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Advanced GeoServices Engineering, P.C.

WORK PLAN FOR THE REMOVAL ACTION AT NL INDUSTRIES/DEPEW PLANT SITE, DEPEW, NEW YORK

WORK PLAN FOR REMOVAL ACTION AT NL INDUSTRIES/DEPEW PLANT SITE, DEPEW, NEW YORK

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1.0 INTRODUCTION

This Work Plan for Removal Action (Work Plan) developed by Advanced GeoServices Engineering (AGE) on behalf of NL Industries Inc. (NL or the Respondent) describes the soil removal and restoration activities to be performed at off-site residential properties in the vicinity of the former NL Industries/Depew Plant Site in Depew, New York pursuant to Administrative Order on Consent Index Number CERCLA-02-2004-2024. The Work Plan was initially submitted to the New York State Department of Environmental Conservation (NYSDEC) and has been updated to incorporate comments from the U.S. Environmental Protection Agency Region II (EPA) and to make the Work Plan consistent with current EPA guidance. In general, the activities will consist of removal of surficial lead-impacted soil exceeding 400 milligrams per kilogram (mg/kg) from specified properties, confirmatory soil sampling, transportation of this soil to stock piles, and ultimately, off-site disposal of the soils. Disturbed properties will be restored. Restoration will include fill and topsoil placement, replacement of landscaping (as necessary), and turf establishment. The remainder of this Work Plan provides a brief description of the Site and describes in more detail the remedial tasks and the proposed project team for completion of this work.

1.1 SITE LOCATION AND HISTORY

NL and predecessor companies operated a brass foundry in Depew, New York from 1892 until 1972. In 1974, NL sold the foundry property to Anglo-Recycling Corporation. The property is now used by Metro Waste Paper Recovery Inc., a division of the Cascades Group, for paper recycling. Figure 1-1 identifies the location of the Site and the former foundry Facility, now operated by Metro Paper Recovery, Inc.

Investigations conducted by XCG Consultants, Ltd (XCG) of Oakville, ON, Canada in 1999 and 2000 indicated that specific areas at the property and adjacent residential areas have soil lead concentrations above the New York State Department of Health goal of 400 mg/kg. Additional off-site surficial soil investigations of 12 residential properties were performed by XCG in 2001 near the Facility. The residential properties are situated on Walden Avenue, West Second Street, West Third

Street, and Princeton Avenue, all located north of the former foundry. The sampling results indicated that at least 8 properties contain soil with lead concentrations above 400 mg/kg. Additional residential properties were sampled in the spring of 2002, in the same vicinity of the previously sampled properties, to delineate the entire area exceeding 400 mg/kg lead. The area to be addressed by the actions, described in this Work Plan and considered to be the Site is shown on Figure 1-2.

1.2 WORK PLAN ORGANIZATION

The remainder of this Work Plan describes the delineation sampling, the planned soil removal activities for areas which exceed 400 mg/kg lead and the proposed team for completion of project activities. This information is organized into the following sections:

- Section 2.0 - Work Procedures;
- Section 3.0 - Project Organization; and
- Section 4.0 - Final Reporting.

A Quality Assurance Project Plan (QAPP) which describes the procedures to be utilized by the off-site laboratory to confirm that activities are successfully completed is provided as Appendix A. A Health and Safety Plan (HASP) is also provided as Appendix B. The Contractor selected to perform the removal and restoration activities may elect to use this HASP or develop its own HASP using this plan as guidance.

2.0 PERFORMANCE OF WORK

2.1 COORDINATION WITH PROPERTY OWNERS

AGE and NL will secure access to each privately held property which will undergo delineation sampling and/or soil removal. A sample access agreement is included in Appendix C. We understand that the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) have informed property owners of the sample results on their properties. AGE and the Contractor will review procedures for removal, restoration and the anticipated schedule with the property owners. The Contractor will also coordinate a landscaping inventory of site features and document existing conditions prior to remediation activities. AGE and the Contractor will keep the property owners informed of changes in schedule or work and will be available to answer questions and concerns raised by the property owners. Significant communication with the property owners will be documented by AGE and the Contractor. AGE will be prepared to submit a letter to each homeowner documenting completion of the work, if requested by EPA.

Temporary relocation shall be offered to residents if health and safety risks or circumstances arise that pose a threat or unreasonable inconvenience and cannot be adequately addressed by other means without significantly increasing the overall cost or duration of the response action. Temporary relocation may be selected when the response action creates too much disruption to residents (e.g., use of heavy equipment, they may not be able to easily access their houses during the response action and they may have concerns over dust resulting from excavation activities).

Temporary relocation will be offered to residents where conditions warrant and in accordance with the principles set forth in EPA's guidance "*Superfund Response Action: Temporary Relocations Implementation Guidance*", OSWER Directive 9230.0-97, April 2002.

2.2 SITE PREPARATION ACTIVITIES

2.2.1 Permits, Certificates and Licenses

The Contractor will obtain all construction-related permits, licenses and/or certificates required by local, state and federal agencies. Copies will be provided to AGE and to EPA upon request and all required permits, licenses, and certificates will be obtained prior to initiation of work requiring the permits. At this time there are no specific permits which have been identified for this work. The Contractor will develop erosion and sediment control procedures and a traffic control plan as described below.

2.2.2 Property Sketches

The Contractor will prepare property sketches showing the locations of features that may be disturbed by work. Property pins and boundaries may be located and maintained throughout the duration of the project. A surveyor licensed in the State of New York will be retained if necessary in the event of a property line dispute.

2.2.3 Utility Verification

Prior to excavation, the Contractor will coordinate with local utilities to mark all utilities (underground, surface and above-ground) in accordance with local, state and federal regulations. The Contractor will also request utility clearances from local utility companies, as needed. Care will be taken to protect all utilities during operations.

2.2.4 Delineation of Work Zones

The Contractor will clearly mark the Exclusion Zones, Contamination Reduction Zone and Support Zone with appropriate signage. The Exclusion Zone will encompass soil removal areas as well as the entire soil staging area. Temporary fencing will be used as needed to designate the zones and to control access to work areas.

2.2.5 Erosion and Sediment Control

Erosion and sediment control procedures will be developed by the Contractor and reviewed by AGE prior to starting removal activities. This procedure will utilize temporary and permanent structural and vegetative measures or Best Management Practices (BMPs) such as silt fencing and inlet protection to control erosion and sedimentation for each stage of the project.

2.2.6 Traffic Control

All excavated material will be transported via surface streets directly to a Staging Area or off-site. Proposed traffic routes will be determined by the selected Contractor based on sequencing removal methods and properties to be remediated. The Contractor will prepare a Traffic Control Plan which will be submitted to EPA along with a drawing that shows these proposed routes.

The Contractor will control vehicular traffic to make sure activities are performed safely and efficiently. Speed limits will be established and enforced to minimize dust generation. All trucks hauling excavated soil will be securely tarped.

2.2.7 Decontamination

Decontamination procedures are specified in the HASP along with specific levels of personal protection equipment (PPE) and dust monitoring procedures. Most work is anticipated to be completed in Level D PPE which includes hard hat, long pants or coveralls, and boots.

2.2.8 Air Monitoring Equipment and Dust Control

Personal and ambient air monitoring for lead will be conducted during soil removal activities in accordance with the approved HASP. Ambient air monitoring for lead will be conducted simultaneously with mini-Ram sampling as specified in the HASP.

2.2.9 Site Security

The Contractor will not allow unauthorized entry during working and non-working hours through the following steps:

- Establishing exclusion zone fencing or other easily identifiable visual demarcation (e.g. caution tape) around all excavation areas;
- Limiting access to authorized personnel and vehicles;
- Posting Work Area signs at 50 foot intervals along the exclusion zone fencing;
- Maintaining a visitors log;
- Checking the integrity of perimeter fencing and attachment of warning signs at regular intervals; and

- Closing the excavation area perimeter fence at the end of each day.

All excavations in the direct vicinity of dwellings will be backfilled in an expedited manner. Side slopes of excavations will be left at a safe angle of repose. All equipment, when not in operation, will be left in a safe manner (e.g., wheels blocked and buckets on the ground). The Contractor's Site Health and Safety Officer will be responsible for implementing that site security measures in a proper and complete fashion. Areas of excavation will be planned and sequenced to provide ingress and egress for the affected residents. Typically, the homes will not be vacated overnight. If they are, a subcontracted security company will be provided to protect the vacated residence. The security company will be provided by the Contractor.

2.2.10 Protection of Existing Property

Throughout site preparation and remedial activities, the Contractor will implement precautions to protect existing properties adjacent to and within the work area. Precautions will include safe working distances, warning tape, temporary fencing and barriers, and manual labor around sensitive items.

2.2.11 Site Clearing

Clearing activities will be carefully conducted by the Contractor prior to or during removal activities. Shrubs, brush and trees will be removed with conventional construction equipment, if necessary. Vegetation will be stockpiled with excavated soil materials for disposal with excavated materials. Photo-documentation of pre-excavation conditions will be conducted to document the condition of properties and to serve as a reference for restoration and landscaping. Mature landscaping areas adjacent to homes and separated from the yard by a sidewalk, wall or other barrier may be sampled to determine whether removal is warranted in order to minimize the impact of the soil removal on the properties. Established trees may remain in place if soil samples collected under the canopy of the tree do not exceed the lead cleanup criteria. Gardens will be evaluated on a case by case basis and sampled to determine if excavation is warranted.

2.2.12 Structures

Each property will be evaluated to determine how each structure should be addressed on a case-by-case basis.

Decks and porches: Decks and porches will be evaluated for accessibility; if soil removal is possible without dismantling the deck or porch, the Contractor will be instructed to remove the soil. In a case where accessibility is effectively limited because of the structure's construction and the structure is unlikely to be removed (i.e., it provides access to the house), the deck or porch will remain in place without soil removal.

Sheds: Sheds will be moved to access the soils below where practicable. If the shed is in such disrepair that replacement of the shed intact is not practical, the shed will be disposed with other debris from the excavation at the property owner's consent. The actual specifics will be discussed with each property owner during the pre-excavation meeting at the property. Section 6.5 of the USEPA's *Superfund Lead-Contaminated Residential Sites Handbook (August, 2003)* states "...including the removal of debris and dilapidated structures that may be required prior to initiating the excavation of contaminated soil".

Above Ground Pools: If at all possible, composite sampling will be performed to show that the soil underneath the pool is below cleanup standards. If sampling is not possible or the samples obtained show concentrations above the cleanup standard, the pool will be removed and the property owner reimbursed for the cost of constructing a new pool comparable in make, size and shape. Decks attached to the pools will be moved or dismantled to allow excavation and placed at a position acceptable to the property owner.

Patios: Patios not consisting of concrete, asphalt or mortared brick will be moved and the underlying soil removed if sampling shows the subgrade to be above 400 mg/kg. The Contractor will replace the patio to pre-excavation condition or monetary compensation will be provided to the property owner for the replacement of the patio.

2.2.13 Delineation Sampling

Insufficient data has been collected from certain residential properties to determine no further action. Sampling will be performed in accordance with Section 4.0 of the *Superfund Lead-Contaminated Residential Sites Handbook (August 2003)*. Five-point composite samples will be collected between 0 to 6 inches and 6 to 12 inches in depth following the Composite Sampling Procedures and Composite Sampling Protocols on figures QAPP-2 and QAPP-3. These composites will consist of aliquots collected from the same depth interval, and will be equally spaced. At houses where grass extends to the side of the house (i.e., there is no landscaped bed adjacent to the house), two of the five sample aliquots will be taken 3 feet from the house. While this sampling approach may bias the sample results high when sampling a property with an older house, the risk of confounding influences unrelated to the Site is reduced when compared to taking a separate Drip Zone sample as outlined in the Handbook. High impact areas such as play areas or gardens will be sampled using separate five point composites; if the area is small, then the number of aliquots taken to represent the area will be reduced to three.

Sampling may be performed below tree canopies and landscaped areas at NL's discretion. Sampling will consist of a 3-5 point composite sample.

Sampling will not be conducted below decks or porches. If delineation sampling of the property shows removal is necessary in the surrounding yard, soil below decks and porches will be removed with the surrounding soils if accessible by either hand or machine. If the soils below decks or porches is not accessible, no removal will be performed.

Sampling will not be performed below sheds; if delineation sampling of the property shows removal is necessary in the surrounding yard, the sheds will be moved to access the soil.

Patios not consisting of concrete, asphalt or mortared brick will be moved and the underlying soil removed if composite sampling shows the subgrade to be above 400 mg/kg. The composite sample will consist of 3-5 aliquots depending on the size of the area beneath the patio.

If possible, composite sampling will be performed to show that the soil underneath above ground pools is below cleanup standards. If sampling is not possible or the samples obtained show concentrations above the cleanup standard, the pool will be removed and the property owner reimbursed for the cost of constructing a new pool comparable in make, size and shape.

The aliquots collected for all composite samples will be homogenized and a representative sample sent off-site to STL-Buffalo for lead analysis.

The properties or portions of properties to be sampled are shown on Figure 1-2 and include:

- 26 W. 2nd Street
- 7 Bostwick Place
- 14 Bostwick Place
- 33 Bostwick Place
- 50 Bostwick Place
- 5774 Transit Road
- 243 Harvard Avenue
- 249 Harvard Avenue

Should the lead concentrations from any composite samples be above 400 mg/kg, adjacent properties will be delineated to ensure the extent of lateral contamination above the cleanup level is addressed.

2.3 SOIL REMOVAL ACTIVITIES

2.3.1 Excavation

Soil will be removed from the areas being addressed by the Contractor to a minimum depth of 6-inches. Additional excavations will be conducted in 3-inch intervals as needed, based on XRF field screening for total lead and analysis of confirmatory samples by STL Buffalo (using SW-846 Method 6010B), until soils remaining at the excavation bottom are less than 400 mg/kg total lead. Excavations will be conducted with traditional construction equipment selected by the Contractor. In addition, hand or vacuum assisted excavations will be conducted in proximity to utilities, within a 6-foot radius of trees, and within 2 feet of fences which will remain and structures or other areas that would be difficult to excavate with heavy equipment. Figure 2-1 shows a typical excavation of a residential property. Efforts will be made to prevent damage to tree roots and trees if sampling shows that they may remain. The Contractor will determine the order and direction in which excavations are conducted. Emphasis will be placed on minimization of potential cross-contamination and transport travel routes. Equipment will be decontaminated if it is necessary to traverse through clean areas to get to the next property being addressed.

Areas under paved surfaces, such as driveways, sidewalks, and patios, and within the foot print of the house will not be excavated. As discussed in Section 2.2.12, excavation may be performed below above ground pools, accessible decks and porches, and patios not constructed of concrete, asphalt or mortared brick. Excavation will be performed below sheds as applicable. Matured landscaped areas determined to be below the clean up level will not be excavated.

Materials will be loaded into small transport vehicles for transportation to a temporary stockpile within the Staging Area. The Staging Area will be made secure to prevent un-authorized access to the stockpile. Stockpiled soils will be placed on a plastic liner to separate them from the underlying soil. Transport vehicles may also be directly loaded for off-site disposal.

While stockpiled within the Staging Area, the materials will be covered with 10 mil reinforced polyethylene to reduce runoff or contact water and provide dust control. Temporary covers will be anchored with sandbags or similar methods to prevent uplift (see Figure 2-2). Stormwater runoff will be allowed to infiltrate the surrounding ground surface. The maximum allowable stockpile slope will be 1.5 H:1V. The Contractor will also construct stormwater diversion along the upslope side(s) of the stockpile, as necessary.

2.3.2 Transport and Disposal

An approved off-site disposal facility will be selected by the Contractor in accordance with local, state and federal regulations. The Contractor will perform sampling of stockpiled soils or in-situ prior to excavation to determine whether soils require treatment before being transported to the disposal facility and to provide any additional information required by the disposal facility. Sampling and analysis will be performed to satisfy the requirements of the disposal facility.

2.3.3 Confirmatory Sampling

Post excavation sampling shall be performed as specified in the New York State Department of Environmental Conservation, Division of Environmental Remediation Draft Technical Guidance for Site Investigation and Remediation (Section 5. Remedial Design/ Remedial Action.) Field screening will be conducted using a NITON X-Ray Fluorescence (XRF) analyzer, or equivalent at a frequency of 4 grab samples taken from depths of 0 to 6 inches per 900 square feet of the base of the excavation area. Samples will be also be collected from the perimeter (where appropriate) at depths of 0 to 6" of surface soils, at a frequency of every 30 linear feet.

If the XRF reading for any grab sample exceeds 400 mg/kg total lead, the respective area(s) will be re-excavated to remove an additional 3 inches of soil and the area will be re-sampled. Re-excavations will continue until none of the grab samples exceed 400 mg/kg total lead. The XRF sample with the highest value under 400 mg/ kg will then be submitted for analysis of total lead by STL-Buffalo. The XRF analysis procedures are presented in more detail in Section 2.4.1 of the QAPP.

The Contractor will be responsible for documenting the location of grab samples, noting the sample that is sent off-site for analysis, final removal depths and horizontal limits of excavation on the property sketch.

2.3.4 Backfill and Restoration

2.3.4.1 **Topsoil Backfill**

Once cleanup criteria have been achieved within the areas of excavation, each excavation will be backfilled to approximately pre-excavation grades. Fill materials will not be placed in areas of standing water or frozen material. Vegetative materials will be removed from within excavation areas prior to backfill. The material will be staged in a manner that minimizes disruption to the adjacent residents. The maximum allowable stockpile slope will not exceed 1.5 H:1V.

Topsoil material will be a natural friable soil with organic content and nutrients sufficient to sustain grass growth. The maximum particle size will be 3/4 inch. A topsoil sample will be collected and submitted by the Contractor for laboratory analysis to determine that the topsoil is acceptable. The analysis results on the topsoil will be compared to Table 2-1, NYSDEC Cleanup Objectives and also to determine that the topsoil has the nutrients and organic content to sustain turf establishment. A minimum of 3 inches of topsoil materials will be placed in the excavation areas.

The Contractor will perform testing and certify that both the backfill and topsoil are clean in accordance with the New York State Department of Environmental Conservation. Topsoil and backfill will be tested every 10,000 cy of material used. The analytical results will be compared to NYSDEC recommended soil cleanup objectives and approved by NL. If topsoil is blended or amended, the frequency of the testing may be increased at the request of the USEPA.

2.3.4.2 **Final Grading**

All areas covered by the project will be uniformly smooth-graded, including backfilled excavation areas and adjacent transition areas. The finished surface will mimic pre-excavation grades to +/-0.15 feet and permit adequate drainage, will be reasonably smooth, compacted and free from irregular surface changes.

2.3.4.3 **Sodding and Restoration**

The Contractor will install sod to all disturbed areas, where grass is presently located, for the residential properties and consistent with the contract requirements. Erosion control devices will remain in-place until sod has been installed in disturbed areas. Trees or bushes damaged or removed will be replaced with similar trees/bushes from nursery stock unless an alternative compensation plan is developed with individual property owners.

The Contractor will be responsible for establishing turf on all affected areas. The Contractor will be responsible for watering sod until a root growth into the topsoil is established. Once, root growth is established, the responsibility for sustaining the established grass growth will be passed on to the property owner by watering and maintenance (e.g., mowing). The Contractor will be responsible for replacement of unsuccessful vegetation where erosion and settling has occurred up to one year's time following turf establishment.

As discussed in Section 2.2.12, sheds that are structurally sound will be replaced following backfill placement. If the shed is in such disrepair that replacement is not practicable, the shed will be disposed as debris. Compensation for above ground pools and patios removed for excavation will be dispensed to the property owner.

2.4 DEMOBILIZATION

Demobilization will be conducted following completion of removal and restoration activities. The Contractor will not complete demobilization procedures until EPA and NL are satisfied that the work is complete and disturbed conditions have been restored. Activities to be conducted during demobilization include:

- Decontamination and removal or disposal of all equipment and materials;
- Disconnection of temporary utilities;
- Removal of temporary facilities;
- Removal of stockpile and staging area containment systems;
- Removal of fencing in the construction staging area;
- Final site cleaning (i.e., trash and miscellaneous material removal); and
- Restoration of construction staging area to pre-mobilization conditions.

3.0 PROJECT ORGANIZATION

Completion of soil removal activities at the residential properties will involve coordination and cooperation among multiple parties and organizations. The specific parties and individuals within the organization are described below.

3.1 NL's ON-SITE REPRESENTATIVE

NL's on-site representative will be Advanced GeoServices Engineering, P.C. (AGE), a professional corporation licensed in the state of New York. AGE is an affiliated company of Advanced GeoServices Corp. (AGC). AGC/AGE has worked on over 10 residential sites where heavy metal contamination was involved. AGE's Project Director will be Barbara Forslund, P.E. (#077365-1). Mr. Christopher Reitman may assist Ms. Forslund with project activities from time to time. Both Mr. Reitman and Ms. Forslund have over ten years experience working on residential and industrial projects with lead and heavy metals. Mr. Kevin O'Rourke will also be involved on a day-to-day basis with project activities serving as the Project Manager. NL is represented by Mr. Terry Casey.

3.2 QUALITY ASSURANCE REPRESENTATIVE

AGE will act as the Quality Assurance (QA) Representative and will provide full-time on-site oversight of all removal activities and coordination with the residents. AGE's QA Representative will be experienced in oversight of soil removal activities and will communicate with the AGE Project Manager. The QA Representative will also conduct confirmatory soil sampling following excavations. The AGE QA Manager, Jennifer Stanhope, will also provide QA support for field and laboratory personnel and laboratory data validation services, in accordance with USEPA Region II guidelines.

3.3 REMOVAL CONTRACTOR

Following approval of this Work Plan, NL will retain a contractor to conduct the removal operations. The Contractor will be responsible for providing on-site Health and Safety and Construction Quality Control (CQC) services. The Contractor will be experienced in soil excavation on residential properties and the removal and disposal of contaminated materials. The Contractor will retain, as necessary, qualified subcontractors to perform specified tasks. All subcontractors shall be subject to the approval of AGE and NL.

3.4 SURVEYOR

If a surveyor is required to resolve property line disputes within the removal areas, the Contractor will retain a Surveyor licensed in the State of New York.

3.5 ANALYTICAL LABORATORY

AGE will utilize STL Buffalo of Amherst, NY, a laboratory certified by the NYSDOH (ELAP certification ID #10026), for analysis of all confirmatory soil samples. STL Buffalo's Quality Assurance Manual (QAM) for the laboratory is included as Attachment B of the QAPP.

4.0 REPORTING AND SCHEDULE

4.1 PROGRESS REPORTING

Pursuant to the requirements of the Order, AGE will provide daily verbal reports and written weekly reports during active field work.

The progress reports will include the following information as required by the Order:

- Actions taken during the previous week to comply with the Order;
- Problems encountered and plans and schedule to rectify the problems;
- All results of sampling and other data received since the last report;
- Actions scheduled for the following week;
- Other pertinent information; and
- Anticipated schedule for completion and discussion of any delays and efforts to mitigate the delay.

During periods of project inactivity and subject to the approval of EPA, monthly reports will be submitted by the 10th of each month in lieu of the weekly reports.

4.2 CONTENTS OF FINAL REPORT

Following completion of work items and validation of data, AGE will compile a Remedial Action Report for submission to EPA. The Final Report shall conform to the requirements of the Order. The report will include the following information at a minimum:

- Introduction;
- Description of the Removal Action and any changes to the Work Plan;
- Summary of the Removal Action including waste classification of excavated soil, quantities of soil removed, confirmatory sampling and off-site disposal;
- Site restoration and documentation of homeowner acceptance of the restoration; and
- Quality Assurance and Quality Control Summary.

The report will contain the following certification statement:

> "I certify that the information contained in and accompanying this is true, accurate, and complete."

The report will be submitted within 60 days following demobilization.

4.3 SCHEDULE

A detailed construction schedule will be proposed by the selected Contractor and submitted as an addendum to this Work Plan. It is anticipated that the remaining delineation sampling will occur during Contractor mobilization. Soil removal activities are expected to begin in May 2005 subject to weather conditions. The soil removal and property restoration work should take about 6 to 8 weeks to complete. Project schedule and timing issues will be coordinated with EPA. AGE and NL will work with EPA to meet project deadlines and requirements.

TABLE

TABLE 2-1
Recommended Soil Cleanup Objectives (mg/kg or ppm)
Volatile Organic Contaminants

Contaminant	Partition Coefficient, Koc	Groundwater Standards/Criteria, Cw (ug/l or ppb)	a Allowable Soil Conc., Cs (ppm)	b** Soil Cleanup Objectives to Protect GW Quality (ppm)	USEPA Health Based (ppm)		CRQL (ppb)	*** Rec. Soil Cleanup Objective (ppm)
					Carcinogens	Systemic Toxicants		
Acetone	2.2	50	0.0011	0.11	N/A	8,000	10	0.2
Benzene	83	0.7	0.0006	0.06	24	N/A	5	0.06
Benzoic Acid	54*	50	0.027	2.7	N/A	300,000	5	2.7
2-Butanone	4.5*	50	0.003	0.3	N/A	4,000	10	0.3
Carbon Disulfide	54*	50	0.027	2.7	N/A	8,000	5	2.7
Carbon Tetrachloride	110*	5	0.006	0.6	5.4	60	5	0.6
Chlorobenzene	330	5	0.017	1.7	N/A	2,000	5	1.7
Chloroethane	37*	50	0.019	1.9	N/A	N/A	10	1.9
Chloroform	31	7	0.003	0.30	114	800	5	0.3
Dibromochloromethane	N/A	50	N/A	N/A	N/A	N/A	5	N/A
1,2-Dichlorobenzene	1,700	4.7	0.079	7.9	N/A	N/A	330	7.9
1,3-Dichlorobenzene	310*	5	0.0155	1.55	N/A	N/A	330	1.6
1,4-Dichlorobenzene	1,700	5	0.085	8.5	N/A	N/A	330	8.5
1,1-Dichloroethane	30	5	0.002	0.2	N/A	N/A	5	0.2
1,2-Dichloroethane	14	5	0.001	0.1	7.7	N/A	5	0.1
1,1-Dichloroethene	65	5	0.004	0.4	12	700	5	0.4
1,2-Dichloroethene (trans)	59	5	0.003	0.3	N/A	2,000	5	0.3
1,3-Dichloropropane	51	5	0.003	0.3	N/A	N/A	5	0.3
Ethylbenzene	1,100	5	0.055	5.5	N/A	8,000	5	5.5
113 Freon (1,1,2Trichloro-1,2,2Trifluoroethane)	1,230*	5	0.06	6.0	N/A	200,000	5	6.0
Methylene Chloride	21	5	0.001	0.1	93	5,000	5	0.1
4-Methyl-2-Pentanone	19*	50	0.01	1.0	N/A	N/A	10	1.0
Tetrachloroethene	277	5	0.014	1.4	14	800	5	1.4
1,1,1-Trichlorethane	152	5	0.0076	0.76	N/A	7,000	5	0.8
1,1,2,2-Tetrachloroethane	118	5	0.006	0.6	35	N/A	5	0.6
1,2,3-Trichloropropane	68	5	0.0034	0.34	N/A	80	5	0.4
1,2,4-Trichlorobenzene	670*	5	0.034	3.4	N/A	N/A	330	3.4
Toluene	300	5	0.015	1.5	N/A	20,000	5	1.5
Trichloroethene	126	5	0.007	0.70	64	N/A	5	0.7
Vinyl Chloride	57	2	0.0012	0.12	N/A	N/A	10	0.2
Xylenes	240	5	0.012	1.2	N/A	200,000	–	1.2

a. Allowable Soil Concentration Cs = f x Cw x Koc
b. Soil Cleanup Objective = Cs x Correction Factor (CF)
N/A Is not available
* Partition coefficient is calculated by using the following equation:

log Koc = -0.55 log S + 3.64, where S is solubility in water in ppm.

All other Koc values are experimental values.

** Correction Factor (CF) of 100 is used as per TAGM #4046
*** As per TAGM #4046, Total VOCs <10 ppm.

Note: Soil cleanup objectives are developed for soil organic carbon content (f) of 1%, and should be adjusted for the actual soil organic carbon content if it is known.

TABLE 2-1
Recommended Soil Cleanup Objectives (mg/kg or ppm)
Semi-Volatile Organic Contaminants

Contaminant	Partition Coefficient, Koc	Groundwater Standards/Criteria, Cw (ug/l or ppb)	a Allowable Soil Conc., Cs (ppm)	b** Soil Cleanup Objectives to Protect GW Quality (ppm)	USEPA Health Based (ppm)		CRQL (ppb)	*** Rec. Soil Cleanup Objective (ppm)
					Carcinogens	Systemic Toxicants		
Acenaphthene	4,600	20	0.9	90.0	N/A	5,000	330	50.0***
Acenaphthylene	2,056*	20	0.41	41.0	N/A	N/A	330	41.0
Aniline	13.8	5	0.001	0.1	123	N/A	330	0.1
Anthracene	14,000	50	7.00	700.0	N/A	20,000	330	50.0***
Benzo(a)anthracene	1,380,000	0.002	0.03	3.0	0.224	N/A	330	0.224 or MDL
Benzo (a) pyrene	5,500,000	0.002 (ND)	0.110	11.0	0.0609	N/A	330	0.061 or MDL
Benzo (b) fluoranthene	550,000	0.002	0.011	1.1	N/A	N/A	330	1.1
Benzo (g,h,i) perylene	1,600,000	5	8.0	800	N/A	N/A	330	50.0***
Benzo (k) fluoranthene	550,000	0.002	0.011	1.1	N/A	N/A	330	1.1
Bis(2-ethylhexyl)phthalate	8,706*	50	4.35	435.0	50	2,000	330	50.0***
Butylbenzylphthlate	2,430	50	1.215	122.0	N/A	20,000	330	50.0***
Chrysene	200,000	0.002	0.004	0.4	N/A	N/A	330	0.4
4-Chloroaniline	43****	5	0.0022	0.22	200	300	330	0.220 or MDL
4-Chloro-3-methylphenol	47	5	0.0024	0.24	N/A	N/A	330	0.240 or MDL
2-Chlorophenol	15*	50	0.008	0.8	N/A	400	330	0.8
Dibenzofuran	1,230*	5	0.062	6.2	N/A	N/A	330	6.2
Dibenzo(a,h)anthracene	33,000,000	50	1,650	165,000	0.0143	N/A	330	0.014 or MDL
3,3-Dichlorobenzidine	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2,4-Dichlorophenol	380	1	0.004	0.4	N/A	200	330	0.4
2,4-Dinitrophenol	38	5	0.002	0.2	N/A	200	1,600	0.200 or MDL
2,6-Dinitrotoluene	198*	5	0.01	1.0	1.03	N/A	330	1.0
Diethylphthlate	142	50	0.071	7.1	N/A	60,000	330	7.1
Dimethylphthlate	40	50	0.020	2.0	N/A	80,000	330	2.0
Di-n-butylphthalate	162*	50	0.081	8.1	N/A	8,000	330	8.1
Di-n-octylphthlate	2,346*	50	1.2	120.0	N/A	2,000	330	50.0***
Fluoranthene	38,000	50	19	1900.0	N/A	3,000	330	50.0***
Fluorene	7,300	50	3.5	350.0	N/A	3,000	330	50.0***
Hexachlorobenzene	3,900	0.35	0.014	1.4	0.41	60	330	0.41
Indeno (1,2,3-cd)pyrene	1,600,000	0.002	0.032	3.2	N/A	N/A	330	3.2
Isophorone	88.31*	50	0.044	4.40	1,707	20,000	330	4.40
2-methylnaphthalene	727*	50	0.364	36.4	N/A	200,000	330	36.4
2-Methylphenol	15*	5	0.001	0.1	N/A	N/A	330	0.100 or MDL
4-Methylphenol	17	50	0.009	0.9	N/A	4,000	330	0.9
Naphthalene	1,300	10	0.13	13.0	N/A	300	330	13.0
Nitrobenzene	36	5	0.002	0.2	N/A	40	330	0.200 or MDL
2-Nitroaniline	86	5	0.0043	0.43	N/A	N/A	1,600	0.430 or MDL
2-Nitrophenol	65	5	0.0033	0.33	N/A	N/A	330	0.330 or MDL
4-Nitrophenol	21	5	0.001	0.1	N/A	N/A	1,600	0.100 or MDL
3-Nitroaniline	93	5	0.005	0.5	N/A	N/A	1,600	0.500 or MDL
Pentachlorophenol	1,022	1	0.01	1.0	N/A	2,000	1,600	1.0 or MDL
Phenanthrene	4,365*	50	2.20	220.0	N/A	N/A	330	50.0***
Phenol	27	1	0.0003	0.03	N/A	50,000	330	0.03 or MDL
Pyrene	13,295*	50	6.65	665.0	N/A	2,000	330	50.0***
2,4,5-Trichlorophenol	89*	1	0.001	0.1	N/A	8,000	330	0.1

a. Allowable Soil Concentration Cs = f x Cw x Koc
b. Soil Cleanup Objective = Cs x Correction Factor (CF)
N/A Is not available
MDL Method Detection Limit
* Partition coefficient is calculated by using the following equation:

log Koc = -0.55 log S + 3.64, where S is solubility in water in ppm.
Other KOC values are experimental values.

** Correction Factor (CF) of 100 is used as per TAGM #4046
*** As per TAGM #4046, Total VOCs <10 ppm, Total Semi-VOCs <500 ppm and Individual Semi-VOCs <50 ppm
**** Koc is derived from the correlation Koc = 0.63 Kow (Determining Soil Response Action Levels EPA/540/2-89/057). Kow is obtained from the USEPA computer database 'MAIN'.

Note: Soil cleanup objectives are developed for soil organic carbon content (f) of 1%, and should be adjusted for the actual soil organic carbon content if it is known.

TABLE 2-1
Recommended Soil Cleanup Objectives (mg/kg or ppm)
Organic Pesticides/Herbicides and PCBs

Contaminant	Partition Coefficient, Koc	Groundwater Standards/Criteria, Cw (ug/l or ppb)	a Allowable Soil Conc., Cs (ppm)	b** Soil Cleanup Objectives to Protect GW Quality (ppm)	USEPA Health Based (ppm)		CRQL (ppb)	*** Rec. Soil Cleanup Objective (ppm)
					Carcinogens	Systemic Toxicants		
Aldrin	96,000	ND (<0.01)	0.005	0.5	0.041	2	8	0.041
alpha-BHC	3,800	ND (<0.05)	0.002	0.2	0.111	N/A	8	0.11
beta-BHC	3,800	ND (<0.05)	0.002	0.2	3.89	N/A	8	0.2
delta-BHC	6,600	ND (<0.05)	0.003	0.3	N/A	N/A	8	0.3
Chlordane	21,305	0.1	0.02	2.0	0.54	50	80	0.54
2,4-D	104*	4.4	0.005	0.5	N/A	800	800	0.5
4,4'-DDD	770,000*	ND (<0.01)	0.077	7.7	2.9	N/A	16	2.9
4,4'-DDE	440,000*	ND (<0.01)	0.0440	4.4	2.1	N/A	16	2.1
4,4'-DDT	243,000*	ND (<0.01)	0.025	2.5	2.1	40	16	2.1
Dibenzo-P-dioxins(PCDD)2,3,7,8TCDD	1,709,800	0.000035	0.0006	0.06	N/A	N/A	N/A	N/A
Dieldrin	10,700*	ND (<0.01)	0.001	0.1	0.044	4	16	0.044
Endosulfan I	8,168*	0.1	0.009	0.9	N/A	N/A	16	0.9
Endosulfan II	8,031*	0.1	0.009	0.9	N/A	N/A	16	0.9
Endosulan Sulfate	10,038*	0.1	0.01	1.0	N/A	N/A	16	1.0
Endrin	9,157*	ND (<0.01)	0.001	0.1	N/A	20	8	0.10
Endrin keytone	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
gamma-BHC (Lindane)	1,080	ND (<0.05)	0.0006	0.06	5.4	20	8	0.06
gamma-chlordane	140,000	0.1	0.14	14.0	0.54	5	80	0.54
Heptachlor	12,000	ND (<0.01)	0.0010	0.1	0.16	40	8	0.10
Heptachlor epoxide	220	ND (<0.01)	0.0002	0.02	0.077	0.8	8	0.02
Methoxychlor	25,637	35.0	9.0	900	N/A	400	80	***
Mitotane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Parathion	760	1.5	0.012	1.2	N/A	500	8	1.2
PCBs	17,510*	0.1	0.1	10.0	1.0	N/A	160	1.0 (Surface) 10 (Sub-surface)
Polychlorinated dibenzo-furans (PCDF)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silvex	2,600	0.26	0.007	0.7	N/A	600	330	0.7
2,4,5-T	53	35	0.019	1.9	N/A	200	330	1.9

a. Allowable Soil Concentration Cs = f x Cw x Koc
b. Soil Cleanup Objective = Cs x Correction Factor (CF)
N/A Is not available
* Partition coefficient is calculated by using the following equation:

log Koc = -0.55 log S + 3.64, where S is solubility in water in ppm.
Other Koc values are experimental values.

