be non-hazardous, pending results of waste characterization analyses.

Alternatives for on-site disposal of non-hazardous soils include:

- Backfill inside borehole;
- Collect and dispose on-site;
- Temporarily store on-site prior to off-site disposal;
- Transport from off-site areas to site (without need to manifest or contract with licensed hauler).

Hazardous soils can be sent off site for disposal to a properly permitted treatment, storage, or disposal facility, and non-hazardous soils can be sent to a solid waste management facility. Representative samples of materials will be analyzed for proper classification, treatment, and disposal. Materials will be transported by a licensed hauler and accompanied by the proper manifests.

Disposal alternatives are subject to precautions listed in the TAGM 4032 including the general requirement that the soils “be handled and disposed of in a manner that does not pose a threat to health and the environment”. Specific handling and disposal requirements for drill cuttings will be identified by the Field Operations Leader based on field screening and analytical results of drill cutting samples, if applicable.

4.4.4.2 Groundwater Disposal

The control of contaminated groundwater is important to prevent impacts to surficial soils. Five alternatives for the disposal of groundwater generated during remedial investigations at hazardous or petroleum impacted sites are generally recognized and are provided below:

- Transportation off-site to an authorized Resource Conservation and Recovery Act (RCRA) treatment facility;
- Discharge to a sanitary sewer for treatment at a publicly-owned treatment works (POTW);
- On-site treatment and discharge to a storm sewer, receiving stream, or to the ground;
- Transport by truck to a POTW;
- On-site disposal by allowing water to infiltrate into the ground.

In order to determine the proper disposal option for groundwater generated during monitoring well development and purging, the water will be containerized pending the receipt of laboratory analysis. The preferred method of disposal of non-impacted groundwater is to the ground surface away from the well, or if allowed, to a storm sewer or a surface water body. Disposal of impacted or non-impacted water to a POTW or other disposal facility will require authorization from the receiving facility. Overall, handling and disposal of collected groundwater will be identified by the Field Operations Leader and approved by the DEC project manager based on field screening and analytical results of water samples.

4.4.5 Sample Handling/Shipping Areas

Sample containers will be wiped clean at the sample site, taken to the decontamination area to be further cleaned, as necessary, and transferred to a clean carrier. The sample identities will be checked off against the COC record. The samples will then be stored at approximately 4° C in a secure area prior to shipment.

Sample handling areas will be cleaned/wiped down daily. For final cleanup, all equipment will be disassembled and decontaminated. Equipment that cannot be satisfactorily decontaminated will be disposed of.

4.4.6 Monitoring Equipment

When monitoring equipment is used under conditions where contamination is possible, the equipment will be protected from contaminant sources by draping, masking, or otherwise covering as much of the instrument as possible with plastic without hindering the operation of the unit.

Any contaminated equipment will be taken from the source area and the protective coverings removed and disposed of in appropriate containers. Any direct or obvious contamination will be brushed or wiped with a disposable paper wipe. The units will then be dried, checked, and calibrated for subsequent operations.

4.5 Air Monitoring

The air monitoring program is designed to provide the necessary information to ensure the safety of on-site personnel and to evaluate potential increases to air contaminant levels and dispersion patterns

during site activities. Air monitoring will be conducted during field activities as detailed in the site-specific HASP and/or Work Plan.

4.5.1 Site Safety Air Monitoring

The required level of personal protection equipment specified in the site-specific HASP will be verified by the results of air quality screening performed on-site during field activities. The screening will be performed using a photoionization detector (PID), which detects and measures concentration levels of total VOCs relative to a reference standard on a real-time basis. The PID lamp sensitivity will be specified in the site-specific HASP based on any information regarding identification of potential contaminants. Most sites will require a PID with a lamp of 10.2 or 11.7 electron volts (eV).

The HASP outlines the air monitoring procedures to be followed during the field investigation. Air monitoring equipment used on site may include a PID, chemical indicator tubes (e.g., Draeger® tubes), percent oxygen/lower explosive limit meter, respirable dust monitor, or a radiation detector.

4.6 Field Screening

Headspace vapor monitoring will be performed as a screening tool for determining the relative concentrations of VOCs in soil samples. A photoionization-detector (PID) will be used. The PID will be calibrated daily in accordance with manufacturer's specifications. Headspace readings will be collected using the static headspace analysis method detailed below:

- Approximately 2 oz. of soil will be collected from each open split-spoon and placed in a dedicated laboratory-cleaned glass jar. Alternatively, soil may be placed in a resealable plastic bag which will be immediately sealed. The mouth of the jar will then be immediately covered with aluminum foil prior to sealing the jar lid to minimize the loss of VOCs. Headspace samples will be collected for each split spoon sample.
- The jar will be shaken to break up the compacted soil or material, and will be placed in a specified location (e.g., field vehicle), out of direct sunlight, for a period of no less than 15 minutes to equilibrate prior to field monitoring.
- Where ambient temperatures are below 0°C, headspace development should be within a heated vehicle or building. Ambient temperature during headspace analysis will be recorded and reported.
- The jar lid will be removed from the jar. Headspace will be monitored within the jar by piercing the aluminum foil with the PID probe. Care will be taken to prevent unnecessary mixing of jar headspace and outside air. Monitoring with the PID will continue for at least 1 minute or until a stable reading is shown. The highest PID concentration observed will be recorded along with the sample interval in the field notebook, and on the Soil Boring Log.

4.7 Test Pitting

Test pits are designed to explore and characterize shallow subsurface soils. Test pits allow observation of large sections of the subsurface and facilitate the collection of soil samples for field screening and laboratory analysis. The locations of test pits will be determined in advance and will be detailed in the Work Plan with the provision that site personnel may modify plans in response to site conditions.

Test pits are generally excavated using a hydraulic backhoe, excavator, or other mechanical equipment with dimensions and capabilities sufficient to complete test pits described in the Work Plan. The depths of test pits and collected soil samples will be determined using a weighted tape measure referenced to the ground surface. During test pitting, samples may be collected from the test pit for geologic characterization, field screening, and laboratory analyses. Samples from the test pits are generally collected from the backhoe bucket.

Field personnel may also enter the test pit to collect samples directly from the sidewalls or bottom of the excavation if the depth is less than four feet. Occupational Health and Safety Administration (OSHA) regulations prohibit entry into test pits greater than four feet deep without adequate shoring or benching of sidewalls. Before entry into any test pit, air monitoring will be conducted in accordance to the site HASP.

Soil samples collected from test pits may be screened with a photoionization detector. If a sample is required, it will be taken from the middle of the backhoe bucket and placed in appropriate containers according to soil sampling procedures outlined in Section 4.3.

Samples may also be placed in an airtight jar or a plastic zip-lock bag and field screened for headspace VOC concentrations as outlined in Section 4.6.1.

Excavated materials may be temporarily stockpiled on plastic sheeting. If hazardous conditions are encountered, the material will be stockpiled to one side, preferably downwind, and away from the edge of the pit to reduce pressure on the pit walls. Materials with different permeabilities (i.e., sand, silt, clay) will normally be segregated during stockpiling to allow for proper replacement during backfilling. Heavily contaminated soils will also be segregated and stockpiled pending laboratory analysis and possible alternative disposal.

In the event that it is necessary to excavate below the water table, groundwater will either be left in the excavation or containerized in a frac tank and evaluated for proper disposal. If drums or other obviously contaminated objects are uncovered, the excavation will be stabilized and further excavation terminated. The field geologist will contact the Project Manager and/or NYSDEC for further directions.

Upon completion of the excavation, the test pit will be backfilled to the ground surface. Prior to backfilling, each test pit may be photographed. During backfilling, materials will be compacted by tamping with the backhoe bucket. The surface will then be graded to the level of the ground surface. At locations where heavily contaminated materials are encountered, clean soil may be utilized for backfill.

The contractor operating the excavator will decontaminate the bucket of the backhoe between excavations using the procedures outlined in Section 4.4.1.

All pertinent information will be documented in a field notebook. A test pit log will also be prepared for each test pit. The test pit log may include a sketch of the test pit, geologic description, and a written summary. Information that may be noted in the log or field notebook includes the following:

- Site name and location;
- Date of excavation;
- Total depth and dimensions of excavation;

- Sample designations and methods of acquisition;
- Soil description;
- Air monitoring levels;
- Field screening results;
- Groundwater seeps or levels; List of photographs taken;
- Date and type of backfill;
- Other pertinent information (waste materials encountered, staining, odor, etc.).

4.7.1 Procedure for Obtaining Soil Samples using a Backhoe

In order to obtain relatively vertical samples from known depths, the backhoe technique is employed. Soil can be excavated and placed in a pile. Upon retrieval of subsurface soil from the backhoe bucket, the contents are examined. The use of the backhoe sampling method allows for direct observation of the stratigraphy.

1. Choose a location from which to obtain a soil sample. Solid covering such as concrete or asphalt must be removed using the backhoe. The operator can then proceed with the excavating.
2. Examine the contents of the backhoe bucket and log, noting the depth from which the sample came.
3. If an individual sample is to be saved for further observation or analyses, place it in a capped glass jar.
4. If the sample desired is a composite sample, place the individual sample in a clean bucket, on a clean piece of plastic or in a plastic zip-lock bag. Add additional samples to the bucket or plastic. After thoroughly mixing all individual samples together, obtain a composite sample and place in a capped glass jar.
5. Clean the bucket with soapy water prior to obtaining the next sample. If samples are to be analyzed for contaminants, properly decontaminate (steam clean) the bucket.
6. Repeat procedure at next location.

4.8 Borings and Environmental Wells

4.8.1 Drilling Methods

Soil borings may be drilled to facilitate collection of subsurface soil samples for geologic classification, chemical analyses, and physical testing. Drill rigs are utilized to advance the borings. The rigs are typically mounted on trucks, all-terrain vehicles, or skids. There are a variety of drilling methods that may be utilized including hollow-stem auger (HSA), drive and wash, and mud rotary. Each of these methods enables the collection of soil or groundwater samples. Drilling methods also facilitate the installation of monitoring wells to provide hydrogeologic data.

A geologist will observe drilling operations summarizing boring information in a field notebook, taking photographs when appropriate, and collecting samples in accordance with the Field Sampling Plan. A boring log will be prepared that includes: characterization of subsurface materials and geologic conditions, air monitoring readings, field screening readings, pertinent drilling information, and relevant observations (i.e., staining, odor, sheen, etc.). An example of a typical boring and monitor well log is presented below.

Typical Boring Log

										PROJECT:		Test Boring No.: MW-6			
										LOCATION:				CLIENT:	
PROJECT NO.:										Total Depth: ft.					
Contractor: Drill Rig: Driller: Inspector:										Start Date:		Northing: Easting: Longitude: Latitude:		Borehole Dia.: in.	
										Finish Date:				Depth to Water: ft.	
										El. Datum:				Depth to Rock: ft.	
										G.S. Elevation:				Depth of Well: ft.	
Depth (feet)			Elevation (feet)	Casing Data	Sample No.	Sample Data	Recovery (inches)	PID (ppm)	Group Symbol	Stratum and Field Descriptions:	Well Diagram	Field Notes, Well Notes, Comments:			
1			-1		S1	9	5	0		0-3" Asphalt					
						8				3-6" Gravel road base					
						5				6"-11" Fill - Black, ash, wood, dry, no odor					
2			-2			5									
					S2	8	5	0		2'-2'5" Fill - Black ash, wood, gravel, tip of spoon wet, no odor					
3			-3			2	4								
						8									
4			-4			7									
					S3	6	3	0		4'-4'3" Black, silty CLAY, saturated, no odor					
5			-5			3									
						1									
6			-6			1									
					S4	3	12	0		6'-6'3" Same as above					
7			-7			8				6'3"-7" Reddish brown, silty CLAY, gravel, saturated, no odor					
						4									
8			-8			3									
					S5	4	12	0		8'-9' Dark brown and reddish brown, plastic CLAY, saturated, no odor					
9			-9			1									
						1									
10			-10			2									
					S6	2	12	0		10'-11' Dark brown, silty CLAY, moist to wet, no odor					
11			-11			3									
						2									
12			-12			4									
14			-14							Boring terminated at 12 feet below ground surface					
ADDITIONAL NOTES:															

Drilling methods used during an investigation will be determined in advance and will be detailed in the Work Plan with the provision that the drilling procedure may be modified in response to conditions encountered during drilling. A more detailed discussion of the various drilling methods, sampling procedures, and well installation procedures is provided below.

4.8.1.1 Hollow-Stem Augers

The Hollow Stem Auger (HSA) method utilizes coupled lengths of continuous-flight, hollow steel augers to advance through overburden materials. With this method, drill cuttings rise upward on the flights as the string of augers is rotated.

Typically, 4¹/₄-inch or 6¹/₄-inch inner diameter (ID) augers are used for hazardous waste investigations. These produce nominal 8-inch and 10-inch boreholes, respectively.

A center plug equipped with cutting teeth is attached to drilling rods and placed inside the augers to facilitate cutting and to prevent subsurface materials from entering the augers.

When the augers are advanced to the appropriate depth, the center plug is removed to allow for the collection of soil or in situ samples.

The advantage of the HSA method is that limited fluid use is required. In addition, 2-inch ID monitoring wells can be easily installed inside the augers. The limitations of HSA drilling include the inability to advance through very dense materials like rock, cobbles, rubble, etc., or drilling through loose saturated sands and silts which tend to flow around the plug and seize the tooling. Drilling depths are usually limited to the first dense rock layer encountered or by the torque of the machine.

4.8.1.2 Direct Push

Soil probing or “direct push” machines such as the Geoprobe® push tools and sensors into the ground without the use of rotation to remove soil and to make a path for the tool. A Geoprobe® relies on a relatively small amount of static (vehicle) weight combined with a hydraulic hammer as the energy for advancement of a tool string. Probing tools do not remove cuttings from the probe hole but depend on compression of soil or rearrangement of soil particles to permit advancement of the tool string.

Probing tools are advanced as far as possible using only the static weight of the carrier vehicle. Greater depth is achieved using the combined effect of the vehicle weight and hydraulic hammer. Hammering is often required when probing near the ground surface to penetrate hard-packed surface soil and other hard surfaces. The probe is then allowed to penetrate using only static force until refusal is again encountered, at which time the hammer is reapplied. The hammer is applied as required when probing through sands, gravels, high friction clays, tills, fill materials, and surface frost.

A Geoprobe® can be used to drive tools to obtain continuous soil cores or discrete soil samples; obtain groundwater samples or soil gas samples; install permanent sampling implants and air sparging points; set small diameter permanent monitoring wells; or drive a conductivity sensor probe to map subsurface lithology. Soil probing equipment is typically used for site investigations to depths of 30 to 60 feet.

The advantage of using a Geoprobe® versus conventional drilling techniques, are:

- Minimal cuttings are generated. This reduces handling, containing, storing, sampling, analyzing, and disposing of potentially hazardous and contaminated cuttings. This also reduces disposal costs and potential exposure of site workers, facility employees, residents, and surroundings to hazardous contaminants.

- Only a small diameter hole is created. Grouting is less expensive because a small volume of grouting material is required.
- Less obtrusive equipment required. Small, light, probing equipment is used for sample collection which allows the operator to reach many locations not accessible to larger and heavier conventional drilling equipment.
- Minimal physical and chemical disturbance of the sample materials occurs.
- Typical penetration rates are from 5 to 25 feet per minute, although probing time is highly dependent upon soil conditions.
- Sampling time is shorter; therefore, more sample locations can be sampled per day, depending upon soil conditions.
- The unit can sample all subsurface media including soil, groundwater, and soil gas; log soil conductivity and contaminants; grout probe holes; and inject remediation materials.

4.8.1.3 Deep Drilling

Deep drilling, if needed, will be conducted using a method that prevents borehole collapse when advancing through the unconsolidated formation. A HSA rig will be used in deep overburden drilling if necessary in most cases. This will allow for the advancement of a split spoon sampler in advance of the auger flights which will prevent collapse of the borehole. In the event that HSA is not successful in advancing the borings due to difficult drilling conditions, an example of typical drilling tooling that may be used is Odex, although this task may be conducted by using a different method if the selected driller demonstrates an alternate method is capable of meeting the project's deep drilling and sampling requirement.

An Odex drill bit is designed to fit through typical dimension solid steel well casing. A drive shoe is welded to the bottom of the casing string to provide a ledge for the air hammer to pull the casing downward as the boring advances. This prevents the borehole from collapsing around the hammer which could result in loss of tooling and the well attempt. The cutting head of the drill bit extends beneath the casing and expands during rotation and application of high pressure air, enabling it to drill a borehole that is slightly wider than the outside diameter of the steel well casing. The drill bit pulverizes the material below the casing and uses compressed air to blow the rock and/or soil cuttings back to the top of the borehole. Drill cuttings are collected and placed in 55-gallon drums on the site pending laboratory characterization. The drill bit can be retracted and pulled out of the casing to allow for soil sample collection through the casing using either split-spoon or macro-core sampler.

Diagrams depicting typical ODEX tooling in drilling and retract modes are shown below.

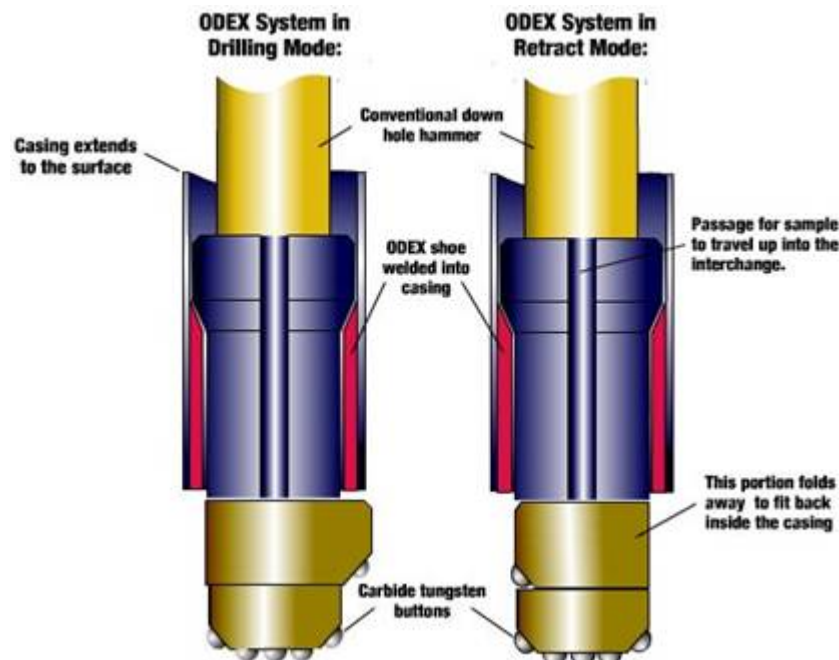


Image provided by Midnight Sun Drilling Ltd

4.8.2 Subsurface Soil Sampling

4.8.2.1 Hand/Bucket Auger

A hand or bucket auger may be used for collecting shallow subsurface soil samples, usually no deeper than 3 to 4 feet below ground surface, although the achievable depth will be limited by soil type and conditions at the site. A hand or bucket auger may be used for collecting surface soil samples. The following procedure is used when collected soil samples with a hand auger:

1. Using a decontaminated stainless steel auger connected to an extension rod and handle, begin turning the auger clockwise until the auger is full. Remove the auger, empty the soil, and continue auguring until the desired depth is reached.
2. Using a decontaminated or second auger obtain soil from the specified depth interval (24-36", 36-48", etc.). The auger used to advance the hole is not suitable for sample collection, as it may be contaminated by the material above it.
3. When sampling at depths deeper than 12 inches, discard ½-inch of material at the top of the auger due to cave in.
4. Transfer soil to a stainless steel mixing bowl. Immediately transfer soil for VOC analysis into sample jar using a stainless steel spoon (unless State requirements specify methanol preservation of samples for VOC analysis).
5. Once a sufficient volume of soil is collected in the mixing bowl, thoroughly homogenize the sample and remove any vegetative material and stones.

6. Transfer the material to the labeled sample containers and place them in sample cooler on ice.
7. Either decontaminate the sampling equipment or place it in a plastic bag for later decontamination.

4.8.2.2 Split-Spoon Sampling

Split-spoon samplers are used to collect soil samples from the bottom of a borehole. The sampler consists of a thick-walled, steel tube that is split lengthwise. It has a cutting shoe attached at the lower end and a check valve at the upper end.

When needed, the split-spoon sampler is attached to drill rods with a threaded adapter. The split-spoon sampler is driven into the ground in accordance with the standard penetration test (ASTM D1586). The standard penetration test (SPT) consists of driving a 1³/₈-inch ID, 2-foot split-spoon 24 inches into the soil using a 140-pound hammer falling 30 inches. The number of blows required to drive the split-spoon each 6 inches is recorded to obtain the SPT-N value, which is defined as the total blows for the penetration from 6 to 18 inches. Often, larger split-spoons are used in order to provide sufficient soil volume when collecting samples for chemical analyses. The size of the split-spoon and the sampling interval are detailed in the FSP.