** Correction Factor (CF) of 100 is used as per TAGM #4046
*** As per TAGM #4046, Total VOCs <10 ppm.

Note: Soil cleanup objectives are developed for soil organic carbon content (f) of 1%, and should be adjusted for the actual soil organic carbon content if it is known.

TABLE 2-1
Recommended Soil Cleanup Objectives (mg/kg or ppm)
Heavy Metals

Contaminant	Protect Water Quality (ppm)	Eastern USA Background (ppm)	* CRDL (mg/kg or ppm)	*****Rec. Soil Cleanup Objective (ppm)
Aluminum	N/A	33,000	2.0	SB
Antimony	N/A	N/A	0.6	SB
Arsenic	N/A	3-12**	0.1	7.5 or SB
Barium	N/A	15-600	2.0	300 or SB
Beryllium	N/A	0-1.75	0.05	0.16 (HEAST) or SB
Cadmium	N/A	0.1-1	0.05	1 or SB
Calcium	N/A	130-35,000***	50.0	SB
Chromium	N/A	1.5-40**	0.1	10 or SB
Cobalt	N/A	2.5-60**	0.5	30 or SB
Copper	N/A	1-50	0.25	25 or SB
Cyanide	N/A	N/A	0.1	***
Iron	N/A	2,000-550,000	1.0	2,000 or SB
Lead	N/A	****	0.03	SB****
Magnesium	N/A	100-5,000	50.0	SB
Manganese	N/A	50-5,000	0.15	SB
Mercury	N/A	0.001-0.2	0.002	0.1
Nickel	N/A	0.5-25	0.4	13 or SB
Potassium	N/A	8,500-43,000**	50.0	SB
Selenium	N/A	0.1-3.9	0.05	2 or SB
Silver	N/A	N/A	0.1	SB
Sodium	N/A	6,000-8,000	50.0	SB
Thallium	N/A	N/A	0.1	SB
Vanadium	N/A	1-300	0.5	150 or SB
Zinc	N/A	9-50	0.2	20 or SB

Note: Some forms of metal salts such as Aluminum Phosphide, Calcium Cyanide, Potassium Cyanide, Copper Cyanide, Silver Cyanide, Sodium Cyanide, Zinc Phosphide, Thallium salts, Vanadium pentoxide and Chromium (VI) compounds are more toxic in nature. Please refer to the USEPA HEASTs database to find cleanup objectives if such metals are present in soil.

SB is site background
N/A is not available

CRDL is contract required detection limit which is approx. 10 times the CRDL for water.

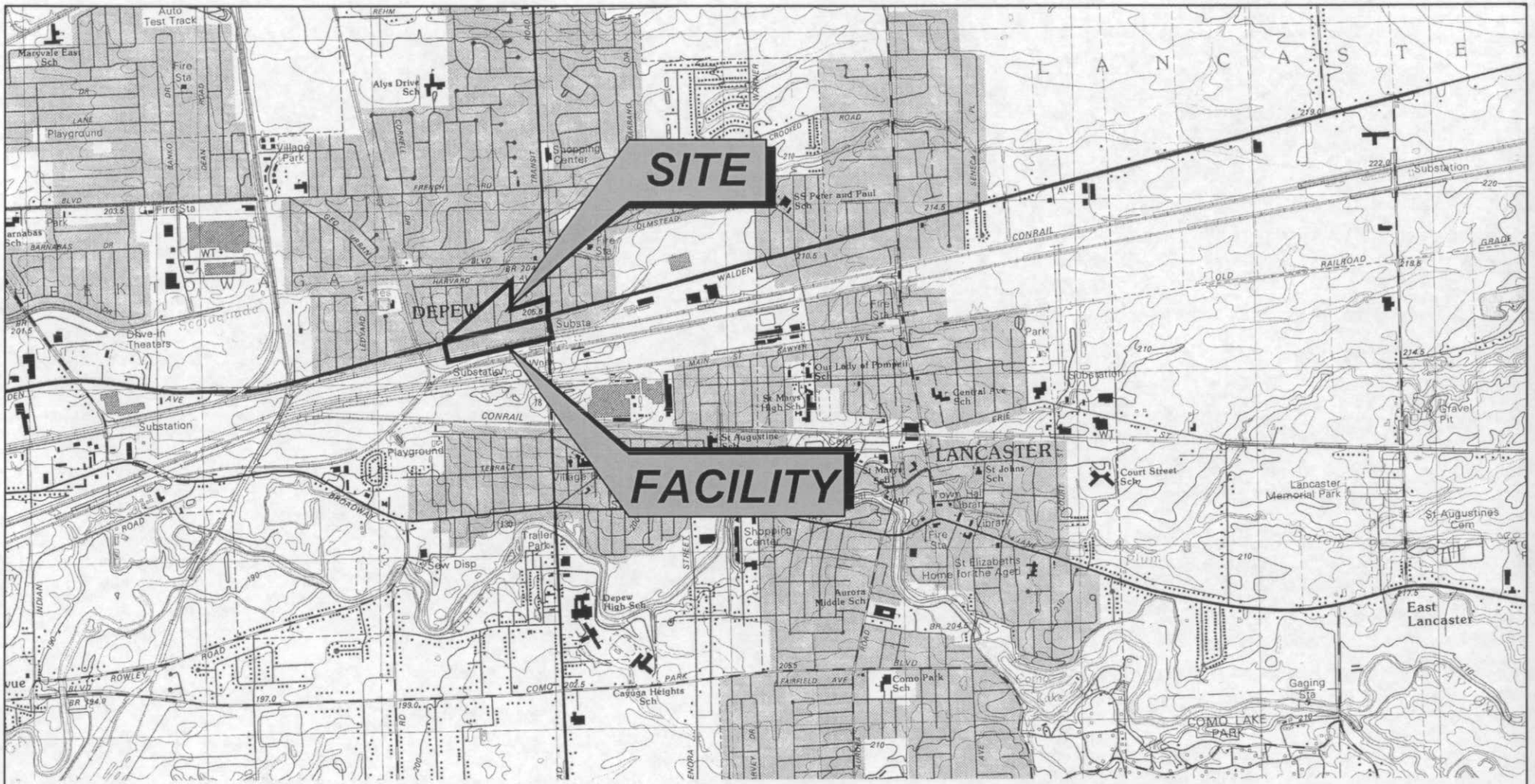
** New York State background

*** Some forms of Cyanide are complex and very stable while other forms are pH dependent and hence are very unstable. Site-specific form(s) of Cyanide should be taken into consideration when establishing soil cleanup objective.

**** Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4-61 ppm. Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200-500 ppm.

***** Recommended soil cleanup objectives are average background concentrations as reported in a 1984 survey of reference material by E. Carol McGovern, NYSDEC.

FIGURES



Basemap source:
U.S.G.S. 7.5 minute quadrangle maps
of Lancaster New York, dated 1982.

J:\Norampac\drawings\NY02-927\NY02-927-11

NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: N.T.S.	SITE LOCATION MAP
Originated By: K.O.	
Drawn By: P.S.G.	
Checked By: K.O.	
Project Mgr: B.L.F.	
Dwg No. NY02-927-11	
MAR 3 0 2005	Project No. NY02-927 — FIGURE: 1-1

Advanced GeoServices Engineering P.C.
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LEGEND

- SOILS EXCEEDING 400 ppm
- SOILS BELOW 400 ppm
- COMMERCIAL PROPERTY BOUNDARY
- ADDITIONAL DELINEATION REQUIRED BY EPA FOR REMOVAL LIMITS
- LIMIT OF REMOVAL (Based on Historical Sampling)

3232 WALDEN (Block 7 Lot 7) - STREET ADDRESS - BLOCK AND LOT

- JAR6 - DISCRETE SAMPLE LOCATION (ACTUAL LOCATION UNKNOWN)

DISCRETE SAMPLE LOCATION

N W E S

(75' WIDE) HARVARD AVE

(60' WIDE) W FIRST ST (60' WIDE) (80' WIDE) TRANSIT RD.

(50' WIDE) W THIRD ST

W SECOND ST

PRINCETON AVE

BOSTWICK PL

WALDEN AVE.

0 W. 1st (Block 3 Lot 6)
243 Harvard (Block 3 Lot 25)
249 Harvard (Block 3 Lot 26)
5798 TRANSIT (Block 3 Lot 23)
COMMERCIAL PAVED AREA
45 W 2nd (Block 3 Lot 9)
14 BOSTWICK (Block 3 Lot 11)
8 BOSTWICK (Block 3 Lot 10)
22 BOSTWICK (Block 3 Lot 12)
BOSTWICK (Block 3 Lot 13)
30 BOSTWICK (Block 3 Lot 14)
34 BOSTWICK (Block 3 Lot 15)
40 BOSTWICK (Block 3 Lot 16)
46 BOSTWICK (Block 3 Lot 17)
50 BOSTWICK (Block 3 Lot 18)
COMMERCIAL PAVED AREA
5774 TRANSIT (Block 4 Lot 9)
41 BOSTWICK (Block 4 Lot 8)
37 BOSTWICK (Block 4 Lot 7)
35 BOSTWICK (Block 4 Lot 6)
LOT WEST OF 33 BOSTWICK (Block 4 Lot 5)
LOT EAST OF 15 BOSTWICK (Block 4 Lot 4)
15 BOSTWICK (Block 4 Lot 3)
7 BOSTWICK (Block 4 Lot 2)
23 W 2nd (Block 4 Lot 1)
COMMERCIAL PAVED AREA
COMMERCIAL PAVED AREA
COMMERCIAL PAVED AREA
3248 WALDEN (Block 4 Lot 13.1)
3246 WALDEN (Block 4 Lot 13.1)
3244 WALDEN (Block 4 Lot 15)
3242 WALDEN (Block 4 Lot 16)
39 W 3rd (Block 7 Lot 15)
32 W 2nd (Block 7 Lot 5)
33 W 3rd (Block 7 Lot 14)
27 W 3rd (Block 7 Lot 13)
26 W 2nd (Block 7 Lot 6)
21 (Block 7 W 3rd Lot 12)
0 WALDEN (Block 7 Lot 7)
3230 Walden (Block 7 Lot 11)
3232 Walden (Block 7 Lot 10)
3236 Walden (Block 7 Lots 8, 9)
22 W 3rd (Block 6 Lot 16)
10 W 3rd (Block 6 Lot 36)
3224 WALDEN (Block 6 Lot 17.1)
COMMERCIAL PAVED AREA

- JAR6 (630ppm)

NOTE:

BASED ON HISTORICAL DATA; FOR DISCUSSION PURPOSES ONLY.

DEPEW PLANT SUPERFUND SITE AS DEFINED IN PARAGRAPH 8g OF THE ADMINISTRATIVE ORDER ON CONSENT FOR A REMOVAL ACTION INDEX NUMBER CERCLA 02-2004-2024 VILLAGE OF DEPEW, ERIE COUNTY, NEW YORK

100 0 100 200
SCALE IN FEET

NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: 1"=100'	SITE BOUNDARY PLAN
Originated By: K.O.	
Drawn By: P.S.G.	
Checked By: K.O.	
Project Mgr: C.T.R.	
Dwg No. NY02-927-02	
Issued: MAR 3 0 2005	Project No. NY02-927

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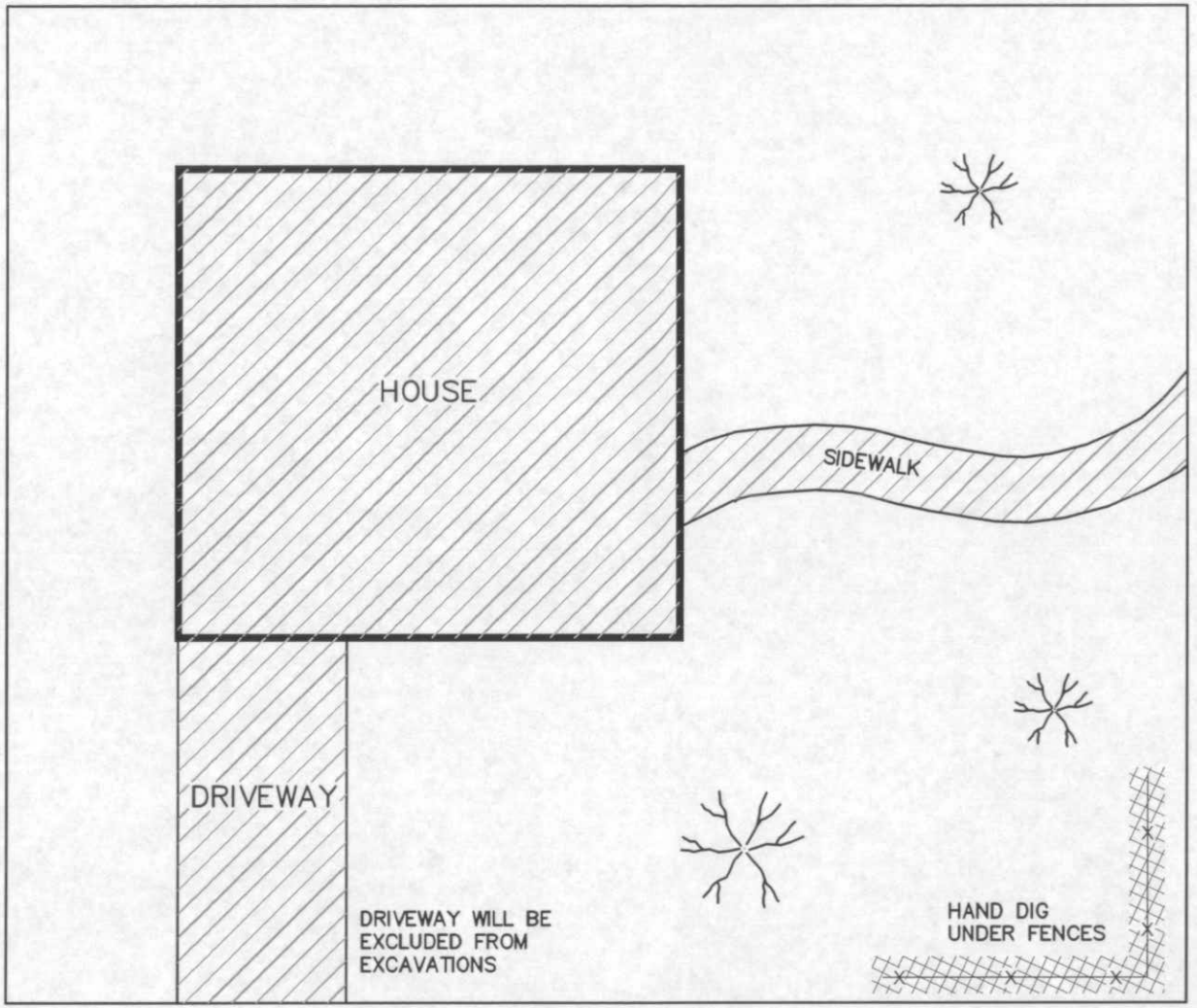
FIGURE: 1-2

J:\Norampac\drawings\NY02-927\NY02-927-02



LEGEND

AREAS NOT TO BE EXCAVATED

NOTE: TYPICAL OFF-SITE REMOVAL SHOWN IS AN APPROXIMATE 1/4 ACRE LOT.

J:\Norampac\drawings\NY02-927\NY02-927-13

NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: NOT TO SCALE	A TYPICAL EXCAVATION OF AN OFF-SITE PROPERTY
Originated By: H.L.H.	
Drawn By: S.M.F.	
Checked By: B.L.F.	
Project Mgr: B.L.F.	
Dwg No. NY02-927-13	
MAR 3 0 2006	Project No. NY02-927

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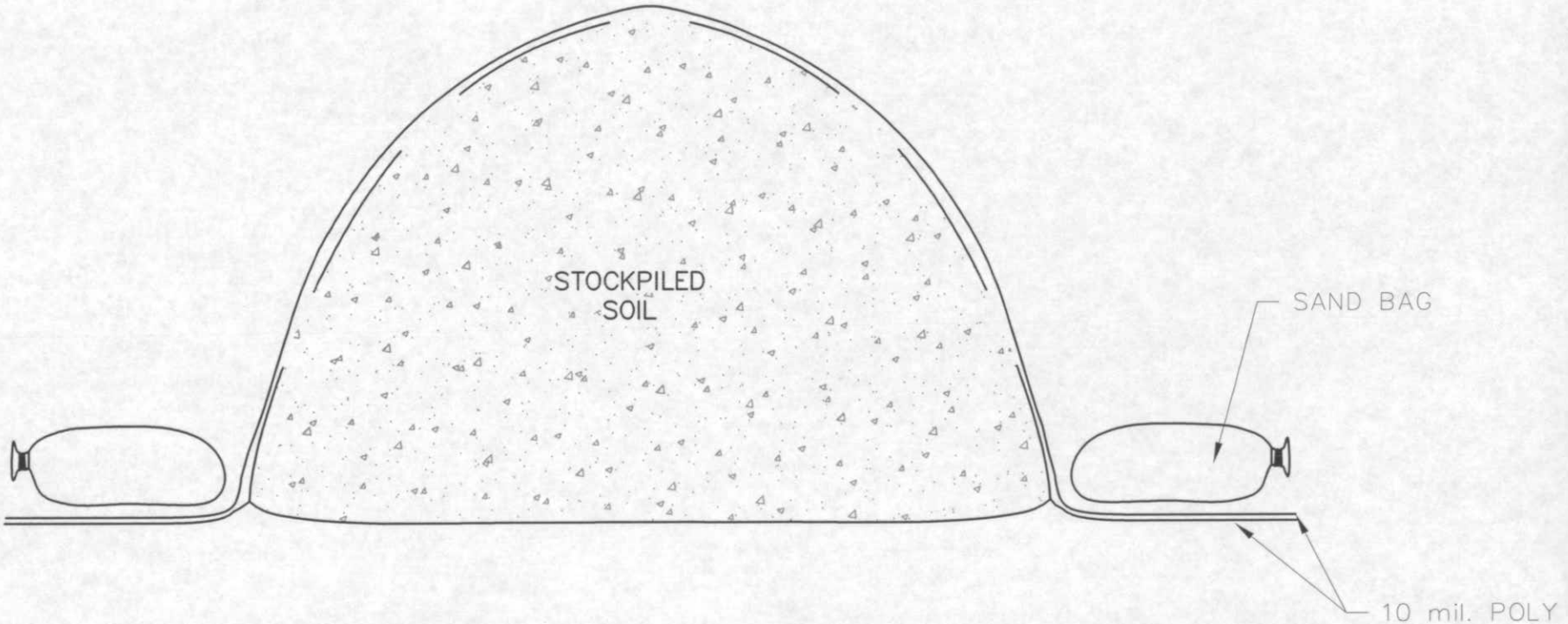
FIGURE: 2-1



NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: NOT TO SCALE	STOCKPILE DETAIL
Originated By: K.O.	
Drawn By: P.S.G.	
Checked By: K.O.	
Project Mgr: B.L.F.	
Dwg. No. NY02-927-14	
MAR 3 0 2005	

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Project No. NY02-927

FIGURE: 2-2

J: \Norampac\drawings\NY02-927\NY02-927-14

APPENDICES

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN FOR NL INDUSTRIES / DEPEW PLANT SITE DEPEW, NEW YORK

Prepared By:

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West Chester, Pennsylvania

March 30, 2005

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1.0 PROJECT MANAGEMENT

1.1 PROJECT/TASK ORGANIZATION

This Quality Assurance Project Plan (QAPP) has been developed to present the quality assurance measures that will be implemented during the removal actions at the NL Industries/Depew Plant Site (Site) located in Depew, New York. The QAPP was prepared by Advanced GeoServices Engineering, P.C. (AGE) on behalf of the Respondent to the Administrative Order on Consent (AOC) between the Respondent and the United States Environmental Protection Agency (USEPA) executed October 6, 2004. The QAPP has been prepared based on guidance presented in the "EPA Requirements for Quality Assurance Project Plans" (QA/R-5, EPA/240/B-01/003, March 2001), "EPA Guidance for Quality Assurance Project Plans (QA/G-5)" (EPA/600/R-98/018, February, 1998), "Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures" (OSWER Directive NO. 9360.4-01, April 1, 1990), and the "Guidance for the Data Quality Objective Process" (QA/G-4, EPA/600/R96/055, March 2001). This QAPP was prepared in satisfaction of the AOC and is Appendix A of the Work Plan.

While all personnel involved in an investigation and in the generation of data are implicitly a part of the overall project and quality assurance program, certain individuals have specifically delegated responsibilities. For samples collected by AGE personnel, the analysis of the samples will be performed by Severn Trent Laboratories (STL-Buffalo) located in Amherst, New York. STL-Buffalo is a New York State Department of Health/New York State Department of Environmental Conservation certified laboratory and a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory. Figure QAPP-1 presents the basic organizational structure for the QA/QC program. The following sections provide additional detail on key QA individuals and their resumes are provided in Attachment A of the QAPP.

1.1.1 Project Director - Barbara Forslund (AGE)

The Project Director is an experienced manager and technical professional who provides quality assurance (QA) review, assists in the coordination of the removal actions, participates in major meetings and regulatory negotiations and provides upper level contact for the client. Christopher Reitman (AGE) will also assume these duties periodically as needed.

1.1.2 Project Manager - Kevin O'Rourke (AGE)

The Project Manager will be the liaison between the Respondent and the remediation contractor. The Project Manager will also be responsible for field quality assurance and other non-analytical data quality review. Additional responsibilities of the Project Manager will include the verification for accuracy of field notebooks, chain-of-custody records, sample labels, and other field-related documentation.

1.1.3 Quality Assurance Manager - Jennifer M. Stanhope (AGE)

The QA Manager will work on all projects requiring the collection of data, and as such is not directly involved in the routine performance of technical aspects of the investigations. The QA Manager's responsibilities include the development, evaluation, and implementation of the QAPP and procedures appropriate to the investigation. Additional responsibilities include reviewing project plans and revising the plans to ensure proper quality assurance is maintained in accordance with USEPA requirements. The QA Manager is also responsible for all data processing activities, data processing quality control and final analytical data quality review.

It is a major responsibility of the QA Manager to ensure that all personnel have a good understanding of the QAPP, an understanding of their respective roles relative to one another, and an appreciation of the importance of the roles to the overall success of the program. The QA Manager's resume has been included as an attachment to the QAPP (Attachment A) documenting the requisite experience.

1.2 PROBLEM DEFINITION/BACKGROUND

NL Industries (NL) and predecessor companies operated a brass foundry facility at the Site in Depew, New York from 1892 until 1972. In 1974, NL sold the foundry property to Anglo-Recycling Corporation. The property is now used by Metro Waste Paper Recovery Inc., a division of the Cascades Group, for paper recycling. Areas adjacent to the Site have been identified as having lead concentrations exceeding 400 mg/kg. These areas will be excavated and the disturbed areas will be restored. This QAPP addresses those removal actions associated with the residential properties and not the facility itself. Figure 1-1 of the Work Plan shows the general location of the Site.

1.3 PROJECT/TASK DESCRIPTION

In general, the activities will consist of delineation soil sampling to determine the size and extent of the removal area; surficial, lead-impacted soil removal from specified properties using conventional construction equipment; confirmatory soil sampling; transportation of this soil to a staging area or directly into transport vehicles; transfer of the soil to hauling vehicles for off-site disposal; off-site disposal of the soil and related material; and restoration of the disturbed properties including fill and topsoil placement, replacement of landscaping (as necessary), and turf establishment.

1.4 QUALITY OBJECTIVES AND CRITERIA

Analytical data will be used to delineate the limits of lead in soil exceeding the residential (400 mg/kg) cleanup levels and to confirm that adequate removal of contaminated soil has occurred to achieve USEPA's performance standards. To meet these goals, data quality objectives (DQOs) have been established as described below. DQOs are qualitative and quantitative statements specifying the quality of the environmental data required to support the decision making process. Separate DQOs are designed for field sampling and laboratory analysis so that clear distinctions can be isolated with respect to cause between any problems found in the system. Conversely, the DQOs are also designed to provide an indication of the variability of the overall system. The overall QA objective is to keep the total uncertainty within an acceptable range that will not hinder the intended use of the data.

1.4.1 Field Investigation Quality Objectives

The main field investigation DQO is to collect high quality data using the proper collection techniques in a repeatable and consistent manner. The following sections discuss the boundaries and the decision rule for the Site. To reduce the random and systematic errors that are introduced in the measurement process during physical sample collection, sample handling, and sample analysis, field duplicates, equipment blanks, and matrix spike/matrix spike duplicate (MS/MSD) samples will be collected.

1.4.1.1 Field Duplicates

Field duplicates are independent samples collected in such a manner that they are equally representative of the sampling point and parameters of interest at a given point in space and time.

Field duplicate samples provide precision information of homogeneity, handling, shipping, storage, preparation and analysis. One field duplicate will be collected for every twenty (20) samples collected for either XRF or laboratory analysis.

1.4.1.2 **Equipment Blanks**

Equipment blanks are designed to address cross-contamination between sample sources in the field due to deficient field equipment decontamination. This blank also addresses field preservation procedures, environmental site interference and the integrity of the source water for field cleaning. One equipment blank will be collected every day, at a minimum, when non-dedicated and non-disposable sampling equipment is decontaminated.

1.4.1.3 **Matrix Spike/Matrix Spike Duplicates**

The matrix spike/matrix spike duplicate (MS/MSD) samples monitor any possible matrix effects specific to samples collected from the Site. In addition, the analysis of MS/MSD samples check precision by comparison of the two spike recoveries. MS/MSD samples are collected from the same location as the parent sample and are analyzed for the same parameters as the parent sample. One MS/MSD sample will be collected for every twenty (20) samples collected and sent to the laboratory for analysis.

The acceptance criteria for the field duplicates, equipment blanks, and MS/MSDs are presented in Table 1.

1.4.2 Laboratory Data Quality Objectives

The ultimate objective for the laboratory is to provide flawless data. However, it is not probable that the analyses will be performed flawlessly and without any need to re-extract or re-analyze samples due to dilution factors, sample matrix, poor surrogate recoveries, analyst error, etc. To reduce the random and systematic errors that are introduced in the measurement process during sample handling, sample preparation, sample analysis, and data reduction, method blanks, MS/MSD and laboratory control samples will be collected. Each are described below:

- Method blanks are generated within the laboratory during the processing of the actual samples. These blanks will be prepared using the same reagents and procedures and at the same time as the project samples are being analyzed. If contamination is found in the method blank, it indicates that similar contamination found in associated samples may have been introduced in the laboratory and may not have actually been present in the samples themselves. Guidelines for accepting or rejecting data based on the level of contamination found in the method blank are presented in the specified analytical method. A minimum of one method blank per 20 samples will be analyzed or, in the event that an analytical round consists of less than 20 samples, one method blank sample will be analyzed per round.

- MS/MSD samples determine accuracy by the recovery rates of the compounds added by the laboratory (the MS compounds are defined in the analytical methods). The MS/MSD samples also monitor any possible matrix effects specific to samples collected from the Site and the extraction/digestion efficiency. In addition, the analyses of MS and MSD samples check precision by comparison of the two spike

recoveries. One MS and MSD sample will be collected for every 20 samples collected per matrix and sent to the laboratory for analysis.

- The Laboratory Control Sample (LCS) is prepared by the laboratory by adding analytes of known concentrations to solution (DI water for metals analysis) for analyses. The LCS is prepared, analyzed and reported once per sample delivery group (SDG). An SDG consists of a maximum of twenty samples. The LCS must be prepared and analyzed concurrently with the samples in the SDG using the same instrumentation as the samples in the SDG. The LCS is designed to access (on a SDG-by-SDG basis) the capability of the laboratory to perform the analytical methods. If the analytes present in the LCS are not recovered within the criteria defined in the specified analytical methods, the samples will be re-analyzed or data will be flagged by the laboratory.

The acceptance criteria for the laboratory QC checks are presented in Table 1.

1.4.3 Criteria Objectives

The cleanup level for the properties is 400 mg/kg total lead. The laboratory must be able to meet this limit. Table 2 contains the laboratory reporting limit (RL) for total lead to show that the analytical methods selected are below or meet the criteria objective. The laboratory will be expected to report the RLs for all samples in the appropriate statistical reporting units for all analytes. However, it should be noted that actual RLs are sample-specific and depend on variables such as dilution factors, sample matrices, percent moisture, and the specific analyte.

1.4.4 Data Management Objectives

It is a data management objective that all aspects of the investigation from sample design, collection, shipment, analysis use/decisions, etc. be performed in conjunction with rigorous QA/QC documentation. The specific details of this documentation can be found throughout this document.

It is expected that, by the design of separate data quality requirements for field sampling and laboratory analysis, clear distinctions can be made such that any problems found in the system can be isolated with respect to the cause. Conversely, the data quality requirements are also designed to provide an indication of the variability inherent to the overall system.

The overall data management objective is to provide a complete data base with a high degree of confidence through the use of a phased approach of sampling, analysis, data assessment (data review), data qualification, and feedback.

1.5 SPECIAL TRAINING/CERTIFICATION

Field sampling will be performed by one or more technicians or field professionals. The Project Manager will be matched to the project based on the field sampling being performed and the sampling-specific experience level of the technician. At a minimum, copies of all required training and health and safety documentation for the on-site personnel will be maintained on-site. This documentation will include, but not limited to: 40-hour certificate, 8-hour refresher training, CPR, first-aid, fit test documentation for respirator's used on-site (if any), and documentation of training for personnel using the XRF.

The training and/or certification for the laboratory personnel are presented in STL-Buffalo's Quality Assurance Manual (QAM), which is Attachment B of this QAPP. Data validation will be performed by a trained QA Scientist and reviewed by the QA Manager. The QA Scientist will have experience validating inorganic data packages.

1.6 DOCUMENTS AND RECORDS

The documentation of sample collection will include the use of bound field logbooks in which all information on sample collection and field instrument calibration will be entered in indelible ink. Appropriate information will be entered to reconstruct the sampling event, including site name (top of each page), sample identification, brief description of sample, date and time of collection, sampling methodology, field measurements and observations, and sampler's initials (bottom of each page with date).

The following documents will be collected and filed as part of the QA process.

- logbooks;
- field data records;
- correspondence;
- chain-of-custody records;
- analytical reports;
- data packages;
- photographs;
- computer disks; and
- reports.

2.0 DATA GENERATION AND ACQUISITION

2.1 SAMPLING PROCESS DESIGN

During site characterization and remediation activities, soil sampling will be conducted to determine work areas and confirm satisfactory remediation. Each type of sampling is described in the following sections.

2.1.1 Delineation Sampling

Insufficient data has been collected from certain residential properties to determine no further action. Sampling will be performed in accordance with Section 4.0 of the *Superfund Lead-Contaminated Residential Sites Handbook (August 2003)*. Five-point composite samples will be collected between 0 to 6 inches and 6 to 12 inches in depth, following the Composite Sampling Procedures and Composite Sampling Protocols on figures QAPP-2 and QAPP-3. These composites will consist of aliquots collected from the same depth interval, and will be equally spaced. At houses where grass extends to the side of the house (i.e., there is no landscaped bed adjacent to the house), two of the five sample aliquots will be taken 3 feet from the house. While this sampling approach may bias the sample results high when sampling a property with an older house, the risk of confounding influences unrelated to the Site is reduced when compared to taking a separate Drip Zone sample as outlined in the Handbook. High impact areas such as play areas or gardens will be sampled using separate five point composites; if the area is small, then the number of aliquots taken to represent the area will be reduced to three.

Sampling may be performed below tree canopies and landscaped areas at NL's discretion. Sampling will consist of a 3-5 point composite sample.

Sampling will not be conducted below decks or porches. If delineation sampling of the property shows removal is necessary in the surrounding yard, soil below decks and porches, will be removed with the surrounding soils if accessible by hand or by machine. If the soils below decks or porches are not accessible, no removal will be performed.

Sampling will not be performed below sheds. If delineation sampling of the property shows removal is necessary in the surrounding yard, the sheds will be moved to access the soil.

Patios not consisting of concrete, asphalt or mortared brick will be moved and the underlying soil removed if composite sampling shows the subgrade to be above 400 mg/kg. The composite sample will consist of 3-5 aliquots depending on the size of the area beneath the patio.

If possible, composite sampling will be performed to show that the soil underneath the pool is below cleanup standards. If sampling is not possible or the samples obtained show concentrations above the cleanup standard, the pool will be removed and the property owner reimbursed for the cost of constructing a new pool comparable in make, size and shape.

The aliquots collected for all composite samples will be homogenized and a representative sample sent off-site to STL-Buffalo for lead analysis.

The properties or portions of properties to be sampled are shown on Figure 1-2 and include:

- 26 W. 2nd Street
- 7 Bostwick Place
- 14 Bostwick Place
- 33 Bostwick Place
- 50 Bostwick Place

- 5774 Transit Road
- 243 Harvard Avenue
- 249 Harvard Avenue

Should the lead concentrations from any composite samples be above 400 mg/kg, adjacent properties will be delineated to ensure the extent of lateral contamination above the cleanup level is addressed.

2.1.2 Post-Excavation Sample Collection

Post excavation sampling shall be performed as specified in the New York State Department of Environmental Conservation, Division of Environmental Remediation Draft Technical Guidance for Site Investigation and Remediation (Section 5. Remedial Design /Remedial Action).

Four grab soil samples will be collected from approximately every 900 square feet of excavation area. The grab samples will be evenly spaced within the excavation area and marked with pin flags. Grab samples will be collected, using either a hand auger, disposable scoops, or steel trowel from 0-6 inches below the bottom of the excavation. Samples will be also be collected from the perimeter (where appropriate) at depths of 0 to 6" of surface soils, at a frequency of every 30 linear feet" will be added.

2.1.2.1 **XRF Screening**

Discrete soil samples will be analyzed by X-ray fluorescence (XRF) to guide excavations. The calibration of the XRF instrument is performed automatically each time the unit is turned on. Calibration checks will be made using standards provided with the instrument in accordance with the manufacturer's user's guide (Attachment C). Field screening using an XRF will be used at a frequency of 4 samples per 900 square feet of base area. If the XRF reading for any grab sample

exceeds 400 mg/kg total lead, the respective quadrant(s) will be re-excavated to remove an additional 3 inches of soil. Following re-excavation, a new grab soil sample from 0-6 inch depth will be collected from the original horizontal location, prepared, and analyzed by XRF to verify that the remaining total lead concentrations are less than 400 mg/kg. Re-excavations will continue until the grab sample(s) does not exceed 400 mg/kg total lead.

2.1.2.2 **Confirmatory Sampling**

After all four grab samples have been successfully screened (i.e., <400 mg/kg total lead) per 900 square feet of excavation area using the XRF, the XRF sample with the highest value under 400 mg/kg will be selected and submitted for analysis of total lead by SW-846 Method 6010B by STL-Buffalo. STL-Buffalo is a New York State Department of Health/New York State Department of Environmental Conservation certified laboratory.

This post-excavation confirmatory sampling is intended to comply with the New York State Department of Environmental Conservation, Division of Environmental Remediation Draft Technical Guidance for Site Investigation and Remediation (Section 5. Remedial Design/Remedial Action). The cleanup goal for this action is 400 mg/kg.

2.1.3 Backfill Sample Collection

Topsoil and backfill will be tested every 10,000 cy of material used. The analytical results will be compared to NYSDEC recommended soil cleanup objectives and approved by NL. If topsoil is blended or amended, the frequency of the testing may be increased at the request of the USEPA.

2.2 SAMPLING METHODS

2.2.1 Soil Sampling

Prior to sampling, leaves, grass and surface debris will be removed from the area using a stainless steel spoon or shovel or disposable scoops. Sampling implements will include stainless steel trowels or disposable plastic scoops, hand augering devices, and stainless steel pans and/or mixing bowls. Field personnel will don a new clean pair of disposable nitrile gloves prior to sampling at each location. All implements, if not disposable, shall be decontaminated between the collection of each sample using the protocol described in Section 2.3.1 of this QAPP. Samples will be thoroughly mixed by techniques to fully homogenize the samples. Each soil sample will be of sufficient volume for subsequent analytical testing requirements and shall be contained in a resealable plastic bag or plastic cylinder as described in Section 2.3.3 of this QAPP. Field personnel will record a description of the sample location and depth, the time period for each sample collection, surface conditions surrounding the sample location, and all pertinent meteorological information (see Field Sampling Documentation Procedures, Section 2.3.2 of this QAPP).

2.3 SAMPLE HANDLING AND CUSTODY

The following sections describe the sample handling and custody procedures that are required to ensure the proper analytical tracking.

2.3.1 Soil Sampling Decontamination

The sampling methods prescribed herein have been developed to minimize the possibility of cross-contamination. Those sampling implements which cannot be decontaminated effectively shall be disposed of between and after sample collection. Decontamination procedures for non-dedicated and non-disposable sampling equipment will be as follows:

- Remove particulate matter and surface films with tap water, Alconox and brush as necessary;
- Tap water rinse;
- Deionized water rinse;
- Air dry (if possible); and
- Cover with plastic or wrap in aluminum foil if stored overnight.

Equipment blanks will be collected for decontamination quality assurance. A description of the types and frequency of QC samples is included in Section 2.5.

Any deviations from these procedures will be documented in the field logbook.

All derived decontamination wastes from each sampling event will be returned to the ground in the immediate vicinity of the sample collection point.

2.3.2 Field Sampling Documentation Procedures

Field sampling operations and procedures will be documented by on-site personnel in bound field logbooks. When appropriate, field operations and procedures will be photographed. Documentation of sampling operations and procedures will include documenting:

- Procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., preservatives and absorbing reagents);
- Procedures for recording the exact location and specific considerations associated with sampling acquisition;
- Specific sample preservation method;
- Calibration of field instruments;
- Submission of field-based blanks, where appropriate;
- Potential interferences present at the Site;
- Field sampling equipment and containers including specific identification numbers of equipment;

- Sampling order;
- Decontamination procedures; and
- Field personnel.

Field logbooks will be waterproof and bound. The logbook will be dedicated to the job. No pages will be removed. Corrections will be made by drawing a single line through the incorrect data and initialing and dating the correction that was made to the side of the error. An initialed diagonal line will be used to indicate the end of an entry or the end of the day's activities.

Photographs of field sampling operations and procedures will be documented in the field logbooks. The following information regarding photographs will be recorded:

- Date, time, location of photograph;
- Photographer;
- Weather conditions;
- Reason why the photograph was taken; and,
- Sequential number of photograph and the film roll number.

Once the photographs have been developed, this information will be recorded on the back of the photograph.

2.3.3 Sample Containers and Preservation

Table 3 lists the appropriated sample containers, preservation methods, and holding times for lead analysis. Samples will be labeled in the field according to the procedures outlined in Section 2.3.4.3 of this QAPP.

2.3.4 Sample Custody

Sample identification and chain-of-custody shall be maintained for the Site through the following chain-of-custody procedures and documentation:

- Sample labels, which prevent misidentification of samples;
- Custody seals to preserve the integrity of the sample from the time it is collected until it is opened in the laboratory;
- Field logbooks and pictures to record information about the site investigation and sample collection;
- Chain-of-Custody records to establish the documentation necessary to trace sample possession from the time of collection to laboratory analysis; and
- Laboratory logbooks and analysis notebooks, which are maintained at the laboratory to record all pertinent information about the sample.

The purpose of these procedures is to insure that the quality of the sample is maintained during its collection, transportation, storage and analysis. All chain-of-custody requirements shall comply with standard operating procedures indicated in the USEPA sample handling protocol. All sample control and chain-of-custody procedures applicable to the subcontracted laboratory will be presented in the laboratory's procedures.

2.3.4.1 **Chain-of-Custody**

A sample is in custody if it is in someone's physical possession or view, locked up or kept in a secure area that is restricted to authorized personnel. The chain-of-custody record must be completed by the person responsible for sample shipment to the subcontracting laboratory. All constraints on time and analytical procedures should be marked on the record. The custody record should also indicate any special preservation or filtering techniques required by the laboratory. Figure QAPP-4 depicts a typical chain-of-custody record.

As few persons as possible should handle samples in the field. The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person.

The QA Manager will determine whether proper custody procedures were followed during field work and decide if additional samples are required. The USEPA has the final determination that proper custody procedures were followed.

2.3.4.2 **Sample Designations**

Sample locations at the Site will be marked with pin flags and field located using physical features and standard measuring devices (e.g., tape measure, measuring wheel).

Samples collected from each location shall be identified by using a standard label which is attached to the sample container. Sample information will be printed on the label in a legible manner using waterproof ink. The identification on the label must be sufficient to enable cross-reference with the logbook. Figure QAPP-5 depicts a field sample label. The following information shall be included on the sample label:

- Site name;
- Date and time of sample collections;
- Designation of the sample (i.e., grab or composite);
- Type of sample with brief description of sampling location (depth);
- Signature of sampler;
- Sample preservative used; and
- General types of analyses to be conducted.

2.3.4.3 Custody Seals

Custody seals are preprinted adhesive-backed seals. Seals are placed on all shipping containers, and seals shall be signed and dated before use. The custody seals must be placed on the shipping containers in a manner which will make it obvious to see if the container has been tampered with or opened.

2.3.5 Transfer of Custody and Shipment

Chain-of-Custody records must be kept with the samples at all times. When transferring the samples, the parties relinquishing and receiving them must sign, date, and note the time on the record. Each shipment of samples to the laboratory must have its own Chain-of-Custody record with the contents of the shipment, method of shipment, name of courier, and other pertinent information

written on the record. The original record accompanies the shipment and the copies are distributed to the AGE QA Manager. Freight bills, postal service receipts and bills of lading are retained as permanent documentation.

2.4 ANALYTICAL METHODS

2.4.1 Real-Time XRF Analysis

For screening the excavation prior to confirmation sampling, the XRF unit will be placed directly on the subgrade (in bulk sample mode) for a period of 60 nominal seconds at a minimum. The total lead result will be the result plus the precision of the analysis provided by the XRF unit. For example, if the unit provides a reading of 250 and a precision of $\pm$ 22, the recorded reading shall be 272 mg/kg total lead. XRF procedures are presented in Attachment C.

2.4.2 Laboratory Analysis

All of the delineation and confirmation samples will be analyzed by STL-Buffalo (USEPA SW-846 Method 6010B) to provide data on which field decisions can be made. Those samples that are sent to the laboratory will be placed into a laboratory-provided sample container labeled (Figure QAPP-5) as specified in Section 2.3.4.2. STL-Buffalo will sieve all samples through a #60 sieve after drying and only the fine fraction will be analyzed.

2.5 QUALITY CONTROL

Field QC samples will be collected to determine if contamination of samples has occurred in the field and, if possible, to quantify the extent of contamination so that data are not lost. Duplicate samples, equipment blanks and matrix spike/matrix spike duplicate (MS/MD) samples will also be collected. The duplicate QC samples will be labeled with fictitious identification locations and times, and submitted to the laboratory as regular samples. The actual identification of the duplicate QC samples will be recorded in the field logbook. The samples will be identified as field duplicate, equipment blank, and MS/MSD samples in the final report.

2.5.1 Field Duplicate Samples

Field duplicate samples are independent samples collected in such a manner that they are equally representative of the sampling point and parameters of interest at a given point in space and time. Field duplicate samples provide precision information of homogeneity, handling, shipping, storage, preparation and analysis.

Soil sample field duplicates will be collected and homogenized before being split. Field duplicate samples will be analyzed with the original field samples for the same parameters. One of every twenty investigative samples collected will be duplicated.

2.5.2 Equipment Blanks

The equipment (rinsate) blank is designed to address cross-contamination between sample sources in the field due to deficient field equipment decontamination procedures. This blank also addresses field preservation procedures, environmental site interference and the integrity of the source water for field cleaning.

An equipment blank will be prepared during soil sampling when a particular piece of sampling equipment was employed for sample collection and subsequently decontaminated in the field for use in additional sampling. The equipment blank will be composed in the field by collecting, in the appropriate container for the water, a blank water rinse from the equipment (trowel, spoon, auger, etc.) after execution of the last step of the proper field decontamination protocol. Preservatives or additives will be added to the equipment blank where appropriate for the sampling parameters. One equipment blank will be collected per sampling day.

2.5.3 Matrix Spike/Matrix Spike Duplicate Samples

MS and MSDs will be collected from the same location as the parent sample and will be analyzed for the same parameters as the parent sample. Each sample will be labeled with the sample number as the original sample, designated as MS or MSD samples, and submitted to the laboratory for the appropriate analyses. MS/MSD samples determine accuracy by the recovery rates of the compounds added by the laboratory (the MS compounds are defined in the analytical methods). The MS/MSD samples also monitor any possible matrix effects specific to samples collected from the Site and the extraction/digestion efficiency. In addition, the analyses of MS and MSD samples check precision by comparison of the two spike recoveries. One MS and MSD sample will be collected for every 20 samples collected and sent to STL-Buffalo for analysis.

2.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

2.6.1 Field Equipment

Field measurement equipment and the XRF unit will be maintained in accordance with manufacturer's instructions. All field equipment will be checked by qualified technicians prior to use

in the field. The instrument operator will be responsible for operating the equipment properly in the field. Any problems encountered while operating the instrument will be documented in the field logbook. If problem equipment is detected or should require service, the equipment will be returned and a qualified technician will perform the maintenance required. Use of the instrument will not be resumed until the problem is resolved. Routine maintenance of field instruments will be documented in the field logbooks.

2.6.2 Laboratory Equipment

Preventative maintenance and periodic maintenance is performed as recommended by the manufacturers of the equipment in use in the laboratory. Spare parts are kept in inventory to allow for minor maintenance. Service contracts are maintained for most major instruments, balances and critical equipment. If an instrument fails, the problem will be diagnosed as quickly as possible, and either replacement parts will be ordered or a service call will be placed. The samples will not be analyzed until it is determined that the instrument is in proper working condition.

Laboratory logbooks are kept by the laboratory to track the performance maintenance history of all major pieces of equipment. The instrument maintenance logbooks are available for review upon request. Specific details of preventative maintenance programs for the laboratory will be provided in the Laboratory QAM.

2.7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

2.7.1 Laboratory Calibration

Laboratory calibration and frequency is specified in the USEPA SW-846 Method 6010B and is summarized in the STL-Buffalo QAM.

2.7.2 Field Calibration

All instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations. Operation, calibration and maintenance will be performed by trained personnel on a daily basis. All maintenance and calibration information will be documented and will be available upon request.

2.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Supplies and consumables are inspected upon receipt to check for damage during shipment, to confirm that no potential cross contamination occurred, and to confirm the items ordered were shipped. If cross-contamination and/or damage is suspected the supplies/consumables will be discarded and new supplies/consumables will be obtained.

2.9 NON-DIRECT MEASUREMENTS

There will not be any non-direct measurements.

2.10 DATA MANAGEMENT

All field data is documented in bound, pre-page numbered logbooks. Once a logbook has been filled, the logbook is returned to the office and filed in the project files. Samples collected are documented in the logbook and on the Chain-of-Custody for submittal to the laboratory.

All laboratory data is submitted to AGE in both a hard copy sample delivery group (SDG) and as an electronic data deliverable (EDD). The hard copy SDG is used for the validation of the data and

after validation it is placed in a project-specific archive box, a unique archive number assigned and archived.

A copy of the Chain-of-Custody is used to hand enter the sample identification into the database. All hand entries are 100% checked and validated by the QA Manager or another designated individual who did not enter the Chain-of-Custody originally. The EDD is used to enter the analytical results into the database. No modification of the data is made to the EDD. Once the field data and laboratory data have been entered into the database, tables are made for use in the validation of the data. Through the process of data validation, the tables are checked against the laboratory Form 1's to confirm that the EDD was accurate.

Any qualifiers assigned during the data validation are entered by the QA Scientist and 100% checked by the QA Manager or another designated individual who did not enter the qualifiers.

3.0 ASSESSMENTS AND OVERSIGHT ELEMENTS

3.1 ASSESSMENTS AND RESPONSE ACTIONS

3.1.1 Laboratory Assessments

The purpose of a quality assurance audit is to provide an objective, independent assessment of a measurement effort. The quality assurance audit ensures that the laboratory's data generating, data gathering, and measurement activities produce reliable and valid results. There are two forms of quality assurance audits: performance evaluation audits and system audits.

3.1.1.1 **Performance Evaluation Audits**

The purpose of performance evaluation audits is to quantitatively measure the quality of the data. These audits provide a direct evaluation of the various measurement systems' capabilities to generate quality data.

The laboratory regularly participates in performance evaluation audits as part of their laboratory certification efforts. Performance audits are conducted by introducing control samples in addition to those routinely used.

The results of the performance audits are summarized and maintained by the Laboratory QA Supervisor and distributed to the section supervisors who must investigate and respond to any out of control results.

3.1.1.2 **Technical System Audits**

A technical systems audit is an on-site, qualitative review of the various aspects of a total sampling and/or analytical system. The purpose of the technical systems audit is to assess the overall effectiveness, through an objective evaluation, of a set of interactive systems with respect to strength, deficiencies, and potential areas of concern. Typically, the audit consists of observations and documentation of all aspects of sample analyses. External and internal audits are conducted of the laboratory throughout each year.

3.1.2 Field Assessments

The purpose of the field audits is to confirm that field sampling, documentation, and analytical procedures are being performed in accordance with the Work Plan. Additionally, the field audits confirm that the field crew is performing the procedures consistently.

Formal field audits will be performed during the delineation sampling. Formal audits may be performed periodically and would consist of the Project Manager (or higher rank) observing the sampling crew perform a sampling, documentation, and/or analytical event. The formal audits would be unannounced to the field crew and will be documented in the field log books or daily reports.

3.1.3 Response Actions

When field sampling activities or laboratory QC results show the need for corrective action, immediate action will take place and will be properly documented. The USEPA OSC will be notified of all corrective actions that are taken. In the event that a problem arises, corrective action

will be implemented. Any error or problem will be corrected by an appropriate action which may include:

- Replacing or repairing a faulty measurement system;
- Discarding erroneous data;
- Collecting new data; and
- Accepting the data and acknowledging a level of uncertainty.

3.1.3.1 **Field Sampling Response Actions**

The Project Manager will be responsible for all field QA. Any out of protocol occurrence discovered during field sampling will be documented in the field logbook and immediate corrective action will be taken. For problems or situations which cannot be solved through immediate corrective action, the Project Manager will immediately notify the Project Director and/or the QA Manager. The Project Director and/or the QA Manager and Project Manager will investigate the situation and determine who will be responsible for implementing the corrective action. Corrective action will be implemented upon approval by the Project Director and/or the QA Manager. The Project Director will verify that the corrective action has been taken, appears effective, and at a later date, verify that the problem has been resolved. The successfully implemented corrective action will be documented in the field logbook by the Project Manager. Any deviations from the QA protocol in the QAPP must be justified, approved by the Project Director and/or the QA Manager and the USEPA and properly documented.

3.1.3.2 **Laboratory Situation Response Actions**

Corrective action will be implemented to correct discrepancies found which affect the validity or quality of analytical data, and to identify any analytical data that may have been affected. Limits of data acceptability for each parameter and sample matrix are addressed in the instrument manuals, USEPA Methods and/or Laboratory QA Manual. Whenever possible, immediate corrective action procedures will be employed. All analyst corrective actions are to be followed according to the instrument manuals, USEPA Methods, or Laboratory QA Manual. Any corrective action performed by the analyst will be noted in laboratory logbooks.

Laboratory personnel noting a situation or problem which cannot be solved through immediate corrective action will notify the Laboratory QA Supervisor. The QA Supervisor will investigate the extent of the problem and its effect on the analytical data generated while the deficiency existed. All data suspected of being affected will be scrutinized to determine the impact of the problem on the quality of the data. If it is determined that the deficiency had no impact on the data, this finding will be documented. If the quality of the analytical data were affected, the Laboratory Program Manager and AGE QA Manager will be notified immediately so that courses of action may be identified to determine how to rectify the situation.

The laboratory must take corrective action if any of the QC data generated during the laboratory analyses are outside of the method criteria. Corrective action for out-of-control calibrations is to recalibrate the instrument and reanalyze the samples. A sequence is specified in the USEPA specified methods when problems in analyses are encountered. The laboratory will follow these procedures exactly and document the problems encountered and the corrective action in a case narrative enclosed with each data deliverables package.

The Laboratory QA Supervisor will be responsible for informing the Laboratory Program Manager and AGE QA Manager of the effects on the data, the data affected and the corrective action taken. It is also the Laboratory QA Supervisor's responsibility to verify that the corrective action was performed, appears effective, and at a later date, the problem was resolved.

3.1.3.3 **Data Validation QA Response Actions**

Upon completion, sample data packages will be sent from the laboratory to the AGE QA Scientist for data validation. If all project samples are not present in the data packages or any deficiencies affecting the sample results are noted, the QA Scientist will contact the Laboratory QA Supervisor. The Laboratory QA Supervisor will respond in writing to any inquiries and provide any changes to the data packages to the QA Scientist. Any errors, problems, questionable data values, or data values outside of established control limits will be corrected by the appropriate action which may include disregarding erroneous data, collecting new data, and accepting the data and acknowledging a level of uncertainty. The data validation report will provide a description of the usability of the data.

3.2 REPORTS TO MANAGEMENT

Data validation reports, along with copies of all support documentation, validated data summary tables, and analytical data packages, will be submitted periodically to the Respondent and the USEPA or their designated contractor as data are validated.

4.0 DATA VALIDATION AND USABILITY

4.1 DATA REVIEW, VERIFICATION, AND VALIDATION

All analytical data will be permanent, complete and retrievable. The analyst will enter the analytical data into the Laboratory Information Management System (LIMS) upon analysis completion and laboratory validation. The laboratory will report sample results on analysis report forms and provide the information referenced in the USEPA Methods for each deliverables package. All laboratory data will undergo the data validation procedures described in the Laboratory QA Manual prior to final reporting. Data will be stored on the laboratory's network until the investigation is complete and data archived from the LIMS will be transferred to magnetic tape which will be retained by the laboratory for an additional five years.

All lead results will be reported in milligrams per liter (mg/l) for aqueous samples or milligrams per kilogram (mg/kg) for solid samples. Equations to calculate concentrations are found in the USEPA SW-846 Method 6010B. All blank results and QC data will be included in the data deliverables package. Blank results will not be subtracted from the sample results. The blank results and QC data will be used in data validation to review sample results qualitatively. Data validation will be performed for samples analyzed at the STL-Buffalo in general accordance with the guidelines identified in Section 4.2. Outliers and other questionable data will be addressed in the data validation report and specific QA/QC flags will be applied to questionable data. The QA/QC flags will be consistent with the USEPA data validation guidelines.

All analytical data, reports, and any other project related information produced during this project will be stored in the project file at AGE's office maintained by the Project Director. Project reports,

tables, etc. will be stored in project specific electronic files. On a regular basis, the data will be backed up on magnetic tapes and stored off-site.

4.2 VERIFICATION AND VALIDATION METHODS

Validation of the analytical data will be performed by an AGE QA Scientist. One hundred percent of the analytical data will be validated. Validation will be performed in general accordance from the following data validation guidance documents, where applicable:

- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, July 2002.

- Evaluation of Metals Data for the Contract Laboratory Program (CLP), USEPA Region II, March 1990.

Specifically, the information examined will consist of sample results, analytical holding times, sample preservation, chains-of-custody, initial and continuing calibrations, field and laboratory blank analysis results, serial dilutions, instrument performance check sample results, MS/MSD recoveries and RPD, laboratory control sample recoveries, and field duplicate recoveries. If the criteria listed in the analytical method are not met for any parameter, the associated samples will be flagged as described in the referenced validation guidelines. During data validation, data is also reviewed for transcription, calculation, and reporting errors. Calculations for obtaining concentration data for all parameters may be found in the referenced methods.

The purpose of data validation is to verify and retrace the path of the sample from the time of receipt for analysis to the time the final data package report is generated. Upon completion of data

validation, the existing results will be reported in tabular form with data validation flags applied as appropriate to determine the usefulness of the data. The data validation flags will be consistent with the USEPA data validation guidelines. A data validation report will be written to assist the Project Director in making decisions based on the analytical results. Laboratory data packages and data validation reports will be provided to USEPA at its request.

4.3 RECONCILIATION WITH USER REQUIREMENTS

Completeness will be calculated to reconcile the useable validated data to the entire data set. A completeness of 90% or greater is required for the project. If a completeness of less than 90% is obtained, then the lack of completeness will be investigated. The corrective actions to be taken will be determined based on the investigation conclusion. Any corrective action that may be required will only occur after USEPA approval.

TABLES

TABLE 1
PARCC PARAMETERS
NL Industries/Depew Plant Site
Depew, New York

DQO PARAMETER	SOIL
PRECISION	
Matrix Spike/Matrix Spike Duplicate	<20% RPD for results > 5xRL
Field Duplicate	<40% RPD for results > 5xRL <+/-2*RL for results < 5xRL
ACCURACY	
Laboratory Blank	<RL
Equipment Blank	<RL
Matrix Spike/Matrix Spike Duplicate	75-125% R unless sample concentration exceeds the spike concentration by a factor of 4 or more
Laboratory Control Sample	80-120 %R
COMPLETENESS	90%
COMPARABILITY	Based on precision, accuracy and media comparison

RPD: Relative percent difference.
RL: Quantitation limit.
%R: Percent recovery.
NA: Not applicable.

TABLE 2
DATA QUALITY OBJECTIVES
NL Industries/Depew Plant Site
Depew, New York

MATRIX	METHOD	PARAMETER	RL	DQO	UNITS
Soil	SW-846 6010B[1]	Lead	5	400	mg/kg

Units:
mg/kg: milligrams per kilogram

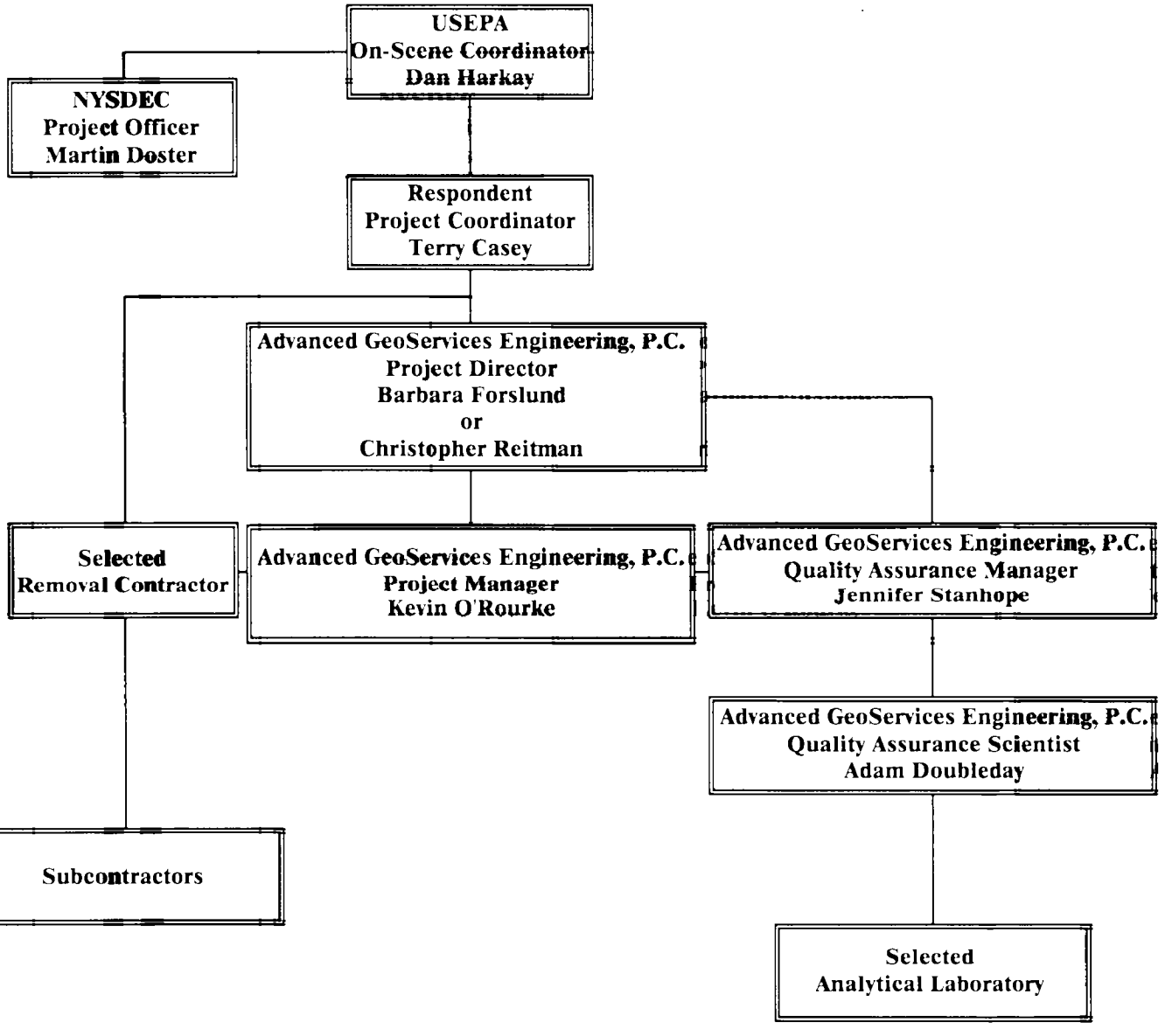
RL: Reporting Limit
DQO: Data Quality Objective

[1] According to USEPA "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods", April 1998, SW-846, Fifth edition.

TABLE 3
SAMPLE CONTAINERS, PRESERVATIVES AND HOLDING TIMES
NL Industries/Depew Plant Site
Depew, New York

MATRIX	METHOD	PARAMETER	CONTAINER	PRESERVATIVE	HOLDING TIME
Soil	SW-846 6010B	Total Lead	resealable plastic bag	none	6 months
Aqueous	SW-846 6010B	Total Lead	1 L plastic	HNO3 pH<2; cool 4°C	6 months

FIGURES



NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: N.O. SCALE	PROJECT ORGANIZATION
Originated By: J.M.S	
Drawn By:	
Checked By: J.M.S	
Project Mgr: C.T.R	
Dwg. No. NY02-927-06	
Date:	

Advanced GeoServices Engineering P.C.
1055 Andrew Drive Suite A
West Chester, Pennsylvania 19380
(610) 840-9100
FAX: (610) 840-9199

Project No. NY02-927 | FIGURE: QAPP-1

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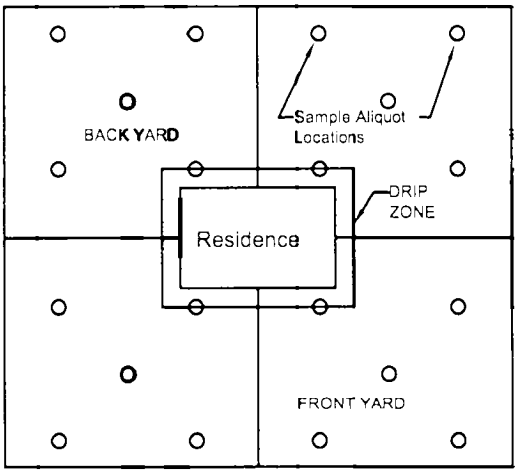
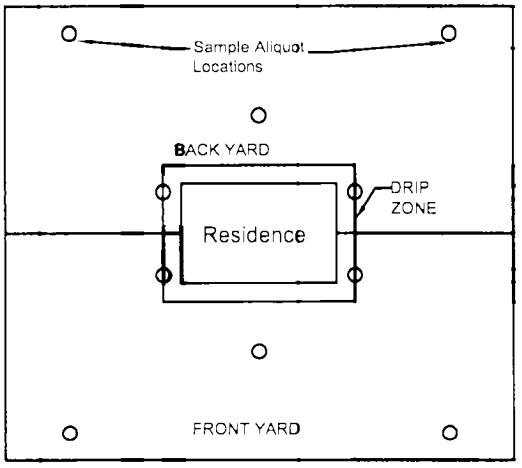


PROPERTIES > 5,000 Square Feet
4 COMPOSITES PER PROPERTY FOR EACH HORIZON (DEPTH INTERVAL).

COMPOSITE SAMPLING PROCEDURES

1.) Remove vegetation to access bare soil on all sampling points within each Exposure Area (EA).
2.) If there is a distinct play area or vegetable garden, collect a 3-point composite sample for each, where applicable.
3.) Use stainless steel trowel or hand auger to obtain aliquot at sampling point (0-6 inches and 6-12 inches)
4.) Homogenize all aliquots from same depth interval and EA.
5.) Collect representative sample from homogenized aliquots and place in self sealing plastic bag or testing cylinder.
6.) Collect two of the five sample aliquots 3 feet from the house where grass extends to the side of the house.
7.) Record testing results and create sketch of property which shows each discrete sampling location so that the points can be located at a future date.



PROPERTIES < 5,000 Square Feet
2 COMPOSITES PER PROPERTY FOR EACH HORIZON (DEPTH INTERVAL).

COMPOSITE SAMPLING PROTOCOLS

1.) Samples will be collected at a minimum of 5 feet from down-spouts and drainage features.
2.) Samples will be collected at a minimum of 5 feet from potential property specific contamination sources, (i.e., trash burning areas, barbecues, waste storage areas, etc).
3.) Samples will not be collected beneath asphalt, concrete or mortared brick areas.

Reference
Figure developed from CERCLA Superfund Lead-Contaminated Residential Sites Handbook (EPA, 2003).

NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: NO SCALE	GENERAL COMPOSITE SAMPLING LAYOUT
Originated By: K.O.	
Drawn By:	
Checked By:	
Project Mgr.: C.T.R.	
Dwg. No.: NY02-927-03	
Issued: MAR 3 0 2005	Project No.: NY02-927

Advanced GeoServices Engineering P.C.
1055 Andrew Drive Suite A
West Chester, Pennsylvania 19380
(610) 840-9100
FAX: (610) 840-9199

FIGURE: QAPP-2

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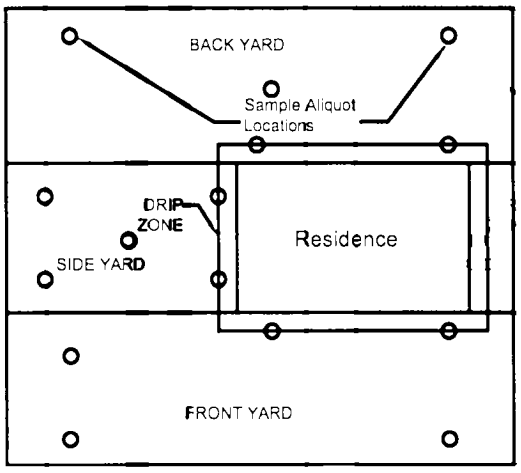
COMPOSITE SAMPLING PROCEDURES

1.) Remove vegetation to access bare soil on all sampling points within each Exposure Area (EA).
2.) If there is a distinct play area or vegetable garden, collect a 3-point composite sample for each, where applicable.
3.) Use stainless steel trowel or hand auger to obtain aliquot from each horizon at sampling point (0-6 inches and 6-12 inches)
4.) Homogenize all aliquots from same depth interval and EA.
5.) Collect representative sample from homogenized aliquots and place in self sealing plastic bag or testing cylinder.
6.) Collect two of the five sample aliquots 3 feet from the house where grass extends to the side of the house.
7.) Record testing results and create sketch of property which shows each discrete sampling location so that the points can be located at a future date.



PROPERTIES < 5,000 Square Feet with Side Yard
3 COMPOSITES PER PROPERTY FOR EACH HORIZON (DEPTH INTERVAL).

COMPOSITE SAMPLING PROTOCOLS

1.) Samples will be collected at a minimum of 5 feet from down-spouts and drainage features.
2.) Samples will be collected at a minimum of 5 feet from potential property specific contamination sources, (i.e., trash burning areas, barebecues, waste storage areas, etc).
3.) Samples will not be collected beneath asphalt, concrete or mortared brick areas.

Reference
Figure developed from CERCLA Superfund Lead-Contaminated Residential Sites Handbook (EPA, 2003).

NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: NO SCALE	SIDE YARD COMPOSITE SAMPLING LAYOUT
Originated By: K.O.	
Drawn By:	
Checked By:	
Project Mgr: S.T.R.	
Dwg. No. NY02-927-03	
Issued: MAR 30 2005	Project No. NY02-927

Advanced GeoServices Engineering P.C.
1055 Andrew Drive Suite A
West Chester, Pennsylvania 19380
(610) 840-9100
FAX: (610) 840-9199

FIGURE: QAPP-3

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ADVANCED GEOSERVICES ENGINEERING, P.C.

1055 Andrew Drive, Suite A
West Chester, Pennsylvania 19380
PHONE: (610) 840-9100
FAX: (610) 840-9199

CHAIN OF CUSTODY

page ____ of ____

Project Name: _____ Project No: _____

AGC Contact Person: _____ Shipment No: _____

Laboratory Name/Location: _____

Sampler's Name(s) (Print): _____

Sample ID/Location	Date Collected	Time Collected	Sample Type: Comp	Sample Type: Grab	Sample Matrix	Field Filtered: Yes	Field Filtered: No	Total Number of Containers	Analysis Requested	Preservatives: H_2SO_4	Preservatives: HCL	Preservatives: HNO_3	Preservatives: NAOH	Preservatives: NONE	Remarks

Turnaround time (circle one): Standard 5-7 Days (Rush) 2-4 Days (Rush) 24 Hours (Rush)

Deliverables (circle one): Results Only Results/QC Summary CLP-Like CLP NJ/CLP NJ/CLPII Other _____

Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:

Sample Matrix: SW - Surface Water, GW - Groundwater, Sed - Sediment, S- Soil, Sld - Sludge

NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: NO SCALE	CHAIN OF CUSTODY
Originated By: J.M.S.	
Drawn By:	
Checked By: J.M.S.	Advanced GeoServices Engineering P.C.
Project Mgr: S.T.R.	1055 Andrew Drive Suite A
Dwg. No. NY02-927-05	West Chester, Pennsylvania 19380
Date: 3 0 2	(610) 840-9100
Project No. NY02-927	FAX: (610) 840-9199
	FIGURE: QAPP-4

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ADVANCED GEOSERVICES ENGINEERING, P.C. 1055 Andrew Drive, Suite A West Chester, Pennsylvania 19380 (610) 840-9100 FAX: (610) 840-9199	PROJECT NO. _____
SAMPLE IDENTIFICATION NUMBER	**REMARKS:**
COLLECTION INFORMATION ☐ COMPOSITE ☐ GRAB DATE: TIME: **BY:**	
TESTING REQUIRED	PRESERVATIVES ADDED
RECEIVING LAB	LAB SAMPLE NO.

NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: NO SCALE	SAMPLE LABEL
Originated By: J.M.S	
Drawn By:	
Checked By: J.M.S	Advanced GeoServices Engineering P.C. 1055 Andrew Drive Suite A West Chester, Pennsylvania 19380 (610) 840-9100 FAX (610) 840-9199
Project Mgr: D.T.B.	
Dwg No: NY02-927-04	Project No: NY02-927
Issued: 10/30 3 0 2000	FIGURE QAPP-5

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ATTACHMENTS

ATTACHMENT A

AGC/AGE RESUMES

BARBARA L. FORSLUND
Consultant

FIELDS OF EXPERTISE
Geotechnical Engineering, Environmental Engineering, Remedial Design, Construction Management, Hydrogeology, Community Relations and Regulatory Compliance.

EDUCATION
Master of Science - Civil Engineering; University of Michigan, 1984
Bachelor of Science - Environmental Science Engineering; University of Michigan, 1983

PROFESSIONAL REGISTRATIONS
Professional Engineer: AL, CO, DE, IL, MD, MI, NC, NE, NJ, NY, OH, OR, PA, and WY

PRESENT DUTIES AND RESPONSIBILITIES
Ms. Forslund is a Project Manager coordinating activities on RCRA and CERCLA sites. She is responsible for work quality, budgets and schedules as well as serving as a technical reviewer on other AGC projects.

EXPERIENCE SUMMARY
Ms. Forslund has been working in the environmental industry since 1984, managing and conducting remedial, hydrogeologic, geotechnical investigations and feasibility studies for the remediation of contaminated sites. Her work has included the management of emergency removal and remediation activities from investigation through design; risk assessment; and construction oversight as well as extensive community relations and regulatory responsibilities.

PROJECT EXPERIENCE

Remedial Design/Remedial Action

Former Lead Smelter in Omaha, Nebraska. *Project Manager.* Prepared comments on EPA's proposed plan for a $150+ million residential soil removal. Comments discussed deficiencies in EPA's risk assessment and RI/FS and demonstrated that the lead in soil did not originate from the smelter.

Residential Lead Sites. *Project Manager.* Assisted in Consent Order negotiations, prepared Work Plans, assisted in contractor selection, oversaw removal activities, and managed implementation of the Work Plans at sites in Illinois, Georgia, and Indiana.

Former Brass Foundry in New York. *Project Manager.* Developed a Remedial Action Work Plan and related bid documents for over 20 residential properties in the vicinity of a former brass foundry. Developed remedial alternatives to address former lagoons and contaminated soil at the foundry property.

Former Secondary Lead Smelter in Michigan. *Project Manager.* Completed the Remedial Action Work Plan and bid documents for soil removal on approximately 100 residential properties in the vicinity of a former lead smelter. Assisted in the selection of the remedial contractor and managed the implementation of the Work Plan.

Former Rail Yard. *Project Manager.* Assisted in the oversight and coordination for the remediation of a former rail car repair facility that was contaminated with PCBs. Oversaw the construction of an 11,000 s.f. MSE retaining wall.

Battery Recycling Site. *Project Manager.* Directed a CERCLA emergency removal action at an inactive lead-acid battery processing plant and the surrounding community. Project involved excavation and restoration of about 133 residential properties; stabilization of an eroding 170,000 cubic yard battery casing landfill using vegetative covers, surface water diversions, and a sedimentation basin; excavation and restoration of intermittent streams; design and construction of a storm sewer system; building demolition; interior cleaning of residences for removal of lead contaminated housedust; determination of extent of contamination from site operations; and risk assessment for exposure to lead contaminated soils. Responsibilities include overseeing design and construction activities; construction management; field investigations; data analysis; report preparation; community relations; public meetings; coordination of subcontractors; budgeting and schedules; negotiations with regulatory agencies; client contact; and coordination with client's attorneys and litigation support. Project recognized for design excellence by Pennsylvania's Consulting Engineers Council (1992).

BARBARA L. FORSLUND

Battery Recycling Site. *Project Manager.* Directed a RCRA corrective action at an inactive lead-acid battery processing facility. The site contains over 370,000 cubic yards of battery casing and contaminated fill and overlies abandoned surface and deep coal mines. Work includes preparation of work plans; implementation of RFI and CMS; evaluation and selection of alternate corrective measures; and budgeting, schedules, and negotiations with federal and state regulatory agencies. **Former Lead Smelter in Portland, Oregon.** *Project Manager.* Prepared work plans, design documents and technical specifications for the dredging and backfilling of a lake and the construction of an on-site containment facility for the disposal of 65,000 cubic yards of contaminated soils and sediments and stabilized battery casing materials.

Interior Cleaning Program. *Project Manager.* Directed a CERCLA emergency removal action for lead contamination in a community adjacent to a former zinc smelter. Interior housedust removal was performed in twelve homes; in addition, extensive dust, soil, water and lead paint sampling was performed for purposes of exposure assessment and to evaluate the effectiveness of cleaning activities. Work included development of the Removal Action Plan, bid documents, contractor selection, oversight of removal activities, sampling, data evaluation and report preparation.

Former Copper Smelter. *Principal and Technical Reviewer.* Worked on a community soils RI/FS at an NPL smelter site. Work included statistical analysis of arsenic soil data; report preparation; negotiations with EPA and public meetings.

Active Secondary Lead Smelter/Battery Manufacturing Facility. *Project Manager/Technical Reviewer.* Sampled an adjacent residential area and conducted an on-site groundwater investigation for RCRA facility investigation.

Closure of Surface Impoundments. *Project Engineer.* Performed an in-place, RCRA closure of four surface impoundments containing over 1 million cubic yards of electroplating sludges and other wastes. Work included investigation of impoundments and surrounding area to determine volume of wastes, bottom configuration, piezometric levels, geotechnical characteristics of soils, and contaminant migration; review and selection of closure alternatives; bench scale evaluation of stabilized sludges for contractor evaluation; conceptual design and closure plan; and cost estimates for closure and negotiations with state and federal regulatory agencies.

Strategic Support Services

Due Diligence at a Former Steel Manufacturing Site. *Project Manager.* Assisted the client in evaluating environmental conditions on a 30-acre parcel within a former steel manufacturing site. Assessed geotechnical conditions and other development-related components to the project.

Residential Lead Investigations. *Project Manager.* Performed three investigations into the presence of lead within residences including housedust soil and tap water sampling and lead based paint screening. The projects were located in Texas, Pennsylvania and Idaho.

Human Health and Ecological Risk Assessment at a Manufacturing Site in Ohio. *Project Manager.* Considered the site contaminants, which included TCE in groundwater and lead-bearing wastes in an on-site disposal area. Risks to workers, future residents and ecological receptors in the adjacent creek and wetlands were considered.

Community Task Force. ***Consultant.*** Acted as a consultant to a community task force at an NPL smelter site. The task force included community members and representatives of the PRPs and EPA. Work included coordination and management of a lead exposure study and reduction program; and coordination of task force participation in an EPA risk assessment.

Litigation Support on Lead Contamination Cases. *Expert Witness.* Provided expert, fact witness support for several cases involving lead contamination on industrial sites and in residential areas. Services have included data management, expert testimony, sampling, data analysis and preparation of graphics for courtroom use. The cases have involved sites in Pennsylvania, Michigan, Georgia and Texas.

Landfill and Surface Impoundment Services

Geotechnical Evaluation of Liner System for a Hazardous Waste Landfill. *Staff Engineer.* Performed geotechnical evaluations of a multi-layer clay/geosynthetic liner system for two hazardous waste landfills. Performed extensive calculations at various

BARBARA L. FORSLUND

slope geometries, laboratory and field investigation of soil strength characteristics at different moisture contents and compaction efforts, and construction and controlled failure of a test fill and construction monitoring.

Other work on landfills includes cover design, closure plans, hydrogeologic investigations and construction quality control.

PUBLICATIONS

"Results of a Soil Lead Study Conducted in a Residential Area, " by J.R. Taylor and B.L. Forslund.

"Source Attribution of Elevated Residential Soil Lead Near a Battery Recycling Site," by M. J. Small, A.B. Nunn, III, B.L. Forslund and D.A. Daily. Environmental Science and Technology, April, 1995.

"Comparison of UPBK Model Predictions and Actual Blood Lead Values at a Former Battery Recycling Site," by T.A. Lewandoski (primary author) and B.L. Forslund. Environmental Geochemistry & Health. December 1994.

"Environmental Impacts on Blood Lead Levels in the Vicinity of a Former Battery Recycling Plant," by J.R. Taylor (primary author) and B.L. Forslund. Proceedings of the 25th Annual Conference on Trace Substances in Environmental Health. 1991.

"Artificial Recharge of Stormwater Runoff from a Shopping Center," by B.L. Forslund (primary author) and D.A. Daily. Proceedings of the Cluster of Conference, Ground Water Management and Wellhead Protection; NWWA. 1990.

"The Use of Electromagnetic Techniques in Site Assessments," by K.H. Earley (primary author) and B.L. Forslund. Presented at the Association of Engineering Geologists Annual Meeting. 1989.

"Physical Testing Program for a Stabilized Metal Hydroxide Sludge," by L.J. Shekter Smith, W.R. Bergstrom, and B.L. Forslund. STP 1033 Environmental Aspects of Stabilization and Solidification of Hazardous and Radioactive Wastes: American Society for Testing and Materials Special Technical Publication. 1989.

"Test Fill for Double Liner System," by L.J. Shekter Smith, M.A. Young, and B.L. Forslund. Proceedings of the ASCE Specialty Conference on Geotechnical Practice for Waste Disposal. June 1987.

CONTINUING EDUCATION

- 8-Hour OSHA Training Refresher, 2004
- National Safety Council Emergency Care Adult CPR Course, 2004
- Geosynthetics in Infrastructure Enhancement, December 1995
- Hazardous Waste Site Manager/Supervisor, 1988
- 40-Hour OSHA Health and Safety Training, April 1987
- Nuclear Density Gauge Training, March 1987

PROFESSIONAL AFFILIATIONS

- American Society of Civil Engineers
- Society for Environmental Geochemistry & Health, Executive Board

CHRISTOPHER T. REITMAN
Senior Project Consultant

FIELDS OF EXPERTISE
Strategic Environmental Liability Management, Civil Engineering, Environmental Engineering, Geotechnical Engineering, Landfill Design, Geologic and Hydrogeological Investigations, Construction Management and Environmental and Facility Audits

EDUCATION
Bachelor of Science - Mining Engineering; Pennsylvania State University, 1984
Master of Science - Civil Engineering; Drexel University, 1991

LICENSES
Professional Engineer: PA, OH

PRESENT DUTIES AND RESPONSIBILITIES
Mr. Reitman is responsible for all facets of project management and technical evaluation. His activities include developing project management strategies, client contact, task assignments, quality control, budget and schedule control, invoicing, performing and reviewing engineering calculations, and report writing.

EXPERIENCE SUMMARY
Mr. Reitman is a Project Consultant with experience in applied Environmental, Civil, and Geotechnical Engineering. Most of this experience is on active and inactive industrial sites and contaminated residential properties. Mr. Reitman's experience in the environmental field includes investigating, designing, constructing, and closing of hazardous waste landfills, surface impoundments, and on-site remediations of soil and groundwater. Mr. Reitman has also overseen removal activities and is familiar with regulations for chemical and waste management and has completed or managed audits on over 15 facilities.

PROJECT EXPERIENCE

Strategic Support Services

Brownfields Activities. *Project Manager.* Oversaw the brownfield investigation and redevelopment activities in New York, Pennsylvania, North Carolina, New Jersey and Ohio.

Feasibility for a Superfund Site. *Project Manager.* Developed a feasibility study for a large Superfund site contaminated with PCBs. The cost and implementability of capping, solidification/ stabilization, off-site disposal, thermal separation, solvent extraction, incineration and dechlorination treatment options were evaluated.

Remediation Oversight. *Project Manager.* Tracked budget for a $100,000,000 remediation project to determine compliance with an insurance policy. Identified budget variances and rationale for variances and recommended follow up actions.

Remedial Options to Remove TCE in Groundwater. *Project Manager.* Performed economic and technical analysis for remedial options to remove TCE in groundwater.

Soil and Groundwater Contaminated with Dissolved Phase VOCs and Free Phase DNAPLs. *Project Manager.* Evaluated soil and groundwater clean up alternatives and provided estimated remediation costs for sites with soil and groundwater contaminated with dissolved phase volatile organic compounds and free phase Dense Non-Aqueous Phase Liquids (DNAPL).

Act 2 Closure. *Project Manager.* Developed an Act 2 closure plans for sites with significant metals and organic contamination in soil and groundwater.

Feasibility Analysis. *Project Manager.* Coordinated an evaluation of the feasibility of using rail transportation to remove several hundred thousand cubic yards of solidified material from a large landfill being remediated under the RCRA Corrective Measures process.

Groundwater Remedial Design/Remedial Action. *Project Manager.* Completed a remedial design for a 150 gallon per minute groundwater extraction and treatment system. Oversaw construction of this site.

Risk-Based Analysis. *Project Manager.* Utilized a risk-based rationale to justify the impractibility of remediating soils to residential standards at a site with DNAPLs.

CHRISTOPHER T. REITMAN

RCRA Corrective Measures Study. *Project Manager.* Prepared a RCRA Corrective Measures Study of remediation alternatives for a very large industrial site. Used a risk based cost-benefit analysis which highlighted the technical, environmental, and cost advantages associated with a containment.

General Investigations

Extent of Contamination. *Project Manager.* Estimated the quantity and extent of contamination at several industrial sites from subsurface sampling and analysis. Performed fate and transport modeling to estimate cleanup times associated with various remedial alternatives.

Extent of Gas Migration. *Project Manager.* Developed and implemented an investigation to determine the extent of landfill gas migration at an inactive landfill.

Extent of Lead. *Project Manager.* Identified the extent of lead contamination at several industrial and residential properties.

Subsurface Rock Quality. *Project Manager.* Conducted a subsurface investigation which included coring of over 1,500 feet of rock over abandoned surface and subsurface coal mines. Based on the results, the stability of subsurface conditions were evaluated.

Sediment Investigation. *Project Manager.* Characterized creek sediments to determine the impact of an adjacent site. Negotiated with EPA to determine a practical and implementable remedial action.

Remedial Design/Remedial Action

Remedial Design/Remedial Action Site. *RD/RA Coordinator.* Oversaw the remedial design and remedial action efforts for a 100-acre site with lead and other heavy metal contamination. Implemented an approach which reduced the cost to complete by approximately 50%.

Reduced TCE Concentrations in Soil. *Lead Designer and Senior Manager.* Used a thermally enhanced soil vapor extraction system at a large Superfund site to reduce TCE concentrations in soil to less than 1 ppm.

Phytoremediation. *Project Manager.* Managed the implementation of a phytoremediation project designed to remove VOCs in groundwater.

Fast-Tracked Remedial Investigation/Feasibility Study/Remedial Design/Removal Action Project. *Project Manager.* Managed and expedited a fast-tracked RI/FS/RD/RA on soils with volatile organic compounds in soil. Developed an EPA approved remedial alternative for these soils and managed all aspects of implementation of this remedy. All activities at this site were completed in less than a year.

Plan and Specifications Development for a Superfund Site. *Project Engineer.* Developed plans and specifications for a Superfund site with a 60-foot-deep slurry wall with a groundwater pumping and air stripper treatment system.

Quality Assurance/Quality Control Program for a Superfund Landfill. *Project Engineer.* Developed and managed a QA/QC program for a Superfund landfill (remediation cost, $30+M). The QA/QC program included analytical and geotechnical testing of sand, clay and geosynthetic components of the landfill liner.

Pre-Design Investigation for a Superfund Site. *Project Manager.* Coordinated all aspects of a pre-design investigation for a Superfund site. This included developing work plans and implementing a field investigation which included borings, test pits, installation of monitoring wells and a continuous groundwater level monitoring system. Prepared a pre-design summary of site conditions.

Thermally Enhanced Soil Vapor Extraction. *Project Manager.* Oversaw the implementation of the process for thermally treating soils and sludges using a thermally enhanced soil vapor extraction system at two sites.

Developed Bench-Scale Testing Plans to Test Remediation Alternatives. *Project Engineer.* Developed and implemented numerous bench-scale testing plans to evaluate cost and technical feasibility of soil washing, solidification/stabilization, grouting and thermal treatment remediation alternatives.

Developed a Pilot-Scale Testing Program for a Feasibility Analysis. *Project Engineer.* Developed a

pilot scale testing program to evaluate the cost and feasibility of using a combustion engine, thermal oxidizer and enclosed flare on landfill gases from a Superfund site.

Hazardous Waste Landfill Design and Specifications. *Project Manager.* Prepared design drawings and specifications for the remediation of a 60-acre and 8-acre hazardous waste landfill. These designs included composite geomembranes and a soil liner system, and included all surface water management features. Managed quality assurance programs associated with these caps.

Superfund Site Plans and Specifications. *Project Engineer/Project Manager.* Developed plans and specifications for a Superfund site which included a groundwater extraction system, surface water management system, steel sheetpile retaining wall and 20-foot-deep slurry wall.

Audits/Compliance Services

Audits. *Project Manager.* Performed environmental and facility audits associated with property transactions at industrial facilities.

Audits. *Project Manager.* Led teams of auditors on over 15 industrial audits for compliance with chemical, hazardous waste, and OSHA regulations.

RCRA Part B Permit Application. *Project Engineer.* Prepared RCRA Part B permit application for an industrial facility, which includes recycling, transfer, storage and disposal operations.

Landfill and Surface Impoundment Services

Landfill Cap. *Senior Engineer and Project Manager.* for design at an 8-acre landfill cap with geonet and geomembrane liner. The innovative approach used for this design resulted in over $1 million dollars of cost savings.

Superfund Landfill Design Report. *Project Engineer.* Developed a design report for a Superfund landfill that evaluated slope stability, surface water management, settlement, geosynthetic liners, construction and post closure costs for several alternative closure scenarios.

Infrastructure

Geotechnical Investigations. *Engineer.* Developed and implemented numerous investigations to determine geologic conditions, hydrogeologic conditions, and subsurface contamination. Results were used for design of shallow footings, sheetpile walls, concrete retaining walls, tied back anchor walls, gabion walls, embankments, pressure injected footings, compacted fills and stone columns.

CONTINUING EDUCATION

- 8-Hour OSHA Refresher Training, 2004
- National Safety Council Emergency Care Adult CPR Course, 2004
- Natural Attenuation of Chlorinated Solvents in Groundwater, 1998
- 19th Annual Hazardous Waste Symposium, April 1993
- Aeration Technologies for Soil and Groundwater Remediation, St. Louis, MO, 1993
- Survival Skills for Running Community Meetings, Philadelphia, PA, 1993
- Computer Modeling to Solve Groundwater Problems, Princeton, NJ, 1992
- Hazardous Waste Site Manager/Supervisor, 1992
- Groundwater Hydrology and Hydraulics, Princeton, NJ, 1990
- Solidification/Stabilization of Contaminated Sites, Philadelphia, PA, 1990
- Characterization of Subsurface Contamination, Philadelphia, PA, 1990
- 40-Hour OSHA Health & Safety Training, July 1989
- Nuclear Density Gauge Training, February 1987

PUBLICATIONS

"TCE Site Groundwater Closure with Risk-Based Pathway Elimination," by K. Hansen, C. Reitman, W. Bowen and W. Richardson, Jr. Presented at the Second International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA. May 2000.

"Evaluation of a Bedrock DNAPL Pool Site," by C.T. Reitman, W.K. Richardson, Jr., and D. Hwang. Proceedings of the Non-Aqueous Phase Liquids (NAPLs) in Surface Environmental Assessment and Remediation Conference; Held in conjunction with the ASCE National Convention. Washington, D.C. 1996.

CHRISTOPHER T. REITMAN

PROFESSIONAL AFFILIATIONS
- National Ground Water Association

KEVIN O'ROURKE
Senior Staff Professional

FIELDS OF EXPERTISE
Construction Quality Assurance and Quality Control, Site Design, Community Relations, and Computer-Aided Design

EDUCATION
Bachelor of Science - Civil Engineering; Drexel University, June 2000

PRESENT DUTIES AND RESPONSIBILITIES
Mr. O'Rourke is currently responsible for construction oversight on environmental and geotechnical projects including resident engineering and quality assurance. Mr. O'Rourke also provides engineering design and analysis support on remedial projects.

EXPERIENCE SUMMARY

Mr. O'Rourke has been working in the environmental industry since 1997 and has performed various duties performing construction oversight for residential projects, performing the following tasks: hiring, training and supervising employees and subcontractors during all aspects aspects of field activities; quality control, quality assurance, scheduling and planning, and community relations.

PROJECT EXPERIENCE

Remedial Design/Remedial Action

Residential Soil Remediation. *Quality Assurance Official.* Performed project management duties on a residential Superfund sites. These duties included: bidding processes, remedial contractor selection, contract negotiations, quality assurance, regulatory agency relations, community meetings and relations, invoicing review, permitting, and soliciting access from property owners.

PCB-Impacted Superfund Site. *Quality Assurance Official.* Performed full-time on-site quality assurance on a Superfund soil removal project involving PCB impacted soils. Other tasks on the project included: stormwater management system construction which encompassed concrete and HDPE piping systems, basin and gabion wall construction. Specific duties included: quality assurance, multiple contractor oversight, community relations, regulatory agency relations and soil confirmatory sampling.

Residential Soil Remediation. *Quality Assurance Official.* Performed full-time on-site quality assurance on a residential soil removal project involving lead-impacted soils. Specific duties included: quality assurance, community relations, regulatory agency relations, construction oversight, soil confirmatory sampling, on-site laboratory analysis, and erosion and sedimentation control design. The project excavated and restored 24 residential properties.

Construction Monitoring

Field Inspections. *Field Technician.* Performed field density tests, monitored concrete placement, asphalt placement, and soil compaction for compliance with project specifications. Reported results to client and contractor.

Design/Build

Site Design Activities. *Design Technician.* Created plans, performed calculations for stormwater design, grading design, utility placement, and parking design. Performed surveying, site investigations and feasibility studies.

Computer Aided Drafting Design. *Design Technician.* Created and altered site development plans including CADD conversion techniques, parking design and site grading.

Sewer Design. *Design Technician.* Performed stormwater and sanitary sewer calculations including basin system design and utility placement for commercial and residential projects.

Site Design Support. *Design Technician.* Performed project research including surveying, site investigation, deed research and feasibility studies.

KEVIN O'ROURKE

CONTINUING EDUCATION

- 8 Hour OSHA Refresher, 2004
- National Safety Council Emergency Care Adult CPR Course, 2004
- OSHA Health and Safety Training, 2000
- Troxler Operator Training, 1999

PROFESSIONAL AFFILIATIONS

- American Society of Civil Engineers

HONORS, AWARDS AND GRANTS

- Academic Grant and Scholarship
- John E. Heisler Memorial Award

JENNIFER M. STANHOPE
Quality Assurance Manager

FIELDS OF EXPERTISE
Quality Assurance/Quality Control (QA/QC) Duties; Validation of Inorganic and Organic Data; Preparation and Implementation of Quality Assurance Project Plans (QAPPs); Directs the Purchasing of Laboratory Subcontracted Analytical Services; Field and Laboratory Audits; Data Management and Data Coordination Duties; Supervisor of Field Technicians.

EDUCATION
Bachelor of Science - Environmental Chemistry; State University of New York, College of Environmental Science and Forestry, 1992.

PRESENT DUTIES AND RESPONSIBILITIES
Ms. Stanhope is the QA Manager responsible for the coordination, management, review, and validation of all analytical data (soil, aqueous, air, sediment, and other matrices); the interpretation and technical consultation of the data usability; preparation, documentation and implementation of QAPPs; and field and laboratory auditing for QA/QC compliance. Her responsibilities also include coordination with field personnel regarding QA/QC requirements and procedures and with subcontracted laboratories for analytical services. She is also the administrative supervisor for all AGC field technicians.

EXPERIENCE SUMMARY
Ms. Stanhope has been involved in the environmental consulting industry and laboratory services field since 1993. This experience has included validation and interpretation of analytical data; generation of site specific sampling plans, QAPPs, and health and safety plans (HASPs); field data collection and environmental sampling; and field and laboratory auditing.

PROJECT EXPERIENCE

Data Validation of Organic and Inorganic Data. *Quality Assurance Manager* Reviewed and validated inorganic and organic data (aqueous, air, soil, sediment, other solids, and tissue) for numerous clients and over 10,000 samples using USEPA CLP National Functional Guidelines, USEPA Regional modifications to the National Functional Guidelines, and various state guidelines (Pennsylvania, New Jersey, Delaware, Ohio, North Carolina, Indiana, Florida, Tennessee, Michigan, Illinois, Oregon, Washington, California, Idaho, Georgia, Missouri, Iowa, New York, and Alaska).

Analytical Laboratory Service Coordination. *Project Manager.* Provided environmental analytical quotes to over 30 clients (federal, state, and industrial) for local, national, and international sampling projects; reviewed all samples entered into the laboratory information management system (LIMs); provided excellent client service; CLP inorganic contact person for the laboratory; coordinated and reviewed in-house sample tracking; and prepared the final sample delivery group (data deliverable) individually tailored to the client's specifications.

Field and Laboratory Coordination. *Quality Assurance Manager.* Managed the QA/QC aspect of field sampling for a multitude of projects for various clients (USEPA, various states, and industrial clients) from the planning stage of sampling through the final reporting of the data. Assisted in planning sampling events, writing field sampling plans, quality assurance project plans, health and safety plans, contacted and arranged the laboratory for analytical analysis, arranged the bottle orders for field sampling, instructed the field samplers in the QA/QC procedures and sample requirements for sampling events, primary contact for the analytical laboratories and dealt with issues arising from cooler receipt, analysis, and data reporting.

Development of QAPPs and HASPs. *Quality Assurance Manager.* Prepared QAPPs and HASPs for several clients as per the guidelines and regulations provided by the USEPA including USEPA Regions, and several states (Indiana, Pennsylvania, Delaware, Iowa, Michigan, New York, Ohio, New Jersey, Florida, Illinois, Missouri, Georgia, and Louisiana) and provided comments and suggestions for improving numerous QAPPs and HASPs written by others.

CLP Sampling Coordinator. *Assistant Scientist.* Participated in a CLP sampling project in Oregon. Was responsible for filling out all required CLP paperwork (bottle labels, bottle tags, organic and inorganic chain-of-custodies, and custody seals). Coordinated the shipment of the sample coolers to the CLP approved laboratories. Was the primary contact for the USEPA

JENNIFER M. STANHOPE

Region X quality assurance manager, the CLP laboratory project manager, and the CLP coordinator.

Sediment Sampling. *Environmental Chemist.* Participated in the collection of sediment samples from the Puget Sound for the Washington State Department of Ecology.

Data Reviewer. *Environmental Chemist.* Performed QA/QC reviews on ocean discharge data submitted to the USEPA by various industrial clients for the Ocean Discharge Evaluation System (ODES).

Wetland Delineation. *Assistant Scientist.* Participated in the wetland delineation at a landfill in Everett, Washington. Identified terrestrial and aquatic species of plants.

Columbia River Investigation. *Environmental Chemist.* Participated in multi-year environmental studies of the Columbia River, examining water and sediment quality, fish and benthic invertebrate communities, fish health, and contaminant concentrations in fish tissue.

Environmental Educator. *Naturalist.* Lead the public in groups of 1 to 200 in plant identification, stream/pond assessments, wildlife identification and care in Baltimore County, MD. Stream assessments have involved the assessment of macroinvertebrate and fish communities through the collection and identification of species, as well as the characterization of stream and riparian habitats.

CONTINUING EDUCATION

- National Safety Council Emergency Care Infant/Child CPR Course, 2005
- Access 2002 Level 3, 2004
- National Safety Council Emergency Care Adult CPR Course, 2004
- AutoDesk MAP, 2003
- 8-Hour OSHA Health and Safety Refresher, 2004
- National Safety Council First Aid, 2002
- AutoCAD 2002 Level One, 2002
- DOT Hazardous Materials Handler, 2002
- Hazardous Waste Site Manager/Supervisor, 2002
- Microsoft Access: Intermediate Training, 2000
- 40-Hour OSHA Health and Safety Training, 1995

PROFESSIONAL AFFILIATION

- American Chemical Society
- Society of Environmental Toxicology and Chemistry
- Society of Women Environmental Professionals
- Treasurer for the Friends of the Oxford Public Library

COMPUTER PROGRAMS USED

Microsoft Access, Microsoft Excel, Corel WordPerfect, VLEACH, Rockware, Microsoft Word, Microsoft Project, AutoCAD

ATTACHMENT B

STL-BUFFALO QUALITY ASSURANCE MANUAL (QAM)

STL Buffalo

10 Hazelwood Drive
Amherst, New York 14228
(716) 691-2600

Laboratory Quality Manual

Revision: 2

June 15, 2002

Approved: _____ Date: 6/24/02
STL Buffalo General Manager
Robert K. Wyeth

Approved: _____ Date: 6/25/02
STL Buffalo Laboratory Director
Susan L. Mazur

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STL Buffalo Technical Director
Kenneth E. Kasperek

Approved: _____ Date: 6/25/02
STL Buffalo Quality Manager
Verl D. Preston

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3.0 Description

3.1 Introduction

STL-Buffalo is a part of Severn Trent Laboratories, Inc. (STL), a major group of environmental laboratories. Both companies are owned by Severn Trent, plc, an international provider of water and wastewater services headquartered in Birmingham, UK.

3.2 Terms and Definitions

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

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

Batch: environmental samples, which are prepared and/or analyzed together with the same process, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same matrix, meeting the above mentioned criteria. An analytical batch is composed of prepared environmental samples, extracts, digestates or concentrates that are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

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

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

Compromised Sample: a sample received in a condition that jeopardizes the integrity of the results.

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

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

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

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

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

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

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

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

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

Good Automated Laboratory Practices (GALP): EPA 2185, 1995. Referenced as part of the basis of the STL Buffalo Quality system.

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

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

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

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

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

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

Table 1: Matrix Descriptions

Matrix	Description
Aqueous	Aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine source. Includes surface water, groundwater and effluents.
Drinking Water	Aqueous sample that has been designated a potable water source.
Saline	Aqueous sample from an ocean or estuary, or other salt-water source such as the Great Salt Lake.
Air	Air samples are ambient air particulate filters, PUF's, cartridges or canisters.
Leachate / Synthetic Leachate	Product of a solid matrix that is exposed to/reacted with an aqueous matrix.
Liquid	Non solid material with < 0.5% non-dissolved solids
Solid	Soil, sediment, sludge or non-liquid matrices
Waste	A product or by-product of an industrial process that results in a matrix not previously defined.

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

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

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

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

Method Detection Limit (MDL): the minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific method. An MDL value, by definition, has an uncertainty of ± 100%. The MDL thus represents the range where qualitative detection occurs using a specific method. Quanitative results are not produced in this range. Also referred to as a Limit of Detection (LOD).

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

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

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

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

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

Proprietary: belonging to a private person or company.

Storage Blank: a blank matrix stored with field samples of a similar matrix. Sometimes referred to as a holding blank.

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

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

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

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

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

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

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

Raw Data: any original information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof and that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments.

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

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

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

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

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

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

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

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

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

Test Method: defined technical procedure for performing a test.

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

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

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

4.0 Organization and Personnel

4.1 QA Policy and Objectives

4.1.1 STL Quality Assurance Policy

It is STL's policy to:

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

4.1.2 Management Commitment to Quality Assurance

STL management is committed to providing the highest quality data and the best overall service in the environmental testing industry. To ensure that the data produced and reported by STL meet the requirements of its clients, complies with the ISO 17025 Quality Policy and agrees with the letter and spirit of municipal, state and federal regulations. STL maintains a Quality System that is clear, effective, well communicated, and supported at all levels within the company.

4.1.3 STL Mission Statement

We enable our customers to create safe and environmentally favorable policies and practices, by leading the market in scientific and consultancy services. We provide this support within a customer service framework that sets the standard to which others aspire. This is achieved by people whose professionalism and development is valued as the key to success and through continued investments in science and technology.

4.1.4 Purpose and Scope of LQM

The purpose of this Laboratory Quality Manual (LQM) is to describe the implementation of the Severn Trent Laboratories (STL) Quality system at the STL Buffalo laboratory. The LQM is written within the guidelines of the STL Quality Management Plan (QMP), which applies to all STL laboratories. This LQM outlines specific policies, organization,

responsibilities and activities required to assure high quality laboratory services. The LQM also fulfills the requirements of our clients and government agencies for the laboratory quality manual. Particular emphasis is given to the requirements of the National Environmental laboratory Accreditation Conference (NELAC) standards.

The requirements set forth in this document are applicable to all employees at the STL Buffalo laboratory. The policies and practices described here are presented as minimum guidelines only. Based on good scientific judgment, more rigorous requirements may be applied by laboratory employees. Specific requirements delineated in project plans may supersede general quality requirements described in this manual.

4.2 QA Management

4.2.1 Organization and Responsibilities

The STL Buffalo laboratory operational and support staff works under the direction of the Laboratory Director. A functional organizational chart of STL Buffalo is depicted in Appendix A. The responsibilities of the individuals associated with Quality Assurance Management are described below. A list of STL Buffalo personnel (management and supervisory level) including education and experience is found in Appendix B. A designee will be appointed by the General Manager/Laboratory Director, for an interim period not to exceed three months, if a prolonged absence in a supervisory position occurs.

The General Manager is directly responsible for the overall operations of one or more operating facilities within STL. The GM's responsibilities include:

- Allocation of personnel and resources, long term planning, setting goals, and achieving the financial, business, and quality objectives of STL.
- Ensures Timely compliance with corporate management directives, policies, and management systems reviews.

The Laboratory Director reports directly to the General Manager and oversees the daily operations of the facility. The duties and responsibilities of the Laboratory Director are:

- Supervision of staff, setting goals and objectives for both the business and the employees
- Achieving the financial, business, and quality objectives of the facility
- Ensures timely compliance with audits and corrective actions
- Responsible for maintaining a working environment that encourages open, constructive problem solving and continuous improvement.
- Annually assess the effectiveness of the QMP and LQM within the operation.

The Technical Director reports directly to the Lab Director and is responsible for technical operations and business management. The duties and responsibilities of the Technical Director are:

- Facility design, construction and management
- Maintaining environmental conditions
- Technical and financial evaluation of capital equipment
- Capital budgeting and asset valuation
- Investigates technical issues related to projects as directed by QA or Senior Management Team.

The Program Management Supervisor reports directly to the Lab Director and has overall responsibility for management of the client requirements for sample analysis. The duties and responsibilities of the Program Management Supervisor are to:

- Supervise all requirements of the analytical tasks to ensure meeting the client objectives on schedule.
- Act as liaison between the laboratory and the client to discuss and resolve any problems that may occur.
- Work with laboratory supervisors in planning and conducting progress meetings.
- Take part in corrective actions.
- Assesses and assures customer satisfaction.

The Health & Safety Officer reports directly to the Technical Director and has overall responsibility for the facility's safety training and compliance with all required safety regulations. The Health & Safety Officer is responsible for:

- Development of the safety training manual.
- Oversight on the facility safety committee. Acting as liaison between the committee and management.
- Conduct and document training on waste handling and disposal.
- Documenting and tracking all incidents and accidents.

The QA Manager reports directly to the Lab Director and, for all QA matters, to the Corporate QA Director to maintain independence of QA oversight, and is responsible for reviewing and advising on all program aspects of QA/QC. The duties and responsibilities of the QA Manager are to:

- Coordinate the maintenance, update and pursuit of certifications with various state and federal agencies.
- Implement quality control procedures and techniques to assure that the laboratory achieves established standards of quality.
- Evaluate data quality and maintain records on other pertinent information.
- Monitor laboratory activities to determine conformance with the authorized quality assurance policy and to implement appropriate steps to ensure adherence to quality assurance programs.
- Coordinate internal facility audits

- Hosts external audits conducted by outside agencies.
- Review performance evaluation results.
- Administer intralaboratory and interlaboratory QA efforts.
- Approves quality control reference data changes in the LIMS
- Review all new or revised controlled documents.
- Responsible for maintaining, approving and implementing the Laboratory Quality Manual
- Responsible for implementing and communicating the QMP
- Providing Quality Systems and Ethics training to all new personnel
- Prepare monthly QA reports to management
- Authorized representative/contact for state/agency certification procedures.
- Has final authority to accept or reject data, and to stop work in progress in the event that procedures or practices compromise the validity and integrity of the analytical data.