After the sampler has been retrieved, a field geologist will perform field screening, soil characterization, and sample collection according to the following procedures:

1. The split-spoon will be screened for VOCs immediately upon opening with a total VOC analyzer such as a PID. The instrument will be passed over the sample while slightly disturbing the soil with a sampling trowel or spoon.
2. The soil from the split spoon will be characterized in the field using Modified Burmeister Soil Classification System or the Unified Soil Classification. Physical characteristics such as color, grain size, soil type, texture, consistency, and moisture will be recorded in a field notebook or boring log form.
3. Representative soils will be placed into the appropriate jars for physical and chemical testing. The type and frequency of tests that will be performed are discussed in the FSP. Samples that may be submitted for laboratory analysis will be placed immediately into laboratory-supplied jars with a pre-cleaned stainless steel trowel or spoon. The samples will be labeled with the date and time of sampling, sample identification and site location, then packed for shipment to the laboratory in a cooler with ice. An 8-ounce jar and/or 40-ml vial will also be filled (if specified in the Work Plan) for soil jar headspace tests as detailed in Section 4.6.1.
4. The split-spoon and sampling utensils will be decontaminated between each sample according to the procedures outlined in Section 4.4.3.

4.8.2.3 Geoprobe® Sampling

Macro-Core Soil Samples

The MacroCore® Soil Sampler is a solid barrel, direct push device for collecting continuous core samples of unconsolidated materials at depth. The standard MacroCore® Sampler has an assembled length of approximately 52 inches (1,321 mm) with an outside diameter (OD) of 2.2 inches (56 mm). Collected samples measure up to 1,300 ml in volume in the form of a 1.5-inch by 45-inch (38-mm by 1,143-mm) core contained inside a removable liner. The MacroCore® Sampler may be used in an open-tube or closed-point configuration. It has a removable/replaceable, thin-walled liner tube inserted inside for the purpose of containing and storing soil samples. The standard MacroCore® liner is 1.75-inches OD by 46-inches long (44-mm by 1,169-mm). Liner materials include stainless steel, Teflon®, PVC, and PETG.

To obtain a soil sample, an assembled MacroCore® Soil Sampler is driven one sampling interval into the subsurface and then retrieved using a Geoprobe® soil probing machine. The collected soil core is removed from the sampler inside a liner.

The MacroCore® Soil Sampler is most commonly used as an open-tube sampler. In this configuration, coring starts at the ground surface with a sampler that is open at the leading end. The sampler is driven into the subsurface and then pulled from the ground to retrieve the soil core. In stable soils, an open-tube sampler is advanced back down the same hole to collect the next core.

In unstable soils, which tend to collapse into the core hole, the MacroCore® Sampler can be equipped with a piston rod point assembly. The point fits firmly into the cutting shoe and is held in place by a piston rod and stop-pin. The MacroCore® Piston Rod System prevents collapsed soil from entering the sampler as it is advanced to the bottom of an existing hole, thus ensuring collection of a representative sample.

Loose soils may fall from the bottom of the sampler as it is retrieved from depth. Better recovery is obtained when the core catcher is used with saturated sands and other non-cohesive soils. A core catcher should not be used with tight soils as it may actually inhibit sample recovery.

Large Bore Soil Sampler

The Large Bore (LB) Soil Sampler is a solid-barrel, piston-sealed, direct push device for collecting discrete interval samples of unconsolidated materials at depth. The assembled Large Bore Sampler is approximately 30-inches long with an OD of 1.5-inches. Collected samples measure up to 283-ml in volume in the form of a 1.0-inch by 22-inch core contained inside a removable liner. It has a 1.15-inch OD by 24-inch long removable/replaceable, thin-walled tube liner inserted inside for the purpose of containing and storing soil samples. Liner materials include brass, stainless steel, Teflon®, and clear plastic (cellulose acetate butyrate).

The Large Bore Sampler is used primarily as a discrete interval sampler; that is, for the recovery of a sample at a prescribed depth. In certain circumstances, it is also used for continuous coring.

To obtain a sample, the assembled Large Bore Sampler is connected to the leading end of a Geoprobe® rod and driven into the subsurface using a Geoprobe® Soil Probing Machine. Additional probe rods are connected in succession to advance the sampler to depth. The sampler remains sealed (closed) by a

piston tip as it is being driven. The piston is held in place by a reverse-threaded stop-pin at the trailing end of the sampler. When the sampler tip has reached the top of the desired sampling interval, a series of extension rods, sufficient to reach depth, are coupled together and lowered down the inside diameter of the probe rods. The extension rods are then rotated clockwise using a handle. The male threads on the leading end of the extension rods engage the female threads on the top end of the stop-pin, and the pin is removed. After the extension rods and stop-pin have been removed, the tools string is advanced an additional 24 inches. The piston is displaced inside the sampler body by the soil as the sample is cut. To recover the sample, the sampler is retrieved from the hole and the liner containing the soil sample is removed.

4.8.3 Monitoring Well Installation

This section outlines the general procedures for monitoring well installation and typical materials utilized. The number, location, and construction details of monitoring wells will depend on the project objectives and will be discussed in the Work Plan.

4.8.3.1 Well Construction Materials

Well construction materials consist of well screen, riser pipe, sand pack, bentonite seal, cement grout, and protective casing. Specific monitoring well details may be outlined in the Work Plan. Typical well construction specifications are described below.

Well Screen and Riser Pipe

The most common materials used in the construction of monitoring wells are polyvinyl chloride (PVC) and stainless steel. Generally, PVC is used because it is less expensive and non-corrosive. However, PVC may deteriorate as a result of certain compounds. In such cases, stainless steel may be preferred. Riser pipe and well screen is typically 2-inch or 4-inch ID and has flush joint threads.

When PVC is used, wells constructed in unconsolidated materials less than 100 feet deep are constructed with Schedule 40 PVC.

Well screens are used in the construction of monitoring wells to limit sediment from entering the well. Generally, screens are machine slotted at slot sizes of 0.01 inches (10-slot) for fine materials or 0.02 inches (20-slot) for coarse materials such as coarse sand and gravel. The screen slot size should be selected to retain 90 percent of the filter pack material or native aquifer material.

Sand Pack

The sand pack consists of uniformly graded sand. A grade of sand is selected such that it will not pass the well screen slot size and will exclude the fines from the formation. At least a 2-inch layer of sand will be placed at the bottom of the hole prior to the well installation. Sand will be placed around the well screen to a level of 2 feet above the top of the screen, site conditions permitting. In situations that require a well to straddle a shallow water table, it may be necessary to place less sand above the top of the screen to allow enough space for an adequate bentonite seal.

Bentonite Seal

The bentonite seal may consist of pure Wyoming sodium bentonite chips, pellets, or slurry. A bentonite seal expands by absorbing water, and due to its low permeability, serves to isolate the screened interval

from the rest of the borehole. The bentonite seal should be at least 2 feet thick and be placed directly above the sand pack. It may be necessary to install less bentonite for shallow water table wells. Bentonite seals that are placed above the water table should be hydrated with potable water. NYSDEC guidelines (TAGM 4008) specify that bentonite seals must be placed via tremie method. For deeper installations it is often more practical to tremie a bentonite slurry. In such cases, the bentonite slurry may be placed up to the ground surface in place of cement or cement-bentonite grout.

Cement-Bentonite Grout

Grout will be placed from the top of the bentonite seal to the ground surface via the tremie method. Generally, the grout consists of a cement-bentonite mixture. Cement is Portland Type 1, in conformance to ASTM specifications C150. The bentonite is powdered Wyoming sodium bentonite. Cement-bentonite grout typically consists of 94 pounds of cement mixed with 3 to 5 pounds of powdered bentonite and 7 gallons of water or a media approximating this mixture. The purpose of the grout seal is to replace material removed from the borehole during drilling and prevent collapse and subsidence around the well. Pure bentonite slurry may also be used in place of the cement-bentonite grout.

Protective Casings

Protective casings are placed around wells to prevent damage, provide security, and to provide a seal to prevent surface runoff from entering the well. They usually consist of a 4- or 6-inch diameter steel casing with a 2-3 foot stick up above the ground or a manhole road box installed flush to the ground surface (flush-mounted casing). The casings should be watertight and equipped with a locking cover. All protective casings should be labeled with the well identification. A concrete surface seal should be constructed around the protective casing at the ground surface to provide a seal and to divert surface runoff away from the well. All details of well installation will be recorded by the geologist.

4.8.4 Bedrock Monitor Well Installation

Monitor wells will be installed following National Water Well Association protocol and good engineering practices. The on-site geologist will be present during all drilling and monitor well installations to ensure that work progresses in a timely fashion. Continuous sampling of the unconsolidated sediments will be completed using split spoons. These samples will be examined to define the stratigraphy.

The on-site geologist shall log the borehole and provide an interpretation of cores, unconsolidated sediment samples, and drill cuttings. The on-site geologist shall also maintain a log of each boring including:

- Reference point for all depth measurements.
- The depth at which each change of formation occurs.
- Identification and classification of formation materials using Unified Soil Classification system for unconsolidated sediment samples.
- The number, interval, and time of sample collection.
- Identification of the bedrock type, rock quality density (RQD), fracture frequency and weathered zone by the examination of rock cores.
- Description of drilling progress.
- The number and time of each core run.
- Estimated water level, yield, and recovery rate.
- Field-screening PID readings in parts/million of each sample as logged at the time of drilling.

The bedrock monitor well will be installed using the air rotary method. A 4- to 6-inch steel casing will be sealed at least 1-foot into bedrock. The boring will be completed as an open rock well. The well will also be sealed with cement at the ground surface.

4.8.5 Well Development

Monitoring wells will be developed in order to restore the natural permeability of the formation adjacent to the borehole; to permit water to flow through the screen easily. Well development removes fine sediment from the formation so, during sampling, water will not be turbid or contain suspended materials that can interfere with chemical analysis.

Shallow wells are generally developed with a bailer, a foot-valve pump, or a submersible pump. Pumping is usually a more efficient method for deeper wells. The selection of the well development methods and equipment will be determined on site by the field personnel based on drilling, well construction, and site-specific geologic information.

Well development will occur after a minimum of 24 hours following construction or after recovery is complete, whichever is later (NYSDEC TAGM 4007). All equipment that is introduced into the well will be decontaminated according to the procedures discussed in Section 4.4. The general procedures for well development are summarized below:

1. Measure the water level in the well with a water level indicator. The depth to the bottom of the well is measured with a weighted measuring tape.
2. A bailer or other pumping device is lowered to the bottom of the well. The well is surged by the bailer or the pump to agitate and loosen fines in the well screen and sand pack.
3. Groundwater is bailed or pumped from the well. If a pump is used, the pump intake will be periodically placed at different depths throughout the well and within the screen interval during development.
4. Readings of pH, temperature, specific conductance, and turbidity will be collected after each well volume removed or at other intervals depending upon well output and other factors pertinent to sampling.
5. Well development will continue until the field measurements stabilize. Ideally, the well should be developed to 50 Nephelometric Turbidity Units (NTU), if possible, according to NYSDCE TAGM 4007. The goal of 50 NTUs may not be practical in formations which contain a lot of silt and clay in which case the well will be developed until the turbidity readings appear to have stabilized.
6. The development tools will be removed from the well and the water level and well bottom will be measured following development.
7. The well will be covered and locked.
8. Purged water will be containerized pending subsequent sampling and handled according to the procedures outlined in Section 4.4.4.
9. All pertinent field data will be recorded on a Field Data Sheet (see Section 4.10).

4.9 Groundwater Sampling

Groundwater samples are collected from monitoring wells for laboratory analysis. The specific number and location of samples, rationale, and parameters to be tested are discussed in the Work Plan. The equipment and general procedures normally utilized for groundwater sampling are presented below.

4.9.1 Groundwater Sampling Equipment

Monitoring wells will be purged using one of the following pieces of equipment:

- Lubricant-free stainless steel submersible pump with polyethylene or Teflon discharge tubing.
- Peristaltic pump equipped with dedicated polyethylene tubing with or without a foot valve.
- Dedicated Teflon bailer connected to new solid-braid nylon rope.
- Inertial lift pump with dedicated polyethylene valve and tubing.

Project-specific purging methods are outlined in the Work Plan. The selection of a purging method is determined based on the following information:

- 1) Well depth
- 2) Static water level
- 3) Hydraulic conductivity
- 4) Well diameter
- 5) Well location

4.9.2 Procedures for Collecting Groundwater Samples

4.9.2.1 Pre-Sampling Activities

Before sampling, the following pre-sampling activities will occur:

- The well will be inspected for integrity and proper identification.
- A sheet of polyethylene will be laid out for placement of monitoring and sampling equipment.
- If site conditions are unknown, conditions warrant, or project requirements call for VOC monitoring, VOCs will be measured at the rim of the opened well with a PID and recorded in the field logbook.
- After removing the well cap, the water level will be allowed to equilibrate for a minimum of 5 minutes. The static water level in the well will be measured with a water level indicator to the nearest 0.01 feet referenced to a permanent mark on the PVC riser. The probe of the meter will be decontaminated according to the procedures detailed in Section 4.4.
- The volume of water in the well will be calculated by the following equation:

$$V = (\pi)r^2l(7.48)$$

where,

V = volume, in gallons

π = 3.14

r = inside radius of well, in feet

l = height of water in well, in feet

7.48 = conversion factor for cubic feet to gallons

- If desired, the depth of any non-aqueous phase liquids (NAPLs) will be measured using an interface probe and recorded. If LNAPLs or DNAPLs are detected, the well will not be sampled. A sample of the LNAPLs or DNAPLs present may be obtained using a bailer, if appropriate.

4.9.2.2 Sampling Procedures

Low Flow Sampling:

- **Install Pump:** Slowly lower the pump, safety cable and tubing into the well to the depth specified for that well. The pump intake should be in the middle or slightly above the middle of the screened interval. Too close to the bottom increases the possibility that solids that have collected in the well over time will be collected in the sample. Too close to the top increases the possibility that water stored in the casing will be included in the sample. Record the depth to which the pump is lowered.
- **Measure Water Level:** Before starting the pump, measure the water level again with the pump in the well. Leave the water level measuring device in the well.
- **Purge Well:** Start pumping the well at 100 to 500 milliliters per minute (ml/min). The water level should be monitored approximately every 5 minutes. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less). Pumping rates should be reduced, if needed, to the minimum capabilities of the pump to ensure stabilization of the water level. Care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.
- **Monitor Indicator Parameters:** During purging of the well, monitor and record the field indicator parameters (temperature, specific conductance, and pH) approximately every 5 minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

±0.1 for pH

±3% for temperature

±3% for specific conductance (conductivity)

The pump must not be removed from the well between purging and sampling.

- **Sample collection** should be directly from the dedicated or disposable tubing, not from the flow-through cell discharge hose.
- **Remove pump and tubing:** After collecting the samples, the tubing must be properly discarded or dedicated to the well for resampling by hanging the tubing inside the well.
- **Close and lock the well.**

Sample Collection

All laboratory samples will be placed in containers according to the procedures outlined in Section 4.3.3 of this document. Drums containing purge water will be handled in accordance with Section 4.4.4.

4.10 Sediment and Shallow Soil Sample Collection

Shallow soil samples and sediment samples provide information related to the presence of contamination caused by surface releases. These samples are typically collected utilizing one of the following tools:

- Split-spoon sampler
- Hand auger
- Sampling trowel

Depending on the objectives of the sampling program, either grab samples or composite samples may be collected. Samples can be composited over various depths from one location, or laterally from several locations of the same depth. Composite samples are homogenized in a stainless steel bowl using a stainless steel mixing spoon or trowel. Grab samples to be analyzed for VOCs are collected directly from the sampling implement and are not mixed. Soil samples are placed in the appropriate laboratory jars based on the proposed analytical methods, labeled, and packed for shipment to the laboratory in a cooler with ice.

All sampling equipment will be decontaminated between sample locations according to the procedures outlined in Section 4.4.

A detailed log for each sample will be recorded in a field notebook. This record will include: time and date of sample collection, depth, location, sampler's name, sampling procedures, soil types collected, and all other pertinent observations.

The various methods for obtaining shallow soil and sediment samples are described below. Site-specific sampling objectives and procedures are described in the Work Plan.

Split-Spoon Sampling: Split-spoon samples are collected in accordance with the procedures outlined in Section 4.8.2.2.

Hand Auger Sample Collection: A hand auger is twisted into the ground by hand. The auger is generally advanced in one-half to one-foot intervals to the target depth. Samples are collected by removing the device from the hole and emptying the sample from the bucket auger into a stainless steel bowl. The sample is then homogenized according to the procedure described above. Hand augers generally have a maximum depth range of about five feet, depending on soil type and density, frequency of cobbles, depth to water, and other natural or manmade conditions.

Sampling Trowel: The use of sampling trowels will follow the same procedures as described for hand augers. However, samples are collected by hand with a stainless steel shovel, trowel, or similar instrument. The maximum depth is generally about one to two feet.

4.11 Surface Water Sampling

The procedures for surface water sampling are dependent on the depth of water, flow rate, and analytical parameters of interest. Site-specific sampling locations and methods are presented in the FSP. In general, samples are collected according to the following procedures:

- A clean sample bottle is lowered into the surface water body. Care will be taken to avoid floating debris. Samples from streams are collected with the opening of the sampling vessel facing upstream.
- If a sample collection vessel is required due to depth or flow rate, the vessel will be filled as described above. The appropriate sample container can be filled from the sampling vessel.
- Depending on the parameters being sampled, collect measurements of pH, specific conductance, and temperature from the surface water body. Details of required surface water measurements will be shown in the FSP.
- All pertinent information will be recorded in a field notebook and on a Field Data Sheet.
- The sampling location will be staked and labeled for subsequent field survey, if required by the Work Plan.

4.12 Water Level Measurements

Groundwater level measurements are taken to calculate groundwater elevations so that groundwater contour maps can be constructed. Groundwater contour maps are used to assess flow directions and hydraulic gradients.

Water levels are measured with a water level indicator to the nearest hundredth (0.01) foot. Measurements collected from monitoring wells are taken from the top of well casing. The measurement point is notched or marked indelibly on the casing.

Water levels are measured according to the following procedures:

- Check the well for proper identification.
- Inspect the integrity of the protective casing and surface seal.
- If previous data warrant, or unknown conditions exist, then monitor the ambient air in the breathing zone and at the well head while unlocking and removing the well cover.
- Using a pre-cleaned water level indicator, measure the water level to the nearest hundredth (0.01) foot from the reference mark at the top of the well riser pipe.
- Record the water level measurements in a field notebook and/or on a field data sheet along with the date and time of measurement.
- Decontaminate the water level probe between locations by rinsing it with methanol and deionized water.
- Replace the well cover and lock.

4.13. Ground Penetrating Radar

Ground penetrating radar (GPR) uses high frequency radio waves to investigate shallow geologic features (e.g. depth to the water table or depth to bedrock) and for the detection of buried objects. GPR can provide subsurface information ranging in depth from several tens of feet to inches and is useful for locating subsurface objects, utilities, and geologic interfaces.

Ground penetrating radar operates by transmitting pulses of microwave-range (0.1- to 100-cm wavelength) electromagnetic energy into the ground through an antenna (a.k.a. transducer). Some of the energy is scattered where materials with different dielectric permittivity interface. The rest of the energy passes through the interface and on to the next interface where it may be reflected or pass through to deeper interfaces. The reflected signals are received by a control unit which registers the reflections against two-way travel time in nanoseconds. The control unit typically contains an output

display on which the signals are plotted in profile (radargram).

The GPR antenna is pulled slowly along the ground surface radiating energy downward into the subsurface. Reflected energy is gathered at a receiving antenna and variations in the return signal are continuously recorded. These variations are caused by wave reflections from surfaces of materials having different electrical properties. These surfaces may be geologic features (e.g., soil interfaces, changes in moisture content, voids or fractures in bedrock) or indications of human activity (e.g., buried drums, utilities, tanks).

The depth of penetration is highly site-specific and is dependent on the soil types and properties. In general, dry, sandy soils provide better data, while moist, clayey or conductive soils provide poorer results.

4.13.1 Equipment/Instrumentation

The GPR system consists of a control unit, antenna, and a graphic recording device. The antenna transmits electromagnetic pulses of short duration into the ground. Pulses are reflected back to the antenna from the various interfaces within the subsurface. The receiver sends the signal to the control unit for processing and display.

Several manufacturers produce commercially-available GPR systems. For this reason, a detailed description of instrument operation is not practical. The operator should refer to the instrument setup and operations manual to prepare the instrument for a survey. The instrumentation should be selected based on the desired target and actual field conditions. The selection of a transducer frequency will need to balance the desired depth of penetration with resolution.

4.13.2 Field Procedures

The general field procedures for conducting GPR surveys are outlined below:

- Where possible, the instrument is calibrated by burying a metal object at known depth. The instrument is then adjusted so that the readings are consistent with the true depth.
- A grid of parallel lines is established across the investigation area. The size of the grid is dependent upon the project objectives and is detailed in the FSP.
- Data are collected by slowly pulling the antenna along the survey lines. The beginning and end points of each traverse should be surveyed from a known location, which can be recovered at a future date.