The Laboratory Manager reports directly to the Lab Director and oversees the daily operations of the analytical laboratory. The duties and responsibilities of the Laboratory Manager are:

- Supervision of laboratory staff, setting goals and objectives for the laboratory.
- Ensures compliance with project/client requirements (report/data due date, holding time, client/agency specific QAPP).
- Oversees the implementation of the quality systems.
- Ensures timely compliance with audits and corrective actions
- Supervises maintenance of instruments and scheduling of repairs
- Responsible for maintaining a working environment that encourages open, constructive problem solving and continuous improvement.

The Information Services Manager reports directly to the Lab Director and is responsible for maintaining the in-house and commercially purchased software systems. The areas of responsibility are to:

- Supervise the design, development, testing/validation, implementation and output of software modifications.
- Control/Monitor access of personnel and clients to data information.

The Laboratory Supervisors report directly to the Laboratory Manager and are responsible for meeting all the technical and analytical terms and conditions for sample analysis. Their areas of responsibilities are:

- Organize the personnel, equipment and materials in a manner required to fulfill the analytical requirements of sample analysis.
- Oversee daily activities of laboratory analyses within the group and provide technical support when necessary.
- Review analytical data for validity and clarity.

- Maintain contact with the Project Manager in areas of technical concern, and advise the Project Manager of analytical progress, needs of potential problems that occur.
- Advise the Laboratory Director of progress, needs and potential problems that occur.
- Inform Laboratory Manager if the daily review indicates a decline in data quality, deviations or deficiencies in QC and implement corrective actions.
- Perform, evaluate and implement annual MDL & QC limit studies.
- Responsible for generation of SOPs for their department.
- Train employees on the proper methods and procedures performed in their department.

The Sample Analysts report directly to the Laboratory Supervisor and are responsible for the analysis of samples. The analysts will:

- Schedule, prepare and analyze samples according to the method specific requirements indicated by the chain-of custody or ASRF.
- Advise the section supervisor of progress, needs and potential problems that occur.
- Verify that the laboratory QC and analytical procedures are being followed as specified.
- Review sample QC data, at least daily, including inspection of raw chromatograms and calibration curves.
- Inform Laboratory Supervisors and QA Manager if the daily review indicates a decline in data quality and implement actions.
- Responsible for meeting quality requirements defined in this LQM and other supporting QA procedures.

The Sample Custodian reports directly to the Technical Director and is responsible for the receipt and login of client samples:

- Confirming the samples received against the Chain of Custody (COC).
- Transporting the samples to the proper storage unit within the facility.
- Tracking the disposal of client samples after the required holding time.

The Document Control Officer reports directly to the QA Manager and is responsible for the filing, archiving and unarchiving of all related job data and reports:

- Responsible for the security of all on-site issued reports/raw data.
- Tracking all requests for the unarchiving of raw data and job folders.
- Arranging for the off-site archival of data/job reports as space is needed.

4.3 Quality System

4.3.1 Objectives of STL Quality System

The Quality System is a set of management principles, objectives, policies, responsibilities and implementation plans of the organizational and project-specific

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

To achieve this goal, it is necessary to provide STL clients with not only scientifically sound, well documented, and regulatory compliant data, but also to ensure that STL provides the highest quality service available in the industry. A well-structured and well-communicated Quality System is essential in meeting this goal. STL's Quality System is designed to minimize systematic error, encourage constructive communication, documented problem solving, and provide a framework for continuous improvement within the organization.

The Corporate Quality Management Plan (QMP) is the basis and outline for STL's Quality System and contains general guidelines under which all STL facilities conduct their operations. This Laboratory Quality Manual (LQM) describes the implementation at the STL Buffalo laboratory.

4.4 Project Document Control Procedures

The goal of the project document control program is to assure that all documents for a group of samples will be accounted for. Before releasing any analytical result, the laboratory assembles and crosschecks the information of custody records, lab bench sheets, analyst and instrument logs and other relevant data to ensure that data pertaining to each particular sample is consistent throughout the record.

4.4.1 Sample File Organization, Preparation and Review Procedures

Project file folders are created prior to sample analysis and stored in the assigned project manager's office. A specific job number will be assigned to samples that are received for analysis for each project. The assignment of job number is sequential, automatically assigned by the laboratory LIMS system and based on the date and time of receipt. All documents, sample tags (if applicable), custody forms, and all other laboratory data pertaining to a particular case will be placed in the job folder. Job folders pertaining to issued data will be filed in numerical order and stored in a secure area with access limited to authorized personnel. Authorized personnel are limited to QA personnel, Lab Director, Technical Director and and Document Control Officer or designee. All other personnel may formally request archived documents using the Document Retrieval Form.

4.5 Request, Tender, and Contract Review

4.5.1 Contract Review

For many environmental sampling and analysis programs, testing design is site or program specific and does not necessarily "fit" into a standard laboratory service or product. It is STL Buffalo's intent to provide both standard and customized

environmental laboratory services to our clients. To ensure project success, the technical staff performs a thorough review of technical and QC requirements contained in contracts prior to the receipt of samples. Contracts are reviewed for adequately defined requirements and STL Buffalo's capability to meet those requirements.

All contracts entered into by STL Buffalo are reviewed and approved by the Laboratory Director or General Manager/Chief Operating Officer as required based upon value. Agreements for continuing work are the responsibility of the laboratory Project Managers or Project Manager Supervisor. Depending on the size and scope of the proposed project, other STL management staff can also be involved. Any contract requirement or amendment to a contract communicated to STL Buffalo verbally is documented and confirmed with the client in writing. Any discrepancy between the client's requirements and STL Buffalo's capability to meet those requirements is resolved in writing before acceptance of the contract. Contract amendments, initiated by the client and/or STL Buffalo, are documented in writing for the benefit of both the client and STL Buffalo.

All contracts, Quality Assurance Project Plans (QAPPs), Sampling and Analysis Plans (SAPs) contract amendments, and documented communications are part of the permanent project record, as detailed in section 4.7.4 of the LQM.

4.5.2 Project Specific Quality Planning

Communication of contract specific technical and QC criteria is an essential activity in ensuring the success of site specific testing programs. To achieve this goal, STL Buffalo assigns a Project Manager (PM) to each client. The PM is the first point of contact for the client. It is the PM's responsibility to ensure that project specific technical and QC requirements are effectively communicated to the laboratory personnel before and during the project. The LIMS system (ALMS®) requires the PM to enter project, task and test information before any samples can be logged in.

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

4.5.3 Subcontracting

STL Buffalo shall advise the client in writing of its intention to subcontract any portion of the testing to another laboratory. This includes both STL laboratories and non-STL laboratories. The laboratory shall not proceed unless a timely response which jeopardizes sample integrity cannot be obtained. All QC guidelines specific to the client's analytical

program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Proof of required certifications from the subcontract facility is maintained in STL Buffalo's subcontract laboratory file. Where applicable, specific QC guidelines and QAPJPs, are transmitted to the subcontract laboratory. Samples are subcontracted under formal Chain of Custody (COC). A separate QAPP for the subcontract work may be prepared by the subcontract laboratory and submitted under a separate cover. The Quality Department will keep a file on each subcontract laboratory providing analytical results. The file may contain a subcontract lab's QAMP, certifications and or method specific SOPs.

Subcontract laboratories may receive an on-site audit by a representative of STL's QA staff if it is deemed appropriate by the Corporate or facility QA Manager. An audit may be scheduled after a review of SOPs, PE scores or at the request of the client. The audit involves a measure of compliance with the required test method, QC requirements, as well as any special client requirements. Audit reports from applicable state and federal agencies may be substituted for the on-site audit.

Project reports from external subcontract laboratories are not altered and are included in original form in the final project report provided by STL. The final report from STL Buffalo clearly identifies what testing was performed by other laboratories.

Subcontracting may also occur between STL facilities. Subcontracting within STL is subject to the same requirements as detailed above. STL's Corporate Quality Manager oversees each facilities compliance with the corporate quality requirements.

4.5.4 Purchasing Services and Supplies

Evaluation and selection of suppliers and vendors is done, in part, on the basis of the quality of their products, their ability to meet the demand for their products on a continuous and short term basis, the overall quality of their services, their past history, and competitive pricing. STL Corporate Policy #PG-001, "Procurement and Contracts," details the process used. This is achieved through evaluation of objective evidence of quality furnished by the supplier, which can include certificates of analysis, recommendations, and proof of historical compliance with similar programs for other clients. To ensure that quality critical consumables and equipment conform to specified requirements, a member of the supervisory or management staff approves all purchases from specific vendors.

Chemical reagents, solvents, glassware, and general supplies are ordered as needed to maintain sufficient quantities on hand. Purchasing guidelines for equipment and reagents meet or exceed the requirements of the specific method and testing procedures for which they are being purchased. National vendors and suppliers are available from the on-site purchasing agent.

Where possible, a consignment system is utilized where supplies are provided by the vendor, warehoused at the STL Buffalo facility and billed as used.

The Laboratory Director, or designee has the responsibility for approving purchase orders. The laboratory supervisors are responsible for ensuring that the requested quality of materials ordered matches those received, for verifying that material storage is properly maintained and for removing materials from use when shelf life is expired.

4.5.5 Instrument Maintenance Activities and Schedules

A complete listing of instrumentation may be found in Appendix C. Instrument preventative maintenance and careful calibration help to assure accurate measurements from laboratory instruments. Where applicable, all laboratory instrumentation is on a service contract with the instrument manufacturer or licensed service organization. The service contracts include regular preventative maintenance service calls on a scheduled basis.

Preventative maintenance procedures such as lubrication, source cleaning, detector cleaning and the frequency of such maintenance are performed according to the procedures delineated in the manufacturer's instrument manual or when deemed necessary by the analyst. All maintenance is documented in the instrument's injection log or maintenance logbooks.

Instrument logbooks are in the laboratory at all times. They contain records of usage, calibration, maintenance and repairs. Adequate supplies of spare parts such as GC columns, syringes, septa, injection port liners, and electronic parts are maintained in the laboratory so that they are available when needed or on expedited delivery.

4.6 QA Document Control Procedure

4.6.1 Document Type

The following documents, at a minimum, are controlled at each STL Facility:

- Quality Management Plan
- Laboratory Quality Manual
- Standard Operating Procedures (SOP)
- Laboratory Logbooks

4.6.2 Document Control Procedure

Security and control of documents is necessary to ensure that confidential information is not distributed and that all current copies of a given document are from the latest applicable revision. Unambiguous identification of a controlled document is maintained by identification of the following items in the document header: Document Name,

Document Number, Revision Number, Effective Date, and Number of Pages. Management and/or the QA Department authorize controlled documents. Controlled documents are marked as such and the QA Department keeps records of their distribution.

Controlled documents are available at all locations where the operational activity described in the document is performed.

4.6.3 Document Revision

Changes to documents occur when a procedural change warrants a revision of the document. When an approved revision of a controlled document is ready for distribution, obsolete copies of the document are replaced with the current version of the document. The previous revision of the controlled document is archived by the QA Department. Obsolete documents are retired by the QA Department. In accordance with NELAC, all quality documents and records are stored for at least five years.

4.7 Records

4.7.1 Record Types

Record types are described in Table 2.

Table 2: STL Record Types

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

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

4.7.2 Record Retention

Table 3 outlines STL's standard record retention time. For raw data and project records, record retention is calculated from the date the project report is issued. For other records, such as Controlled Documents, QC, or Administrative Records, the retention time is calculated from the date the document is formally retired. Records related to the programs listed in Table 4 have lengthier retention requirements and are not subject to STL's standard record retention time. Record retention responsibilities will be included in the event of an ownership change. Clients will be notified of any change in policy.

Table 3: STL Record Retention

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

* Exceptions listed in Table 4.

4.7.3 Programs with Longer Retention Requirements

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

Programs with record retention requirements greater than five years are detailed in Table 4.

Table 4: Special Record Retention Requirements

Program	Retention Requirement
Commonwealth of MA – All environmental data 310 CMR 42.14	10 years
NY Potable Water NYCRR Part 55-2	10 years
Pennsylvania – Drinking Water	10 years
AFCEE	10 years

4.7.4 Archives and Record Transfer

Archives are indexed such that records are accessible on either a project or temporal basis. Archives are protected against fire, theft, loss, deterioration, and vermin. Electronic records are protected from deterioration caused by magnetic fields and/or electronic deterioration. The electronic records (EDDs) are archived off-site in a secured facility. Access to archives is controlled and documented.

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

All observations and results recorded by STL Buffalo are entered into the laboratory LIMS or into permanent laboratory logbooks. Data recorded are referenced with the sample laboratory number, date and analyst's signature at the top of the page. Test records will reference the method of analysis, analyst, date of analysis, instrument, client ID, laboratory ID and results.

All logbooks, data records and other document entries are made in ink. Any corrections made to a logbook entry, data record or other documented entry will be made by crossing a single line through the error and entering the correct information. The person will subsequently date and initial the correction.

All chemicals and reagents received by STL Buffalo must be dated upon receipt, and again dated and initialed upon opening. All samples, standards, extracts, reagents and equipment will be labeled with appropriate inks (labels) to ensure that the identification is permanent when subject to adverse environmental conditions. Documentation of purity, if received, will be kept on file in the laboratory department that received the chemical or reagent.

The preparation of all standards and reagents must be in accordance with the written SOP. Preparation must be documented in a bound preparation log. Documentation must include the date, analyst initials, identification of stock source and the final concentration of the solution.

Once in the possession of the Analyst, all logbooks are their responsibility to maintain. No logbooks are permitted outside the facility. Analysts are responsible for proper documentation in the logbooks. Once a Logbook has been completed it is returned to the QA Manager for proper archiving. Logbooks are archived on-site for a year and then off-site for an additional four years.

4.8 Service to the Client

4.8.1 Sample Acceptance Policy

STL Buffalo's *SOP #ASR–Receipt–05* describes the sample receipt and log-in process in detail. Samples are considered "compromised" if the following conditions are observed upon sample receipt:

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

If notified by the customer of the following conditions, samples would also be considered compromised:

- Samples have high levels of polychlorinated dibenzo-p-dioxins/dibenzofurans (PCDD/PCDFs)
- Samples have high level gross alpha or beta radiation
- Samples are from a site known to contain chemical warfare agents (CWAs) and the samples have not been screened for them.

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

4.8.2 Client Confidentiality and Proprietary Rights

Data and sample materials provided by the client or at the client's request, and the results obtained by STL, shall be held in confidence (unless such information is generally available to the public or is in the public domain or client has failed to pay STL for all services rendered or is otherwise in breach of the terms and conditions set forth in the STL and client contract) subject to any disclosure required by law or legal process. STL's reports, and the data and information provided therein, are for the exclusive use and benefit of client, and are not released to a third party without written consent from the client. The audit reports supplied by federal, state and local regulatory agencies are public information and can be released without written consent of these agencies. However, specific client audits are confidential and must be approved by the client before releasing them to a third party.

4.8.3 Samples Tracking/Custody Procedures

- Sample are received at the laboratory by the sample custodian or designee who removes the samples from the shipping containers together with all accompanying documentation such as chain-of-custody (COC) forms, analysis request forms, etc.
- The condition of the custody seal if present, is examined and recorded.
- The temperature of the samples, upon receipt, will be recorded on the COC.
- The cooler or sample container is scanned for radiation.
- The PM group will be notified of sample arrival in order to perform general inspection and triage procedures.
- The pH of the sample (when required) will be taken upon receipt. Any inappropriate pH reading for reportedly preserved samples will be recorded. Necessary pH adjustments will be made, after confirming with the client and only with their consent, as required and documented in the AIMS® sample inventory log.
- The samples are inspected for general condition and the COC received with any samples is examined for discrepancies between package contents and the enclosed documents.
- Discrepancies, omissions, or inappropriate samples discovered would be noted and an ARRF form generated and sent to the Project Manager. The Project Manager will contact the client to resolve the problem.
- If the client cannot be reached, the samples will be assigned to cold storage (4 degrees +- 2 degrees C) until the problem is resolved. Time critical analysis will be started to ensure holding time compliance.
- Samples delivered directly by the sample collector are received and inspected by the Sample Custodian or designee in the presence of the sample collector. Discrepancies, omissions, or inappropriate samples should be noted and discussed with the sample collector to resolve the problem.
- Samples received through COC by the Sample Custodian or designee will be assigned an STL Buffalo laboratory ASRF (Analytical Services Request Form)number.
- The Sample Custodian or designee will complete the STL COC with the STL Buffalo ASRF number and corresponding individual sample number. The STL Buffalo sample number will be written on the client sample bottle or adhered via printed label to the client sample bottle, making sure the label does not obscure the original sample information. Each bottle will be identified with a unique sample tracking number.
- The sample identification and required test procedures will be entered by sample control into the laboratory sample database (AIMS®). Each sample will be given a unique laboratory identification number. All documents, sample tags, shipping labels, will be stored in the job folder.
- The project manager or designee will validate the accuracy of the sample log-in procedure by initialing the job folder after reviewing the documents against the project set up.
- Upon log-in completion of jobs with expedited turnaround (less than 3 days), notification will be sent to all affected laboratory departments and the Project Manager.

- When a sample is to be analyzed/prepared for analyses the analyst/ technician must verify that the sample ID number and parameter match with the analysis/prep they are performing. This is accomplished by confirming the sample ID with the ID on the analytical batch. In addition, the client ID printed on the label must match the client ID found on the original sample label. If any discrepancies are found the department supervisor is to be notified immediately. All discrepancies need to be addressed and resolved by the supervisor/program manager and with client input if needed.
- Once in the possession of the Laboratory, all samples and extracts are refrigerated and/or stored in areas that are accessible only to Laboratory personnel. Internal COCs are used to track the sample or extract in the lab facility. All coolers and refrigerators are monitored for temperature compliance. Samples and standards must be stored in separate refrigerators or freezers. Storage areas for volatile organic test procedures should be monitored weekly by analysis of a holding blank.
- Access to the facility is limited to STL Buffalo employees and monitored by an outside agency. Employees are granted access to the facility based on their job requirements and normal working hours. A swipe card system is used to open the electronically locked entrances. All visitor access to the building is controlled and monitored. All visitors are required to sign in at the reception desk and escorted through the facility. A log of all visitors is available from the QA Department. The facility is equipped with fire and burglar alarms throughout the facility.
- All Samples are stored at the Laboratory for a minimum of 14 days after the final report has been issued. Specific client or project requirements may lengthen the time a sample is held before disposal. Client and laboratory labels may be removed prior to sample container disposal/recycling.
- If samples are returned to the client rather than disposed of by the laboratory, the original COC or a new COC is used to document custody transfer back to the client.

4.9 Complaints/Inquiries

Client complaints/inquiries are documented, communicated to management, and addressed promptly and thoroughly. The employee receiving the call/letter/fax, normally the Project Manager or a client service representative documents the client complaints/inquiries. The documentation can take the form of a corrective action report (as described in Section 4.11) or in a format specifically designed for that purpose (DQR form). Service to client complaints are forwarded to the Project Manager for response. The Laboratory Director, Project Manager, and QA Manager are informed of all client complaints, and assist in resolving the complaint.

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

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

4.10 Control of Non-conformances

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

All non-conformances that affect a sample and/or sample data become part of the affected project's permanent record. A Job Exception form is filed with the Project Manager and QA Department relaying any non-conformance. When appropriate, reanalysis is performed where QC data falls outside of specifications, or where data appears anomalous. If the reanalysis comes back within established tolerances, the results are approved. If the reanalysis is still outside tolerances, further reanalysis or consultation with the Supervisor, Manager, Project Manager, Laboratory Director, or QA Manager for direction may be required. The client may also be consulted for direction in non-compliant situations. All records of reanalysis are kept with the project files.

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

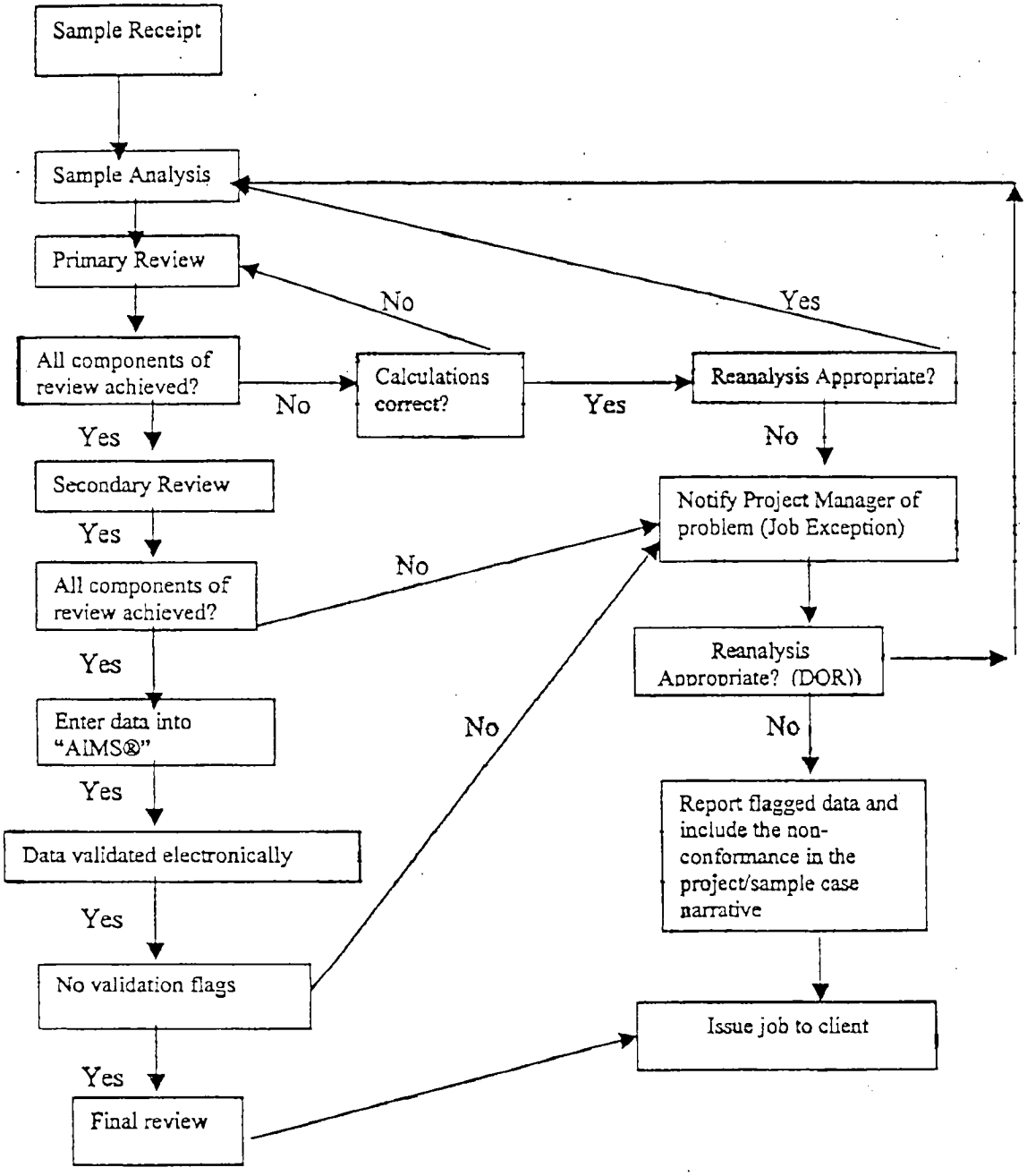
Where a non-conformance has no affect on the analytical data a comment in the job summary will be included with the raw data. The comment will be included in the case narrative.

Whenever a systematic error is discovered that affects the accuracy, validity or defensibility of calibrations or test results reported to STL's clients, our clients will be notified in writing immediately when the nature and extent of the problem are understood. The STL QA Director must also be notified.

4.11 Corrective Action

An important part of any quality assurance program is a well-defined, effective policy for correcting quality problems and to prevent their recurrence. This is depicted in the Figure 1. STL Buffalo maintains a closed-loop corrective action system, which operates under the direction of the QA Manager. While the entire quality assurance program is designed to avoid problems, it also serves to identify and correct those that may exist. Usually these quality problems fall into two categories: immediate corrective action or long-term corrective action.

Figure 1: STL Buffalo Decision Processes, Procedures and Responsibility for Initiation of Corrective Action



Specific quality control procedures are designed to help analysts detect the need for corrective action. Often an analyst's experience will be most valuable in identifying suspicious data or malfunctioning equipment; and an immediate corrective action may then be taken. The actions should be noted in laboratory notebooks but no other formal documentation is required unless further corrective action is necessary.

The need for long-term action may be identified by standard QC procedures, control charts, performance or system audits. Any quality problem, which can not be solved by immediate corrective action, falls into this long-term category. STL Buffalo uses a system to insure that the condition is reported to a person who is part of the closed-loop action and follow up plan (Figure 1)

The essential steps in the closed-loop corrective action system are:

- The problem will be identified
- Responsibility for investigating the problem will be assigned.
- The cause of the problem will be investigated and determined.
- A corrective action to eliminate the problem will be determined
- Responsibility for implementing the corrective action will be assigned
- The effectiveness of the corrective action will be established and corrective action implemented
- The fact that the corrective action has eliminated the problem will be verified
- The complete process of establishing and implementing corrective action will be documented.

This process of corrective action will be used to make all corrections deemed necessary by the STL Buffalo management or QA Department. The corrective action will be assigned for timely completion and tracked by the QA Department.

4.12 Preventive Action

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

5.0 Data Generation and Validation

5.1 Data Reduction

Analysis results will be reduced to the concentration units specified in the analytical procedures using the equations provided in the analytical references utilizing AIMS® or technician/analyst. The calculation algorithms used in the AIMS® system for electronically transferred data must be verified to be accurate. The appropriate senior laboratory staff or designee will independently check the manual analytical calculations.

Manual integrations are sometimes necessary to produce good chromatography, but must only be performed when necessary. Further discussion of manual integrations and the required documentation is given in STL Corporate SOP *S-Q-004, "Manual Integration,"* and STL Buffalo SOP, *AGP-Man Int-20, "Manual Integration."*

5.2 Data Validation

Data validation is the process by which analytical data are evaluated and accepted or rejected based on a set of criteria. STL Buffalo uses an electronic data validator built into the AIMS® computer system to monitor compliance with approximately 70 QA issues. In addition, STL Buffalo personnel use the following criteria in the validation of laboratory data:

- Use of published or approved analytical procedures
- Use of properly operating and calibrated instrumentation
- Precision and accuracy achieved comparable to that achieved in similar analytical programs
- Precision, accuracy and blank contamination meeting the analysis specified criteria as and/or the criteria found in the applicable method.
- Completeness of data set.
- Consistency with historical data (where available)
- Cation/Anion calculations (when applicable)

All data will be validated by laboratory supervisors or trained data entry personnel prior to being released for reporting purposes to the STL Buffalo client services group. The persons validating the data will have sufficient knowledge of the technical work to identify questionable values.

5.3 Data Reporting

All analytical data are submitted to the client services group after the secondary review. The client services group generates the case narrative, cover letter and proper analytical forms. The completed report is forwarded to the PM for final review. The reviewed report is copied, scanned into a .PDF file and issued by the client services department. The .PDF file of the report, original raw data and all job summaries are archived.

5.4 Data Review

5.4.1 Primary Review

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

One of the most important aspects of primary review is to make sure that the test instructions are clear, and that all project specific requirements have been understood and followed. A completed job summary form is used to document the procedure. If directions to the analyst are not clear, the analyst must go to the Supervisor, QA Manager, or Project Manager, who must clarify the instructions.

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

- Sample preparation information is complete, accurate, and documented.
- Analysis information is correct and complete.
- Calculations have been performed correctly.
- Quantitation has been performed accurately.
- Qualitative identifications are accurate.
- Client specific requirements have been followed.
- Method and process SOPs have been followed.
- Method and/or QAPP specific QC criteria have been met.
- QC samples are within established limits.
- Dilution factors are correctly recorded and applied.
- Non-conformances and/or anomalous data have been properly documented and appropriately communicated.
- Internal COC procedures have been followed
- Results are consistent with historical information (where available).

Any anomalous results and/or non-conformances noted during the Primary Review are communicated to the Supervisor and the QA Manager for resolution. Resolution can require sample reanalysis, or it may require that data be reported with a qualification.

The data reduction and primary review are documented on a "job summary" checklist and signed and dated by the analyst completing the process.

5.4.2 Secondary Review

The secondary review is a technical review of a data set and is completed by the department supervisor or designee. The secondary review is conducted after the raw data have been entered into the AIMS® system. Report forms are generated and reviewed against the raw data for compliance. Any exceptions noted by the analyst must be reviewed.. The electronic data validator is run for each test and a comment regarding any

non-correctable non-compliance is entered into the AIMS® job comments module. The secondary reviewer closes the sample/test to ensure the results are not changed after the review. Any change in status from closed to open is tracked electronically by the IS department. The following items are reviewed:

- Adherence to procedure and method SOPs
- Correct interpretation of chromatograms, mass spectra, etc.
- Correctness of numerical input when computer programs are used (checked randomly)
- Correct identification and quantitation of constituents with appropriate qualifiers
- Numerical correctness of calculations (checked randomly)
- Acceptability of QC data
- Documentation that instruments were operating according to method specifications (calibrations, performance checks, etc.)
- Documentation of dilution factors, standard concentrations, etc.
- Sample holding time assessment.

If problems are found during the secondary review, the reviewer must work with the appropriate personnel to resolve them and notify the project manager if delays or client input is required.

The specific items covered in the second stage of data verification may vary according to the analytical method, but this review of data must be documented by signing the same checklist utilized for the primary review.

5.4.3 Final Review

Personnel from the Project Management Department perform the final review. The final review serves to verify the completeness of the data report and to ensure that project requirements are met. The final review includes the generation of a project narrative and/or cover letter, which outlines anomalous data and all non-compliances.

If problems are found during the final review, the reviewer must work with the appropriate personnel to resolve them. If changes are made to the data, such as alternate qualitative identifications, identifications of additional target analytes, re-quantitation, or re-integration, the completeness reviewer must contact the laboratory analyst and/or primary reviewer of the data so that the primary analyst and/or reviewer is aware of the appropriate reporting procedures. This is accomplished by submitting a Data Quality Review form to the appropriate personnel.

The final reviewed report is paginated copied, signed by the appropriate personnel, (Program Manager, Laboratory Director, Quality Manager) and mailed to the client. The Quality Department randomly reviews a selection of all issued reports for case narrative, system and method compliance.

5.5 Revised Deliverables

If, after issuance of a report, STL Buffalo observes any mistake that affects the results reported or the QC interpretation of those results, the client will be notified. Any material amendments or changes to a report after issue must clearly be identified as "Revision" and appropriate case narrative comments applied.

6.0 QA Program

6.1 Levels of QC Efforts

The EPA has established six primary analytical Data Quality Objectives (DQOs) for environmental studies. These DQOs are precision, accuracy, representativeness, completeness, comparability and detectability.

The components of analytical variability can be estimated when QA and QC samples of the right types and quantities are incorporated into measurement procedures at the analytical laboratory.

STL Buffalo will make every attempt to have all data generated be valid data and compliant. The precision of laboratory analysis will be evaluated using sample duplicates and matrix spike duplicates. Analytical accuracy will be monitoring using recovery of analytes from system monitoring compounds, matrix spikes, blank spikes, EPA reference check standards and Performance Evaluation (PE) samples. These quality control measures and frequencies are summarized in Section 8.1. Detectability is discussed in section 7.5 of this LQM. These QA efforts will assist in determining the reliability of the analytical data.

6.2 Accuracy and Precision

Accuracy is a measure of the degree of agreement between the analyzed value and the true or accepted reference value where it is known. Systematic errors affect accuracy. Accuracy is usually expressed as a percent recovery.

Precision is a measure of the mutual agreement among individual measurements of the sample parameter under similar conditions. The precision of a measurement system is affected by random errors. Precision is usually expressed as a relative percent difference or as relative standard deviation. Accuracy and precision in the laboratory are assessed by the regular analysis of known standards and duplicate samples.

6.3 Completeness

Completeness is a measure of the amount of valid data obtained from the analytical measurement system, expressed as a percentage of the number of valid measurements that should have been or were planned to be collected. STL Buffalo will make every attempt to generate valid data from

all samples received. However, realistically, some samples may be lost in laboratory accidents or some results may be deemed questionable based on internal QC procedures. Due to the variable nature of the completeness value, the objective will be to have data completeness for all samples received for analysis as high as possible to meet completeness objectives as described by the client.

6.4 Representativeness

Representativeness is a measure of how closely the measured results reflect the actual concentration of distribution of the chemical compounds in the sample. Sample handling protocols (e.g., storage, preservation and transportation) have been developed to preserve the representativeness of the collected samples. Subsamples are obtained within the lab using proper homogenization techniques. The techniques are outlined in SOP *AGP–Homo–30*. Compliance with established SOPs ensures representative subsample aliquots within the laboratory. Proper documentation will establish that protocols have been followed and that sample identification and integrity have been assured.

6.5 Comparability

Comparability is a QA objective wherein all sample data are comparable with other representative measurements made by STL Buffalo for past results. STL Buffalo will achieve comparability by operating within the instrument linear range and by strict adherence to analytical protocols. The use of published analytical methods, standards reporting units and thorough documentation will ensure meeting this objective. Comparison of historical data may also be used for this purpose.

7.0 Quality Control

7.1 Internal Quality Control

Quality control is the routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process. Quality Control checks are application of the STL Buffalo Quality Control program for laboratory analysis in order to ensure the generation of valid analytical results on project samples. These checks are performed by project participants throughout the program, under the guidance of the Quality Manager.

7.2 Quality Control Samples

STL Buffalo makes use of a number of different types of QC samples to document the validity of the generated data. The following types of QC samples are used routinely:

A. Blank Samples – Blanks are used to assess contamination introduced in transit, storage or in the laboratory.

- Laboratory Method Blanks – The method blank is a AC sample that consists of all reagents specific to the method and is carried through every aspect of the procedure, including preparation, cleanup and analysis. The method blank is used to identify any contamination of the analytical system that may lead to an elevated analyte concentration. In general, the method blank is a volume of de-ionized lab water for water samples or a purified solid matrix for soil/sediment samples that is processed as a sample.
- Laboratory Holding Blank – For organic analyses, these blanks are placed in cold storage with the volatile organic samples during the holding time to assess contamination which may be introduced in storage.
- Instrument Calibration Blanks – For all analyses, these blanks are used in instrument calibration and contain all the reagents used in preparing instrument calibration standards except the parameters of interest.

B. Initial and Continuing Calibration Verification - Verification samples are analyzed during each analysis run to assure calibration accuracy for each analyte. An initial calibration verification is analyzed, minimally, at the beginning of an analytical run. The continuing calibration verification is analyzed on a frequency defined by the analytical method. The concentration level of the verifications is generally the mid-point of the analytical curve.

C. System Monitoring compound – For most organic analyses, samples are fortified with system monitoring (surrogate) compounds prior to sample preparation in order to assess the behavior of actual components in individual samples during the entire preparative and analysis scheme. Surrogate standard compounds are chemically similar to compounds of interest (target compounds).

D. Matrix Spikes – For most analyses at frequencies particular to each method, spiking solutions are added to environmental samples in order to evaluate any matrix effects of the sample on the analytical method. Matrix spikes and analytical spikes are performed using actual elements of interest or target compounds. Due to the potential variability of the matrix of each environmental sample, the results of the matrix spike may have immediate bearing only on the specific sample spiked and not on samples collected at other locations that are included in the batch.