4.13.3 Data Analysis

Most modern GPR systems utilize portable digital processors operating on battery (DC) power. Digital processing allows the operator to utilize filtering, stacking, and gain controls as well as manipulate them in the field. Data is typically stored in an unfiltered (raw) form that can be reviewed and processed after the survey is complete.

GPR data are evaluated qualitatively in the field as the survey progresses. Data is displayed on the GPR system and observed in profile as it is collected. Estimates of depth are automatically made by utilizing a

velocity conversion factor. The velocity conversion factor is a user-entered estimate of the radar wave propagation rate through the subsurface. It is used to determine distance (depth) from the GPR antenna.

4.13.4 Data Evaluation

The propagation velocity of the EM pulse depends upon the relative dielectric permittivity of the material (ϵ_r) through which the pulse travels. The relative dielectric permittivity is a measure of the degree to which a medium can resist the flow of the EM pulse: the higher the relative permittivity, the lower the resistance to flow, and vice versa. For most earth materials and rocks, the relative dielectric permittivity does not exceed 10 and is always greater than unity, the value for a vacuum. The table below gives typical permittivity values for commonly encountered materials.

Approximate Electromagnetic Properties of Various Materials

Material	Relative Dielectric Permittivity	Pulse Velocity (ns/ft)
Air	1	1
Freshwater	81	9
Seawater	81	9
Sand (dry)	4 – 6	2.1 – 2.4
Sand (saturated)	30	5.5
Silt (saturated)	10	3.1
Clay (saturated)	8 – 12	2.8 – 3.3
Average "dirt"	16	4
Dry sandy coastal land	10	3.1
Marshy forested flat land	12	3.5
Rich agricultural land	15	3.9
Pastoral land, hilly, forested	13	3.6
Freshwater ice	4	2
Permafrost	4 – 8	2.0 – 2.9
Granite (dry)	5	2.2
Limestone	7 – 9	2.6
Concrete	6.4	2.5
Asphalt	3 – 5	1.7 – 2.5

The dielectric permittivity is related to the propagation velocity by the formula:

$$\epsilon_r = \left(\frac{c}{V_m} \right)^2$$

where, "c" is the propagation velocity in free space (3×10^8 meters per second or approximately 1 foot per nanosecond) and V_m is the propagation velocity through a material. It follows that

$$(\epsilon_r)^{1/2} = \frac{c}{V_m} \quad \text{or} \quad \frac{1}{V_m} = \frac{(\epsilon_r)^{1/2}}{c}$$

Since c is approximately equal to 1 ft/ns, then

$$1/V_m \approx (e_r)^{1/2} \quad (\text{Formula 1})$$

Where units are in ns/ft (one-way travel time).

Formula 1 gives a method for estimating the propagation velocity for a medium (and therefore the depth to a reflecting horizon) if the soil conditions are known. If they are unknown or their properties cannot be estimated accurately enough, a reflector of known depth can often be used to calibrate the GPR recordings to site conditions.

Approximate Depth Ranges for Various Antenna Frequencies

Frequency (MHz)	Minimum Target Size (m)	Approximate depth range (m)*
100	0.1-1	2-15
250	0.05-0.5	1-10
500	0.04	1-5
800	0.02	0.4-2

4.14 Soil Vapor Sampling

Soil vapor sampling will be conducted in accordance with the NYSDOH Guidance for Evaluating Soil Vapor Intrusion, Final October 2006.

Soil vapor samples are collected outside, and not beneath the foundation or slab of a building, to determine whether there is soil vapor contamination, to characterize the nature and extent of soil contamination, and to identify possible sources of contamination. The results are often used to evaluate the potential for current and future human exposures and to determine the effectiveness of measures implemented to remediate contaminated subsurface vapors.

4.14.1 Investigation Considerations

Existing environmental data and site background information are used to select the sample locations. When evaluating sites that are proposed for development, where soils are suspected or known to be contaminated, the soil vapor samples should be collected from:

- Known or suspected VOC source material
- In a grid pattern across the area
- From multiple depths from suspected subsurface sources, former source, or a depth comparable to the expected depth of foundation footings.

Soil vapor intrusion investigations often involve more than one round of sampling.

4.14.2 Sample Probe Installation

Samples at depths less than 5 feet below the ground surface (bgs) are prone to negative bias from infiltration of outdoor air and should only be collected when deeper samples are not feasible.

Soil vapor probe installation can be permanent, semi-permanent, or temporary. Permanent probes are preferred for data consistency. Soil probes should be constructed in the same manner at all sampling locations to minimize possible discrepancies. The following procedures should be used when constructing and installing soil probes:

- Direct-push technology is the preferred method of installing sample probes. When necessary, an auger could be used.
- Porous backfill material (i.e. coarse sand, glass beads) should be used to create a sampling zone of 1 to 2 feet in length.
- Implants/probes should be fitted with VOC-inert tubing (i.e. polyethylene, stainless steel, or Teflon®) of the appropriate size (typically $\frac{1}{8}$ -inch to $\frac{1}{4}$ -inch diameter) that is of laboratory or food grade quality.
- The probes should be sealed above the sampling zone with bentonite slurry for a minimum distance of 3 feet to prevent outdoor air infiltration. The hole should be filled with clean material.
- For multiple probe depths, the borehole should be grouted with bentonite between probes to create discrete sampling zones.
- For permanent installations, a protective casing should be set around the top of the probe tubing and grouted in place to the top of the bentonite to minimize infiltration of outdoor air, as well as to prevent accidental damage to the probe.

4.14.3 Soil Vapor Sample Collection

Soil vapor samples should be collected in the same manner at all locations to minimize discrepancy and should include the following:

- Samples should be collected a minimum of 24 hours after the installation of permanent probes, and shortly after the installation of temporary probes.
- One to three implant volumes (volume of sample probe and tube) must be purged prior to sample collection.
- Flow rates for purging and collecting must NOT exceed 0.2 liters/minute to minimize outdoor air infiltration.
- Use conventional sampling methods, in an appropriate container that meets the requirements of the sampling and analytical methods and has been certified to be clean by the laboratory.
- Sample size is dependent on the volume needed for laboratory minimum reporting limits.
- Tracer gas (i.e. helium, butane, or sulfur hexafluoride) must be used to verify that outdoor air infiltration is not occurring. Once verified, continued use of the tracer gas may not be necessary. Two approaches can be selected when using a tracer gas:
 - Include the tracer gas in the list of laboratory analytes.
 - Use a portable field monitoring device to analyze the sample for the tracer gas.

4.15 Sub-slab Vapor Sampling

Sub-slab vapor samples are collected to characterize the nature and extent of soil vapor contamination immediately beneath a building with a basement foundation and/or a slab-on grade. The sample results are used when evaluating current and potential for future human exposures, and site specific attenuation factors (i.e., the ratio of indoor air to sub-slab vapor concentrations). Sub-slab vapor samples are collected after soil vapor characterization and/or other environmental sampling (soil and groundwater characterization). Sub-slab samples are typically collected concurrently with indoor and outdoor samples. However, outside of the heating season, sub-slab vapor samples may be collected independently depending on the sampling objective.

Sub-slab vapor samples and, unless there is an immediate need for sampling, indoor air samples are typically collected during the heating season because soil vapor intrusion is more likely to occur when a building's heating system is in operation and air is being drawn into the building.

4.15.1 Investigation Considerations

Existing environmental data, site background information, and building construction details should be considered when selecting buildings and locations within buildings for sub-slab vapor sampling. At a minimum, these general guidelines should be followed:

- Buildings located above or directly adjacent to known or suspected areas of subsurface VOC contamination should be sampled;
- Buildings in which positive responses with field equipment were obtained should be sampled; and
- Buildings with known or suspected areas of subsurface VOC contamination that are used or occupied by sensitive population groups (i.e. daycares, schools, etc) should be given special consideration for sampling.

Investigations of sub-slab and/or indoor air contamination should proceed outward from known or suspected sources, as necessary, on an aerial basis until potential and human exposures have been adequately addressed. Samples should be collected in a central location away from the foundation footings, and from the soil or aggregate immediately below the basement or slab and the number of samples will depend on the number of slabs.

4.15.2 Sub-slab Vapor Probe Installation and Sampling

Prior to the installation of the sub-slab vapor probes, the building floor will be inspected within 25 feet of the proposed sampling area and the location of any penetrations such as cracks, floor drains, utility perforations, or sumps will be noted and recorded. The probes will be installed at locations where the potential for ambient air infiltration via floor penetrations is minimal and may be adjusted from the proposed locations based on any floor inspection findings. Sub-slab vapor probe installation can be either permanent, semi-permanent, or temporary. Sub-slab probes should be constructed in the same manner at all sampling locations to minimize possible discrepancies and as described in section 4.14.2 above, Sample Probe Installation)

Sub-slab samples should be collected in the following manner:

- The probes will be purged of 1 to 3 volumes (i.e., the volume of the sample probe and tube) prior to collecting the samples;
- Environmental Protection Agency Method TO-15 will be followed when collecting and analyzing samples;
- The samples will be collected in a 6-liter Summa[®] canister over a minimum 8-hour sampling period in order to achieve a detection limit of 0.25 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$);
- The flow rates for both purging and collecting will not exceed 0.2 liters per minute; and
- The Summa[®] canisters will be certified as clean by the laboratory;
- If possible, samples will be collected over the same period of time as concurrent indoor and outdoor air samples.

The heating systems in each building, if functional, will have been in operation for at least 24-hours prior to and during the sample collection period at a normal indoor temperature typically between 65^o and 75^oF. Additionally, a pre-sampling building inspection should be performed prior to each sampling event to identify and minimize conditions that may interfere with proposed testing.

4.16 Indoor Air Sampling

Indoor air samples are collected to characterize exposures to air within a building. Like sub-slab vapor sampling, indoor air sampling results are used when evaluating current and the potential for future human exposures, and site-specific attenuation factors. Indoor air samples are collected concurrently with sub-slab vapor and outdoor air samples. Some site-specific situations may warrant indoor air samples without concurrent sub-slab vapor and outdoor air samples. Additionally, Indoor and outdoor air samples may be collected without sub-slab vapor samples when confirming the effectiveness of a mitigation system.

4.16.1 Investigation Considerations

Similar to soil vapor and sub-slab vapor sampling, existing environmental data, site background information, and building construction details should be considered when selecting buildings and locations within buildings for sub-slab vapor sampling. At a minimum, these general guidelines should be followed:

- Where sub-slab vapor samples were collected without indoor air samples, buildings in which elevated concentrations of contaminants were measured in sub-slab vapor samples should be sampled
- Buildings located above or directly adjacent to known or suspected areas of subsurface VOC contamination should be sampled
- Buildings in which positive responses with field equipment were obtained should be sampled; and

- Buildings with known or suspected areas of subsurface VOC contamination that are used or occupied by sensitive population groups (i.e. daycares, schools, etc) should be given special consideration for sampling.

To characterize contaminant concentration trends and potential exposures, indoor air samples should be collected from:

- The crawlspace area
- Basement (where vapor infiltration is suspected or in a central location) at a height approximately three feet above the floor
- The lowest level living space (in centrally-located, high activity-use areas) at a height of approximately three feet above the floor
- Or if in a commercial setting, from multiple tenant spaces at a height of approximately three feet above the floor

Investigations of indoor air contamination should proceed outward from known or suspected sources, as necessary, on an aerial basis until potential and human exposures have been adequately addressed.

4.16.2 Indoor Air Sampling

During colder months, the heating systems in each building will have been in operation for at least 24-hours, if operable, prior to and during the sample collection period at a normal indoor temperature typically between 65⁰ and 75⁰F. If possible, a pre-sampling inspection should be preformed.

In general, indoor air samples should be collected in the following manner:

- Sampling duration should reflect the exposure scenario without compromising the detection limit or sample flow collection rate (e.g. an 8 hour sample from a workplace with a single shift versus a 24 hour sample from a workplace with multiple shifts). Samples should be collected for at least one hour. If the goal is to represent an average concentration over a longer period of time, then longer duration sampling periods may be appropriate.
- Personnel should avoid lingering in the immediate area of the sampling device while the samples are being collected
- Sample flow rates must conform to the specifications in the sample collection method, and if possible, be consistent with the flow rates for concurrent outdoor and sub-slab samples;
- Samples must be collected using conventional sampling methods, in an appropriate container which meets the objective of the samples and one that is certified clean by the laboratory.

At sites with tetrachloroethene contamination, passive air monitors that are specifically analyzed for tetrachloroethene (i.e. perc badges) are commonly used to collect indoor and outdoor air samples.

4.17 Outdoor Air

Outdoor air samples are collected to characterize site-specific background outdoor air conditions. Outdoor air sampling results are primarily use when evaluating the extent to which outdoor sources may be influencing indoor air quality. They may also be used in the evaluation of soil vapor results.

Typically, outdoor air samples are collected at each location where an indoor air sample is collected (e.g. near each tenant space sampled). Outdoor samples should be collected in a representative upwind location, away from wind obstructions, and at a height of 3 to 5 feet. A representative sample is one that is not biased towards obvious sources of VOC.

4.17.2 Outdoor Air Sampling

Outdoor air samples must be collected simultaneously with indoor air samples, and may also be collected concurrently with soil vapor samples. Outdoor samples must be collected in the same manner as indoor air samples (see Section 4.16.2 above).

4.18 Vapor Intrusion Assessment Documentation/Considerations

The following should be considered during a soil vapor sampling event and may influence the interpretation of the results:

- If sampling near a building, uses of VOC-containing products during normal operations of the facility should be identified.
- Outdoor sketches, including site, streets, nearby facilities, and outdoor ambient air sample locations (if appropriate) should be drawn.
- Weather conditions should be noted for 24-48 hours prior to sampling events.
- Pertinent observations (odors, field screening readings) should be recorded.
- Use of HVAC systems during sampling (sub-slab and indoor air);
- A floor sketch of each building that includes the floor layout with sample locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system air supply and return registers, compass orientation (north), and any other pertinent information;

A sample log sheet should be maintained to include:

- Sample ID
- Sample date and time
- Sampler ID
- Sampling Methods/devices
- Purge volume
- Volume of vapor sample
- For canisters, the vacuum reading before and after sample collection
- Apparent moisture content of sampling zone
- Chain of Custody procedures used to track sample

4.19 Vapor Intrusion QA/QC Precautions and Laboratory Analytical Methods

On the day of sample collection activities, the person collecting the samples should avoid the following: fueling vehicles, use of permanent markers, wearing freshly dry-cleaned clothing, wearing perfumes, and any other activity where the use of VOCs could contaminate the samples. Proposed analytical procedures are identified in the Work Plan. TO-15 for VOCs, and NYSDOH Method 311-9 for tetrachloroethene are the preferred laboratory analytical methods.

5.0 DOCUMENTATION / CHAIN OF CUSTODY PROCEDURES

5.1 Chain of Custody

Chain-of-Custody (COC) procedures are followed to insure that sample integrity is maintained throughout the sampling and analysis process and that all samples collected are accounted for at all times. The COC process begins when the sample is collected and carries on throughout the analytical laboratory operations. The field team member responsible for the collection of the samples acts as the initial sample custodian.

A sample is considered “in custody” of an individual if it is either in direct view of, or directly controlled by, that individual. Chain-of-Custody transfer is accomplished when the samples or sealed sample containers are directly transferred from one individual to the next. At the time of transfer, the first individual witnesses the signature of the receiver on the COC record. The objective of the COC program is to ensure that:

- Samples are protected from loss or damage.
- The correct samples are analyzed.
- All samples are uniquely identified.
- Samples are traceable to their records.
- Documentation of sample handling procedures including: sample location, sample number, number of sample containers, and the COC process.
- A signed COC record is included for each sample shipment, documenting contents of the shipment. The COC record indicates the following information:
 - Site name
 - Sample Identification Numbers
 - Date and time of collection
 - Sample type (e.g., groundwater, soil, etc.)
 - Number and type of containers per sampling location
 - Parameters requested for analysis for each container
 - Signature of person(s) involved in the chain-of-possession
 - Description of sample bottles and their condition
 - Problems associated with sample collection (i.e., breakage, no preservatives), if any.

The COC records are printed on triplicate forms. One copy is retained by The Chazen Companies when the samples are taken into custody by either a shipping agency or the lab. A second copy is kept by the analytical lab. The third copy is returned to Chazen with completed lab results.

5.1.1 Sample Tracking

In order to track the samples sent to the laboratory, a permanent log of each shipment is maintained in a log book. A copy of all COC records is also maintained in a project file. All pertinent COC information is recorded in the log book, as well as follow-up correspondence with the laboratory, via telephone or mail, indicating receipt of the samples, breakage, turnaround time, or any problems with the shipment. As analytical data are received, the database is updated to reflect the new information. Turnaround

times are compared to protocols to ensure quality control. Missing data or invalid samples are addressed by the Field Operations Leader or the Project Manager.

5.1.2 Laboratory Operations

Specific laboratory Standard Operating Procedures used during the investigation are provided by the selected analytical laboratory. These procedures include sample tracking, methods for collection and handling of laboratory blanks, laboratory duplicates, matrix spikes, laboratory control samples, and surrogates. Maximum/minimum holding times and data reporting procedures are also defined by the laboratory.

5.2 Analytical Sample Shipping

Sample containers are packed in coolers. Bottles are packed tightly in materials such as Styrofoam, vermiculite, and/or “bubble pack” to minimize motion. Ice placed in zip-lock bags and can be added to the cooler to cool the samples to around 4° C. All paperwork is sealed in a separate zip-lock bag and placed in the cooler which is then taped shut. The samples are shipped to the laboratory together with the COC documents.

The standard procedure followed for shipping environmental samples to the analytical laboratory is:

- 1) Samples are shipped by courier or equivalent overnight delivery service.
- 2) Samples are shipped to the laboratory within 24 to 48 hours of acquisition.
- 3) Prior to leaving for the field, the Analytical Lab is notified of the number, type, collection date, and shipment dates for samples. If the number, type, or date of shipment changes due to site constraints or program changes, the Lab is informed of the change. Notification to the Lab also occurs when sample shipments will arrive on Saturdays. This communication is critical to allow the laboratory enough time to prepare for the samples' arrival.
- 4) If prompt shipping and laboratory receipt of the samples is not possible, (i.e., Sunday arrival), members of the Field Team are responsible for proper storage of the samples until adequate transportation arrangements can be made.
- 5) Field Operations Leader or his/her designee ensures that samples collected by the client are entered into the project sample log.

6.0 CALIBRATION PROCEDURES

This section details the calibration and operating procedures for the field and laboratory analytical instruments that will be used during this investigation.

6.1 Field Instruments

Field instrumentation is calibrated according to the manufacturer's instructions to ensure that accurate field data are collected. Each piece of equipment is calibrated daily prior to use or as specified by the manufacturer. More frequent calibration may be performed when accuracy of the equipment becomes suspect or under extreme field conditions. Calibration information is recorded in the same field notebook in which the field instrument readings will be recorded. The recorded calibration includes:

- Name of instrument
- Instrument serial number
- Date of calibration
- Observations and results of calibration
- Calibration gas used, if applicable
- Buffer solutions used, if applicable
- Specific calibration procedures and operating instructions are detailed below.

6.1.1 pH Meters

pH is the measure of the acidity or alkalinity of a solution. It is defined as the negative logarithm of the hydrogen ion activity. Hydrogen ion activity is related to the hydrogen ion concentrations, which in relatively weak solutions are nearly equal. For practical purposes, pH is the measure of the hydrogen ion concentration.

The operation of a pH meter relies on the same principal as many other ion-specific electrodes. Measurement relies on establishment of a potential difference in the response to hydrogen ion concentration across a membrane in the electrode. The membrane is conductive to ionic concentrations, which in combination with a reference electrode (which can be combined into a single "combination" electrode), can generate a potential difference proportional to the hydrogen ion concentration.

Variation in temperature will effect the association of hydrogen and hydroxide ions, which without proper compensation will affect the pH. pH meters have several controls to compensate for the variations between electrodes and the different responses to changes in temperature.

It is very important to obtain a pH measurement as soon as possible after sample collection, since temperature changes, precipitation/dissolution reactions, and sorption of carbon dioxide from the air all affect the pH of a solution.

Because of the great variety of pH meters available, operators should refer to the manufacturer's instruction manual for specific calibration, operation, and troubleshooting procedures for their instrument. The following general procedure is used for measuring pH in the field with a pH meter:

- The pH meter is calibrated at each sample site.
- The instrument and batteries are checked prior to the initiation of the field effort. pH electrodes are kept moist at all times.
- Buffer solutions used for calibration are checked since buffer solutions will degrade upon exposure to the atmosphere.
- Generally, 4.00 and 7.00 pH buffers are selected for calibration.
- All electrolyte solutions within the electrode(s) are filled to their proper levels and no air bubbles are present within the electrode(s).
- The electrodes are immersed in a pH-7 buffer solution.
- The temperature compensator is adjusted to the proper temperature (on models with automatic temperature adjustments, immerse the temperature probe into the buffer solution). Alternatively, the buffer solution may be immersed in the sample and allowed to reach temperature equilibrium before equipment calibration. It is best to maintain buffer solution at or near expected sample temperature before calibration.
- The pH meter is adjusted to read 7.0.
- The electrodes are removed from the buffer and rinsed well with deionized water. The electrodes are immersed in pH-4 (or pH-10 buffer solution) and the slope control is adjusted to read the appropriate pH. To check the calibration, three successive readings are taken, one minute apart, to see that readings are within ± 0.1 pH unit.
- The electrodes are immersed in the unknown sample, slowly stirring the probe until the pH stabilizes. Stabilization may take several seconds to minutes. If the pH continues to drift, the sample temperature may not be stable, a chemical reaction (e.g., degassing) may be taking place in the sample, or the meter or electrode may be malfunctioning. This must be clearly noted in the logbook.
- The pH and temperature of the sample are read and recorded. pH is recorded to the nearest 0.1 pH unit.
- The electrodes are rinsed with deionized water.

6.1.2 Specific Conductance Meters

Conductivity is a numerical expression of the ability of a water sample to carry an electric current. This value depends on the total concentration of ionized substances dissolved in the water and the temperature at which the measurement is made. It is important to obtain a specific conductance measurement soon after sample collection since temperature changes, precipitation reactions, and sorption of carbon dioxide from the air affect the specific conductance.

Specific conductance can be used to identify the direction and extent of the migration of contaminants in groundwater and surface water. It can also be used as a measure of subsurface biodegradation or to indicate alternate sources of groundwater contamination.

A conductance cell and a Wheatstone Bridge (for the measurement of potential difference) may be used for measurement of electrical resistance. The ratio of current applied to voltage across the cell may also be used as a measure of conductance. Depending on ionic strength of the aqueous solution to be tested, a potential difference is developed across the cell which can be converted directly or indirectly (depending on instrument type) to a measurement of specific conductance.

Because many conductivity meters are available, operators should refer to the manufacturer's instruction manual for specific calibration, operation, and troubleshooting procedures. The following general procedure is used for obtaining specific conductance measurements:

- The conductivity meter is calibrated at the start of each sampling day or more frequently if deemed necessary.
- Batteries are checked before going into the field.
- The instrument is calibrated using a potassium chloride standard solution by completely immersing the electrode into the solution. The temperature of the calibration solution is checked and the temperature dial is adjusted on the meter (if not self-compensating). Calibration measurements and time are recorded in the field logbook.
- The umho value of the solution is checked in terms of the temperature. The Cell Constants dial is adjusted until the display reads the appropriate value.
- The electrode is rinsed with one or more portions of the sample to be tested.
- The electrode is immersed in the sample and the temperature and the conductivity are measured.
- The results are noted in the field logbook.
- If the specific conductance measurements become erratic, or inspection shows that any platinum black has flaked off the electrode, replatinization of the electrode is necessary. See the manufacturer's instructions for details.

6.1.3 Photoionization Detector

For monitoring total ambient air quality during field activities and for conducting static headspace testing, Chazen uses a MiniRae PID. This instrument measures total VOC concentrations. The operating and calibrating procedures for this instrument follow.

A MiniRAE 2000 PID can be used to detect a variety of trace gases, particularly VOCs. The MiniRAE 2000 uses the principle of photoionization to detect and measure the VOC concentrations in the atmosphere or from a sample.

The MiniRAE 2000 operates using an electrodeless discharge ultraviolet (UV) lamp as the high-energy photon source. As organic vapors pass by the lamp, they are photo-ionized and the ejected electrons are detected as a current. The PID sensor with a standard 10.6 eV lamp detects a broad range of organic vapors. In principle, any compound with ionization energy lower than that of the lamp photons can be measured.

The following procedure is used for operating and calibrating the MiniRAE 2000:

- Press and hold the MODE key for one second and release to turn on the MiniRAE 2000. The audio buzzer will beep once and the air pump will turn on. The display will show "ON"
- To turn off the MiniRAE 2000, press and hold the MODE key for 5 seconds. The monitor will beep once per second during the power-down and the message "OFF" will flash and the screen will go blank.
- After the monitor is turned on, it runs through the start up menu and then a "READY..." message is displayed. At this point the user can either 1) step through the operation menu or 2) take a measurement.

- In the first menu of the programming mode, the user can calibrate the MiniRAE 2000. The calibration is a two-point process using “fresh air” and the calibration gas (Isobutylene)
- Calibration Process
 - Press and hold down both the [N/-] and MODE keys for three seconds to enter the programming mode; the first menu item is “Calibrate/select Gas”
 - The Fresh Air calibration determines the zero point of the sensor calibration curve. If a fresh air source from a cylinder or tedlar bag is not available, any clean ambient air without detectable contaminant or a charcoal filter can be used.
 - The first menu shows “Fresh Air Cal?”; make sure the instrument is connected to the fresh air source; press the [Y/+] key, the display will show “zero in progress”, flowed by “wait..” and a countdown timer; after a pause, the display will show the message “zeroed...reading= x.x. ppm...”; press any key or wait about 20 seconds, the monitor will return back to the submenu.
 - For the second point of the sensor calibration, a cylinder of span gas (Isobutylene) fitted with a 500 cc/min. flow limiting regulator is attached to the instrument.
 - Press the [Y/+] key at the “Span Cal?” to start the calibration. The display shows the gas name and the span value of the corresponding gas; the display will show “Apply gas now” at which point the valve will be turned to open the gas supply.
 - The display will ask you to wait 30 seconds. When the count down timer reaches 0, the display will show the calibrated value. Turn off the flow to gas and disconnect the span gas. Press any key
- To record measurements
 - Press the [Y/+] key to start a measurement in survey mode
 - Instantaneous readings in ppm are updated every second
 - To stop measurements press the MODE key and the display shows STOP. Press [N/-] to continue measurement

The meter is calibrated once per day or more frequently, if necessary. The MiniRAE 2000 is used to monitor the breathing zone for health and safety precautions or to screen samples by placing the probe near suspected sources of contaminants.

6.1.4 Airborne Particulate Matter Meters

For monitoring airborne particulate matter (i.e., dust) during field activities, Chazen uses a MIE, Inc. Personal Data-logging Real-time Aerosol Monitor (*personalDataRAM*). This instrument provides direct and continuous data measurements and is a high sensitivity nephelometric monitor optimized for the measurement of the respirable fraction of airborne dust emitted from ground intrusive work or work that has the potential to produce dust. The following procedures are used for calibrating and operating the *personalDataRAM*:

- Calibration/Zeroing Process
 - Conduct zeroing in a particle-free environment such as a *personalDataRAM* Z-Pouch, a clean room, a duct or area directly downstream of a HEPA filter, or the MINIRAM Z-Bag. The following instructions are for the Z-Pouch.
 - Wipe the outside surfaces of the instrument to remove as much dust as possible, then in a reasonably clean area, open the zipper of the Z-Pouch and place the unit inside.
 - Open the small nipple of the Z-Pouch and insert the fitting of the hand-pump/in-line filter unit into the nipple. Start pumping the hand-pump until the Z-Pouch begins to bulge slightly.

- o While continuing to pump, press ENTER and keep pumping slowly while ZEROING is displayed for 1.1 minutes followed by CALIBRATION: OK. If screen shows BACKGROUND HIGH or MALFUNCTION, consult instruction manual.
- o To set up a run and scroll logging/operating parameters, press NEXT when screen shows READY: NEXT.
- o After completing zeroing process, remove the *personal*/DataRAM from the Z-Pouch, close the zipper and flatten the Z-Pouch while plugging its nipple to prevent dust contamination in the Z-Pouch.
- Operating Process
 - o To enable the logging function, press ENTER when screen shows LOGGING DISABLED.
 - o LOG INTRVL 600s indicates that logging is enabled (in this example for 10-minute log period). Press ENTER.
 - o At ALARM: OFF press ENTER to toggle through alarm modes.
 - o Press NEXT to move through the calibration factor screen and battery charge screen.
 - o Press NEXT at CONNECT TO PC, then again to return to ready mode (this will enable data to be downloaded).
 - o Press ENTER at LOG INTRVL with TAG # displayed. Concentration screen will be displayed after three seconds. Pressing NEXT will successively scroll to show various run values.
 - o Press EXIT to terminate the current run, then ENTER to return to Ready mode.

6.2 Laboratory Equipment Calibration

The Laboratory's Project Manager will be responsible for the operation and calibration of laboratory analytical instruments in accordance with the schedules and procedures specified by the NYSDEC ASP (Analytical Services Protocol, Revised September 1993).

The laboratory calibration procedures are addressed in the QA documents for the laboratory subcontractor.

7.0 ANALYTICAL PROCEDURES

Laboratory analyses will be scheduled based on historic information regarding potentially hazardous material disposal, previous site information, review of data objectives, and NYSDEC criteria. Specific parameters will be outlined in the Work Plan.

7.1 Analytical Laboratory

All sample analyses will be performed by a laboratory certified by the New York State Department of Health (NYSDOH). In order to provide legally defensible data, selected analytical procedures to be used will be in accordance with the most recent NYSDEC ASP. Laboratory analytical parameters will be based on previous site information, as well as data quality objectives and applicable NYSDEC criteria. The sampling program and related analytical methods are documented in the FSP. All samples will be received by the laboratory within 48 hours of collection.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

Independent third party data validation will be utilized. Data will be validated using the NYSDEC ASP Revision 12/91 and the USEPA Region II Functional Guidelines. The details supporting an independent validator's selection, describing how the individual is independent from the project, will be set forth in the Work Plan or other supplementary documentation.

8.1 Data Reduction

Data reduction is the conversion of raw data into a useful form from which conclusions can be made and presented. Raw data may consist of field data, which are real-time measurements, and technical data, which includes field and laboratory analytical data. Raw field data (e.g. PID readings) will be compared to laboratory analytical results which will be compared to site-specific criteria.

8.2 Data Validation

Data validation is the process of reviewing data and accepting it or rejecting it on the basis of sound criteria.

Records of all data will be maintained, even those judged to be "outlying" or spurious values.

The principle criteria that will be used to validate the integrity of the data during collection and reporting should be modeled from the following EPA guidance documents:

- "National Functional Guidelines for Organics Review", (USEPA, June, 1991)
- "Laboratory Data Validation, Functional Guidelines for Evaluating Inorganic Analyses", (USEPA, October, 1989)
- "NYSDEC ASP Revision 12/91"

8.2.1 Field Data Validation

Field data will be validated at the time of collection by following standard procedures and QC checks and after the data is reduced to review data sets for anomalous values. The objectives of field data validation are as follows:

- Adherence to approved site-specific plans.
- Standard operating procedures are followed.
- Sufficient sample volume is obtained, sample integrity is maintained, all required analyses are conducted, and all applicable field QC samples are provided with each sample set.
- Complete chain-of-custody documentation is maintained throughout the duration of the field effort.
- Maximize data consistency between field personnel by random checks of sampling and field conditions by supervisory personnel.

8.2.2 Laboratory Data Validation

Laboratory data verification will be performed by qualified individuals appointed by the analytical laboratory. Data verification will involve routine audits of the data collection and flow procedures and

monitoring GC sample results. Results from the analysis of project and blind audit QC samples will be calculated and evaluated as reported. Immediate corrective action will be taken if these results indicate data quality problems.

An individual independent from the project (i.e., third party data validator) will conduct a data validation of the laboratory data and prepare a Data Usability Summary Report (DUSR). Independent validation will be according to criteria such as:

- Holding times
- Instrument tuning and performance
- Calibration
- Blanks
- Surrogate recoveries
- Matrix spike and matrix spike duplicate recoveries

8.3 Reporting

When required for a project, Category B Deliverables will be supplied for laboratory analysis. Validated field and laboratory data will be presented in a final report in the form of tables and/or figures. Figures may include planimetric maps, cross sections, and contour maps. All supporting data, such as raw field and laboratory analytical data, will be presented as an appendix to the final report. Electronic files may be provided in lieu of hardcopies.

9.0 INTERNAL QUALITY CONTROL PROCEDURES

Quality control (QC) checks will be performed to ensure the collection of representative and valid data. QC checks provide the mechanisms by which the quality assurance objectives are monitored.

9.1 Field Quality Control

Field quality control measures will be conducted in accordance with the NYSDEC RCRA Quality Assurance Project Plan Guidance dated March 29, 1991. The field QC checks that will be used are listed and described as follows.

9.1.1 Documentation

All activities must be properly documented including: sampling procedures, decontamination activities, chain-of-custody procedures, equipment calibration, and justification for all actions taken contrary to the approved QAPP, Work Plan, and FSP.

9.1.2 Blank and Duplicate Samples

Three types of blanks can be used during sampling: trip blanks, field blanks and equipment blanks. These are discussed below.

Trip Blanks: Trip blanks are for assessing the potential for contaminating aqueous samples with VOCs during sample shipment. The trip blank consists of a VOC sample container shipped to the site with the other VOC sample containers either filled with reagent water at the lab or filled on-site with reagent water. Trip blanks will be used so as to maintain a 1:20 ratio of blanks to samples or with each shipment, whichever is greater. Non-aqueous samples do not require trip blanks.

Field Duplicates (Replicates): When required, field duplicates of soil, sediment, and groundwater samples will be submitted for analysis of all site-specific parameters at a rate of one every 20 samples collected for analyses. These duplicates are intended to assess the homogeneity of the sampled media and the precision of the sampling protocol. True duplicates of soil, sediment, and solid waste samples; however, are not possible because chemicals are typically not uniformly distributed.

Equipment Blanks: Equipment blanks for the bailer, sampling pump, and/or tubing assembly are collected during monitoring well sampling at a rate of one per day on one piece of equipment per equipment type. VOCs, SVOCs, or inorganics present within the bailer, pump apparatus, or discharge tubing are assessed by collecting a sample of reagent water passed through the sampling apparatus after washing with the decontamination solution followed by at least one rinse with reagent water.

Equipment blanks, sometimes called rinsate blanks, are collected during each field event at a rate of one per day on one piece of equipment per equipment type. VOC, SVOC, or inorganics present within or on the sampling apparatus where intimate contact with the sample occurs (i.e., split-spoon, trowel) are assessed by rinsing the sampling apparatus with ASTM Type II water following decontamination. Rinsate blanks are collected directly into the appropriate water container.

Matrix Spike/Matrix Spike Duplicates (MS/MSD): For some projects, the NYSDEC ASP requires the laboratory to analyze MS/MSDs for organic analyses at a frequency of five percent. To meet this requirement, the Field Operations Leader will select samples for MS/MSD analyses and will provide additional sample volume to the laboratory.

9.1.3 Completeness

Completeness of scheduled sample collection is controlled in the field by comparing a pre-sampling inventory with samples actually collected each day. Daily checking of field data sheets and comparison of transport and COC logs provides further control of documentation and completeness.

9.1.4 Field Analytical Quality Control

QC checks are performed on field measurement systems that emulate laboratory measurement systems (e.g., portable field GC).

9.2 Laboratory Analytical Quality Control

Data from QC samples (e.g., blanks, spiked samples) will be used as a measure of performance and as an indicator of potential sources of cross-contamination. In some cases, quality control data and records will be submitted to the data validator. Laboratory analytical quality control will be in accordance with the requirements outlined in the NYSDEC RCRA Quality Assurance Project Plan.

10.0 PERFORMANCE AND SYSTEM AUDITS

10.1 Systems Audit

System audits are performed to ensure that the QA/QC procedures are being followed. These audits include a careful evaluation of both field and laboratory control procedures.

Organization and Personnel: The project organization is reviewed for compliance with the proposed organization and for clarity of assigned responsibility. Personnel assigned to the project will be placed so that responsibility, skill, and training of the personnel are properly matched.

Facilities and Equipment: The audit will address whether field equipment and analytical instruments are meeting requirements specified by the project objectives stated in the Work Plan. Equipment and facilities provided for personnel health and safety may also be evaluated. Calibration and documentation procedures for instruments will also be verified.

Analytical Methodology: A review of analytical methodology with regard to the data requirements for the project will be performed. An on-site observation of analyst technique, data reduction, and record keeping may be performed if determined necessary. Periodic review of precision and accuracy of data will be performed.

Sampling and Sample Handling Procedure: An audit of scheduled samples versus samples collected versus samples received for analysis may be performed. Field documentation may be reviewed. If deemed necessary, a site visit will be made to document that designated control procedures are practiced during sampling activities.

Data Handling: During a system audit, the QAM will review data handling procedures with the TLs. Accuracy, consistency, documentation, and appropriate selection of methodologies will be discussed:

10.1.1 Field Systems Audit

Field systems audits are performed by QA personnel to compare field practices with standard procedures. These audits focus on such things as:

- Compliance with Work Plan
- Proper working order of field equipment
- Documentation procedures
- Field team efficiency
- Level of QA conducted by field members
- Proper sample packaging and shipping

10.1.2 Laboratory Systems Audit

Laboratory systems audit are conducted to ensure that measurement systems are properly maintained and used. Laboratory records and procedures may be reviewed for completeness, accuracy, precision, and adherence to prescribed methods.

10.1.3 Field Performance Audits

Field performance audits are conducted by QA personnel on an ongoing basis during a project as field data are generated, reduced, and analyzed. Field performance audits include review of numerical manipulations and review of blank and replicate samples.

10.1.4 Laboratory Performance Audits

Laboratory performance audits may be conducted and may include:

- Verification of written procedures, and analyst's understanding
- Verification and documentation of procedures and documents
- Periodic unannounced inspections, if warranted
- Review of a portion of all analytical data and calculations

11.0 PREVENTATIVE MAINTENANCE

11.1 Analytical Instrumentation

Preventative maintenance of analytical instrumentation is outlined in the QA documents of the subcontract analytical laboratory.

11.2 Field Instrumentation and Equipment

Preventative maintenance of field instrumentation and equipment includes the following measures:

- The field operations leader shall ensure that all scheduled maintenance occurs as obligated.
- Critical spare parts will be kept in stock.
- Equipment will be cleaned on a daily basis after use.
- Field crews will report on the condition and performance of the equipment after each sampling event.

12.0 DATA MEASUREMENT ASSESSMENT PROCEDURES

The purpose of a data quality assessment is to document that data generated under the program are accurate and consistent with project objectives. The quality of data is assessed based on the precision, accuracy, representativeness, comparability, and completeness of the data that are generated. Data quality assessments are conducted in three phases.

Phase 1: Prior to data collection, sampling, and analysis procedures are evaluated in regard to their ability to generate the appropriate, technically acceptable information required to achieve project objectives.

Phase II: During data collection, results will be assessed so that selected procedures are efficient and effective and that the data generated provide sufficient information to achieve project objectives. In general, evaluation of data are based on performance audits, results of duplicate and spiked sample analyses, and review of completeness objectives.

Documentation may include:

- Number and identity of duplicate samples collected
- Number and identity of duplicate, spike, and field blank samples analyzed
- Identification of statistical techniques, if used
- Use of historical data
- Identification of analytical method
- Data validation results

Procedures for assessing precision and accuracy for analytical data are outlined in Section 3.2. Precision is generally expressed as the relative percent difference (RPD) among duplicate analyses. Accuracy is generally expressed as percent recovery. Precision and accuracy of instrumental analysis is further addressed in the NYSDEC ASP and the Laboratory QAPP. It is the laboratory's responsibility to attempt to identify the source of substandard recoveries and take corrective action or document the cause as required by the NYSDEC ASP.

Phase III: Following completion of data collection activities, an assessment of the adequacy of the database generated in regard to completing project objectives is undertaken by the Project Manager and/or the Technical Reviewer. Recommendations for improved QC are developed, if appropriate. If data gaps are identified, additional raw data collection may be recommended to fully support the project findings and recommendations.

13.0 CORRECTIVE ACTIONS

Corrective actions are QA/QC problem-solving measures taken to rectify a laboratory or field measurement system that is out of control. Corrective action is required when potential or existing conditions are identified which may adversely affect the data quality. The need for corrective action may be identified by system or performance audits or by standard QC procedures. The corrective action system will include the following procedures:

The Project Manager is immediately notified of any potential problem with the data quality, and will then evaluate the need for changes in affected procedures and conduct appropriate corrective actions. Potential data quality problems may include:

- Loss of a sample or damaged sample containers.
- Analytical results that are substantially different from those expected.
- Laboratory QC samples that do not attain target performance objectives.
- Events that may require changes in specifications and sampling procedures.

Corrective action related to questionable analytical results or damaged sample containers may include re-sampling and re-analysis, if appropriate. Modification of procedures may be necessary to remedy problems related to unexpected conditions encountered in the field.

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Project Manager submits periodic QA reports for appraisal by management, appropriate to their level of responsibility. Reports to management include:

- Periodic assessment of measurement data accuracy, precision, and completeness.
- Results of performance and system audits.
- Significant QA/QC problems and recommended solutions.
- Resolutions of previously stated problems.

14.1 Field Quality Assurance Reports

Periodic status reports describing the progress of the project are submitted periodically to management. These reports include: copies of field notes or daily field progress reports, compiled field data sets, and corrective action documentation. The Project Manager is notified immediately of situations requiring corrective action measures.

14.2 Laboratory Quality Assurance Reports

A project QA report that summarizes QA activities and QC data is issued to the QA Manager and Project Manager. Any laboratory QA situations requiring immediate corrective action is reported to the Project Manager.