E. Duplicate Samples – For all analyses, a second aliquot of a sample or sample spike is carried through all sample preparation and analysis procedures to verify the precision of the analytical method. At least one sample in each analysis batch of 20 or fewer samples is analyzed in duplicate.

F. Laboratory Control Samples / Matrix Spike Blank – For inorganic / organic analyses, at least one method blank in each preparation batch of 20 or fewer samples is fortified with each analyte of interest or an appropriate subset of analytes and carried through the analysis procedure. The LCS recovery data are used to monitor the analytical method performance in terms of accuracy.

Reagents used in the laboratory are normally of analytical reagent grade or higher purity. Each lot of acid or solvent received is checked for acceptability, i.e., no contaminants, prior to lab use. All reagents are labeled with the date received, date opened and expiration date. The quality of the laboratory de-ionized water is monitored daily. The de-ionized water used at STL Buffalo is run through activated carbon, a cation resin, an anion resin, and a mixed bed resin. The Volatile free water is carbon filtered only and is used only for volatile analyses. The de-ionized water and volatile free water are verified daily by the analysis of the prep blank water for inorganics and by the analysis of the method blank for organics. At the time of field blank / trip blank preparation, a sample is taken of the de-ionized water and volatile free water and is either analyzed immediately or held by the laboratory to be analyzed if contamination of the field blank / trip blank is determined.

7.3 Internal Quality Assurance

To monitor quality, STL Buffalo's QA Department conducts internal quality assurance audits including:

A. QC Blind Samples (Proficiency Testing samples) – STL Buffalo routinely participates in the ERA Performance Evaluation Program studies for both potable and non-potable water. This program allows STL Buffalo to monitor overall performance using a comprehensive set of single-blind check samples that are received as real-time samples. STL Buffalo participates in this program on a quarterly basis (2 of each study per year). In addition, STL Buffalo participates in the New York State Department of Health performance evaluation programs for potable water, non-potable water, solid waste, and CLP deliverables. The program evaluates report format as well as analytical accuracy. Participating laboratories receive detailed reports indicating an overall laboratory quality performance grade. The final reports along with any corrective actions are available upon request.

B. Internal Data Audit – On an ongoing basis, a selection of the issued analytical reports are chosen randomly and reviewed for analytical and client specific requirements. This data review includes each laboratory section.

C. Internal Laboratory Systems Audit – The QA department or designee will perform a systems evaluation covering each operational and support area at least once per year.
   - sample storage
   - chain of custody
   - instrument maintenance
   - documentation
   - precision
   - accuracy

D. Spot Assessments – Spot assessments or special audits are conducted on an as-needed basis, generally as a follow-up to specific issues such as client complaints, data audits, corrective

actions or DQR trends. The STL Buffalo "Shadow Program," which focuses on the acceptability of practices surrounding a specific procedure is also a part of spot assessments.

In addition the QA manager will meet frequently with the project managers and laboratory supervisors to review QA data summaries and other pertinent information.

7.4 System and Performance Audits

7.4.1 System Audits

A system audit is an evaluation of the various components of a laboratory's measurements system to assess proper selection and use. This audit will consist of an on-site review of a laboratory's quality assurance system and physical facilities for sampling, calibration and measurements. System audits are performed on a regular basis by the various regulatory agencies and annually by the QA department or designee. The audit may included several or all of the components listed below:

- Personnel, facilities and equipment
- Chain - of - custody procedures
- Instrument calibration and maintenance
- Standards preparation and verification
- Analytical procedures
- Quality control procedures
- Data and sampling handling procedures
- Documentation control procedures

7.4.2 Performance Audits

Performance audits provide a systematic check of laboratory operations and measurement systems by comparing independently obtained data with routinely obtained data. To fulfill the PT requirements for NELAC accreditation, STL Buffalo routinely participates in laboratory performance evaluations received from the NYSDOH ELAP as part of the Potable and Non-Potable Water/Solid & Hazardous Waste/Air & Emissions Chemistry Proficiency Programs. STL Buffalo also analyzes proficiency samples to maintain participation in the NYSDEC CLP program. A corporate double blind proficiency study is analyzed annually and compiled by the corporate Quality Manager. The ERA WP, WS studies and NYSDOH PE studies schedules for STL Buffalo are detailed in Table 5.

Table 5: Laboratory Performance Evaluation Schedule (1 year)

(NELAC)	ERA WP	twice per year
(NELAC)	ERA WS	twice per year
(NELAC)	NYS DOH Potable	twice per year
(NELAC)	NYS DOH Non-Potable	twice per year
(NELAC)	NYS DOH Solid/HW	twice per year
	NYS DOH CLP	twice per year
	APG Non-Potable	once per year
	Corporate Double Blind	once per year

7.5 Detection Limits

7.5.1 Instrument Detection Limit

The Instrument Detection Limit (IDL) is the level at which the instrument can reliably detect an analyte response. Method-specific sample preparation steps are not considered in the IDL calculation. IDLs will be determined on a frequency stated by the method of analysis.

Inorganic IDL Determination
Most frequently, the inorganic IDLs are determined by multiplying the standard deviation obtained for the analysis of a standard solution (each analyte in reagent water) at a concentration of 3x-5x the estimated IDL, with seven consecutive measurements per day by the appropriate Student-t value, for a 99% confidence.

Organic IDL Determination
Most frequently, organic IDLs are determined by multiplying the standard deviation obtained for three to seven replicate analyses of a standard solution (each analyte in reagent water) by the appropriate Student-t value, for a 99% confidence.

The IDL is calculated by multiplying the standard deviation by the Students t-Test (n-1) value.

No. of Replicates	t-statistic
3	6.96
4	4.54
5	3.75
6	3.36
7	3.14
10	2.82

7.5.2 Method Detection Limit (40 CFR 146)

A number of procedures that can be used for estimating the MDL are referenced below:

Critical Level Approach (Currie, 1968)
This approach estimated the LOD based on a critical level. The critical level is determined from the standard deviation and population characteristics of successive blank determinations.

Decision Limit Approach (Hubaux and Vos, 1970)
This procedure uses a decision limit and the confidence limits from at least squares fitted regression line to estimate the LOD.

Decision Limit Approaching using Non-Central t-Distribution (Clayton et al., 1987)
This approach estimates the LOD based on a decision limit. This approach is similar to the Hubaux-Vos method but using a non-centrality parameter of distribution in calculating the LOD.

Method Detection Limit Study (USEPA, Glaser et al., 1981)
This approach establishes a procedure for estimation of the MDL at a single concentration using a minimum of seven successive determinations of samples or spikes containing the analyte to be determined.

Weighted Least Squares Approach (Gibbons et al., 1997)
This approach for estimating the LOD utilizes spiked samples at a series of concentrations and applies a weighted least squares regression analysis to the resulting data.

Most frequently, the Method Detection Limit (MDL) is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. A MDL utilizes all preparatory steps in the final detection.

To obtain an MDL:

1. Seven method blank samples are spiked at a concentration that is two to five times the IDL, or estimated MDL
2. The MDL is calculated by multiplying the standard deviation obtained for seven replicate analyses of a standard solution (each analyte in reagent water) by the appropriate Student-t value, for a 99% confidence.
3. Calculated MDL's must meet specific requirements stated in 40 CFR part 136 or be repeated.

MDL's are determined per method per sample preparation procedure. MDL's are determined or verified annually, for each method and when analytical conditions or methods change. Verification involves analysis of a single standard prepared at the MDL concentration and carried through the entire procedure, with appropriate documentation

of response. The QA Department maintains copies of MDL studies for all tests performed at STL Buffalo.

7.5.3 Reporting Limits

Method reporting limits and client required limits are set by the method or specified by the client. These limits are verified by the MDL and IDL studies. In general, the reporting limit is determined by the concentration of the lowest standard in the calibration curve analyzed for a particular parameter.

The dilution of samples will affect the reporting limit for analytes. Dilutions are required when the matrix of the sample affects the chromatogram/color or if the result is above the analytical range of the analysis.

7.6 Training

STL is committed to furthering the professional and technical development of its employees at all levels. Minimum training requirements for STL- employees are outlined in Table 6.

Table 6: STL – Employee Minimum Training Requirements

Required Training	Time Frame	Employee Type
Environmental Health & Safety	Week 1 from hire	All
Basic Analytical Skills	Week 1 from hire	Technical
Ethics Initiation	Week 1 from hire	All
Quality System & Ethics Training	Quarter 1	All
Initial Demonstration of Capability (IDOC)	Prior to unsupervised method performance	Technical

Technical training is accomplished within each department by the supervisor to ensure method/procedure comprehension. All new personnel are required to demonstrate competency in performing a particular method by successfully completing an Initial Demonstration of Capability (IDOC) before conducting analysis independently on client samples.

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

Prior to an analyst assuming responsibility for an analysis, an Initial Demonstration of Capability (IDOC) must be performed and approved by the Laboratory Manager and QA Manager.

7.7 Ethics Policy

Establishing and maintaining a high ethical standard is an important element of a Quality System. In order to ensure that all personnel understand the importance the company places on maintaining high ethical standards at all times; STL has established an Ethics Agreement. Each employee signs the Ethics Agreement, signifying agreed compliance with its stated purpose. STL Buffalo has established an Ethics Initiation, which is given to new employees within 1 week of employment. A central tenet is that management must consistently convey the message to analysts that financial pressures can never be allowed to compromise the quality of work.

7.8 Management Reviews

7.8.1 QA Reports to Management

A monthly QA report is prepared by QA Manager and forwarded to the Laboratory Director, the General Manager, and the Corporate QA Manager. The reports include metrics that are used to assess the effectiveness of the Quality System. The format of the monthly report is shown in Figure 2.

A Corporate QA Monthly Report containing a compilation of the Facility QA reports statistics, information on progress of the Corporate QA program, and a narrative outlining significant occurrences and/or concerns is prepared by the Corporate QA Manager and forwarded to the STL Chief Operating Officer.

7.8.2 Management Systems Review

The Laboratory Director will conduct annual evaluations of the status of the quality systems in the laboratory to review their suitability and effectiveness, and to introduce necessary changes or improvements. The management systems review is forwarded to the facility QA Manager, the facility General Manager and the Corporate QA Director.

The Corporate QA Manager issues a report on the management systems review within 21 calendar days of the audit. The audit is addressed to the facility Laboratory Director, QA Manager, General Manager, and Chief Operating Officer.

Written responses are required within 21 calendar days of report issue. The response follows the format of the report, and corrective actions and time frames for their implementation are included for each deficiency. The response is directed to all individuals copied on the audit report. Where a corrective action requires longer than 21 days to complete, the target date for the corrective action implementation is stated and evidence of the corrective action is submitted to

the Corporate QA Manager in the agreed upon time frame. An internal audit will verify that the corrective actions stated in the response are implemented by the facility.

Figure 3: Monthly QA Report Format

1. Audits
   Internal systems audits performed, significant and/or repeat deficiencies noted.
   External systems audits performed.
   Data audits (in percent).

2. Revised Reports/Client Complaints
   Revised reports in percent.
   Total number of client complaints, reason, and resolution.

3. Certifications/parameters changes.

4. Proficiency Testing
   Score for each PT as a percent.
   Note repeat failures and/or significant problems.

5. Standard Operating Procedures
   - Total number requiring revision.
   - Percent complete.
   - Percent still requiring revision.

6. Miscellaneous QA and Operational Issues
   Narrative outlining improvements, regulatory compliance issues, general concerns, and assistance required from Corporate QA. Include corrective actions and/or audit follow through that are beyond completion date.

8.0 Standard Operating Procedures

STL Buffalo maintains a SOP Index (see Appendix D) for all standard, non-standard, and laboratory developed methods (see Appendix E). The SOPs are available to all employees through the facility Intra-Net. Original signed copies are stored in a secure file cabinet and maintained by the QA department. SOPs are also maintained for describing processes that are not related to a specific method. Method SOPs are maintained to describe a specific test method. Process SOPs are maintained to describe function and processes not related to a specific test method.

8.1 Method SOPs contain the following information:

Title Page with Document Name, Revision Number, Effective Date, Page Numbers and Total # of Pages, Authorized Signatures, Dates and Proprietary Information Statement (Figure 3), and Certification of Test Method.

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

8.2 Process SOPs: contain the following information:

Title Page with Document Name, Document Number, Revision Number, Effective Date, Page Numbers and Total # of Pages, Authorized Signatures, Dates and Proprietary Information Statement (Figure 3).

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

The QA Department is responsible for maintenance of SOPs, archival of SOP historical revisions, and maintenance of a SOP index. SOPs, at a minimum, undergo review every 2 years. If the procedure, scope or content of the SOP changes, a revision to the SOP is issued. This revision may be implemented during the review or at any time that the content of the SOP is

altered. Where a SOP is based on a published method, the laboratory maintains a copy of the reference method. A proprietary statement is included with each SOP (figure 3).

Figure 4: Proprietary Information Statement

SOP Appendix

In some cases, a standard laboratory procedure is modified slightly for a specific client or project, at the client or regulatory agency's request. In these cases, an Appendix to the SOP may be attached that indicates the modifications to the SOP, which are specific to that project. The SOP may also include specific state/agency requirements within the body of the document.

8.3 Laboratory Developed Methods

Laboratory developed methods are validated and documented according to the procedure described in section 8.5.

8.4 Non-standard Methods

Non-standard methods are validated and documented according to the procedure described in section 8.5.

8.5 Method Validation

Before analyzing samples by a particular method, the method is validated. Validation of the method is required for standard methods, non-standard methods, and laboratory developed methods. While method validation can take various courses, the following activities are generally

required as part of method validation. Method validation records are designated QC records and are archived accordingly.

8.5.1 Determination of Method Selectivity

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

8.5.2 Determination of Method Sensitivity

Method sensitivity is determined using detection limit studies. Method detection limit studies are routinely performed using the criteria in 40 CFR Part 136 Appendix B. Instrument detection limits are performed, where required, by specific data quality objectives or regulation.

8.5.3 Determination of Interferences

A blank matrix is analyzed to indicate that the method is free from analytical interferences. Sample matrix spikes will be analyzed to determine matrix interferences.

8.5.4 Determination of Range

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

8.5.5 Initial Demonstration of Capability

IDOCs are performed prior to method performance. A single blind standard is analyzed with an acceptable result prior to sample analysis. Certification is received by the regulating agency, if required, prior to analyzing samples.

8.5.6 Documentation of Method

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

8.5.7 Continued Demonstration of Method Performance

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

8.6 Measurement Traceability

8.6.1 General

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

At a minimum, these include procedures for checking specifications for balances, thermometers, temperature, De-ionized (DI) water systems, automatic pipettes and other volumetric measuring devices. Wherever possible, subsidiary or peripheral equipment are checked against standard equipment or standards that are traceable to national or international standards.

An external certified service engineer services laboratory balances on an annual basis. This service is documented on each balance with a signed and dated certification sticker. Balance calibration is verified on each day of use. All mercury thermometers are calibrated annually against a traceable reference thermometer. A correction factor is listed on the calibrated thermometer. Certified (non-mercury) thermometers are used within the facility as replacements for mercury thermometers and are traceable to their certificate of analysis. The expiration date of the thermometer is documented in the thermometer logbook and on the thermometer. Temperature readings of ovens, refrigerators, and incubators are checked and documented on each day of use. Deviations are noted along with any corrective actions.

Laboratory DI water systems have documented preventative maintenance schedules and the conductivity of the water is recorded on each day of use.

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

8.6.2 Reference Standards

The receipt of all reference standards is documented. References standards are labeled with a unique Standard Identification Number, date received, date opened and the expiration date. All documentation received with the reference standard is retained as a QC record and references the Standard Identification Number.

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

All efforts are made to purchase standards that are $\geq$ 97.0% purity. If this is not possible, the weight of the standard is corrected for the purity when performing calculations.

The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a different lot is acceptable for use as a second source. The appropriate Quality Control (QC) criteria for specific standards are defined in laboratory SOPs.

8.6.3 Reagents

Reagents are, in general, required to be analytical reagent grade unless otherwise specific in method SOPs. Reagents must be, at a minimum, the purity required in the test method. The date of reagent receipt, expiration date and the date the reagent was opened are documented. Sample bottles are certified by the manufacturer to be free of contaminants. The certificates are stored at STL Buffalo.

9.0 Project Reports

9.1 General

The criteria described in Section 9.1.1 apply to all Project Reports that are generated under NELAC, State, Federal Agency and/or client requirements. The criteria described in 9.1.2 apply to all Project Reports.

9.1.1 Project Report Content

- Title
- Laboratory name, address, telephone number, contact person
- Unique Laboratory Project Number
- Total Number of Pages (report must be paginated)
- Name and address of Client
- Client Project Name (if applicable)
- Laboratory Sample Identification
- Client Sample Identification
- Matrix and/or Description of Sample
- Dates: Sample Receipt, Collection, Preparation and/or Analysis Date

- Definition of Data Qualifiers
- Reporting Units
- Test Method
- Chain of Custody

9.1.2 Additional Content Requirements (method specific):

- Solid Samples: Indicate Dry or Wet Weight
- Whole Effluent Toxicity: Statistical package used
- If holding time $\leq$ 48 hours, Sample Collection, Preparation and/or Analysis Time
- Indication by flagging where results are reported below the quantitation limit.

9.1.3 Project Narrative

A Project Narrative and/or Cover Letter is included with each project report and at a minimum includes an explanation of any and all of the following occurrences:

- Non-conformances
- "Compromised" sample receipt, Method Deviations
- QC criteria failures

9.2 Project Release

The Laboratory Director or his/her designee authorizes the release of the project report with their signature.

Where amendments to project reports are required after issue, these shall be in the form of a separate document and/or electronic data deliverable. The revised report is clearly identified as revised with the date of revision and the initials of the person making the revision. Specific pages of a project report may be revised using the above procedure with an accompanying cover letter indicating the page numbers of the project revised. The original version of the project report must be kept intact and the revisions and cover letter included in the project files.

9.3 Subcontractor Test Results

Subcontracted data are clearly identified as such, and the name, address, and telephone number for the laboratory performing the test is included in the project report. Test results from more than one STL facility are clearly identified with the name of the STL facility that performed the testing, address, and telephone number for that facility.

9.4 Electronic Data Deliverables

Electronic Data Deliverables (EDD) are routinely offered as part of STL Buffalo's services. STL Buffalo offers a variety of EDD formats including Environmental Restoration Information Management System (ERPIMS), New Agency Standard (NAS), Format A, Excel, DBase, GISKEY, and Text Files.

EDD specifications are submitted to the IT department by the PM for review and undergo the contract review process. Once the facility has committed to providing diskettes in a specific format, the coding of the format is performed. This coding is documented and validated. The validation of the code and associated documents are retained as a QC record.

EDDs are subject to a secondary review to ensure their accuracy and completeness.

9.5 Project Report Format

STL Buffalo offers a wide range of project formats, including EDDs, short report formats, and complete data deliverable packages modeled on the Contract Laboratory Protocol (CLP) guidelines. More information on the range of project reports available can be obtained by contacting STL Buffalo. Regardless of the level of reporting, all projects undergo the same levels of review.

10.0 Analytical Methodology

STL Buffalo analyzes samples by the methods listed below. Modified versions of the methods may be used if all Quality System requirements are achieved (MDL, DOC acceptable PE study). All method specific requirements for calibration, QC limits and data analyses are followed.

References

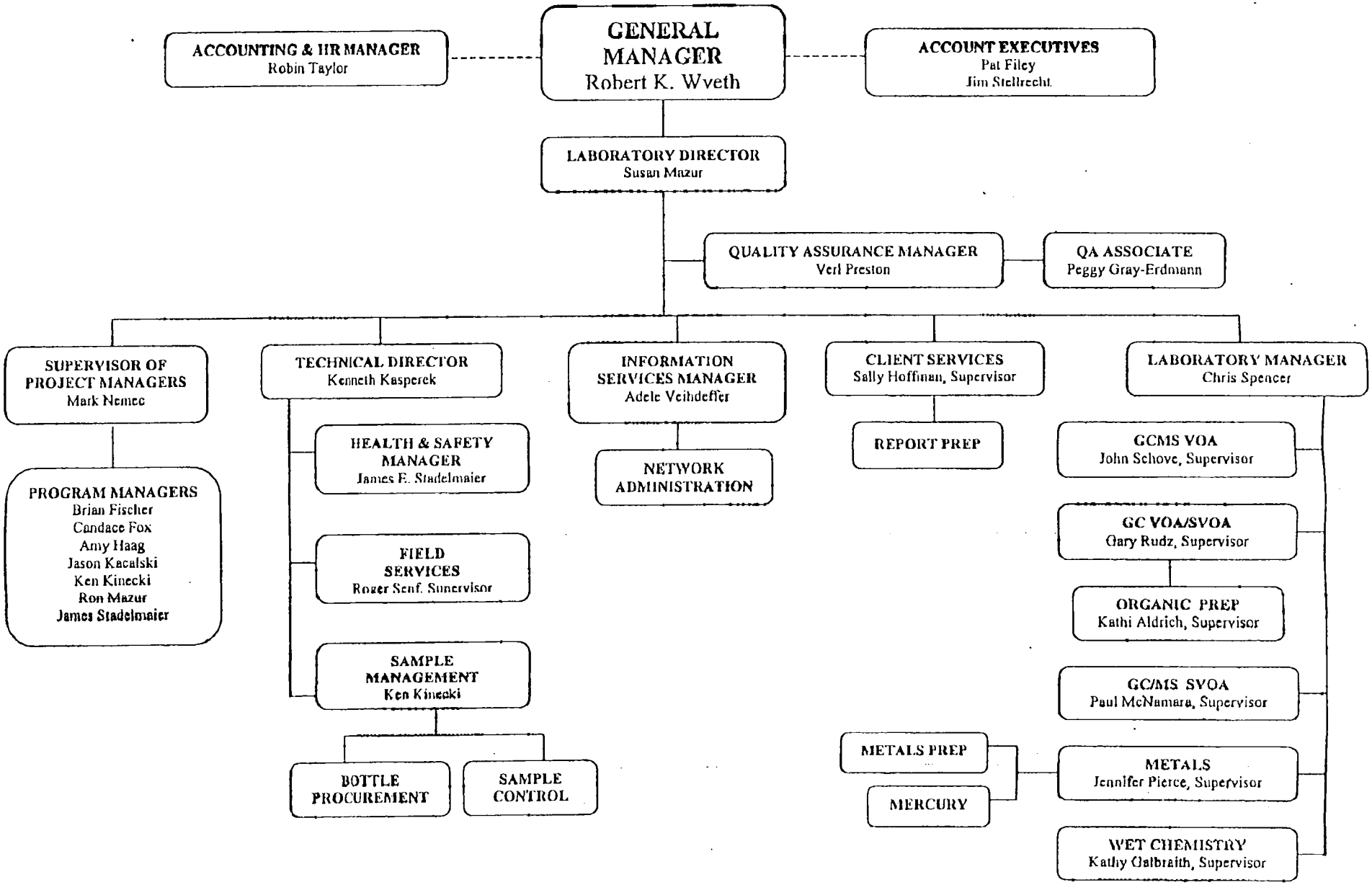
1. Methods for Chemical Analysis of Water and Wastewater", EPA-600/4-79-020, March 1983.
2. "Test Methods for Evaluating Soil Waste", USEPA-SW846, 3RD Edition, September 1986 with all current revisions.
3. "Methods for the Determination of Organic Compounds in Drinking Water," EPS-600/4-88-039, December 1988.
4. The Analysis of Trihalomethanes in Finished Water by the Purge and Trap Method, EMSL, Cincinnati, Ohio 45268, November 6, 1979.
5. Volatile Aromatic and Unsaturated Organic Compounds in Water by Purge and Trap Gas Chromatography, EMSL, Cincinnati, Ohio 45268, Revision 2.0, (1989).
6. Volatile Organic Compounds in Water by Purge and Trap Capillary Column Gas Chromatography with Photoionization and Electrolytic Conductivity Detectors in Series, EMSL, Cincinnati, Ohio 45268, revision 2.0 (1989).

7. Determination of Chlorinated Acids in Water by Gas Chromatography with an Electron Capture Detector, EMSL, Cincinnati, Ohio 45268, Revision 4.0 (1989).
8. "New York State Department of Environmental Conservation Analytical Services Protocol," June 2000.
9. "ASTM, Petroleum Products, Lubricants, and Fossil Fuel, Vol. 5.01 D56-D1947, 1990.
10. "Analytical Handbook for the Laboratory of Organic Analytical Chemistry", Wadsworth Center for Laboratories and Research, New York State Department of Health, August 1991.
11. "Standard Methods for the Examination of Water and Wastewater," 16th Edition, 1986
12. "Standard Methods for the Examination of Water and Wastewater," 17th Edition, 1989
13. "Standard Methods for the Examination of Water and Wastewater," 18th Edition, 1992
14. "Standard Methods for the Examination of Water and Wastewater," 19th Edition, 1995

APPENDIX A

STL BUFFALO ORGANIZATIONAL CHART

SEVERN TRENT LABORATORIES, INC. – BUFFALO
ORGANIZATIONAL CHART



Rev. 5/8/02

APPENDIX B

EDUCATION AND EXPERIENCE OF KEY PERSONNEL

Summary of Key Personnel.

General Manager: Robert Wyeth
Education: BS Physical Science, MS Chemistry
Experience: 34 years

Technical Director: Kenneth Kasperek
Education: BS Biochemistry, MS Pending
Experience: 16 years
Designated Deputy: Laboratory Director

Laboratory Director: Susan Mazur
Education: BS Chemistry
Experience: 12 years
Designated Deputy: Laboratory Manager

Laboratory Manager: Christopher Spencer
Education: BS Chemistry
Experience: 12 Years
Designated Deputy: Technical Director

Quality Assurance Officer: Veri Preston
Education: BS Medical Technology
Experience: 14 years
Designated Deputy: Peggy Gray-Erdmann

Project Manager Supervisor: Mark Nemec
Education: AAS Environmental Science
Experience:19 years
Designated Deputy: Laboratory Director

Information Services Manager: Adele Veihdeffer
Education: AAS Computer Programming
Experience: 12 Years
Designated Deputy: Laboratory Director

Organic Department Personnel:

GC/MS Laboratory Supervisor SVOA: Paul McNamara
Education: BA Biology
Experience: 12 Years
Designated Deputy: Laboratory Manager

GC/MS Laboratory Supervisor VOA: John Schove
Education: BS Chemistry
Experience: 12 Years
Designated Deputy: Laboratory Manager

GC Laboratory Supervisor: Gary Rudz
Education: BA Chemistry
Experience: 16 Years
Designated Deputy: Laboratory Manager

Organic Sample Prep Laboratory Supervisor: Kathleen Aldrich
Education: BS Biology
Experience: 6 Years
Designated Deputy: Laboratory Manager

Inorganic Department Personnel:

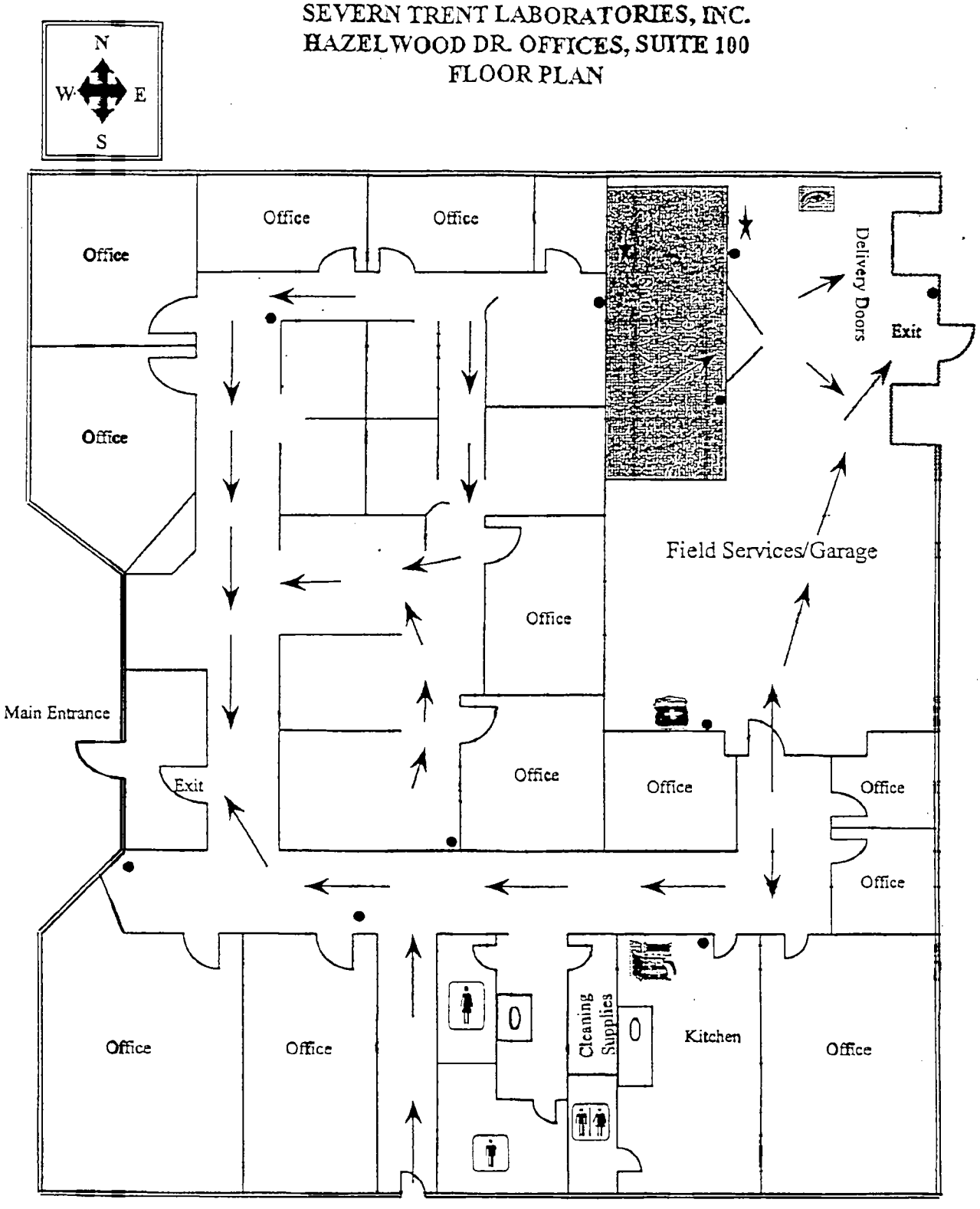
Metals Laboratory Supervisor: Jennifer Pierce
Education: BS Chemistry
Experience: 12 Years
Designated Deputy: Laboratory Manager

Wet Chemistry Laboratory Supervisor: Kathy Galbraith
Education: AAS Laboratory Technology
Experience: 17 Years
Designated Deputy: Laboratory Manager

APPENDIX C

FACILITIES AND EQUIPMENT LIST

SEVERN TRENT LABORATORIES, INC.
HAZELWOOD DR. OFFICES, SUITE 100
FLOOR PLAN



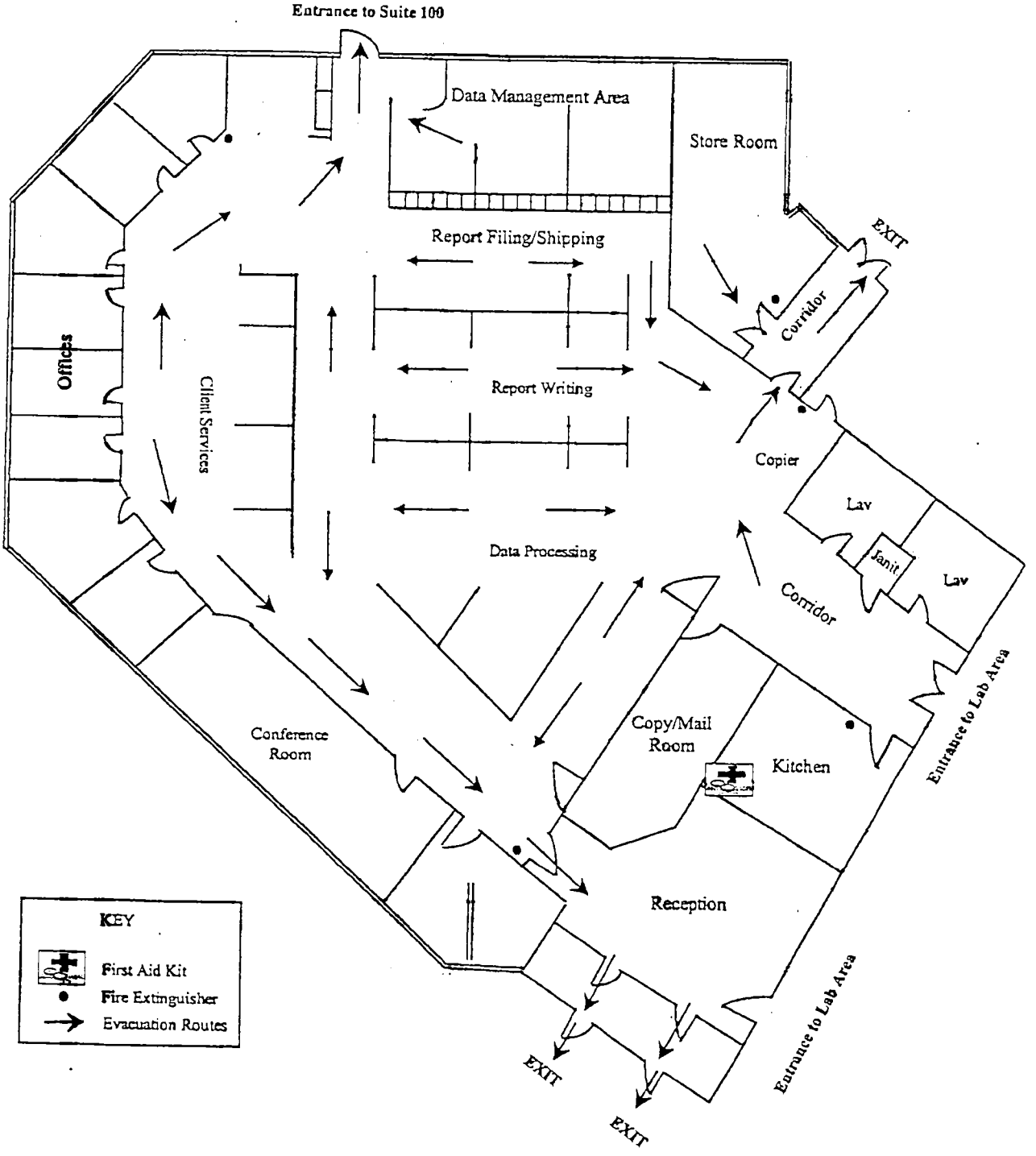
Doorway leading to Suite 106

KEY

- Spill Kit
- Emergency EyeWash
- Fire Extinguisher
- First Aid Kit
- Evacuation Routes