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Appendix C
Health and Safety Plan

Site Health & Safety Plan

Former Package Lighting Systems, Inc.

29 Grant Street

Village of Walden

Orange County, New York

October 2011

Chazen Project No. 41115.00



Prepared for:
The Estate of Hy Hilzen
25 Flag Hill Road
Chappaqua, New York 10514

Site Health & Safety Plan

Former Package Lighting Systems, Inc.

29 Grant Street

Village of Walden

Orange County, New York

October 11, 2011

Chazen Project No. 41115.00



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APPENDICIES:

APPENDIX A: Daily Site Sign-in Sheet

APPENDIX B: HASP Acknowledgement Sheet

1.0 INTRODUCTION AND OBJECTIVES

The Chazen Companies (Chazen) have prepared this Health and Safety Plan (HASP) for employees of Chazen for the Former Package Lighting Systems site located at 29 Grant Street in the Village of Walden, New York. This HASP is applicable to remedial investigation and interim remedial measure (IRM) activities, and has been prepared to specifically address potential hazards associated with the tasks identified in HASP Section 3.3.

The activities, equipment, and procedures described in this plan are designed to provide personal protection against potential environmental hazards which may be present on the work site. This plan includes a preliminary evaluation of site characteristics; establishes an emergency chain-of-command; details the use of basic safety equipment, personal protective equipment (PPE) and air monitoring devices, and describes equipment decontamination procedures.

The objectives of this HASP are to:

- Identify the physical, chemical, and biological hazards which may be present during the proposed site activities,
- Specify the protective measures necessary to control those hazards,
- Define emergency procedures,
- Specify training and medical qualification criteria for personnel.

This HASP must be read and understood by all Chazen personnel who enter the Former Package Lighting Systems, Inc. property.

We have generated a daily site sign in sheet (Appendix A) and HASP acknowledgement sheet (Appendix B) to be maintained by the Field Operations Leader and records appropriately filed in the project folder.

2.0 PROJECT PERSONNEL & EMERGENCY RESPONSE CONTACTS

The personnel and emergency response contacts associated with the proposed scope of work at the Former Package Lighting Systems site are presented below and are to be posted onsite during all field activities.

DIAL 911 FOR EMERGENCY IN ORANGE COUNTY

Title/Project Responsibility	Name	Main Office Phone	Mobile/Other Phone
Project Personnel			
Chazen Project Manager	Emily Pereira	(845) 486-1558	(914) 204-0583
Field Operations Leader	Will Olsen	(845) 486-1521	(845) 532-0602
Field Operations Leader	Eric Orlowski	(845) 486-1522	(518) 928-5823
Health & Safety Officer	Kimberly Cuppett	(845) 454-3980	(845) 249-5213
Emergency Personnel – DIAL 911 In Orange County			
Hospital St. Luke's Cornwall Hospital 70 DuBois Street Newburgh, New York (Hospital Route Map Attached On Next Page)		*Emergency-Dial 911	(845) 568-2311 non-emergency
Fire Department Coldenham Fire and Rescue		Dial 911	(845) 564-0438 non-emergency
Police Dept. Walden Village Police		Dial 911	(845) 778-5595 non-emergency
NYSDEC Spills Hotline		(800) 457-7362	
NYSDEC Regional Office		(845) 256-3000	
Poison Control Center		(800) 336-6997	
National Response Center		(800) 424-8802	

* Dialing 911 will connect all land lines and wireless calls to the Orange County Sheriffs Office Emergency Communications Center.

2.1 Hospital Route

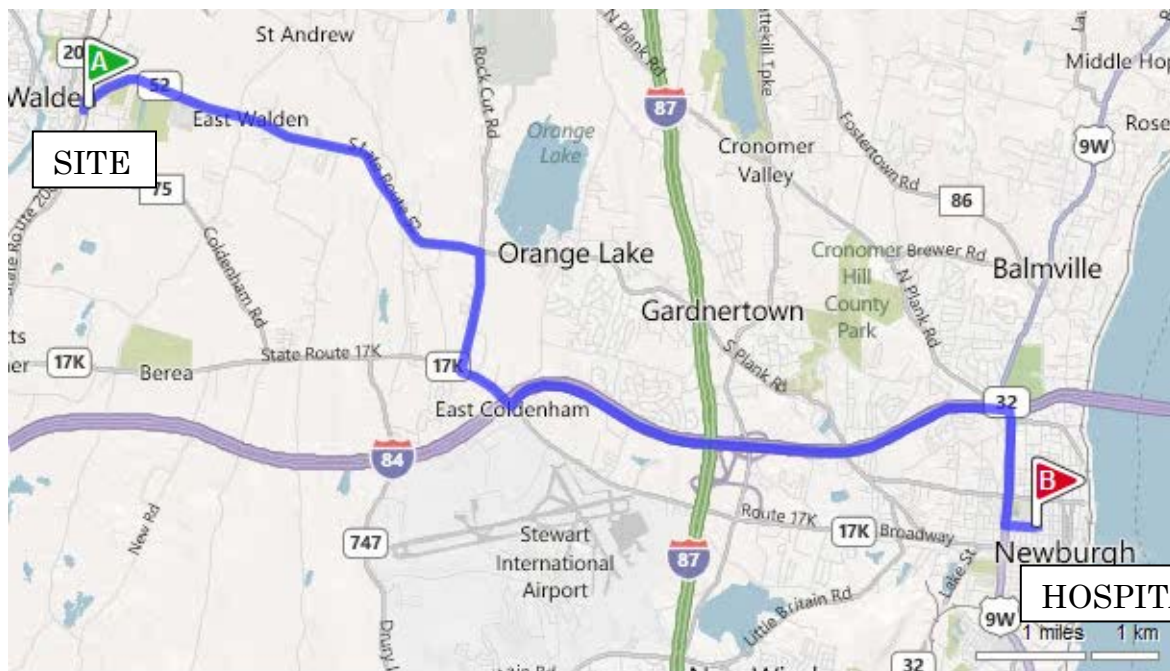
St. Luke's Cornwall Hospital is located approximately 12.4 miles from the subject site. The estimated travel time from the site to St. Luke's Cornwall Hospital is approximately 20 minutes. Directions and a route plan map are provided below.

Directions To St. Luke's Cornwall Hospital

1.	Depart Grant St. toward Hepper St.	143 feet
2.	Turn right onto Hepper St.	0.1 miles
3.	Turn right onto Route 52/East Main St.	4.3 miles
4.	Turn right onto Rock Cut Road/CR 23.	1.1 miles
5.	Turn left onto Route 17K/Newburgh Cohecton Tpke.	0.6 miles
6.	Take ramp left for I-84 East.	4.7 miles
7.	At Exit 10, take ramp right for Rt-32/US-9W toward Highland/Newburgh.	0.2 miles
8.	Turn right onto US-9W/Rt-32/Route 9W.	1.1 miles
9.	Turn left onto Carter St.	0.3 miles
10.	Turn right onto DuBois St.	206 feet
11.	Arrive at 70 DuBois St, Newburgh, NY	

Total estimated time = 20 minutes

~ 12.4 miles



3.0 SITE CHARACTERIZATION

3.1 Site Location & Description

This former commercial/industrial site is located at 29 Grant Street, in the Village of Walden, Orange County, New York. The site is situated along the southern side of Grant Street, approximately 500 feet east of the intersection of Grant Street and New York State Route 208. The site is bounded to the north by Grant Street, to the west by an active railroad line, to the east by two residences along Elm Street and to the south by a commercial/industrial facility (Ampac Paper). The site contains an abandoned, vacant commercial/industrial use building last occupied by Packaged Lighting Systems, Inc. The buildings on the property have been vacant since 2008.

3.2 Historic Site Uses

The subject property has four commercial buildings. The dates of construction for the site buildings range from the mid-1800s through the 1960s. The site has a history of industrial use dating back to the mid-1800s. From 1885 to 1894, the site was operated by the Rider Engine Company, a manufacturer of steam engines. From 1900 to 1939 the facility operated under the name Rider-Ericsson Engine Company, and continued manufacturing steam engines. From the 1920s until 1967, the facility was operated by Spence Engineering, a manufacturer of steam regulators and valve mechanisms. From 1968 until 2008 the facility was used by Packaged Lighting Systems, Inc., which designed unique lighting systems for New York City theaters.

A preliminary Phase II subsurface investigation of the facility was conducted in 2010 and identified chlorinated solvent impacts to groundwater in excess of New York State standards and also low-level metal impacts to soil that are likely related to historic filling. Based on the limited Phase II data, the source of the groundwater impacts appear to be localized and linked to the historic floor drain (FD) system because concentrations are highest near the FD, and drop sharply towards the east of the FD in the suspected down-gradient direction.

3.3 Proposed Project Scope/Site Activities

The investigative activities proposed at the former Package Lighting Systems site will include the following:

- Investigative delineation of the site through subsurface soil and groundwater sampling.
- Implementation of several IRMs to include:
 - o the closure of two existing underground storage tanks (USTs)(one within the building),
 - o the closure of a historical gasoline UST (if identified),
 - o the closure of up to six floor drain/dry well systems with unknown discharge points, and
 - o the remediation of associated impacted soil removal.

- Sub-slab vapor and indoor air quality sampling.
- A ground penetrating radar (GPR) survey.

4.0 SITE HAZARD EVALUATION AND CONTROL

The potential for exposure to chemical, physical, and mechanical hazards at Former Package Lighting Systems site is considered to be minimal. Hazards which may be encountered at the site are summarized in Table 1. Additional information pertaining to these hazards is provided in later sections of this HASP.

Table 1
Potential Hazards at Former Package Lighting Systems, Inc. Site

Hazard Type	Hazard Anticipated	Associated Investigative Activities	Comments	Hazard Control Methods
Chemical	Chemicals of Potential Concern (COPC)	Soil and groundwater sampling to characterize the site. Closure of two USTs, suspect cistern and floor drain/dry well exploration and closure and soil removal	Considered minimal	PPE, Information on COPCs, Safety Training & Standard Safety Operations
Physical	Slip, trip & fall, heat and cold related illnesses, noise	Any site work	Construction equipment on-site	Safety Training & Standard Safety Operations, Job Awareness, Noise Source Distancing
Biological	Tick, insect bites, poisonous plants	Any outdoor site work	Considered moderate	Safety Training & Standard Safety Operations
Electrical	Working around utilities	Soil Excavation and work at southeastern property where overhead lines exist	Considered minimal	Utility Check Safety Training & Standard Safety Operations

4.1 Hazard Evaluation

4.1.1 Physical Hazards

Site work which occurs in the vicinity of excavating equipment and machinery presents a general safety hazard to personnel on the site. Uneven ground surfaces and the presence of debris on the site presents a concern for slip, trip, and fall incidents.

It is anticipated that site work will be performed during the Fall/Winter of 2011 and will continue into the Spring and possibly the Summer of 2012. Therefore, the potential for both heat-related and cold-related illnesses during site work exist.

Heat-related Illnesses include the following:

Heat Rash – Result of continuous exposure to hot humid air and chafing clothes. Heat rash is uncomfortable and decreases the ability to tolerate heat.

Heat Cramps – Result of the inadequate replacement of body electrolytes lost through perspiration. Signs include severe spasms and pain in the extremities and abdomen.

Heat Exhaustion – Result of the increase stress on the vital organs of the body in the effort to meet the body's cooling demands. Signs include shallow breathing, pale, cool, moist skin, profuse sweating, dizziness and listlessness.

Heat Stroke – Result of overworked cooling system. Heat stroke is the most serious form of heat stress. Body surfaces must be cooled and medical help must be obtained immediately to prevent severe injury and/or death. Signs include red, hot, dry skin, absence of perspiration, nausea, dizziness, confusion, strong rapid pulse, coma and death.

Cold-related Illnesses include the following:

Frostbite – Result of continuous skin exposure to freezing conditions. Signs include loss of feeling in skin, firm or waxy feeling skin and white or grayish-yellow skin discoloration.

Trench Foot – Result of cold wet feet for extended periods of time. Signs include numbness, red or gray discoloration, swelling, burning pain, tingling, itchy, blisters, ulcers, and/or peeling skin.

Hypothermia – Result of abnormally low body temperature. Signs include severe shivering, loss of coordination, slurred speech, drowsiness, confusion, exhaustion and dizziness.

Physical hazards are anticipated to be a concern for all site activities.

4.1.2 Electrical Hazards

Excavation equipment will be used on the site and inside of the building to remove two petroleum storage tanks. There also may be limited soil excavation of highly concentrated soils. The presence of overhead and underground utilities poses a hazard if the lines are contacted by equipment.

4.1.3 Chemical Hazards

Based on Phase II investigation findings, the primary site contaminant is trichloroethylene. Other chemicals of potential concern (COPCs) which are known to be or are believed to be present in site soil and/or groundwater include semi-volatile organic compounds (SVOCs), chlorinated solvents, petroleum hydrocarbons, and heavy metals.

Table 2 lists the potential health hazards that may be encountered.

Table 2
COPCs for Former Package Lighting Systems & Established Airborne Exposure Limits

COPC	Time Weighted Average Airborne Limits			Short-Term Exposure Limit	IDLH	Primary Routes Of Exposure On Site
	OSHA PEL	NIOSH REL	ACGIH TLV			
Petroleum Constituents						
Benzene	1.0 ppm	0.1 ppm	0.5 ppm	5.0 ppm (1.0 NIOSH)	500 ppm ^{Ca}	Inhalation
Ethylbenzene	100 ppm	100 ppm	100 ppm	5.0 ppm (1.0 NIOSH)	500 ppm ^{Ca}	Inhalation
Toluene	200 ppm	100 ppm	50 ppm	125 ppm	800 ppm	Inhalation
Xylenes	100 ppm	100 ppm	100 ppm	150 ppm	500 ppm	Inhalation
1,2,4-TMB	--	25 ppm	25 ppm	150 ppm	900 ppm	Inhalation
1,3,5-TMB	--	25 ppm	25 ppm	--	--	Inhalation
Chlorinated Solvents						
Perchloroethylene & Trichloroethylene ¹	100 ppm	--	25 ppm	100 ppm (ceiling)	150 ppm ^{Ca}	Inhalation
Metals						
Arsenic	0.5 mg/m3	0.002 mg/m3 (ceiling)	0.01 mg/m3	--	5 mg/m3 ^{Ca}	Inhalation
Lead	0.05 mg/m3	--	0.05 mg/m3	--	100 mg/m3	Inhalation

SVOCs						
Napthalene ²	10 ppm	10 ppm	10 ppm	300 ppm	--	Inhalation

1 Numerous VOCs; PCE and Trichlor permissible exposure limit information noted as a conservative example of VOCs. A conservative permissible exposure limit of 5 ppm for VOCs will be used in the field as measured continuously using a portable photoionization detector (PID)

2 Numerous SVOC; Napthalene permissible exposure limit information noted as a conservative example of SVOCs.

Ca: NIOSH has identified the compounds as a potential occupational carcinogen

IDLH: Immediately Dangerous to Life & Health

OSHA PELs are legally enforceable. RELs and TLVs are published as recommended guidelines

COPCs present on the subject property are expected to vary based on location.

Given the nature of the proposed project activities, the potential for site personnel to encounter the site COPCs during performance of the activities outlined in the scope of work is considered to be minimal.

Symptoms of overexposure to the COPCs are summarized in Table 3.

Table 3
General Signs and Symptoms of Overexposure to COPCs

Compound	Signs & Symptoms of Overexposure
Petroleum Hydrocarbons	Irritation eyes, skin, nose, respiratory system; headache, nausea, staggered gait; fatigue, anorexia, lassitude (weakness, exhaustion); dermatitis
Chlorinated Solvents	Confusion, dizziness, drowsiness, euphoria, fatigue, headache, lethargy, light-headedness, pulmonary edema, renal and hepatic damage, respiratory depression, seizures, stupor, visual disturbances
SVOCs	Irritation eyes, skin, nose, respiratory system; headache, nausea, fatigue, anorexia, weakness
Metals	Weakness, insomnia, constipation, abdominal pain, anemia, tremor, weight loss, irritation to eyes and skin, cough, chest pain, breathing difficulty, tremor, irritability, headache

4.1.4 Biological Hazards

Site field work will most likely occur during the winter, spring, and summer months. Warmer weather presents the potential for biological hazards. Biological hazards include poison ivy, snakes, ticks, mosquitoes, and other pests.

4.1.4.1 Tick-Borne Disease

Ticks can carry a number of diseases. In the Northeastern United States primary tickborne diseases include:

- Lyme Disease
- Ehrlichiosis

Lyme Disease - The disease commonly occurs in New York State when deer ticks are active during spring, summer, and autumn, and is transmitted by the bite of infected ticks. Symptoms of Lyme disease include a rash or a peculiar red spot, in a bull's eye shape, which expands outward in a circular manner. The victim may develop a headache, weakness, fever, a stiff neck, swelling and pain in the joints, and eventually, arthritis.

Ehrlichiosis - The disease also commonly occurs in New York State in the spring, summer, and autumn and is transmitted by the bite of infected ticks. Symptoms of ehrlichiosis include muscle aches, joint aches, and flu-like symptoms, but there is typically no skin rash.

4.1.4.2 Other Biological Hazards

Poisonous plants, such as poison ivy and sumac, maybe present on the site and present a hazard for site personnel. Signs and symptoms of exposure to such poisonous plants include itching, burning, redness, rash, blistering and swelling.

Snakes that could be present on the site property present the potential for snake bites. Due to geographic location, venomous snakes are not expected to be present on the site, however, even bites from non-poisonous snakes can cause adverse health symptoms such as redness, swelling, and allergic reaction.

Site personnel may be exposed to mosquitoes during site work. While the presence of mosquitoes is not anticipated to be a significant health and safety concern, bites can cause adverse health symptoms such as redness, swelling, and allergic reaction.

Biological hazards are considered to be a concern for all site activities.

4.2 Hazard Control

4.2.1 Physical Hazards

All personnel should be aware of slip, trip, and fall hazards from scattered debris and/or irregular walking surfaces. Awareness and safe clearance should also be maintained when working in the proximity of excavation and construction equipment.

The following or any combination of the following actions can be taken to prevent heat stress:

- Replace body fluids (water and electrolytes) lost through perspiration. Solutions may include a 0.1% salt and water solution or commercial mixes such as Gatorade and Squench. A fluid/electrolyte replacement will be used as necessary to minimize fluid loss.

- Provide cooling devices to aid in the natural body ventilation. Cooling occurs through evaporation of perspiration and limited body contact with heat absorbing protective clothing. Fans and air conditioners can assist in evaporation.
- Provide hose-down mobile shower facilities, where feasible, to cool protective clothing and reduce body temperature.
- Conduct activities early in the morning or evening to avoid working during very hot weather.
- Provide shelter against heat and direct sunlight to protect personnel.

The following or any combination of the following actions can be taken to prevent cold weather injuries:

- Dress in loose-fitting layers; avoid cotton clothing as it absorbs water and drains body heat.
- Wear a hat that covers ears and choose mittens over gloves when dexterity is not required.
- Keep footwear and socks dry and wear waterproof, insulated boots.
- Keep moving but take occasional breaks and stay hydrated.
- Avoid drinking alcohol or caffeine.

4.2.2 Electrical Hazards

Overhead electric utilities exist at the southeastern portion of the property and municipal mains run through the basement of the main building. Other underground utilities may exist on the property.

Prior to any subsurface excavation required by site activities, underground utilities must be located using facility plans and the NYS Underground Facilities Protection Organization (UFPO) Program (1-800-962-7962). These protective measures will be taken to minimize the potential health and safety risks associated with subsurface excavation activities near underground utility lines.

If activities using heavy equipment are conducted in the vicinity of overhead power lines, the equipment will be positioned such that no part of its structure is within the minimum clearances published in OSHA regulation 29 CFR 1910.333(c)(3)(iii)(A) and NFPA 70E – Standard for Electrical Safety in the workplace, which are outlined in Table 4, below:

Table 4
Minimum Clearances For Overhead Line Conductors

Voltage (kV)	Minimum Required Clearance
<50	10 feet
50-72,500	10 feet plus 0.4 inches for each 1kV over 50 kV
>72,500	Refer to NFPA-70E

4.2.3 Chemical Hazards

To control dermal exposure during site investigation and IRMs activities, a minimum of Modified Level D PPE will be worn as described in Section 5.0 of this HASP.

Based on available information collected during a previous Phase II study, SVOCs, chlorinated solvents, metals, and petroleum hydrocarbons are present on site and therefore the potential for inhalation exposure to airborne dusts and vapors will be evaluated and controlled during site activities as a general safety precaution.

Air monitoring will be performed during site work to evaluate airborne concentrations of chemical contaminants to which site workers may be exposed. Air monitoring control measures are discussed in Section 6.0 of this HASP.

4.2.4 Biological Hazards

The best way to prevent tickborne diseases is to avoid tick bites. Preventative measures to reduce the potential for tick bites include, but are not limited to, the following:

- Wearing long pants and long sleeved shirts.
- Tucking shirts into pants. Tucking pants into socks or boots, or using tape to close the opening where they meet.
- Using an EPA-approved insect repellent or arachnicide (pesticide) which is effective for ticks, such as DEET (N,N-diethyl-m-toluamide) or pyrethrin. Be sure to heed all precautionary information, and be aware that some people are sensitive to these chemicals. For this reason chemicals should be applied to clothing; not to skin.
- Wearing light colored clothing so that a tick can be seen more easily.
- Changing clothes when you return from an area where ticks may be located.
- Showering to wash off any loose ticks.
- Throughout the work day, performing Tick Check and Removal Procedures as follows:

- Check clothing for ticks. If you find a tick, do a more thorough tick check.
- Inspect body parts that bend (back of knee, between fingers and toes, underarms), pressure points where clothing presses against skin (underwear elastic, belts, neck); other common areas (belly button, around or in ear, hairline, top of head).
- Once indoors, do a final tick check and change of clothing.
- If you are in a tick infested area or an area known to have disease carrying ticks, perform the checks on a more regular basis.
- Remove unattached ticks promptly.
- Attached ticks are removed using fine pointed tweezers.
- The mouth parts of the tick are grasped with the tweezers as close to the skin as possible.
- Apply firm steady pressure upward until the tick releases - do not jerk, twist, squash or squeeze the tick.
- Clean the wound and the tweezers with an antiseptic.

Do not use petroleum jelly or nail polish remover, or prick or burn the tick; these actions can cause infected secretions to enter the wound.

Preventative measures will be implemented to avoid contact with poisonous plants on the site property. These measures will include, but are not limited to, the following activities:

- Covering arms and hands if possible.
- Frequently washing exposed skin.
- Avoiding skin contact with objects or protective clothing that have touched the plants.
- Treating every surface that may have touched the plant as contaminated, and practice contamination avoidance.
- If skin contact is made, washing the area immediately with soap and water, and observed for signs of reddening.

To minimize the threat of snake bites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes. If a snake bite occurs, first aid shall be performed. First aid procedures consist of washing the area around the wound to remove any unabsorbed venom and applying a clean dry dressing.

4.2.5 General Health and Safety Controls

4.2.5.1 Communications System

Telephone communication will be available on-site and both on-site and off-site project personnel will be accessible for communication. If there is a lack of cell phone signal at the site, hand-held radios should be used for communication. As an added safety feature, personnel should locate the closest public payphone prior to work commencement. Personnel should also be trained in the use of standard hand signals for health and safety. Personnel in the work zone will use the following standard hand signals:

- Hand gripping throat ----- Can't breathe.
- Grip partner's wrist or both hands around waist ----- Leave area immediately.
- Hands on top of head ----- Need assistance.
- Thumbs up ----- OK, I am all right, I understand.
- Thumbs down ----- No, negative.

4.2.5.2 Basic Safety Equipment

Safety equipment will be kept on site for monitoring and responding to emergency situations. In addition to equipment previously mentioned, basic safety equipment will include, but is not limited to, the following:

- ABC type fire extinguishers.
- First aid kits.
- Air Monitoring Equipment.
- Reference books containing basic first-aid procedures and chemical information.

4.2.5.3 Safe Work Practices

All Chazen personnel and all subcontractors working on-site are expected to follow established safe work practices for their specialties (i.e. excavators, surveying, etc.). The need to exercise caution in the performance of specific work tasks is frequently made more acute due to:

- Weather conditions.
- Restricted mobility and reduced peripheral vision caused by protective gear.
- The need to maintain the integrity of the protective equipment.

Work at the Former Package Lighting Systems will be conducted in accordance with established protocols and guidelines for the safety and health of all involved. General safety practices employed at the site will include but are not limited to the following:

- No smoking, eating or drinking on site or before personnel decontamination. Ingestion of contaminants is the second most likely means of introducing toxic substances into the body. Breathing air contaminants is the primary route.
- In any unknown situation, always assume the worst conditions and plan responses accordingly.
- Personal protective equipment is never 100% effective, so all personnel must minimize contact with potentially contaminated material. Do not place equipment on potentially contaminated ground. Do not sit or kneel on potentially contaminated material. Avoid standing in or walking through puddles or stained soil.
- Avoid heat and other work stresses related to the wearing of protective equipment and clothing. Work breaks should be scheduled (*and actually taken*) to prevent stress-related accidents or fatigue.
- As often as possible, the handling of contaminated materials should be done remotely. Every effort should be made to identify the contents of containers found on-site before they are handled.
- Personnel must be observant of not only their own immediate surroundings, but also of others.
- Contact lenses are not permitted to be worn on site. If any contaminated substance enters the eye, the lenses impede proper flushing of the eye.
- Rigorous contingency planning and dissemination of plans to all personnel minimizes the impact of rapidly changing safety protocols in response to changing site conditions.
- Personnel must be aware that chemical contaminants may mimic or enhance symptoms of other illness or intoxication. Avoid working while feeling ill during field assignments.
- During test pitting investigations, the test pit will be backfilled to the ground surface. If this is not possible, then temporary fencing will be installed around the test pit at the end of each work day prior to leaving the site.

The site Health and Safety Officer or their designee will maintain project Health and Safety records in a safe and secure manner. The Health and Safety records will remain on site for the duration of the project so that any designated replacement can update and maintain the records. At the conclusion of field work, the records will be included with the overall project file.

5.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Site workers will be provided with the appropriate PPE and will be trained on the use of this equipment. PPE will be selected to provide an appropriate level of protection against known and reasonably anticipated site hazards. Given the available data, the level of PPE selected for Former Package Lighting Systems is modified Level D which will include the items listed in Table 5.

Table 5
Site-Specific PPE Components

Area	PPE Item	Associated Tasks
Head	Hard Hat (OSHA approved)	Working around heavy equipment, overhead hazards
Feet	Work Boots (steel-toed)	Working with or around heavy equipment
Skin	Nitrile Gloves	Handling of contaminated equipment, soils, groundwater, or surfaces
Hearing	Ear Plugs/Hearing Protection	Working with or near loud equipment
Eyes	Safety Glasses	Handling of liquids (non-water), soils, working near heavy equipment

The level of PPE will be continually evaluated and will be modified as necessary, depending on site conditions. If necessary, the level of PPE will be upgraded to one of, or a combination of the following levels:

Level C protection consists of:

- (a) Full-face air-purifying respirator
- (b) Tyvek or Poly-tyvek coveralls
- (c) Chemical-resistant gloves taped to coveralls
- (d) Chemical-resistant boots taped to coveralls

The use of PPE above Level C is not anticipated for this site. If Level C protection becomes unprotective for site conditions, the site operations will be halted so that project plans can be formulated to be protective of the site personnel. Plans to increase protection to Level B will be

made in conjunction with the Project Manager, Field Operations Leader, Health and Safety Officer, and other pertinent environmental staff.

Level B protection typically consists of:

- (a) Level C protection for the body, plus
- (b) Positive pressure Self-contained Breathing Apparatus (SCBA) or a tethered cascade breathing system.

It will be the responsibility of the Project Manager to ensure that all personnel and subcontractors are knowledgeable of the level of personal protection required in all work situations. Further, it is the obligation of the Project Manager to see that proper equipment is worn and work rules are observed. All subcontractors are responsible for supplying their personnel with the necessary equipment.

6.0 AIR MONITORING

6.1 Personal Air Monitoring

A preliminary evaluation of site characteristics at Former Package Lighting Systems has been conducted in accordance with 29 CFR 1910.120(c) and monitoring of the air necessary to appropriately protect employees has been assigned as specified below. Immediately after initial site entry, a more detailed evaluation of the site's specific characteristics will be performed by the HSO in order to confirm correct assignment of air monitoring, engineering controls, and PPE during site work tasks.

Adequate outdoor ventilation is expected to minimize respiratory exposure to the COPCs while working outdoors. Indoor ventilation can be improved by opening assessable windows and doors. While the indoor petroleum storage tank is being evaluated and removed, the nearby overhead door should be fully opened to introduce fresh air.

Periodic monitoring of the air is necessary especially when working inside or when the possibility of an IDLH condition, flammable atmosphere, or elevated personal exposure condition could exist. In addition to periodic monitoring of site air conditions, monitoring will be conducted:

- anytime work begins on a different portion of the site,
- when contaminants other than those previously identified are discovered,
- when a different type of operation is initiated (for example, exploratory well drilling discovers free product), or
- when employee are working in areas with obvious liquid contamination (a spill or free product).

General dust conditions will be measured with a hand-held dust monitor, SVOCs will be measured with a hand-held photoionization detector (PID), and as extra precaution when working indoors combustible vapors and hydrogen sulfide will be measured using a 4-gas meter.

The following actions levels and required actions should be referenced when conducting personal air monitoring.

Table 6
Summary of Action Levels

Parameter	Averaging Period	Action Level	Action Required if Level Exceeded
Dust	15 minutes	100 ug/m3	Site continues to operate. Monitoring of dust generating activities and modifying of procedures including additional watering.
Dust	15 minutes	155 ug/m3	Temporary stop work. Project Manager and other project personnel will evaluate work practices and techniques to reduce dust will be identified and implemented. Work will resume within a short time period when revised procedures are implemented.
VOCs	15 minutes	2 ppm	Draeger® Tubes will be implemented to assess benzene contamination. If benzene is above 2 ppm, source will be immediately covered and an action plan will be developed.
VOCs	1 minute	> 15 ppm	Temporary stop work. Implement Draeger® Tubes to determine benzene levels. Project Manager and other project personnel will evaluate work practices and techniques to reduce exposure to VOCs.
Combustible Vapors	1 minute	> 10% LEL	Evacuate area. Project Manager and other project personnel will evaluate work practices and techniques to reduce potential explosive hazards.
Hydrogen Sulfide	1 minute	1 ppm	Evacuate area. Project Manager and other project personnel will evaluate work practices and techniques to reduce exposure to hydrogen sulfide.

6.2 Community Air Monitoring Plan (CAMP)

A CAMP is required for this project. CAMP specifications are detailed in the Remedial Investigation/Interim Remedial Measures Work Plan.

7.0 TRAINING & MEDICAL SURVEILLANCE

7.1 Personnel Safety Training

All workers and other personnel shall receive appropriate training prior to engaging in site activities. All Chazen personnel have received a minimum of 40 hours of comprehensive health and safety training in hazardous waste operations and emergency response (29 CFR 1910.120) and an annual 8 hour refresher course.

All workers must recognize and understand the potential hazards to health and safety that are associated with the investigation activities and must be thoroughly familiar with programs and procedures contained in the safety plan.

The objectives of Chazen's training program, for employees involved in hazardous site activities are:

- To make workers aware of the potential hazards they may encounter.
- To provide the knowledge and skills necessary to perform the work with minimal risk to the health and safety of the workers.
- To make workers aware of the purpose and limitations of safety equipment.
- To ensure that workers can safely avoid or escape from emergencies.

7.2 Medical Surveillance

All Chazen field personnel are currently considered for inclusion in a medical monitoring program in accordance with 29 CFR 1910.120.

Based on the proposed scope of work, the potential for exposure to site COPCs is considered to be negligible. Medical monitoring for common COPCs is performed as part of the existing Chazen medical monitoring program when exposure to site contaminants for established durations can be anticipated or are expected to occur. Any provisions for alterations to the existing medical surveillance program will be made by the Health & Safety Officer based on the site characterization and job hazard analysis.

8.0 WORKING ZONES

Although the following general working zones are not typically formally delineated under Level D apparel (the level of protective apparel anticipated to be needed to appropriately protect workers at Former Package Lighting Systems), they are described below and will be implemented partially or entirely at the discretion of the Project Manager and/or Health and Safety Officer. Decisions on working zones will be made according to site conditions and the determined necessity for formally defined working zones to be fully protective of people and the community.

8.1 Exclusion Zone

An Exclusion Zone will be established in areas where work activities will occur. The Exclusion Zone will be cordoned off while work is in progress. Entry to and exit from this area will be provided only to those persons directly involved in the work activities and only if the prescribed level of personal protection is worn.

The personnel working in the Exclusion Zone will be the Health and Safety Officer, work crews, and specialized personnel. All personnel within the Exclusion Zone must wear the level of protection required by the site safety plan. All personnel in the Exclusion Zone will be 40-hour health and safety trained.

8.2 Contamination Reduction Zone

If needed, the Contamination Reduction Zone (CRZ) will be established at the perimeter of the exclusion zone, where personal decontamination will take place. The CRZ is a transition zone between contaminated and uncontaminated areas of the site.

When personnel, equipment, or materials suspected to be contaminated are taken out of the exclusion zone, they will be properly contained, or decontaminated in the CRZ.

8.3 Support Zone

If a CRZ is established, then a Support Zone will also be created and is considered the area outside the CRZ. The Support Zone will be reserved for the support vehicle and for clean equipment storage. It is separated from the CRZ, and is considered a "Clean" area. Only uncontaminated or decontaminated personnel or materials may enter this zone from the CRZ.

The support vehicle serves as the communications center, clean storage area, and source of emergency assistance for field operations. Certain safety equipment (i.e. fire extinguisher, first aid kit, etc.) are stored in the support vehicle.

9.0 DECONTAMINATION

Standard operating procedures are in place to minimize workers' contact with site contaminants. However, procedures may be necessary to remove and/or minimize contaminants that have accumulated on equipment and personnel and will be established and amended to the HASP as necessary for safe project operation and protection of personnel and the surrounding community.

9.1 Personnel and Equipment Decontamination

All personnel and equipment leaving the work zone must be decontaminated. Decontamination procedures prior to leaving Level "D" areas will consist of brushing loose soil from clothing and equipment, and washing equipment and clothing with water and a mild detergent. Disposable gloves, scoops, paper towels and Tyvek suits will be discarded in trash receptacles provided within these areas. All wastes generated in Level "D" areas will be bagged and disposed of on site without any additional restrictions.

The decontamination for Level "C", if needed will involve a plastic liner to "catch" wash solutions and contaminated soil. When exiting the work zone, workers will enter the CRZ. Instruments, sample containers, and reusable equipment will be placed on a plastic covered table. These items will be cleaned with the appropriate cleaning solutions. The workers will then decontaminate their protective clothing. Disposable items will be discarded in trash receptacles which will be provided within the CRZ.

10.0 EMERGENCY/CONTINGENCY PLAN

10.1 Personnel Roles, Lines of Authority, and Communication

The Health & Safety Officer (HSO) is the primary authority for directing site operations under emergency conditions. During the HSO's absence, the Field Operations Leader will lead emergency operations. All Health and Safety related emergency communications both on and off site will be directed through the HSO.

10.2 Site Evacuation

A representative for local emergency agencies will be informed of the proposed schedule and activities prior to the initiation of on-site work that has been assigned to Level C or greater. The emergency response capabilities of the local authorities and agencies will be assessed prior to the initiation of work.

Prior to the evacuation of the off site area, the Exclusion Zone and the CRZ will be expanded, as practical to reduce the potential for community exposure. Monitoring of the expanded CRZ will be conducted to determine if evacuation is truly necessary.

When the HSO determines that conditions may actually warrant the evacuation of downwind residences and commercial operations, local agencies will be notified and assistance requested. Designated personnel will initiate evacuation of the immediate off site area without delay.

All work crews should be aware of surrounding conditions including the wind conditions while on site. When conditions warrant moving away from a work site, the field crew will relocate up wind. If site access is restricted, or limited in any way, the crew may be instructed by the HSO to evacuate the site rather than move upwind, especially if an upwind withdrawal moves the field crew away from an acceptable escape route.

If conditions warrant a site evacuation, the field crew will proceed upwind of the work site and will notify the HSO or their designated representative. If the decontamination area is upwind and more than 500 feet from the work site, the crew will pass through the CRZ to remove their outer suits. Following decontamination, the field crew will proceed to the support vehicle and an assessment of the situation will be made by the HSO, or their designated representative. As soon as it is practical, and as additional information about site conditions is received from the field crew, the situation will be communicated to the Health and Safety Supervisor, Health and Safety Manager, the Project Manager, and if applicable the appropriate local emergency response agencies.

10.3 Emergency Medical Treatment and First Aid

First aid will be available to any person injured. At least one person holding current certification in first aid will be present on-site. The closest medical facility is approximately 12.4 miles from the site and rapid medical attention can reasonably be anticipated.

A First Aid Kit will be on hand. The injured person may be transported to a trained medical center for further examination and treatment. The preferred transport method is a professional emergency transportation service; however, if this option is not readily available or would result in excessive delay, other transport is authorized.

Under no circumstances should an injured person transport themselves to a medical facility for treatment, no matter how minor the injury may appear.

If an injury occurs in the Exclusion Zone, provisions for decontamination of the victim will be made. However, if injuries are deemed life-threatening, then normal decontamination procedures may be delayed. In such cases arrangements will be made with the emergency response personnel to provide the necessary containment or decontamination in the transport vehicle or at the medical facility.

10.4 Spill Response

The proposed site activities involve the use, storage or generation of bulk quantities of petroleum, chemicals or hazardous wastes (i.e. drums, containers, etc.) which present a potential for spill hazards. In the event of a spill, the Chazen client will be notified and the NYSDEC Spills Hotline (1-800-457-7362) will be notified.

APPENDICES:

APPENDIX A: Daily Site Sign-In Sheet

APPENDIX B: HASP Acknowledgement

APPENDIX A: Daily Site Sign-In Sheet

[illegible]

APPENDIX B: HASP Acknowledgement

I, the undersigned, acknowledge I have read and understand the contents of the HASP for the Former Packaged Lighting Systems, Inc. Site:

[illegible]

Appendix D
Citizen Participation Plan

Brownfield Cleanup Program

Citizen Participation Plan

Former Packaged Lighting Systems, Inc.

NYSDEC Site No. C336079

Village of Walden
Orange County, New York

October 2011



Prepared for:

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APPENDICES

Appendix A: Site Location Map

Appendix B: Project Contacts and Document Repositories

Appendix C: Site Contact List

Appendix D: Identification of Citizen Participation Activities

Appendix E: Brownfield Program Process

Appendix F: Brownfield Cleanup Program Glossary, Abbreviations, and Acronyms

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the brownfield site’s remedial process.

Applicant: **The Estate of Hy Hilzen**
Site Name: **Former Packaged Lighting Systems, Inc.**
Site Address: **29 Grant Street, Walden, New York**
Site County: **Orange**
Site Number: **C336079**

1.0 WHAT IS NEW YORK'S BROWNFIELD CLEANUP PROGRAM

New York's Brownfield Cleanup Program (BCP) is designed to encourage the private sector to investigate, remediate (clean up) and redevelop brownfields sites. A brownfield is any real property where redevelopment or reuse may be complicated by the presence or potential presence of a contaminant. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal and financial burdens on a community. If the brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants that conduct brownfield site remedial activities. An Applicant is a person whose request to participate in the BCP has been accepted by the DEC. The BCP contains investigation and remediation (cleanup) requirements, ensuring that cleanups protect public health and the environment. When the DEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at: <http://www.dec.ny.gov/chemical/brownfields.html>

2.0 CITIZEN PARTICIPATION PLAN OVERVIEW

This Citizen Participation (CP) Plan provides members of the affected and interested public with information about how the NYSDEC will inform and involve them during the investigation and remediation (clean up) of the site identified above under the BCP. This CP Plan describes the public information and involvement program that will be carried out with assistance, as appropriate, from the Applicant.

Appendix A contains a map identifying the location of the site.

Project Contacts

Appendix B identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's remedial program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Document Repository

The location of the site's document repository is identified in Appendix B. The document repository provides convenient access to important project documents for public review and comment.

Site Contact List

Appendix C contains the brownfield site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and remediation (clean up) process. The site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming remedial activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The site contact list includes, at a minimum:

- chief executive officer and official(s) principally involved with relevant zoning and planning matters of each county, city, town and village in which the site is located;
- local media outlets;
- residents, owners, and occupants of the site and properties adjacent to the site;
- the public water supplier which services the area in which the site is located;
- any person who has requested to be placed on the site contact list;
- the administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility; and
- document repositories.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the DEC project contact(s) identified in Appendix B. Other additions to the site contact list may be made on a site-specific basis at the discretion of the DER project manager, in consultation with other DEC staff as appropriate.

CP Activities

Appendix D identifies the CP activities, at a minimum, that have been and will be conducted during the site's remedial program. The flowchart in Appendix E shows how these CP activities integrate with the site remedial process. The public is informed about these CP activities through fact sheets and notices developed at significant points in the site's remedial process.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of the Applicant's efforts to investigate and remediate a site.
- **Public forums, comment periods and contact with project managers** ensure open communication between the public and project staff and provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and remediation.

The public is encouraged to contact project staff at any time during the site's remedial process with questions, comments, or requests for information about the remedial program.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 6 or in the nature and scope of remedial activities. Modifications may include additions to the site contact list and changes in planned CP activities.

3.0 SITE INFORMATION

3.1 Site Description

The Former Packaged Lighting Systems, Inc. site is a 3.0 ± acre former commercial/industrial property located at 29 Grant Street in the Village of Walden, Orange County, New York. The current zoning for the property is I-1, Industrial Park. The site is situated along the southern side of Grant Street, approximately 500 feet east of the intersection of Grant Street and New York State Route 208. The site is bounded to the north by Grant Street, to the west by an active railroad line, to the east by two residences along Elm Street and to the south by a commercial/industrial facility (Ampac Paper). The adjacent properties are of mixed use, including industrial and commercial use as well as residential. A map illustrating the site location is attached as Figure 1.