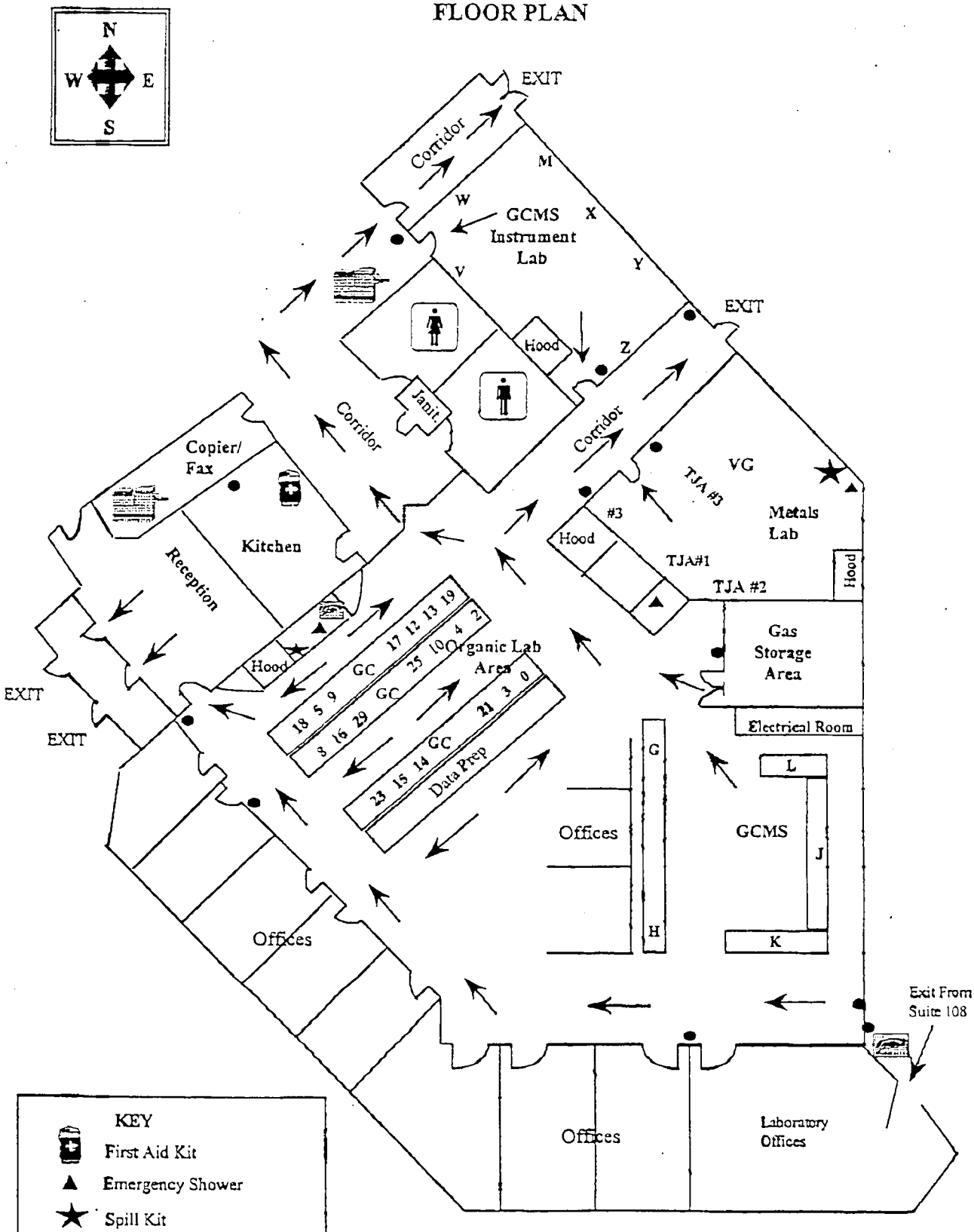
FrPn100
4/00

SEVERN TRENT LABORATORIES, INC.
HAZELWOOD DR. OFFICES, SUITE 106
CLIENT SERVICES/REPORT PREP
FLOOR PLAN



FrPl106L
4/00

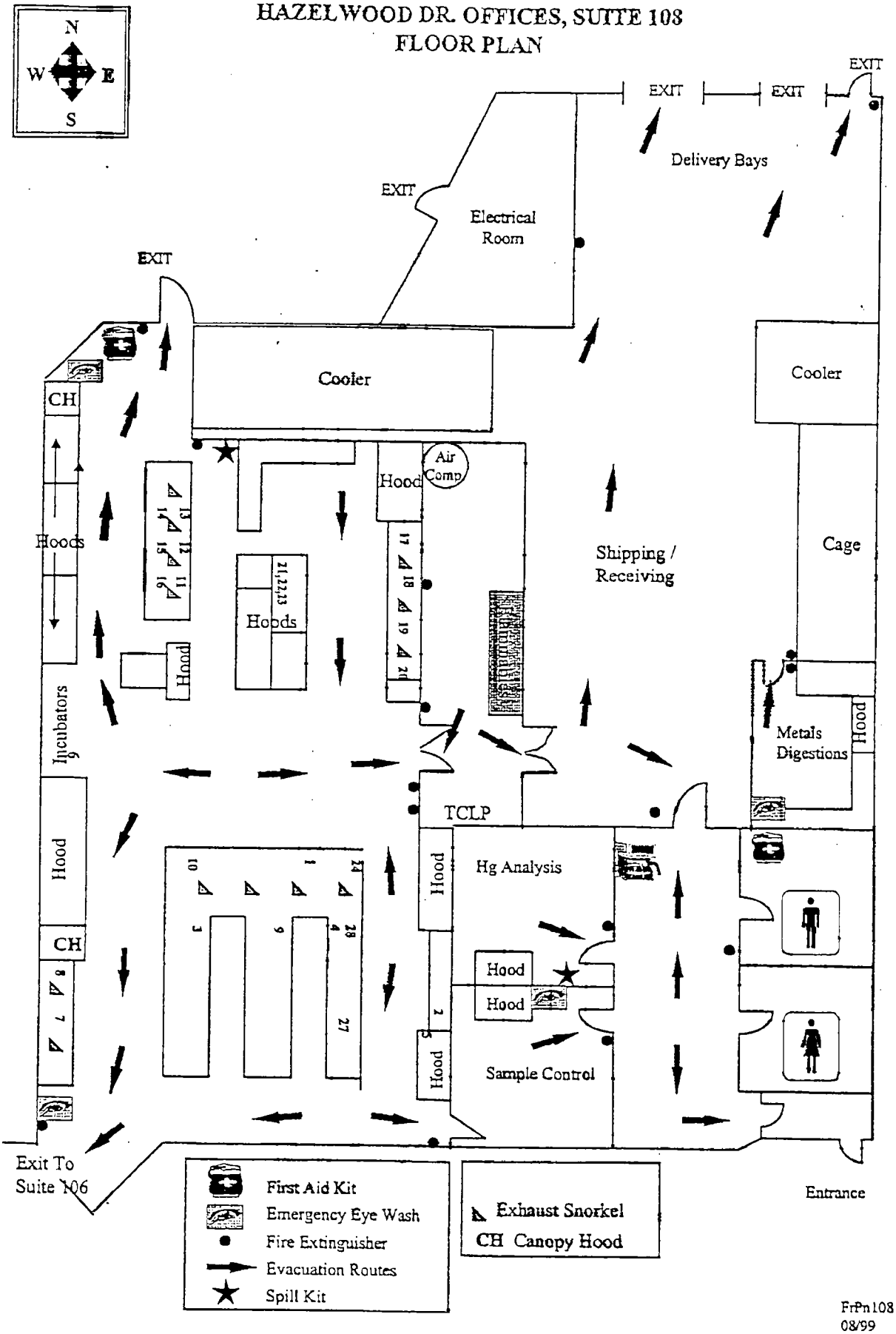
SEVERN TRENT LABORATORIES, INC.
HAZELWOOD DR. NY OFFICES, SUITE 106
LABORATORY AREA
FLOOR PLAN



NOTE: Letters and numbers relate to last 1 or 2 digits of instruments on major capital equipment inventory.

FrPn106r
4/00

SEVERN TRENT LABORATORIES, INC.
HAZELWOOD DR. OFFICES, SUITE 108
FLOOR PLAN



FrPn108
08/99

Severn Trent Laboratories, Inc. - Buffalo
Major Laboratory Equipment/Serial Numbers

SEVERN TRENT SERVICES

STL Buffalo

Instrumentation	Serial Number	Date In Service	Condition	Hazelwood Floor Plan Location
GC/MS Instrumentation				
Hewlett Packard 5973	US05060076	2001	good	F
Hewlett Packard 5973	US05060084	2001	good	N
Hewlett Packard 5973	US03950346	2001	good	P
Finnigan MAT INCOS 50	IN00568	1991	good	M
Hewlett Packard 5973	US82321636	2001	good	Q
Finnigan MAT INCOS 50	IN002568	1992	good	K
Finnigan MAT INCOS 50	IN002571	1992	good	L
Finnigan MAT INCOS 50	IN000303	1991	good	Y
Finnigan MAT INCOS 50	IN000309	1991	good	Z
Finnigan MAT INCOS 50	IN000470	1991	good	W
Finnigan MAT INCOS 50	IN002570	1991	good	V
Finnigan MAT INCOS 50	IN000296	1991	good	W
Finnigan Magnum Ion Trap	IS3650	1995	good	Ma
GC Instrumentation				
Hewlett Packard 5890 dual FID	2518A04945	1991	good	2
Hewlett Packard 5890 dual FID	3019A28433	1991	good	4
Hewlett Packard 5890 dual ECD	3019A28434	1991	good	5
Hewlett Packard 5890 dual ECD	2413A04914	1992	good	7
Hewlett Packard 5890 dual ECD	3203A42206	1992	good	9
Hewlett Packard 5890 dual ECD	3310A47662	1993	good	10
Hewlett Packard 5890 dual ECD	3310A47661	1993	good	12
Hewlett Packard 5890 dual ECD	336A53325	1993	good	13
Hewlett Packard 5890 dual NPD	3336A63126	1994	good	14
Hewlett Packard 5890 dual ECD	3336A53126	1994	good	15
Hewlett Packard 5890 dual ECD	3336A53464	1994	good	16
Hewlett Packard 5890 dual ECD	3336A53463	1994	good	17
Hewlett Packard 5890 dual ECD	3336A54409	1994	good	18
Hewlett Packard 5890 dual ECD	3336A54408	1994	good	19
Hewlett Packard 5890 Hall/PID	2020A01362	1990	good	3
Hewlett Packard 5890 PID/FID	3133A37157	1993	good	8
Hewlett Packard 5890 PID/FID	3336A51040	1994	good	21
Hewlett Packard 5890 Hall/PID	3235A54089	1994	good	22
Hewlett Packard 5890 PID/FID	3336A53728	1994	good	23
Hewlett Packard 5890 dual FID	3336A53729	1994	good	24
Perkin Elmer 8500 dual PID	42923001070	1991	good	Mobile Lab
Perkin Elmer 8500 dual PID	45645001089	1991	good	Mobile Lab
LC Instrumentation				
Hewlett Packard 1100 HPLC	DE92001578	2000	good	25

Severn Trent Laboratories, Inc. - Buffalo
Major Laboratory Equipment/Serial Numbers

Metals Instrumentation				
Thermo Jarrell Ash ICP61E Trace	334490	1995	good	TJA
Thermo Jarrell Ash ICP61E Trace	382590	1995	good	TJA
VG PlasmaQuad PQ2 ICP-MS	763	1991	good	VG
Perkin Elmer 5100	148244-6788	1992	good	Storage
Perkin Elmer 5100	148244-6846	1992	good	3
Perkin Elmer 3100	139289	1992	good	Storage
Leeman PS200 II	HG9045	2000	good	Hg Lab
Leeman PS200 II	HG0033	2000	good	Hg Lab
Water Quality Instrumentation				**(Suite 108)**
OI Carbon Analyzer Model 1010 #1	H92170411	1999	good	1
OI Carbon Analyzer Model 1010 #2	H014710903	2000	good	24
Shimadzu UV-VIS Spec. #UV-120-02	27A06763	1991	good	2
Spectronic Genesis 4001/4	3SGC199091	2000	good	3
Alpkem 510 Autoanalyzer	9380	1993	good	4
Andrews CN Midi-distillation	MCVA-1290380	1994	good	5
Lab-Line Hi-Lo BOD chamber	391-010	1994	good	6
Dohrmann TOX analyzer #DX2000	99243010	1999	good	7
Dohrmann TOX analyzer #DX2000	99243011	1999	good	8
Lachat Quickchem 8000 Autoanalyzer	A83000-1439	1999	good	9
Lachat Quickchem 8000 Autoanalyzer	A83000-1527	2000	good	27
Dionex Ion Chromatograph #DX-120	99010157	1999	good	28
YSI Oxygen Meter #57	93J09826	1995	good	WQ Lab
VWR Ion Meter #2100	1063	1997	good	WQ Lab
Orion Ion Meter #230A	2229	1999	good	WQ Lab
Fischer Accumet Ion Meter #925	860	1991	good	WQ Lab
HACH Spectrophotometer #DR/2000	940200028465	1995	good	WQ Lab
Sample Preparation Equipment				
ISCO Foxy 200 Fraction Collector-GPC	662130002	2000	good	10
ABC Industries GPC #1002B UV-106	822B-222/2335	1992	poor	Storage
ABC Industries GPC #100 UVD-1	9113-9128/3537	1992	poor	Storage
ABC Industries GPC #1002 UV-106	722B/1470	1992	poor	Storage
Organomation Rot-X-Tractor	16902	1999	good	11
Organomation Rot-X-Tractor	16907	1999	good	12
Organomation Rot-X-Tractor	16913	1999	good	13
Organomation Rot-X-Tractor	14206	1995	good	14
Organomation Rot-X-Tractor	15206	1995	good	15
Organomation Rot-X-Tractor	15224	1995	good	16
TurboVap II	TV9445N5816	1996	good	17
TurboVap II	TV9427N4133	1996	good	18
TurboVap II	TV944N5819	1996	good	19
TurboVap II	TV944N5820	1996	good	20
Heat Systems Sonicator #XL-2020	G1647/C5659	1994	good	21
Heat Systems Sonicator #XL-2020	G2665/C5674	1994	good	22
Heat Systems Sonicator #XL-2020	G2620/C5660	1994	good	23
Microtip Sonicator	G2245/C6328	1995	good	Storage
Microtip Sonicator	G2621/C6733	1995	good	Storage
Microtip Sonicator	G2713/C6732	1995	good	Storage
Microtip Sonicator	G1643/C6837	1995	good	Storage
Microtip Sonicator	G2742/C6842	1995	good	Storage
Microtip Sonicator	G2246/C6327	1995	good	Storage
Heat Systems Sonicator #W385	G9286/C4121	1994	good	Storage

Severn Trent Laboratories, Inc. - Buffalo
Major Laboratory Equipment/Serial Numbers

Heat Systems Sonicator #W375	G7122	1994	good	Storage
Heating Banks for Soxhlet	237230	1993	good	Storage
Heating Banks for Soxhlet	240180	1993	good	Storage
Heating Banks for Soxhlet	240181	1993	good	Storage
Heating Banks for Soxhlet	240182	1993	good	Storage
Heating Banks for Soxhlet	240183	1993	good	Storage
Heating Banks for Soxhlet	240184	1993	good	Storage
Heating Banks for Soxhlet	240185	1993	good	Storage

APPENDIX D

PREVENTIVE MAINTENANCE SCHEDULE

Severn Trent Laboratories, Inc. - Buffalo
Preventive Maintenance Schedules

SEVERN TRENT SERVICES

STL Buffalo

Instrumentation	Item	Frequency	Comments
GC/MS Systems			
All Systems:	Replace septa	as needed	VOA, SVOA
	Clip Column, replace liner	as needed	VOA, SVOA
	Replace colums	as needed	VOA, SVOA
	Check gas flow	as needed	VOA, SVOA
	Clean injection port	as needed	VOA, SVOA
	Clean syringes	each use	VOA, SVOA
	Replace gas purifier	yearly	VOA
	Check gas supply	as needed	VOA,SVOA
	Check electronics	semi annual	VOA,SVOA
	Check for leaks	as needed	VOA, SVOA
	Change purge vessel	as needed	VOA
	Change trap	as needed	VOA
	Check trap fan	as needed	VOA
	Check valves and clean	as needed	VOA,SVOA
	Clean and replace filters	semi annual	VOA, SVOA
	Check lubricant levels	semi annual	VOA, SVOA
	Replace lubricants	semi annual	VOA, SVOA
	Check power supplies	semi annual	VOA, SVOA
	Check ventilation fans	semi annual	VOA, SVOA
	Check lubricant levels	semi annual	VOA, SVOA
GC Instrumentation			
All Systems:	Replace septa	as needed	VOA, SVOA
	Clip Column, replace liner	as needed	VOA, SVOA
	Replace colums	as needed	VOA, SVOA
	Check gas flow	as needed	VOA, SVOA
	Clean injection port	as needed	VOA, SVOA
	Clean syringes	each use	VOA, SVOA
	Replace gas purifier	yearly	VOA
	Check gas supply	as needed	VOA,SVOA
	Check electronics	semi annual	VOA,SVOA
	Check for leaks	as needed	VOA, SVOA
	Change purge vessel	as needed	VOA
	Change trap	as needed	VOA
	Check trap fan	as needed	VOA
	Clean cell	as needed	SVOA
	Check valves and clean	as needed	VOA, SVOA
LC Instrumentation			
All Systems:	Replace pre-column	as needed	HPLC
	Back flush column	as needed	HPLC
	Clean cell	as needed	HPLC
	Check pump head seals	as needed	HPLC
	Check valves and clean	as needed	HPLC

Severn Trent Laboratories, Inc. - Buffalo
Preventive Maintenance Schedules

Metals Instrumentation			
All Systems:	Clean nebulizer	each use	ICP, ICP/MS
	Clean capillaries	daily	ICP, ICP/MS
	Clean Torch	weekly	ICP
	Clean contact rings	each use	Furnace AA
	Change graphite tubes	as needed	Furnace AA
	Clean furnace windows	each use	Furnace AA
	Change pump oil	annually	ICP, ICP/MS
Water Quality Instrumentation			**(Suite 108)**
All Systems:	Clean bed supports	as needed	IC
	Change filters	as needed	IC
	Replace columns	as needed	IC
	Change bulb	as needed	Alpkem, Lachat
	Check timing	as needed	Alpkem, Lachat
	Rinse flow cell	as needed	Alpkem, Lachat
	Flush valve	as needed	Lachat
	Replace manifold coils	as needed	Alpkem, Lachat
	Check flows, filters	as needed	TOC
	Check bulb	annually	Spectrophotometer
	Check balances	daily	Balances
Sample Preparation Equipment			
All Systems:	Tune system	weekly	Balances
	Check pressure	each use	Turbovap II
	Check for leaks	each use	GPC
	Check filters	as needed	GPC
	Replace column,tubing	as needed	GPC

APPENDIX E

SOP INDEX

STL Buffalo
STANDARD OPERATING PROCEDURES
MASTER INDEX

6/25/02

SOP No.	Title	Revision #	Date	Review Date	Reviewed By	Scheduled Review	Word ID#
AGP-PIPET-01	Calibration of Autopipettes, Re-Pipettors & Syringes	0 1 2 3 4	8/11/97 4/21/98 1/27/99 5/17/00 6/22/02			6/04	799
AGP-TEMP-03	Recordkeeping and Corrective Actions for Temperature Control Devices	1 2 3 4	1/27/99 5/13/99 5/18/00 5/21/02			5/04	145
AGP-BAL-05	Maintenance of Analytical Balances	0 1 2 3	4/4/94 1/27/99 5/16/00 5/21/02			5/04	146
AGP-DRYWT-07	Determination of Dry Weight	0 1 2 3	1/31/97 1/27/99 5/18/00 5/20/02			5/04	147
AGP-SUPPLY-08	Procurement of Laboratory Supplies and Services	0 1 2	10/24/96 1/27/99 5/16/00			5/02	148
AGP-CRHT-10	Tracking of Critical Holding Time Parameters	0 1 2 3	12/30/96 1/27/99 5/16/00 6/17/02			6/04	144
AGP-WATER-12	Preparation and QA/QC Procedures for Laboratory Reagent Water	0 1 2 3	11/21/96 1/27/99 5/18/00 5/21/02			5/04	150
AGP-STD-14	Standards Traceability and Preparation Logbooks	0 1 2	2/6/97 1/26/99 5/18/00			5/02	152
AGP-TIME-16	Military Time	0 1 2 3	11/16/93 1/27/99 5/16/00 5/21/02			5/04	154
AGP-MAN.INT-20	Manual Integration	0 1 2 3	4/2/92 1/27/99 5/18/00 6/22/02			6/04	157
AGP-LABCONT-23	Sample Storage & Handling Procedures for Mitigation of Sample & Laboratory Contamination	0 1 2	4/13/93 1/28/99 6/15/00			6/02	174
AGP –SAMP.SECUR-25	Sample Security and Storage	0 1 2	1/25/94 1/28/99 6/14/00			6/02	176
AGP-Homo-30	Sample Homogenization and Subsampling	0 1 2	1/6/98 1/28/99 7/14/00			7/02	177

A Bold SOP No. means that SOP has been updated in the NELAP format.

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AGP-THERMCAL-33	Thermometer Calibration	0 1 2	6/9/93 1/28/99 7/14/00			7/02	184
AGP-MAINTAUTH-40	Maintenance Authorization	0 1 2	4/13/93 1/28/99 8/2/00			8/02	186
AGP-MSPREV-45	Preventative Maintenance Schedule & Procedures-GCMS Semivolatile & VOA Lab	0 1 2	4/13/93 1/28/99 1/3/01			1/03	188
AGP-COMPUTER-50	Computer User Responsibilities	0 1 2	11/1/95 1/28/99 9/12/00			9/02	192
AGP-OFF-SITE-55	Off-Site Storage Procedures	0 1 2	1/5/2000 9/12/00 6/17/02			6/04	821
AGP-ON-SITE-56	On-Site Storage Procedures	0 1 2	1/5/2000 9/12/00 6/17/02			6/04	820
AGP-TBNK-60	Time Bank Policy	0 1 2	5/30/00 6/16/00 6/7/01			6/03	831
AGP-Out of Service-65	Out of Service Equipment	0	9/19/00			9/02	851
AGP-DILUTIONS-70	Procedure for Diluting Volatile Samples	0	12/11/00			12/02	854
AGP-COMPVOA-75	Compositing of soil matrix samples for volatile analysis	0	4/27/01			4/03	869
ASR-BOT.CONT-01	Sample Bottle Control	0 1 3	4/22/98 1/28/99 3/4/02			3/04	149
ASR-BOTTLE-03	Sample Container Preparation & Shipment, & Preparation of Pre-Preserved Sample Bottles for Use in Collection of Materials for Environmental Analytical Testing	0 1	8/10/92 1/28/99				151
ASR-RECEIPT-05	Receipt of Analytical Samples	0 1 2	2/20/98 1/28/99 2/25/00				163
ASR-PRES-07	The Chemical Preservation or Checking of Chemical Preservation of Analytical Samples	0 1 2 3	3/4/98 1/28/99 3/3/00 4/6/00				164
ASR-INV-08	Analytical Sample Inventory/Preservation Logbook	0 1 2	1/25/94 1/28/99 2/20/02			2/04	165
ASR-ASRF-10	Analytical Services Request Form	0 1	1/25/94 1/28/99				166

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ASR-ARRF-11	Analytical Receipt Resolution Form	0 1 2 3 4	1/25/94 1/28/99 4/6/00 5/18/00 2/20/02			2/04	167
ASR-COCLOG-15	Internal Chain-of-Custody Logbook	0 1	11/19/93 1/28/99				168
ASR-COCFORM-17	Internal Chain-of-Custody Form	0 1 2 3	1/25/94 1/29/99 5/24/00 2/20/02			2/04	169
ASR-ID-20	AIMS™ Laboratory Sample Identification Systems	0 1	1/25/94 1/29/99				170
ASR-TEMPBL-21	Temperature Blanks	0 1	11/16/93 1/29/99				178
ASR-STORAGE-27	Sample Transportation/Storage	0 1	7/27/95 1/29/99				182
ASR-TEMP-28	Sample Receipt; Temperature Monitoring	0 1 2 3	7/11/94 1/29/99 2/25/00 3/4/02			3/04	181
ASR-RAD-30	Low-Level Radioactive Waste Minimization Plan	0 1	9/15/95 1/29/99				183
ASR-DISP-33	Sample Disposal	0 1 2 3	4/13/93 2/20/98 1/29/99 2/25/00				175
ASP-GLASS-10	Organic Glassware Cleaning	0 1 2 3	4/3/95 3/5/99 12/27/99 2/14/02			2/04	119
ASP-SOLVENT-15	Solvent Purity Check	0 1 2 3	4/2/92 1/29/99 12/29/99 2/12/02			2/04	120
ASP-SONC-20	Sonicator Maintenance	0 1 2 3	2/17/94 1/29/99 12/29/99 2/12/02			2/04	125
ASP-GPCCAL-25	3/90 GPC Calibration	0 1 2 3	6/17/92 2/1/99 11/4/99 12/27/99				126
ASP-507/508-50	Organic Preparation – Methods 507 and 508	0 1 2	4/12/94 2/1/99 3/1/00				061

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ASP-525.1-55	Sample Preparation – Method 525.2	0 1 2 3 4 5	3/29/94 2/1/99 10/5/99 12/27/99 2/4/00 2/22/02			2/04	060
ASP-608-65	Organic Prep Laboratory – EPA Method 608 (Recra Method 305): Non-CLP Pesticides and PCB	0 1 2 3 4	8/4/92 2/1/99 9/27/99 12/27/99 3/4/02			3/04	123
ASP-625-68	EPA Method 625 (Recra Method 401): Base/Neutral & Acid/Phenols (BN/AP)	0 1 2 3 4	8/4/92 2/1/99 10/13/99 12/23/99 2/13/02			2/04	127
ASP-CLPSONC-75	3/90 Pesticide/PCB and BNA Sonication	0 1 2 3	6/17/92 2/1/99 11/23/99 2/25/02			2/04	124
ASP-3510-80	Method 3510B: Aqueous Separatory Funnel Extraction Procedure Method 3510C: Aqueous Separatory Funnel Extraction Procedure	0 1 2 3 4 5 6	5/7/97 4/6/98 1/26/99 9/24/99 12/27/99 3/2/00 3/18/02			3/04	128
ASP-3520B-85	Method 3520B – Continuous Liquid/Liquid Extraction & Accelerated Liquid/Liquid Extraction	0 1 2 3 4 5	5/7/98 2/1/99 9/25/99 12/27/99 3/2/00 2/13/02			2/04	224
ASP-3550B-93	Method 3550B: Ultrasonic Extraction Of Soils And Wipes	0 1 4 5 6	2/24/97 1/26/99 3/2/00 3/10/00 2/25/02			2/04	136
ASP-3580A-94	Waste Dilution – Method 3580A	0 1 2 3 4	4/10/98 2/1/99 8/4/99 3/2/00 2/25/02			2/04	216
ASP-3620A-95	Method 3620A – Florisil Cartridge Cleanup	0 1 2 3	12/4/96 2/1/99 2/3/00 2/25/02			2/04	139
ASP-3640A-96	Method 3640A: Gel Permeation Chromatography	0 1 2 3	3/10/98 2/1/99 9/13/99 12/27/99	2/3/00	KA		210

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ASP-3665A-98	Method 3665A: Acid Cleanup	0 1 2 3 4	1/15/98 2/1/99 9/11/99 12/23/99 3/5/02			3/04	201
ASP-8151A,S-115	Method 8151A Herbicide Extraction-Soil	0 1 2 3 4 5	3/9/98 10/30/98 2/2/99 9/11/99 12/27/99 2/13/02			2/04	211
ASP-8151A,W-118	Method-8151A Herbicide Extraction – Water	0 1 2 3 4 5 6 7	4/27/98 10/30/98 3/8/99 5/18/99 9/13/99 12/27/99 3/8/02 5/20/02			5/04	213
AGE-504-05	Previous Title: 1,2-Dibromoethane (EDB) & 1,2-Dibromo-3-Chloropropane (DBCP) in Water – Method 504 Current Title: Method 504.1/8011 Microextractables in Water	0 1 2 3	9/6/95 8/19/98 2/4/99 8/23/00			8/02	058
AGE-508-20	Chlorinated Pesticide Analysis Method 508	0 1 2	3/24/94 2/4/99 7/1/00				057
AGE-608-45	Organochlorine Pesticides & PCBs – Method 608	0 1 2 3	8/10/92 8/19/98 2/4/99 7/19/00				039
AGE-8000A-46	Gas Chromatography – Method 8000A	0 1	4/10/94 10/30/98				047
AGE-8015DRO-50	Diesel Range Organics – Method 8015B	0 1 2 3	8/25/98 9/23/99 7/4/00 4/4/01			4/03	230
AGE-8081A-61	Organochlorine Pesticides – Method 8081A	0 1 2	8/14/98 1/26/99 7/6/00			7/02	228
AGE-8082-63	Analysis of PCBs – Method 8082	0 1	3/2/98 1/26/99				209
AGE-8151A-77	Chlorinated Herbicides – Method 8151A	0 1 2 3	8/19/98 10/8/99 3/8/01 5/21/01			5/03	227
AGE-310/13-90	NYSDOH Method 310-13/14: Petroleum Products in Water	0 1 2 3	4/11/97 7/20/98 2/9/99 7/29/00				044
AGE-GCPREV-90	Preventative Maintenance Schedule And Procedures-GC & HPLC	0	2/1/00				827
AGE-CLP-95	Analytic Method For Gc/Ecd Pesticides And Aroclors By Cipolm03.3	0	9/23/99				207
AGE-GLASS-100	Glassware Cleaning – GC Department	0 1	4/2/92 2/9/99				033

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AGE-MAINT-103	Maintenance Activities – GC Department	0 1	4/2/92 2/9/99				191
AGE-CALC-105	Calibration and Quantitation of Multicomponent Pesticides and PCBs	0 1 2	6/23/95 2/9/99 7/21/00				035
AGE-PCBID-110	Identification of Polychlorinated Biphenyls as Aroclors	0 1 2	12/22/97 2/9/99 7/21/00				032
AGE-INJLOG-115	Analytical Run-Injection Logbooks – GC Department	0 1 2	8/3/92 8/10/98 2/11/99				036
AGE-STD-120	Analytical Standards – GC Dept.	0 1	4/13/93 2/11/99				037
AGE-DATAACQ-130	Data Acquisition System Operation – GC Department	0 1	4/2/92 2/11/99				034
AGE-DELIV-135	GC Deliverables to GC Data Processing	0 1 2	4/2/92 8/10/98 2/11/99				038
AGE-REVIEW-142	Laboratory Data Review – Gas Chromatography	0 1	4/8/98 2/11/99				220
AGE-CLP-4.0/4.1/4.2-150	Analytical Methods for GC/ECD Pesticides and Aroclors by CLP OLM 04.0/4.1/4.2	0 1	9/23/99 01/26/00				812
AGE-531.1-155	Analysis of Carbamate Pesticides Method 531.1	0	6/22/02			6/04	894
AGV-601/602-10	Halogenated and Aromatic Volatile Organics (Methods 601-602 Individually or in Series)	0 1 2 3	4/1/98 2/11/99 2/28/00 4/17/01			4/03	048
AGV-8015B-21	Gasoline Range Organics Method 8015B	0 1	9/29/99 4/4/01			4/03	813
AGV-8021A-30	Halogenated & Aromatic Volatiles by Gas Chromatography using Electrolytic Conductivity and Photoionization Detectors in Series: Capillary Technique – Method 8021A	0 1 2 3	8/25/98 2/12/99 3/3/00 4/4/01			4/03	208
AGV-8021B-32	Halogenated and Aromatic Volatiles by Gas Chromatography using electrolytic conductivity and Photoionization Detectors in series: Capillary Technique Method 80021B	0	4/4/01			4/03	868
AGV-GRO-35	Gasoline Range Organics – GRO Method	0 1 2	4/20/94 2/12/99 4/4/01			4/03	041
AGV-GCVOAPREV-40	Preventative Maintenance Schedule And Procedures-GC Volatiles	0	2/3/00				828
AMB-MANINT-20	Manual Peak Addition – GC/MS Semivolatile Lab	0 1 2 3	8/3/92 2/12/99 3/10/00 2/28/02			2/04	013
AMB-INJ.LOG-25	GC/MS Semi-Volatile Injection Logbook	0 1 2 3	4/2/92 2/12/99 3/17/00 2/25/02			2/04	014
AMB-STREAMER-40	Loading Magnetic Streamer Tapes	0 1 2 3	4/2/92 2/15/99 3/10/00 4/16/01			4/03	018
AMB-525.2-50	Method 525.1-Determination of Organic Compounds	0	5/11/94				064

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	in Drinking Water by Capillary Column Gas Chromatography/Mass Spectrometry	1	2/15/99				
AMB-625-60	Analytical Method for GC/MS Semivolatiles by EPA– Method 625	0 1 2	3/18/98 2/15/99 3/6/01			3/03	015
AMB-8270C-66	Analytical Methods for GC/MS Semivolatile Samples by SW846 3rd Edition Method 8270C	0 1 2 3	8/28/98 2/16/99 3/13/00 4/3/01			4/03	206
AMB-CLP-70	Analytical Method For GC/MS Semivolatiles By OLMO 4.2 & ASP95-2	0 1	1/26/00 5/2/02			5/04	825
AMB-8270B-(low)-75	Analytical Methods for GC/MS Semivolatile Samples by SW846 3RD Edition Method 8270B (low)	0	9/29/00			9/02	852
AMV-GLASS-10	Syringes, Purge Tubes and Volumetrics – GC/MS Volatile Glassware Cleaning	0 1 2 3 4	4/2/92 4/10/98 2/17/99 10/28/99 2/7/01			2/03	001
AMV-MAN.INT-15	Manual Integration	0 1 2 3	1/19/98 2/17/99 10/28/99 2/14/01			2/03	002
AMV-INJ.LOG-20	Analytical Run-Injection Logbook	0 1 2 3 4	4/2/92 3/9/98 2/17/99 10/28/99 2/19/01			2/03	003
AMV-STD-25	Primary Standards Preparation	0 1 2 3	3/11/98 2/17/99 10/25/99 2/27/02			2/04	004
AMV-IDENT-35	Identification of Target Compounds – Volatiles	0 1 2	3/11/98 2/17/99 3/11/02			3/04	006
AMV-5030-42	Method 5030A: Purge and Trap	0 1 2 3	1/12/98 2/17/99 2/28/00 4/16/01			4/03	200
AMV-5035-43	Method 5035-Closed-System Purge & Trap & Extraction for Volatile Organics in Soil and Waste Samples	0 1 2 3 4	3/10/98 2/19/99 2/28/00 4/16/01 3/4/02			3/04	212
AMV-524.2-45	GC/MS Volatile Method 524.2	0 1 2 3	3/14/94 2/19/99 10/28/99 4/17/01			4/03	009

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AMV-624-50	Method 624	0 1 2 3	6/27/95 2/19/99 10/28/99 4/4/01			4/03	008
AMV-8260B-56	Analytical Methods for the Analysis of GC/MS Volatile Samples – 8260B	0 1 2 3 4 5	5/1/98 1/26/99 3/1/00 9/11/00 12/14/00 4/6/01			4/03	221
AMV-CLP-60	Analytical Method for GC/MS Volatiles by CLP OLM3.2	0 1 2	1/8/98 2/19/99 9/16/99				203
AMV-CLP-4.2-61	CLP OLM04.2 and ASP 2000	0 1 2	9/16/99 01/27/00 3/13/02			3/04	811
AMV-ASP951-62	Analytical Method for GC/MS Volatiles – ASP95-1	0 1 2	1/9/98 2/19/99 4/17/01			4/03	205
AMV-CLP/LC-64	Analytical Methods For The Low Concentration CLP/ASP Analysis Of GC/MS Volatile Samples	0 1 2 3 4	1/16/98 2/19/99 9/30/99 2/28/00 4/23/02			4/04	204
AMP-GLASS-05	Cleaning Procedure for Metals Glassware	0 1 2 3	4/28/97 2/22/99 2/2/01 6/20/02			6/04	066
AMP-BATCH-07	Metals Department Batching Procedure	0 1 2	5/12/97 2/22/99 2/2/01			2/03	067
AMP-3031-22	Procedure for Acid Digestion of Oils for Metals Analysis by Atomic Absorption or ICP Spectrometry Using Method 3031	0 1 2	4/2/98 2/22/99 3/15/00				218
AMP-3050A-25	Acid Digestion of Sediment, Sludges and Soils (Method 3050A)	0 1	6/25/97 2/22/99				069
AMP-3060A-30	Alkaline Digestion Method 3060A; Hexavalent Chromium in Solid Waste	0 1 2	3/13/98 2/22/99 3/15/00				072
AMP-CrVI-33	- Procedures for Extraction of Hexavalent Chromium in Aqueous Samples - Method 7195 Chromium Hexavalent (Coprecipitation)	0 1 2	8/10/92 1/16/98 2/2/99				071 071a
AMP-ASP/CLP,W-41	ASP/CLP Methods – Acid Digestion of Aqueous Samples & Extracts for Total Metals for Analysis by ICP Spectroscopy	0 1 2	5/6/98 3/5/99 3/28/00				223
AMP-ASP/CLP,S-42	Acid Digestion of Soil Samples for Total Metals For Analysis By ICP Spectroscopy (ASP/CLP)	0 1 2	5/6/98 2/11/99 3/28/00				222
AMP-ICPMS-46	Sample Preparation Procedure for ICP-MS Dissolved and Total Recoverable Metals in Water and Soil	0	3/17/00				823
AME-7000A-27	Method 7000A – Graphite Furnace Analysis	0 1 2	4/10/98 1/26/99 4/14/01			4/03	214