The site contains an abandoned, vacant commercial/industrial use building last occupied by Packaged Lighting Systems, Inc., a specialty stage lighting design company. The site contains four commercial buildings that have been vacant, and have been deteriorating, since 2008 and were last used by Packaged Lighting Systems, Inc.

3.2 Site History

The subject property has four commercial buildings. The dates of construction for the site buildings range from the mid-1800s through the 1960s. The site has a history of industrial use dating back to the mid-1800s. From 1885 to 1894, the site was operated by the Rider Engine Company, a manufacturer of steam engines. From 1900 to 1939 the facility operated under the name Rider-Ericsson Engine Company, and continued manufacturing steam engines. From the 1920s until 1967, the facility was operated by Spence Engineering, a manufacturer of steam regulators and valve mechanisms. From 1968 until 2008 the facility was used by Packaged Lighting Systems, Inc., which designed unique lighting systems for New York City theaters.

3.3 Site Environmental History

The primary site contaminant is the chlorinated VOC compound trichloroethylene (TCE), which was detected in shallow groundwater at the site during a Phase II subsurface investigation. Based on the investigations conducted at the site thus far, it appears that the source of the TCE may be from floor drains that discharged to the ground or possibly dry well infrastructure, although TCE has not been documented as a chemical used in the former site operations. Other detected contaminants include low-level concentrations of metals in soil, which appear to be attributable to historic fill and possibly an historic onsite foundry operation; de-minimis concentrations of gasoline-range volatile organic compounds (VOCs) in soil; and low concentrations of polycyclic aromatic hydrocarbons (PAHs) in soil.

A summary of findings from previous environmental investigations at the site is as follows.

A Phase I Environmental Site Assessment (ESA) was completed by Team Environmental Consultants, Inc. (Team) on December 30, 2008. The 2008 Phase I ESA states that it was completed in accordance with ASTM

Practice E 1527-05 (Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process). The Phase I ESA identified recognized environmental conditions (RECs) for the site associated with historic industrial and manufacturing site operations and two identified onsite underground storage tanks (USTs). The following known or suspected environmental conditions were identified through the Phase I ESA:

- One 10,000-gallon suspected heating oil UST, still in place, but inactive since the 1990s.
- One 500 to 1,000-gallon UST within the building, still in place, use unknown.
- Two former 275-gallon fuel oil aboveground storage tanks (ASTs), reportedly located at the rear exterior of the building.
- Five interior floor drains, with discharge points unknown. At least three of the floor drains were identified in parts of the building known to have been used for cleaning and degreasing activities.
- Underground infrastructure, including, but not limited to, USTs, gas piping and an “underground gas machine” dating back more than a century.
- Industrial site operations dating back to the late 1800s including machine shops, a foundry and coal storage.
- Historic onsite rail spur from the adjacent railroad to a former onsite coal storage building.

A Phase II ESA was completed in November 2010 by William L. Going & Associates to investigate the REC areas identified in the 2008 Phase I ESA. The Phase II included a magnetometer survey of the exterior area of the site to the south of the structures to identify potential buried anomalies such as tanks or drums. A ground penetrating radar (GPR) survey was conducted of exterior areas east of the Main Building to locate potential buried anomalies. Specifically, the areas surveyed included the location of the gasoline UST identified on historic Sanborn Fire Insurance Maps through the Phase I ESA, and an exterior storm drain near the rear shipping and receiving area, which appeared to be a possible floor drain receiving drain. The surveys revealed evidence of electrical conduits and historic water pipes, but did not encounter evidence of buried drums or tanks on site, other than the known 10,000-gallon heating oil UST. Small pieces of metal slag were observed at ground surface and just below ground surface (bgs) across the site.

An attempt was made to inspect the building floor drains with a camera snake; however, most of the floor drains were plugged, blocking exploration efforts. The dimension of the interior UST diameter was measured indicating that the tank is either 500- or 1,000-gallons capacity. The tank was observed to be empty during this inspection and suspected to be associated with a historic building heating system.

Additional Phase II ESA activities included the installation of nine test pits and five soil borings. Except for one soil boring location, most borings were installed within the test pits to achieve greater depth. The test pits revealed that site soils consist of organic loam mixed with historic fill including metal slag. Groundwater was encountered at between 4 and 8 feet below ground surface across the site. Soil and groundwater samples were collected from some test pits and soil borings and analyzed for VOCs, semi-volatile organic compounds (SVOCs) and priority pollutant metals.

Some metals were detected in site soils, likely associated with metal slag and scrap metal in the historic fill across the site.

Only part per billion concentrations of solvent-range VOCs were detected in groundwater in all five of the collected groundwater samples. The most elevated concentrations exist near the south side of the Main Building, adjacent to an area of identified floor drains. Groundwater in this area of the site contained trichloroethylene (TCE) at a concentration of 340 ug/L [part per billion]. TCE concentrations in groundwater

samples eastward of the Main Building which is likely in a downgradient direction ranged from 54 ug/L to a trace detection of 2.7 ug/L. These data suggest that TCE concentrations decrease to levels below standards before reaching the eastern presumed downgradient property boundary. The groundwater standard for TCE is 5 ug/L. A groundwater sample was also collected from a test pit on the southeastern most corner of the property and contained a trace concentration of TCE at 1 ug/L.

4.0 REMEDIAL PROCESS

See Appendix E for a flowchart of the brownfield site remedial process.

Application

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a Volunteer. This means that the Applicant was not responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination onsite, and must conduct a "qualitative exposure assessment," a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant in its Application proposes that the site will be used for commercial and/or restricted residential purposes. To achieve this goal, the Applicant will conduct remedial activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting a remedial program at the site.

Investigation

The Applicant will be conducting a remedial investigation (RI) of the site that will be performed with NYSDEC oversight. The goals of the RI are as follows:

1. Define the nature and extent of contamination in soil, groundwater, and any other impacted media;
2. Identify the source(s) of the contamination;
3. Assess the impact of the contamination on public health and/or the environment; and
4. Provide information to support the development of a Remedial Work Plan to address the contamination, or to support a conclusion that the contamination does not need to be addressed.

The RI Work Plan will contain several interim remedial measures (IRMs) to include the closure of two existing underground storage tanks (USTs), the closure of up to six floor drain/dry well systems, and the remediation of associated impacted soil by removal. After the IRMs are completed, it is expected that any residual low-level contaminants will have been reduced to trace concentrations through attenuation or the implementation of additional treatment, if necessary. A report of the IRMs will be provided to the DEC for review and approval. If additional treatment is warranted, the final Alternatives Analysis, included with the Remedial Investigation report, will propose additional remedial measures necessary to protect human health and the environment within the context of the contemplated commercial and/or restricted residential development of the property. The site contact list will be sent a fact sheet that describes the draft RI Work

Plan and announces a 30-day public comment period. NYSDEC will factor this input into its decision to approve, reject or modify the draft RI Work Plan.

The Applicant will prepare the RI and Alternatives Analysis (AA) Report after it completes the RI and IRMs. This report will summarize the results of the RI and will include the Applicant's recommendation of whether remediation is needed to address site-related contamination. The RI/AA Report is subject to review and approval by NYSDEC. Before the RI/AA Report is approved, a fact sheet describing the RI/AA Report will be sent to the site contact list recipients.

Remedy Selection

After NYSDEC approves the RI/AA Report, the Applicant will develop a Remedial Work Plan describing any additional remediation, if any, that has been selected for the site. In many cases, implementation of Interim IRMs during a Remedial Investigation streamlines projects by mitigation conditions that would otherwise require preparation of a Remedial Work Plan, and subsequent implementation of said Work Plan. However, if warranted, a Remedial Work Plan describes how the Applicant would address the contamination related to the site.

The public will have the opportunity to review and comment on the draft Remedial Work Plan and recommended remedy. The site contact list will be sent a fact sheet that describes the draft Remedial Work Plan and announces a 45-day public comment period. NYSDEC will factor this input into its decision to approve, reject or modify the draft Remedial Work Plan.

A public meeting may be held by NYSDEC about the proposed Remedial Work Plan if requested by the affected community and if significant substantive issues are raised about the draft Remedial Work Plan. Please note that, in order to request a public meeting, the health, economic well-being or enjoyment of the environment of those requesting the public meeting must be threatened or potentially threatened by the site. In addition, the request for the public meeting should be made within the first 30 days of the 45-day public comment period for the draft Remedial Work Plan. A public meeting also may be held at the discretion of the NYSDEC project manager in consultation with other NYSDEC staff as appropriate.

Construction

Approval of the Remedial Work Plan by NYSDEC will allow the Applicant to design and construct the alternative selected to remediate the site. The site contact list will receive notification before the start of site remediation.

When the Applicant completes remedial activities or when no further action is required following implementation of Interim Remedial Measures, the Applicant will prepare a Final Engineering Report that certifies that remediation requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the remediation is protective of public health and the environment for the intended use of the site. The site contact list will receive a fact sheet that announces the completion of remedial activities and the review of the final engineering report.

Certificate of Completion and Site Management

Once NYSDEC approves the Final Engineering Report, it will issue the Applicant a Certificate of Completion. This Certificate states that remediation (clean up) goals have been achieved and relieves the Applicant from future remedial liability, subject to certain statutory conditions. The Certificate also includes a description of any institutional and engineering controls or monitoring required by the approved Remedial Work Plan. If the Applicant uses institutional controls or engineering controls to achieve remedial objectives, the site contact list will receive a fact sheet that discusses such controls.

An institutional control is a non-physical restriction on use of the brownfield site, such as a deed restriction that would prevent or restrict certain uses of the remediated property. An institutional control may be used when the remedial action leaves some contamination that makes the site suitable for some, but not all uses.

An engineering control is a physical barrier or method to manage contamination, such as a cap or vapor barrier.

Site management will be conducted by the Applicant as required. NYSDEC will provide appropriate oversight. Site management involves the institutional and engineering controls required for the brownfield site. Examples include: operation of a water treatment plant, maintenance of a cap or cover, and monitoring of groundwater quality.

5.0 CITIZEN PARTICIPATION ACTIVITIES

CP activities that have already occurred and are planned during the investigation and remediation of the site under the BCP are identified in Appendix D: Identification of Citizen Participation Activities. These activities also are identified in the flowchart of the BCP process in Appendix E. NYSDEC will ensure that these CP activities are conducted, with appropriate assistance from the Applicant.

All CP activities are conducted to provide the public with significant information about site findings and planned remedial activities, and some activities announce comment periods and request public input about important draft documents such as the Remedial Work Plan.

All written materials developed for the public will be reviewed and approved by NYSDEC for clarity and accuracy before they are distributed. Notices and fact sheets can be combined at the discretion, and with the approval of, NYSDEC.

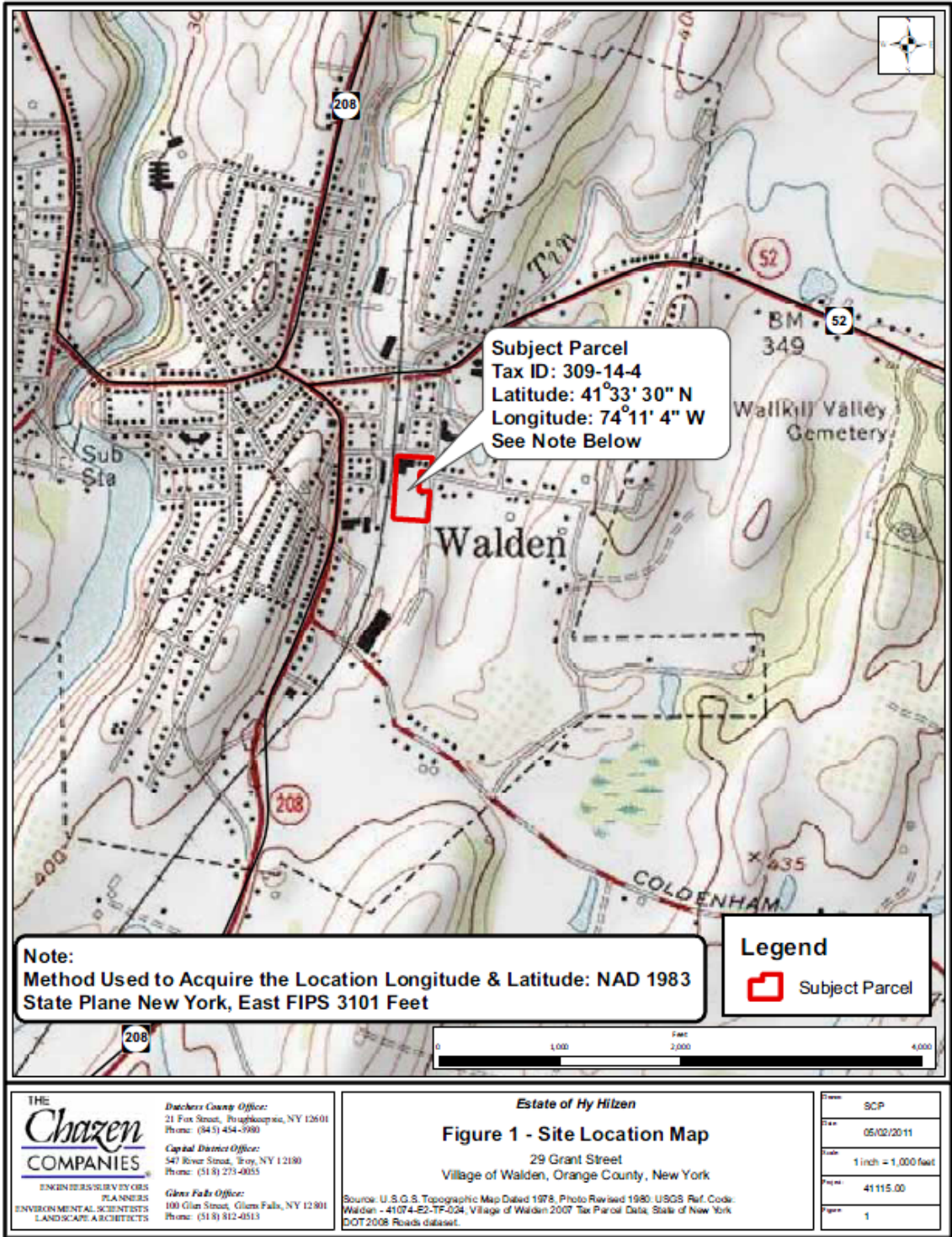
6.0 MAJOR ISSUES OF PUBLIC CONCERN

This section of the CP Plan identifies issues of likely direct public concern at this site. Additional major issues of public concern may be identified during the site's remedial process.

- 1) The main compound of concern at the site is TCE. This industrial solvent is present in shallow groundwater, and the intent of the focused RI will be to define the nature and extent of site impacts. The site is supplied with municipal water and sewer, and no water supply wells are known to exist on the site or to be in use in the immediate vicinity of the property, so there is no direct ingestion exposure pathway. However, the presence of chlorinated solvents in groundwater beneath the site has the potential to impact indoor air quality in current and future site buildings. Vapor intrusion will be a subject of the Remedial Investigation.

APPENDIX A

Site Location Map



APPENDIX B

Project Contacts and Document Repositories

For information about the site's remedial program, the public may contact any of the following project staff:

Table 1: Project Contacts and Document Repositories

NYS Department of Environmental Conservation		
Mr. John Miller Project Manager	Division of Environmental Remediation 625 Broadway Albany, NY 12233	(518) 402-9589
Mr. John Parker, Esq. (correspondence only) Office of General Counsel NYSDEEC Region 3	21 South Putt Corners Road New Paltz, NY 12561-1620	(845) 256-3037
New York State Department of Health		
Mr. Steven Bates Bureau of Environmental Exposure Investigation	547 River Street, Room 300 Troy, NY 12180-2216	(518) 402-7860
Document Repository		
Josephine Louise Public Library Ms. Ginny Neidermier – Director	5 Scofield Street, Walden, NY 12586	Phone: (845) 778-7621 Fax: (845) 778-1946 email: neidg@rcls.org

APPENDIX C

Site Contact List

Table 2: Elected Officials/Representatives

Orange County Contacts	
Orange County Executive Mr. Edward Diana Orange County Government Center 255 Main Street Goshen, NY 10924 Phone: (845) 291-2700 Fax: (845) 291-2724	Orange County Planning Commissioner Mr. David E. Church, AICP 1887 County Building 124 Main Street Goshen, NY 10924 Phone: (845) 615-3840 Fax: (845) 291-2533
Village of Walden Contacts	
Village Manager Mr. John Revella Village Hall 1 Municipal Square Walden, NY 12586 Phone: (845) 778-2177	Village of Walden Planning Board Chairperson Mr. Stan Plato Village Hall 1 Municipal Square Walden, NY 12586 Phone: (845) 778-2177

Table 3: Media

Television	Walden Public Access Channel Ms. Stephanie Fasso – Community Coordinator Village Manager’s Office 1 Municipal Square Walden, NY 12586 Phone: (845) 778-2177
Radio	WNYX Radio 100 West Main Street Walden, NY 12586 Phone: (845) 778-2400
Publications	Walkill Valley Times 300 Stony Brook Court, Newburgh, NY 12550 Phone: (845) 561-0170 Times Herald Record PO Box 2046 Middletown, NY 10940 Phone: (845) 341-1100

Table 4: Property Owner/Tenants and Adjacent Property Owners and Tenants

The mailing list is considered confidential and includes owners of properties located within the immediate vicinity of the site (generally within a block or so). The mailing list of property owners will be kept in the NYSDEC files. If you want to be included on the mailing lists please contact the NYSDEC Project Manager. The Applicant will produce and distribute Fact Sheets providing residents with timely information on project status, including notifications of upcoming activities on-site (e.g., fieldwork) or off-site (e.g., public availability sessions). Included in all Fact Sheets will be the list of individuals to be contacted by the public for additional information (see Table 1, Appendix B). In addition to property owners, Fact Sheets will be mailed to the elected officials/ representatives, environmental groups, and media listed in Tables 2 and 3.

Table 5: Public Water Supply Which Serves the Site and Surrounding Area

Name	Address and Contact Numbers
Walden Village Water Department	5 Cherry Street Walden, NY 12586-1800 (845) 778-5623

APPENDIX D

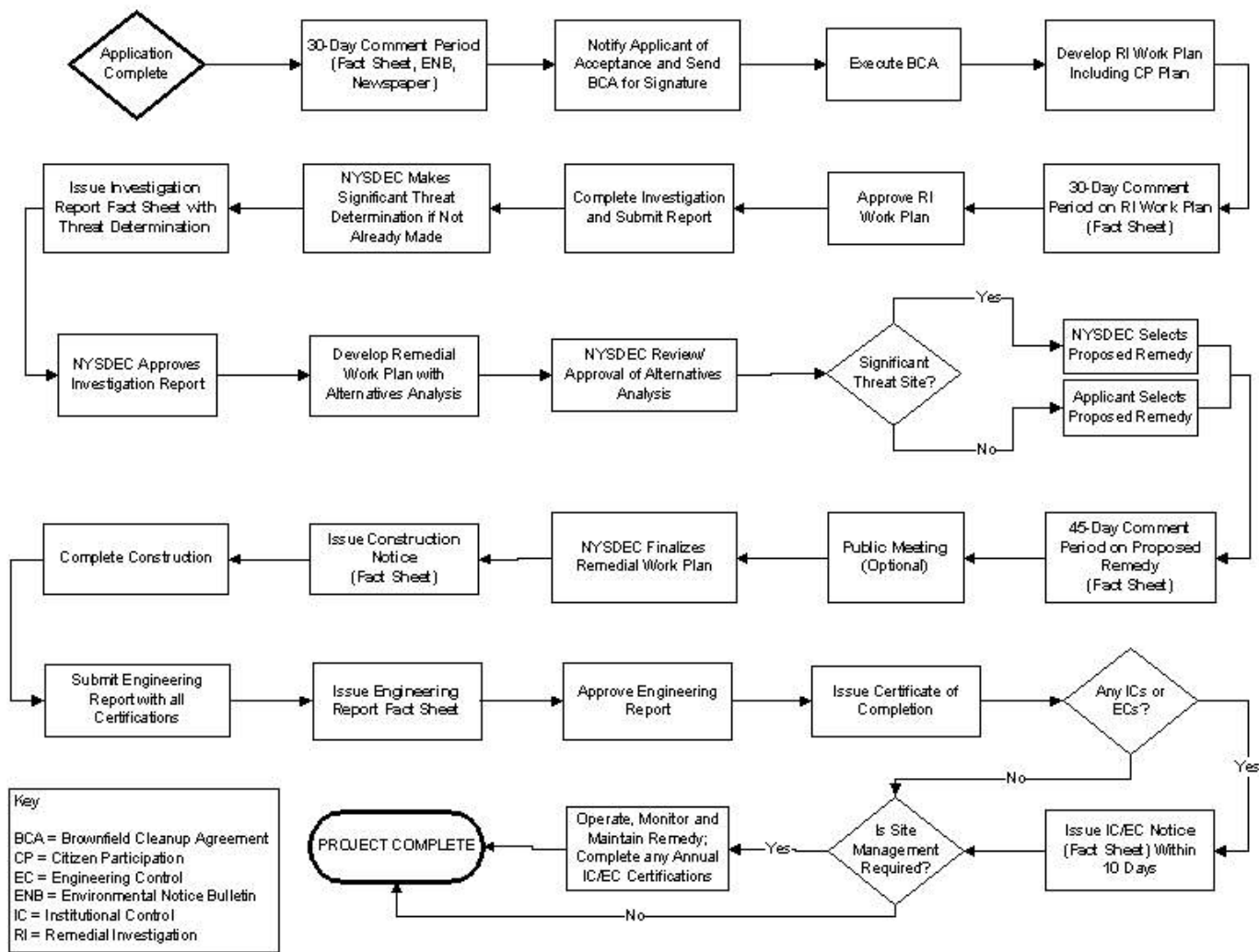
Identification of Citizen Participation Activities

BCP Citizen Participation Requirements	Timing of CP Activities
Application Process: • Prepare site contact list • Establish document repository	At time of preparation of application to participate in BCP
• Place complete Application in document repository • Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of Application and 30-day comment period • Publish notice in local newspaper • Mail notice to site contact list • Conduct 30-day public comment period on the complete Application	When DER determines that BCP Application is complete. The 30-day comment period begins on date of publication date of ENB. ENB, newspaper, and site contact list notices should be provided at the same time. Notice should request comments on all appropriate documents in the Application package.
After Execution of Brownfield Site Cleanup Agreement: • Prepare Citizen Participation (CP) Plan	Draft CP Plan must be submitted with 20 days of entering BCP Agreement (BCA). CP Plan must be approved by DER before distribution.
Before DER Approves Proposed Remedial Investigation (RI) Work Plan: • Place proposed RI Work Plan in document repository • Mail fact sheet to site contact list about proposed RI Work Plan and 30-day public comment period on draft RI Work Plan • Conduct 30-day public comment period on the proposed RI Work Plan	Before DER approves RI Work Plan. If RI Work Plan is submitted with application, comment periods will be combined and public notice will include fact sheet. Comment period begins/ends as per dates identified in fact sheet.
• Place approved RI Work Plan in document repository	When DER approves RI Work Plan
Before DER Approves RI Report: • Mail Fact Sheet to site contact list describing results of RI	Before NYSDEC approves RI report
• Place approved RI Report in document repository	When DER approves RI Report
Significant Threat Determination: • Mail fact sheet to site contact list that discusses significant threat determination. Combine notice with another fact sheet where appropriate	Determination may be made any time during remedial process but no later than 20 days after DER approves RI Report. A significant threat site is eligible for a Technical Assistance Grant.

BCP Citizen Participation Requirements	Timing of CP Activities
Before DER Approves Remedial Work Plan (RWP): • Place draft RWP in document repository • Mail Fact Sheet to site contact list about proposed RWP and announcing 45-day comment period • Conduct 45-day public comment period about draft RWP • Hold public meeting about draft RWP if site a significant threat and requested by community • Place approved RWP and final decision Document in document repository	Before DER approves RWP. 45-day comment period begins/ends as per dates identified in the fact sheet. Public meeting would be held within 45-day comment period. When DER approved RWP and finalizes Decision Document
Before Applicant Starts Remedial Action (RA): • Mail fact sheet to site contact list summarizing upcoming RA	Before the start of RA at the site.
Before DER Approves Final Engineering Report: • Mail fact sheet to site contact list announcing that describes report, and any proposed institutional/engineering controls • Place Final Engineering Report in document repository	Before DER approves Final Engineering Report. When DER approves Final Engineering Report.
When DER Issues Certificate of Completion (COC) • Place Notice of COC in document repository • Mail fact sheet to site contact list that announces issuance of COC	Within 10 days after DER issues COC.

APPENDIX E

Brownfield Cleanup Program Process



APPENDIX F

Brownfield Cleanup Program

Glossary, Abbreviations, and Acronyms

This glossary defines terms associated with New York's citizen participation program and important elements of the Brownfield program.

Administrative Record - Part of a site's Record of Decision which lists and defines documents used in the development of NYSDEC's decision about selection of a remedial action.

Availability Session - A scheduled gathering of program staff and members of the public in a casual setting, without a formal presentation or agenda but usually focusing on a specific aspect of a site's remedial process.

Brownfield - An abandoned, idled or under-used property where expansion or redevelopment is complicated by real or perceived environmental contamination. Brownfields are typically former industrial or commercial properties where improper operations may have resulted in soil and/or groundwater contamination.

Citizen Participation - A program of planning and activities to encourage communication among people affected by or interested in Brownfield sites and the government agencies responsible for investigating and remediating them.

Citizen Participation Plan - A document which must be developed at a site's Site Investigation stage. A CP Plan describes the citizen participation activities that will be conducted during a site's remedial process.

Citizen Participation Specialist - A staff member from an NYSDEC central office or regional office who has specialized training and experience to assist a project manager and other staff to plan, conduct and evaluate a site-specific citizen participation program.

Comment Period - A time period for the public to review and comment about various documents and DER actions. For example, a 45-day comment period is provided when DER issues a Proposed Remedial Action Plan (PRAP).

Contact List - Names, addresses and/or telephone numbers of individuals, groups, organizations, government officials and media affected by or interested in a particular Brownfield site. The size of a contact list and the categories included are influenced by population density, degree of interest in a site, the stage of the remedial process and other factors. It is an important tool needed to conduct outreach activities.

Division of Environmental Remediation - A major program unit within the New York State Department of Environmental Conservation created to manage the hazardous waste site remedial program, the Brownfield program, and the Voluntary Cleanup program. Staff include: engineers, geologists, chemists, attorneys, citizen participation specialists, environmental program

specialists and support staff.

Document Repository - A file of documents pertaining to a site's remedial and citizen participation programs which is made available for public review. The file generally is maintained in a public building near the Brownfield site to provide access at times and a location convenient to the public.

Fact Sheet - A written discussion about part or all of a site's remedial process prepared and provided by DER to the public. A fact sheet may focus on: a particular element of the site's remedial program; opportunities for public involvement; availability of a report or other information, or announcement of a public meeting or comment period. A fact sheet may be mailed to all or part of a site's contact list, distributed at meetings, placed in a document repository and/or sent on an "as requested" basis.

Interim Remedial Measure (IRM) - A discrete action which can be conducted at a site relatively quickly to reduce the risk to people's health and the environment from a well-defined contamination problem. An IRM can involve removing contaminated soil and drums, providing alternative water supplies or securing a site to prevent access.

New York State Department of Health - Agency within the executive branch of New York State government which: performs health-related inspections at suspected contaminated sites; conducts health assessments to determine potential risk from environmental exposure; reviews Exposure Assessments prepared during the Site Investigation/Remedial Alternatives Report; conducts health-related community outreach around sites; and reviews remedial actions to assure that public health concerns are adequately addressed.

Operable Unit - A discrete part of an entire site that produces a release, threat of release, or pathway of exposure. An Operable Unit can receive specific investigation, and a particular remedy may be proposed. A Record of Decision is prepared for each Operable Unit.

Operation and Maintenance - A period in which remedial action may be conducted following construction at a site (for example, operation of a "pump and treat" system), or which is performed after a remedial action to assure its continued effectiveness and protection of people's health and the environment. Activities can include site inspections, well monitoring and other sampling.

Project Manager - An NYSDEC staff member within the Division of Environmental Remediation (usually an engineer, geologist or hydro geologist) responsible for the day-to-day administration of remedial activities at, and ultimate disposition of, an Environmental Restoration site. The Project Manager works with legal, health, citizen participation and other staff to accomplish site-related goals and objectives.

Proposed Remedial Action Plan (PRAP) - An analysis by DER of each alternative considered for the remediation of an Environmental Restoration site and a rationale for selection of the alternative it recommends. The PRAP is created based on information developed during the Site Investigation/Remedial Alternatives Report. The PRAP is reviewed by the public and other state agencies.

Public Meeting - A scheduled gathering of Division of Environmental Remediation staff with the

affected/interested public to give and receive information, ask questions and discuss concerns about a site's remedial program. Staff from other NYSDEC divisions, legal and health staff, and staff from consultants and a responsible party often also attend. A public meeting, unlike an availability session, generally features a formal presentation and a detailed agenda.

Record of Decision (ROD) - A document which provides definitive record of the cleanup alternative that will be used to remediate an Environmental Restoration site. The ROD is based on information and analyses developed during the Site Investigation/Remedial Alternatives Report and public comment.

Remedial Construction - The physical development, assembly and implementation of the remedial alternative selected to remediate a site. Construction follows the Remedial Design stage of a site's remedial program.

Remedial Design - The process following finalization of a Record of Decision in which plans and specifications are developed for the Remedial Construction of the alternative selected to remediate a site.

Site Investigation/Remedial Alternatives Report (SI/RAR) - The SI fully defines and characterizes the type and extent of contamination at the site. The RAR, which may be conducted during or after the SI, uses information developed during the SI to develop alternative remedial actions to eliminate or reduce the threat of contamination to public health and the environment.

Responsiveness Summary - A written summary of major oral and written comments received by DER during a comment period about key elements of a site's remedial program, such as a Proposed Remedial Action Plan, and DER's response to those comments.

Appendix E

Community Air Monitoring Plan

New York State Department of Health Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a **continuous** basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored **continuously** at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

June 20, 2000

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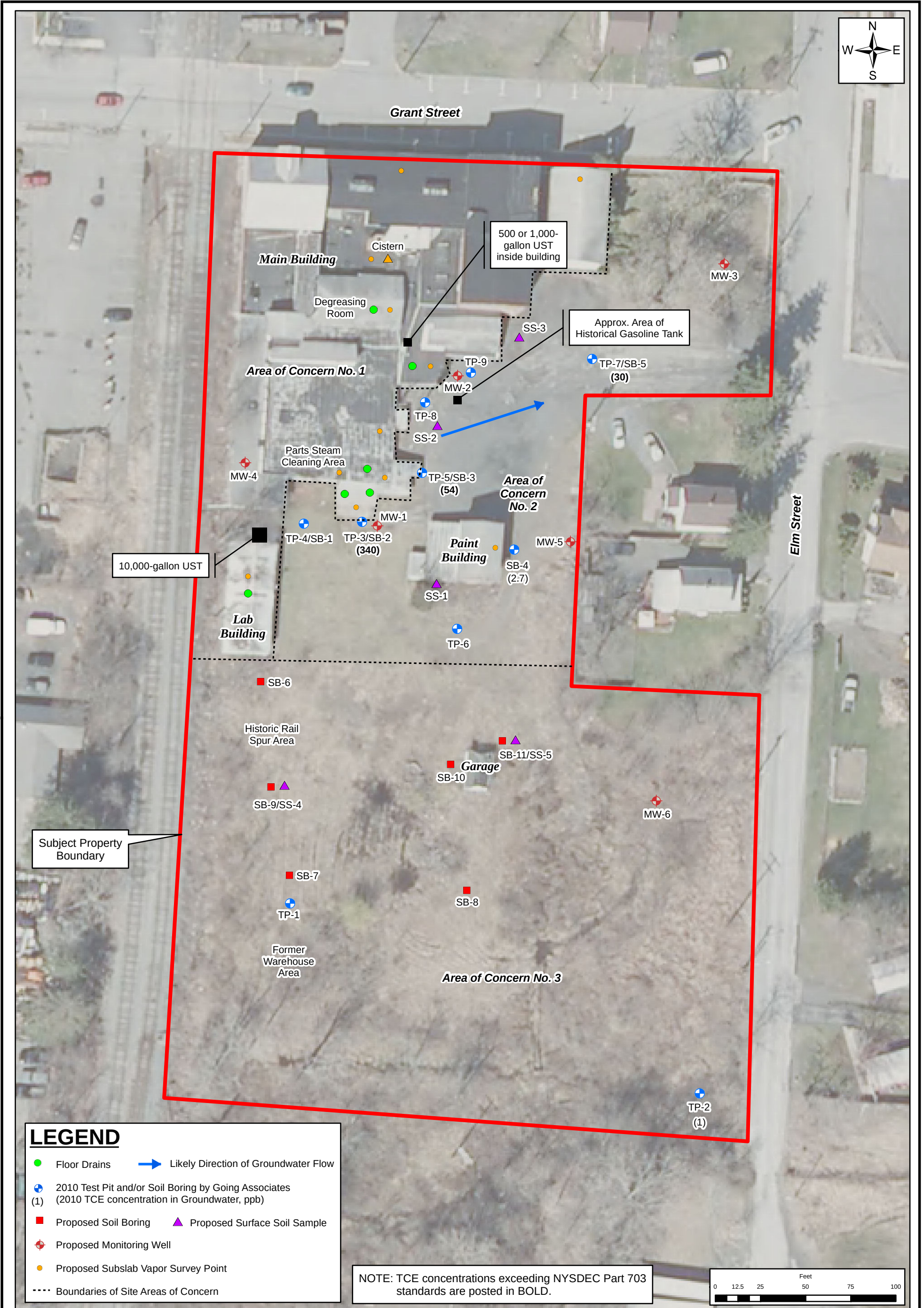


Table 1
Analytical Methods/Quality Assurance Summary Table
Former Packaged Lighting Systems, Inc.

Area of Concern	Sampling Objective	TCL VOCs (8260) ¹	TCL SVOCs (8270) ^{1,2}	Pesticides (8081)	PCBs (8082) ³	TAL Metals ⁴	VOCs (TO-15)	Disposal Facility Characterization
AOC - 1	RI – Upgradient soil boring/monitoring well southwestern area of Main Building (MW-4)	1 soil 1 groundwater	1 soil 1 groundwater	1 soil 1 groundwater	1 soil 1 groundwater	1 soil 1 groundwater		
	IRM - 10,000-gallon Fuel Oil UST and piping closure ⁶	5 Excavation soil 1 Piping soil 1 Excavation groundwater	5 Excavation soil 1 Piping soil 1 Excavation groundwater					1
	IRM - 500- or 1,000-gallon Fuel Oil USTs and piping closure ⁶	5 Excavation soil 1 Piping soil 1 Excavation groundwater	5 Excavation soil 1 Piping soil 1 Excavation groundwater					1
	RI –Vapor Intrusion Assessment Supporting also 6 Floor Drain and Cistern Assessments						10 Sub-slab Vapor 5 Indoor Air 1 Outdoor Air	
	RI- Suspected Cistern	1 liquid	1 liquid	1 liquid	1 liquid	1 liquid		
	IRM – 6 Floor Drain Closures							TBD
AOC-2	RI- Paint Building Vapor Intrusion Assessment						1 Sub-slab Vapor 1 Indoor Air	
	RI -Active Yard Area East and South of Main Building (MW-1, MW-2, MW3- and MW-5 and SS-1)	5 to 9 soil 4 groundwater	5 soil 2 groundwater	1 soil 1 groundwater	2 soil 1 groundwater	4 soil 1 groundwater		
	IRM – Historical Gasoline UST closure (if identified) ⁶	5 Excavation soil 1 Piping soil 1 Excavation groundwater	5 Excavation soil 1 Piping soil 1 Excavation groundwater			5 Excavation soil 1 Piping soil 1 Excavation groundwater		
	IRM -Dry Wells (if identified)	3 to 4 excavation soil per excavation (up to 18 to 24 if six dry wells) Up to 1 excavation groundwater per excavation (up to 6 total if 6 dry wells)	3 to 4 excavation soil per excavation (up to 18 to 24 if six dry wells) Up to 1 excavation groundwater per excavation (up to 6 total if 6 dry wells)		3 to 4 excavation soil per excavation (up to 18 to 24 if six dry wells) Up to 1 excavation groundwater per excavation (up to 6 total if 6 dry wells)	3 to 4 excavation soil per excavation (up to 18 to 24 if six dry wells) Up to 1 excavation groundwater per excavation (up to 6 total if 6 dry wells)		Up to 6
AOC-3	RI -South Vacant Yard Area	7 soil 1 groundwater	10 soil 1 groundwater		1 soil	5 soil		
Range of Primary Sample Quantities		37 to 74	39 to 72	5	13 to 37	15 to 49	18	3 to 9
Quality Assurance Samples ⁷								
Field Duplicates		2-3 soil 2 groundwater/liquid	2 to 3 soil 1 groundwater	1 soil 1 groundwater	1 to 2 soil 1 groundwater	1 to 2 soil 1 groundwater		
Trip Blanks		3-4						
Equipment Blanks		3	3	2	3	3		
Matrix Spike/Matrix Spike Duplicate		6-8	6 to 8	4	5 to 6	5 to 7		
Range of Sample Quantities (including QC)		53-94	50-86	13	23 to 49	25 to 62	18	3 to 9

Notes:

- 1. TCL = target compound list ; VOCs = volatile organic compounds
- 2. SVOCs = semi-volatile organic compounds
- 3. PCBs = polychlorinated biphenyls
- 4. TAL metals = target analyte list
- 5. TCLP = toxicity characteristic leaching procedure (for waste characterization). TCLP as used in this table includes the analysis for VOCs, SVOCs, pesticides, and metals for waste characterization.
- 6. If groundwater is encountered, excavation soil samples will be collected from excavation side walls from a 2-foot depth interval that captures 1' above to 1' below the water table interface. If groundwater is not encountered, then excavation side wall samples will be collected as will one soil samples from the bottom of the excavation. In addition, the excavation will be extended to a maximum depth of 12' bgs in search of groundwater and one sample will be collected of the shallowest depth of unconsolidated saturated soil. One sample will be collected from beneath tank piping.

- 7. Quality assurance field samples will be collected in accordance with the New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) at the following frequencies:

Field Duplicates – 1 field duplicate for every 20 samples collected.

Trip Blanks – 1 trip blank for each shipment of water samples for volatile organic compound analysis.

Equipment Blanks – 1 equipment blank per day, up to 3 maximum.

MS/MSD – 1 per matrix (2), 1 per 20 samples and 1 per every seven days of sampling (up to 2)



Hudson Valley Office

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Capital District Office (518) 273-0055
North Country Office (518) 812-0513

December 19, 2011

Mr. John B. Miller, Project Manager
NYSDEC – Division of Environmental Remediation
Remedial Bureau C – 11th Floor
625 Broadway
Albany, New York 12233-7014

*Re: Remedial Investigation/IRM Work Plan
Former Packaged Lighting Site (C336079)
29 Grant Street, Village of Walden, Orange County, New York*

Dear Mr. Miller:

The Chazen Companies (Chazen) has received the Department's comment letter dated December 1, 2011 regarding the Draft Remedial Investigation/Interim Remedial Measures (IRM) Work Plan for the Former Packaged Lighting Site in Walden, NY. The comment letter will be attached to the Work Plan as an addendum. The work plan addendum will be submitted to the document repositories upon receipt of the Department's approval of the attached revised Table 1 – Analytical Methods/Quality Assurance Summary Table and Revised Figure 2- Site Layout Map.

In summary, the revised Work Plan includes the following:

- One additional soil boring at AOC-3 (SB-9) in the area of the historical rail spur to be analyzed for SVOCs and TAL Metals. In addition, Chazen proposes to analyze the soil sample for PCBs.
- Two additional soil borings at AOC-3 in the vicinity of the garage structure (SB-10 and SB-11) to be analyzed for SVOCs and TAL metals.
- Five surface soil samples: three at AOC-2 (SS-1, SS-2 and SS-2) and two at AOC-3 (SS-4 and SS-5) for SVOCs and TAL metals. SS-1 will be positioned near the rear side of the Paint Building in the vicinity of the former fuel oil aboveground storage tank and will also be analyzed for VOCs. SS-2 will be positioned beneath overhead transformers and SS-4 will be in the vicinity of the historical rail spur and will also be analyzed for PCBs.
- Three additional sub-slab and three additional indoor air samples: two each at AOC-1 within the Main Building along Grant Street and one each at AOC-2 within the Paint Building. We would like to point out, however, that it is likely that the buildings will be demolished as part of future commercial redevelopment of the property and they are unoccupied at this time. An outdoor

sample was included in the Work Plan and will be collected concurrently with the sub-slab vapor and indoor air samples. A parts per billion (ppb) photo-ionization detector (PID) will be used during the vapor sampling.

- Handling of investigation derived wastes will be conducted in accordance with Section 3.3 (e) of DER-10 Technical Guidance for Site Investigation and Remediation.
- Collected data will be submitted to the Department in the EQus format within 90 days of validation.

The geophysical survey field work to look for subsurface anomalies across open parts of the site was conducted on December 14, 2011. We intend to initiate the full remedial investigation subsurface work in early 2012, weather depending. Please contact me if you have any questions regarding the scope of work. I can be reached at (845) 486-1558.

Sincerely,

A handwritten signature in black ink, appearing to read "Emily A. Pereira". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Emily A. Pereira
Environmental Scientist and Project Manager

eap/enc.

cc: Estate of Hy Hilzen
Dean Sommer, Esq.
Christopher Coleman, Esq.
George Heitzman - DER.
Anthony Perretta - NYSDOH
Russell Urban-Mead, Chazen