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AME-6010-30	Method 6010B/200.7/CLP Using the Thermo Jarrell Ash 61E Trace	1 2 3 4 5 6 7	12/4/96 1/26/99 9/30/99 10/8/99 3/30/00 4/6/01 5/21/02			5/04	080
AME-ICP/CLP-35	Methods ASP-91 and EPA 3/90 Using the Thermo Jarrell Ash 61E Trace	0 1	2/15/97 3/5/99				082
AME-LIN.RG-37	Establishment of Linear Ranges for ICP Analysis	0 1	8/10/92 3/5/99				081
AME-REVIEW-40	Laboratory Data Review	0 1 2	4/1/98 3/5/99 6/20/02			6/04	215
AME-ICPMS-45	ICP-MS Analysis Method 200.8/6020	0	3/17/00				824
AME-MERCURY-50	Method # 7470A, 7471A & Mercury Preparation and Analysis	0 1	8/9/00 4/6/01			4/03	841
AME-3005-55	Method 3005A/200.2 Sample Preparation of Waters for Total Recoverable or Dissolved Metals for analysis by ICP-AES, ICP-MS or GFAA	0	4/10/01			4/03	860
AME-3010A/3020A - 60	Method 310A/3020A Acid Digestion of aqueous samples and extracts for Total Metals for analysis by ICP-AES, ICP-MS and GFAA	0	4/10/01			4/03	861
AME-3050B-65	Method 3050B: Acid Digestion of sediments, sludges and soils	0 1	4/10/01 3/1/02			3/04	862
AWC-GLASS-01	Cleaning Procedure for Wet Chemistry Glassware	0 1	3/24/98 3/8/99				794
AWC-IC-05	ION Chromatography; SM: 4110C, 300.0, 9056	0 1 2 3 4	9/29/99 3/17/00 10/4/00 2/12/02 4/22/02			04/04	815
AWC-O&G-07	Total Recoverable Oil and Grease (Gravimetric, Separatory Funnel Extraction) – Method 9070-413.1	0 1 2 3	10/27/97 3/8/99 5/17/01 2/28/02			2/04	761
AWC-CYANIDE-10	Total Cyanide 335.4, 335.2, 9012A and CLP CN	0 1 2 3	4/13/97 1/27/99 12/16/99 4/24/02			4/04	093
AWC-CHLORIDE-13	Chloride: Methods 325.2 & 9251 Automated Ferricyanide	0 1 2	6/5/98 1/27/99 3/5/02			3/04	226
AWC-405.1-14	Biochemical Oxygen Demand (5 day – Method 405.1) Carbonaceous Biochemical Oxygen Demand (CBOD)	0 1 2 3 4 5	10/15/97 3/8/99 11/4/99 12/1/00 01/19/01 2/15/02			02/04	798
AWC-TOC-15	Total Organic Carbon: Method 9060/415.1	0 1 2 3 4 5 6	4/1/93 6/15/98 3/8/99 11/15/99 3/7/01 10/29/01 3/26/02			3/04	095

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AWC-418.1-16	Total Recoverable Petroleum Hydrocarbons (Method 418.1)	0 1 2	1/31/94 3/8/99 2/15/02			2/04	096
AWC-310.1-17	Method 310.1 (Titrimetric, pH 4.5) Alkalinity	0 1 2 3 4	12/12/96 10/26/98 1/27/99 12/22/99 4/24/02			4/04	097
AWC-310.2-18	Alkalinity Method 310.2 (Colorimetric, Automated)	0 1	3/8/00 2/25/02			2/04	830
AWC-350.1-19	Ammonia Nitrogen Method 350.1 Automated Phenate	0 1 2 3	11/17/97 3/8/99 4/5/01 3/1/02			3/04	806
AWC-1311-21	Toxicity Characteristic Leaching Procedure (TCLP)	0 1 2 3 4 5 6	1/27/94 5/6/98 3/8/99 1/29/01 4/3/01 9/28/01 10/22/01			10/03	098
AWC-130.2-23	Total Hardness	0 1 2 3 4	2/9/94 10/26/98 3/8/99 10/10/00 2//10/02			02/04	100
AWC-353.2-24	Nitrate+Nitrite Nitrogen, Nitrite Nitrogen and Nitrate Nitrogen Method 353-2 – Automated Cadmium Reduction Method	0 1 3	6/1/98 1/27/99 2/28/02			2/04	225
AWC-pH-26	pH	0 1 2 3 4	11/8/94 3/9/99 10/5/00 4/12/01 2/28/02			2/04	102
AWC-305.1-27	Acidity	0 1 2	2/9/94 3/9/99 4/24/02			4/04	103
AWC-9095-29	Paint Filter Free Liquids Test	0 1 2 3	2/16/94 3/9/99 4/10/01 2/28/02			2/04	105
AWC-120.1-32	Specific Conductance	0 1 2	5/17/94 3/9/99 4/24/02			4/04	108
AWC-377.1-33	Sulfite – Method 377.1 (Titration, Iodometric)	0 1 2 3	8/19/97 3/9/99 6/1/01 2/15/02			2/04	797
AWC-180.1-34	Turbidity – Method 180.1	0 1 2 3	1/20/97 3/9/99 5/23/01 1/21/02			1/04	109
AWC-160.1-35	Total Filterable Residue (TDS)	0 1 2 3	2/28/94 3/9/99 9/11/00 3/4/02			3/04	110

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AWC-160.2-36	Total Non-Filterable Residue (TSS)	0 1 2 3 4 5	2/28/94 3/10/99 10/7/00 4/5/01 6/5/01 2/25/02			2/04	111
AWC-160.3-37	Total Residue	0 1 2 3	2/28/94 3/10/99 10/7/00 2/12/02			02/04	112
AWC-2540G-38	Method 2540G – Total/Fixed/Volatile Solids	0 1 2 3	7/21/97 3/10/99 6/22/01 2/12/02			02/04	790
AWC-425.1-39	Methylene Blue Active Substances (MBAS)	0 1 2 3	3/28/94 3/10/99 5/8/01 3/1/02			3/04	113
AWC-SULFIDE-41	Sulfide Method 376.1	0 1 3 4	5/5/94 3/10/99 6/22/01 2/12/02			02/04	115
AWC-375.4-42	Sulfate (Turbidimetric)Method 375.4	0 1 2 3 4	10/27/97 1/27/99 10/1/99 2/28/02 5/20/02			5/04	805
AWC-COD-44	Chemical Oxygen Demand (Colorimetric) – HACH 8000 Method	0 1 2 3 4 6 7	7/3/96 5/7/98 3/10/99 4/2/00 4/14/00 4/10/01 4/23/02			4/04	117
AWC-351.2-45	Total Kjeldahl Nitrogen – Method 351.2	0 1 2	8/6/97 3/10/99 3/19/02			3/04	800
AWC-1010-46	Method 1010 – Flashpoint	0 1 3 4	1/19/98 3/10/99 4/9/01 1/16/02			1/04	118
AWC-330.4-47	Total Residual Chlorine – Method 330.4	0 1 2 3	7/21/97 3/10/99 6/22/01 3/8/02			3/04	788
AWC-9020B-49	Total Organic Halides (TOX) Method 9020	0 1 2	7/21/97 3/10/99 12/22/99				789
AWC-9023-50	Extractable Organic Halides (EOX) Method 9023	0 1 2 3	7/21/97 3/10/99 10/26/01 4/24/02			4/04	795
AWC-160.5-51	Method 160.5 – Settleable Solids	0 1 2 3	7/21/97 3/10/99 10/5/00 2/12/02			02/04	793

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AWC – 365.2-55	Method 365.2 – Total and Ortho Phosphorus	0 1	4/30/99 3/28/02			03/04	808
AWC-Iron-56	Total Iron & Ferrous Iron	0 1 2	12/15/99 6/22/01 2/28/02			2/04	817
AWC-HEXCr-58	Hexavalent Chromium	0 1	7/14/00 2/7/02			2/04	840
AWC-Phenolics-60	Total Recoverable Phenolics method 420.2/ 9066	0 1 2	9/28/00 4/5/01 2/12/02			2/04	832
AWC-9045C-65	Soil and Waste pH	1 2	4/12/01 2/25/02			2/04	834
AWC-420.2MOD-70	Total Recoverable Phenolics (Modified Method)	0	9/27/00			9/02	836
AWC-COLOR-75	Color Method 110.2	0 1	10/5/00 3/8/02			3/04	837
AWC-320.1-80	Bromide Method 320.1	0 1	10/10/00 02/12/02			02/04	844
AWC-345.1-85	Iodide-Method 345.1 (titrametric)	0	10/10/00			10/02	845
AWC-370.1-90	Total Silica –Method 370.1	0 1	10/10/00 2/12/02			2/04	846
AWC-340.2-90	Fluoride-Method 340.2	0	2/9/01			2/03	856
AWC-1664SPE-95	1664- n-hexane extractable material (hem) and silica gel treated n-hexane extractable material (sgt-hem) by solids phase extraction	0 1	6/1/01 2/12/02			02/04	855
AWC-Reactivity-100	Reactivity-Method Sect. 7.3	0 2 3	2/9/01 10/29/01 2/12/02			02/04	857
AWC-Density-115	Density	0 1	6/22/01 2/10/02			2/04	873
AWC-DO-120	Dissolved Oxygen	0 1	6/22/01 2/13/02			2/04	874
AWC-VISCOSITY-125	Viscosity	0 1	6/22/01 2/12/02			02/04	875
AWC-376.2-130	Sulfide Method 376.2	0 1	6/22/01 2/12/02			2/04	876
AWC-SPLP-1312	Synthetic Precipitation Leaching Procedure (SPLP)	0 1	12/15/99 5/2/02			5/04	818
AWC-Ignit-135	Ignitability of Solids	0	12/18/01			12/03	880
AWC-1030-145	Method 1030- Ignitability of Solids	0	12/14/01			12/03	886
AWC- Chlorine Demand-150	Chlorine Demand	0	3/18/02			3/04	893
ARP-ICLPREV-15	Inorganic CLP Data Review	0 1	6/6/95 3/11/99	4/29/98	KG/AMK		092
ARP-ICLPREV-16	Preparation and Review of Inorganic CLP Data Packages	0 1	3/3/93 3/11/99	4/29/98	KG/AMK		161
ARP-OCPRCV-20	Preparation and Review of Organic CLP Data Packages	0 1	9/28/92 3/11/99	4/30/98	KG/AMK		158
ARP-O/CSF-22	USEPA Complete SDG File (CSF)/Case File Purge; DC-2 Form	0 1	11/16/93 3/16/99	4/30/98	KG/AMK		160
ARP-I/CSF-23	USEPA Complete SDG File ILM03.0/Case File Purge	0	3/3/93	4/30/98	KG/AMK		162
ARP-MSVER-65	Verification of Qualitative Analysis by GC/MS Data Processing Analytes	0 1	4/2/92 3/16/99				024
ARP-VOAVER-70	Verification of Volatile 3/90 Forms 1 through 8	0 1	8/3/92 3/16/99				025
ARP-SVOAVER-75	Verification of Semi-Volatile 3/90 Forms 1 through 8	0 1	8/3/92 3/19/99				026

SOP No.	Title	Revision #	Date	Review Date	Reviewed By	Scheduled Review	Word ID#
ARP-MSDEL-80	Final Review and Assembly of GC/MS Data Deliverables	0 1	4/13/93 3/19/99				027
ARP-ENTRY-85	Level 2 Metals Entry Verification	0	4/16/01			4/03	863
ARP-MERCURY-90	Mercury Level 2 Entry into AIMS	0	4/16/01			4/03	864
ARP-FURNACE-95	Furnace Level 2 Metals Entry into AIMS	0	4/16/01			4/03	865
ARP-IMPORT-100	ICP/MS Level 2 Metals Import into AIMS	0	4/16/01			4/03	866
ARP-ICPIMPORT-105	ICP Level 2 Metals Import into AIMS	0	4/16/01			4/03	867
ARP-FIELD-110	Field Data Entry and Closure	0	1/24/02			1/04	884
ARP-Padep-110	Padep Forms	0	1/11/02			01/04	887
ARP-Level4Import-115	ICP and ICP/MS Level IV Import into Marrs	0	3/18/02			3/04	891
ARP-LevelIVMercury-120	Mercury Level IV Import into Marrs	0	3/18/02			3/04	892
ARP-WetChem-120	Review and Closure of Wet Chemistry Data	0	3/8/02			3/04	885
APM-PM-01	Program Management	0 1 2	8/1/95 3/29/99 01/21/00				193
APM-QUOTE TRACK-10	Tracking & Submitting Responses to Request for Proposal/Quotation	0 1	1/3/2000 3/11/02			3/04	816
APM-Correct-15	Correctness of Analysis	0 1 2	3/9/01 5/29/01 8/3/01			8/03	858
APM-Proj Info-20	Project Information Requirements	0	3/4/02			3/04	889
AQA-ETHICS-05	Ethics and Data Integrity	0 1 2	3/12/97 3/29/99 3/24/01			3/03	141
AQA-TRAIN-10	Laboratory Personnel Training	0 1 2	8/3/92 03/01/99 2/27/01			2/03	143
AQA-AUDIT-15	Performance and System Audit	0 1 3	4/3/93 4/1/99 5/18/01			5/03	153
AQA-QC Limits-17	Quality Control Limits	0	3/4/02			3/04	890
AQA-MDL-20	The Determination of Method Detection Limits	1 2 3 4	1/29/98 3/27/99 3/19/01 6/6/01			6/03	156
AQA-REC.RET-25	Record Retention	0 1 2	9/28/92 01/09/01 6/17/02			6/04	172
AQA-DOCCONT-30	Sample Tracking & Document Control	0 1	11/16/93 3/17/99				159
AQA-CA-35	Preventative and Corrective Action Procedure	0 1 2 3	9/13/97 3/17/99 3/24/01 1/9/02			1/04	801
AQA-Management Review-45	Management Review	0 1	2/1/00 6/21/02			6/04	826
AQA-SOP-55	Procedure for writing, Reviewing and revising SOP's	0 1 2	6/28/00 12/11/00 1/16/02			1/04	835
AQA-REANALYSIS-60	Reporting requirements for multiple sample analysis	0	7/10/00			7/02	850
AQA-DQR-65	Data Quality Request	0 1	1/3/01 12/27/01			12/03	853

A Bold SOP No. means that SOP has been updated in the NELAP format.

SOP No.	Title	Revision #	Date	Review Date	Reviewed By	Scheduled Review	Word ID#
AQA-Subcontract-70	Certification of Subcontract Labs	0 1	7/3/01 8/3/01			8/03	877
AQA-Cert. Verif-75	Certification Verification	3 4	7/5/01 7/25/01			7/03	870
AFS-COC-01	Chain of Custody Documentation	0 1	3/16/94 3/16/99				194
ASF-SHIP-02	Sample Packaging and Shipment Off-Site	0 1	3/16/94 3/16/99				195
AFS-DECON-03	Equipment Decontamination	0 1	3/16/94 3/16/99				196
AFS-DATACOLL-10	Groundwater Sampling Field Data Collection	0 1	3/16/94 3/16/99				197
AFS-GW-12	Groundwater/Surface Water Sampling	0 1	3/16/94 3/16/99				198
AFS-SOIL-14	Surface and Subsurface Soil/Sediment Sampling	0 1	3/16/94 3/16/99				199
AHS-HSPROG-01	Health and Safety Program	0 1 2 3 4	8/19/96 4/13/98 2/17/99 6/20/00 3/4/02			3/04	185
AWM-HAZ.MG-01	Hazardous Waste Management	0 1 3 4 5	11/18/96 5/13/98 2/15/00 4/26/00 3/08/02			3/04	171
AFC-HSEKP-10	Facility Housekeeping & Maintenance	0 1	4/17/95 6/19/00			6/02	142
AFC-SECURITY-05	Facility Security	0 1	12/16/99 6/19/00			6/02	819
IS-001-01	Product Lifecycle	3	3/29/01			3/03	IS832
IS-002-01	AIMS System Management	2	3/28/01			3/03	IS833
IS-003-01	Workstation Rebooting and Powering off Procedures	3	3/27/01			4/03	IS834
IS-004-01	Logging out and Turning off Computer Equipment	3	3/27/01			4/03	IS835
IS-005-01	Virus Detection and Removal Procedures	3	3/27/01			4/03	IS836
IS-006-01	Data Backup Procedures	3	3/27/01			4/03	IS839
IS-007-01	Equipment Sign out Procedures	3	3/27/01			3/03	IS837
IS-008-01	Disaster Recovery Procedures	2 3	4/17/00 3/27/01			4/03	IS840
IS-009-01	Unauthorized Computer Configuration Changes	3	3/27/01			3/03	IS838
IS-010-01	Computer User Responsibilities	1 2	1/28/99 3/27/01			3/03	IS192
IS-011-01	Network Security	2 3	1/15/99 3/27/01			3/03	IS841
AIS-MARRS-12	Marrs Archive Process	0 1	7/7/00 4/5/01			4/03	IS842

Total number of SOPs =
SOPs that need review in 2002 =
SOPS that need NELAP format =

% of our SOPs are complete
% of our SOPs need review

APPENDIX E

METHOD INDEX

SEVERN TRENT LABORATORIES, INC. - BUFFALO FACILITY
10 HAZELWOOD DRIVE
AMHERST, NEW YORK 14228-2298

ORGANIC ANALYSES - METHOD INDEX

PARAMETER/SAMPLE TYPE	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
GC/MS SEMIVOLATILES				
SVOA - Water	8270C	SW846, 3rd Edition	7 Days from Sample Date	(2) 1 Liter Amber Glass/Cool to 4°C (10% $Na_2S_2O_3$ [1])
SVOA - Soil	8270C	SW846, 3rd Edition	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
SVOA - Water	625	40 CFR 136	7 Days from Sample Date	(2) 1 Liter Amber Glass/Cool to 4°C[2] (10% $Na_2S_2O_3$ [1])
SVOA - Water	525.2	EPA 500 Series	7 Days from Sample Date	(2) 1 Liter Amber Glass/Cool to 4°C (10% $Na_2S_2O_3$ [1])
SVOA - Water	SVOA	OLM04.2 OLM03.2 ASP2000	5 Days VTSR	(2) 1 Liter Amber Glass/Cool to 4°C
SVOA - Soil	SVOA	OLM04.2 OLM03.2 ASP2000	10 Days VTSR	(1) 4 oz. Glass/Cool to 4°C
SVOA - Water	SVOA Low Level	OLC02.1 (3/95) ASP2000	5 Days VTSR	(2) 1 Liter Amber Glass/Cool to 4°C (10% $Na_2S_2O_3$ [1])
SVOA - Water	8270C	ASP2000	5 Days VTSR	(2) 1 Liter Amber Glass/Cool to 4°C
SVOA – Soil	8270C	ASP2000	10 Days VTSR	(1) 4 oz. Glass/Cool to 4°C

[1] Addition of $Na_2S_2O_3$ in presence of Free (Total Residual) Chlorine only
[2] Sample Control to verify that extraction will be completed within 72 hours of collection. If not, Sample Control is to ensure pH range of 5-9 (adjust if necessary)

ORGANIC ANALYSES - METHOD INDEX

PARAMETER/SAMPLE TYPE	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
SVOA - Water	625	ASP2000	5 Days VTSR	(2) 1 Liter Amber Glass/Cool to 4°C (10% $Na_2S_2O_3$ [1])
SVOA - Water	8270C	AFCEE	7 Days from Sample Date	(2) 1 Liter Amber Glass/Cool to 4°C (10% $Na_2S_2O_3$ [1])
SVOA - Soil	8270C	AFCEE	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
GC/MS VOLATILES				
VOA - Water	8260B	SW846, 3rd Edition	14 Days from Sample Date	(2-4) 40 ml Vials/HCl to pH<2, Cool to 4°C
VOA - Water	8260B	AFCEE	14 Days from Sample Date	(2) 40 ml Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
VOA - Soil	8260B	SW846, 3rd Edition	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
VOA - Soil	8260B	AFCEE	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
VOA - Water	624	40 CFR 136	14 Days from Sample Date	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
VOA - Water	524.2	EPA 500 Series	14 Days from Sample Date	(4) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
VOA - Water	VOA	OLM04.2 OLM03.2 ASP2000	10 Days VTSR	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])

[1] Addition of $Na_2S_2O_3$ in presence of Free (Total Residual) Chlorine only

[2] Sample Control to verify that extraction will be completed within 72 hours of collection. If not, Sample Control is to ensure pH range of 5-9 (adjust if necessary)

ORGANIC ANALYSES - METHOD INDEX

PARAMETER/SAMPLE TYPE	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
VOA - Soil	VOA	OLM04.2 OLM03.2 ASP2000	10 Days VTSR	(1) 4 oz. Glass/Cool to 4°C
VOA - Water	VOA Low Level	OLC02.1 (3/95) ASP2000	10 Days VTSR	(4) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
VOA - Water	8260B	ASP2000	10 Days VTSR	(2-4) 40 ml Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
VOA - Soil	8260B	ASP2000	10 Days VTSR	(1) 4 oz. Glass/Cool to 4°C
VOA - Water	624	ASP2000	10 Days VTSR	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
GC EXTRACTABLES				
Organochlorine Pest - Water	8081A	SW846, 3rd Edition	7 Days from Sample Date	(2) Liter Amber Glass/Cool to 4°C
PCB – Water	8082	SW846, 3rd Edition	7 Days from Sample Date	(2) Liter Amber Glass/Cool to 4°C
Organochlorine Pest – Water	8081A	AFCEE	7 Days from Sample Date	(2) Liter Amber Glass/Cool to 4°C pH 5-9[2]
PCB - Water	8082	AFCEE	7 Days from Sample Date	(2) Liter Amber Glass/Cool to 4°C pH 5-9[2]
Organochlorine Pest - Soil	8081A	SW846, 3rd Edition	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
PCB – Soil	8082	SW846, 3rd Edition	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C

[1] Addition of $Na_2S_2O_3$ in presence of Free (Total Residual) Chlorine only

[2] Sample Control to verify that extraction will be completed within 72 hours of collection. If not, Sample Control is to ensure pH range of 5-9 (adjust if necessary)

ORGANIC ANALYSES - METHOD INDEX

PARAMETER/SAMPLE TYPE	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Organochlorine Pest - Soil	8081A	AFCEE	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
PCB – Soil	8082	AFCEE	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Organophosphorous Pesticides - Water	8141A	SW846, 3rd Edition AFCEE	7 Days from Sample Date	(1) 1 Liter Amber Glass/Cool to 4°C pH 5-8[2]
Organophosphorous Pesticides - Soil	8141A	SW846, 3rd Edition AFCEE	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Chlorinated Herbicides - Water	8151	SW846, 3rd Edition	7 Days from Sample Date	(2) 1 Liter Amber Glass/Cool to 4°C
Chlorinated Herbicides - Water	8151	AFCEE	7 Days from Sample Date	(2) 1 Liter Amber Glass/Cool to 4°C pH 5-9[2]
Chlorinated Herbicides – Soil	8151	SW846, 3rd Edition	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Total Petroleum Hydrocarbons (DRO) - Water	8015B	SW846, 3rd Edition	7 Days from Sample Date	(1) 1 Liter Amber Glass/H_2SO_4 to pH<2/Cool to 4°C
Total Petroleum Hydrocarbons (DRO) – Soil	8015B	SW846, 3rd Edition	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Total Petroleum Hydrocarbons (DRO) – Water	8015 (Modified)	AFCEE	14 Days from Sample Date	(1) 1 Liter Amber Glass/Cool to 4°C
Total Petroleum Hydrocarbons (DRO) - Soil	8015 (Modified)	AFCEE	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Diesel Range Organics - Water (DRO by API)	8015 (Modified)	API	14 Days from Sample Date	(1) 1 Liter Amber Glass/Cool to 4°C

[1] Addition of $Na_2S_2O_3$ in presence of Free (Total Residual) Chlorine only

[2] Sample Control to verify that extraction will be completed within 72 hours of collection. If not, Sample Control is to ensure pH range of 5-9 (adjust if necessary)

ORGANIC ANALYSES - METHOD INDEX

PARAMETER/SAMPLE TYPE	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Diesel Range Organics - Soil (DRO by API)	8015 (Modified)	API	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Organochlorine Pest/PCB - Water	608	40 CFR 136	7 Days from Sample Date	(1) 1 Liter Amber Glass/Cool to 4°C[2]
Chlorinated Pesticides - Water	508	EPA 500 Series	7 Days from Sample Date	(1) 1 Liter Amber Glass/ 80 mg Sodium Thiosulfate (if Residual Chlorine present) then 1 ml of 10 mg/ml Mercuric Acid. Cool to 4°C
Organochlorine Pest/PCB - Water	P/PCB	OLM04.2 OLM03.2 ASP2000	5 Days VTSR	(2) 1 Liter Amber Glass/Cool to 4°C
Organochlorine Pest/PCB - Soil	P/PCB	OLM04.2 OLM03.2 ASP2000	10 Days VTSR	(1) 4 oz. Glass/Cool to 4°C
Organochlorine Pest/PCB - Water	P/PCB Low Level	OLC02.1 (3/95) ASP2000	5 Days VTSR	(2) 1 Liter Amber Glass/Cool to 4°C
Organochlorine Pest - Water	8081A	ASP2000	5 Days VTSR	(2) 1 Liter Amber Glass/Cool to 4°C
PCB - Water	8082	ASP2000	5 Days VTSR	(2) 1 Liter Amber Glass/Cool to 4°C
Organochlorine Pest - Soil	8081A	ASP2000	10 Days VTSR	(1) 4 oz. Glass/Cool to 4°C
PCB – Soil	8082	ASP2000	10 Days VTSR	(1) 4 oz. Glass/Cool to 4°C

[1] Addition of $Na_2S_2O_3$ in presence of Free (Total Residual) Chlorine only

[2] Sample Control to verify that extraction will be completed within 72 hours of collection. If not, Sample Control is to ensure pH range of 5-9 (adjust if necessary)

ORGANIC ANALYSES - METHOD INDEX

PARAMETER/SAMPLE TYPE	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Organochlorine Pest/PCB - Water	608	ASP2000	5 Days VTSR	(1) 1 Liter Amber Glass/Cool to 4°C
Petroleum Products - Water	310-13	NYSDOH	7 Days from Sample Date	(1) 1 Liter Amber Glass/Cool to 4°C
Petroleum Products - Soil	310-13	NYSDOH	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Petroleum Products; Fingerprinting - Water	310-14	NYSDOH	7 Days from Sample Date	(1) 1 Liter Amber Glass/Cool to 4°C
Petroleum Products; Fingerprinting - Soil	310-14	NYSDOH	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
PCBs Transformer Fluids & Waste Oil - Oil	600481045	EPA 600 Series	14 Days from Sample Date	(1) 4 oz. Widemouth Glass/Cool to 4°C
GC VOLATILES				
Non-Halogenated Volatile Organics (Direct injection) - Water	8015B	SW846, 3rd Edition	14 Days from Sample Date	(2) 40 ml VOA Vials/Cool to 4°C
Non-Halogenated Volatile Organics - Soil	8015B	SW846, 3rd Edition	14 Days from Sample Date	(1) 4 oz. Widemouth Glass/Cool to 4°C
Aromatic Volatiles - Water	8021B	SW846, 3rd Edition AFCEE	14 Days from Sample Date	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
Halogenated Volatiles - Water	8021B	SW846, 3rd Edition AFCEE	14 Days from Sample Date	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
Aromatic Volatiles - Soil	8021B	SW846, 3rd Edition AFCEE	14 Days from Sample Date	(2) 4 oz. Widemouth Glass/Cool to 4°C

[1] Addition of $Na_2S_2O_3$ in presence of Free (Total Residual) Chlorine only

[2] Sample Control to verify that extraction will be completed within 72 hours of collection. If not, Sample Control is to ensure pH range of 5-9 (adjust if necessary)

ORGANIC ANALYSES - METHOD INDEX

PARAMETER/SAMPLE TYPE	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Gasoline Range Organics Total Petroleum Hydrocarbons – Water	8015B	SW846, 3rd Edition	14 Days from Sample Date	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C
Gasoline Range Organics Total Petroleum Hydrocarbons – Soil	8015B	SW846, 3rd Edition	14 Days from Sample Date	(1) 4 oz. Widemouth Glass/Cool to 4°C
Gasoline Range Organics - Water	8015 (Modified)	AFCEE	14 Days from Sample Date	(2) 40 ml VOA vials/HCL to pH<2
Gasoline Range Organics - Soil	8015 (Modified)	AFCEE	14 Days from Sample Date	(1) 4 oz. Widemouth Glass/Cool to 4°C
Gasoline Range Organics - Water (GRO by API)	8015 (Modified)	API	14 Days from Sample Date	(2) 40 ml VOA vials/HCL to pH<2
Gasoline Range Organics - Soil (GRO by API)	8015 (Modified)	API	14 Days from Sample Date	(1) 4 oz. Widemouth Glass/Cool to 4°C
Purgeable Halocarbons – Water	601	40 CFR 136	14 Days from Sample Date	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
Purgeable Aromatics – Water	602	40 CFR 136	14 Days from Sample Date	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
Purgeable Volatiles - Water	502.2	EPA 500 Series	14 Days from Sample Date	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
Microextractables - Water (1,2 DBE & 1,2 DB-3-CP)	504	EPA 500 Series	28 Days from Sample Date	(2) 40 ml VOA Vials/ 3 mg Sodium Thiosulfate (if Residual Chlorine is present) HCl to pH<2, Cool to 4°C

[1] Addition of $Na_2S_2O_3$ in presence of Free (Total Residual) Chlorine only

[2] Sample Control to verify that extraction will be completed within 72 hours of collection. If not, Sample Control is to ensure pH range of 5-9 (adjust if necessary)

ORGANIC ANALYSES - METHOD INDEX

PARAMETER/SAMPLE TYPE	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Aromatic & Halogenated Volatiles – Water	8021B	ASP2000	10 Days VTSR	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C (10% $Na_2S_2O_3$ [1])
Aromatic & Halogenated Volatiles - Soil	8021B	ASP2000	10 Days VTSR	(1) 4 oz. Widemouth Glass/Cool to 4°C
Purgeable Halocarbons - Water	601	ASP2000	10 Days VTSR	(2) 40 ml VOA Vials/HCl to pH<2, Cool to 4°C
Purgeable Aromatics - Water	602	ASP2000	10 Days VTSR	(1) 4 oz. Widemouth Glass/Cool to 4°C
Separatory Funnel Liquid-Liquid Extraction - Water	3510C	SW846, 3rd Edition ASP2000	N/A	N/A
Continuous Liquid-Liquid Extraction - Water	3520C	SW846, 3rd Edition ASP2000	N/A	N/A
Ultrasonic Extraction - Soil	3550B	SW846, 3rd Edition ASP2000	N/A	N/A
Waste Dilution - Waste	3580A	SW846, 3rd Edition ASP2000	N/A	N/A
Florisil Column Cleanup (Micro) Water & Soil	3620A/B	SW846, 3rd Edition ASP 2000	N/A	N/A
Gel Permeation Cleanup - Soil	3640A	SW846, 3rd Edition ASP2000	N/A	N/A
Sulfur Cleanup - Water & Soil	3660B	SW846, 3rd Edition ASP2000	N/A	N/A

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[2] Sample Control to verify that extraction will be completed within 72 hours of collection. If not, Sample Control is to ensure pH range of 5-9 (adjust if necessary)

ORGANIC ANALYSES - METHOD INDEX

PARAMETER/SAMPLE TYPE	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Purge and Trap - Water & Soil	5030A/B	SW846, 3rd Edition ASP2000	N/A	N/A
Closed System Purge and Trap - Water	5035	SW846, 3rd Edition ASP2000	Extrude and freeze within 48 hours; analyze within 12 days of sampling	Low: (2) 40 ml tared vials containing 1 g Sodium bisulfate, 5 ml H_2O and stir rod High: (2) 40 ml tared vials with 10 ml Methanol Or (3) EnCore sample devices and (1) 4 oz. glass widemouth

* Please note: For environmental analyses\water, SPDES, according to New York State ELAP, Purgeable Aromatics (Methods 602 & 624) can be non-preserved with a holding time of 7 days from sample date. This only applies to New York State water samples – SPDES. For environmental analyses/water – NPDES, according to USEPA Region I, Purgeable Aromatics (Methods 602 and 624) can be run preserved with a holding time of 7 days from sample date. This only applies to EPA Region I – NPDES. It is recommended by STL that all VOA samples be preserved in the field according to the proper techniques as specified by the particular method.

[1] Addition of $Na_2S_2O_3$ in presence of Free (Total Residual) Chlorine only

[2] Sample Control to verify that extraction will be completed within 72 hours of collection. If not, Sample Control is to ensure pH range of 5-9 (adjust if necessary)

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WET CHEMISTRY ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Acidity, Titrimetric - Water	305.1	40 CFR 136	14 Days from Sample date	(1) 4 oz. Plastic with zero headspace/ Cool to 4°C
Acidity, Titrimetric - Water	305.1	ASP2000	12 Days VTSR	(1) 4 oz. Plastic with zero headspace/ Cool to 4°C
Alkalinity, Total (Titrimetric) - Water	310.1	40CFR136 AFCEE	14 Days from Sample Date	(1) 4 oz. Plastic with zero headspace/ Cool to 4°C
	403	SM 18th Edition		
Alkalinity, Total (Titrimetric) – Water	310.1	ASP2000	12 Days VTSR	(1) 4 oz. Plastic with zero headspace/ Cool to 4°C
Alkalinity, Total (Automated)	310.2	40CFR136 AFCEE	14 days from Sample Date	(1) 4 oz. Plastic with zero headspace/ Cool to 4°C
		ASP2000	12 days VTSR	
Alkalinity, Bicarbonate - Water	403	SM 18th Edition	14 Days from Sample Date	(1) 4 oz. Plastic with zero headspace/ Cool to 4°C
	310.1	40CFR		
Alkalinity, Carbonate - Water	403	SM 18th Edition	14 Days from Sample Date	(1) 4 oz. Plastic with zero headspace/ Cool to 4°C
	310.1	40CFR		

WET CHEMISTRY ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP#	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Ash Content - Water	D-482-80	ASTM	N/A	(1) 4 oz. Plastic/Cool to 4°C
Ash Content - Soil	D-482-80	ASTM	N/A	(1) 4 oz. Glass Widemouth/Cool to 4°C
Biochemical Oxygen Demand (BOD 5) - Water	405.1	40 CFR 136	48 Hours from Sample Date	(1) 16 oz. Plastic/Cool to 4°C
Biochemical Oxygen Demand (BOD 5) - Water	405.1	ASP2000	24 Hours VTSR	(1) 16 oz. Plastic/Cool to 4°C
Carbonaceous Biochemical Oxygen Demand - Water	405.1	40 CFR 136	48 Hours from Sample Date	(1) 16 oz. Plastic/Cool to 4°C
Carbonaceous Biochemical Oxygen Demand - Water	405.1	ASP2000	24 Hours VTSR	(1) 16 oz. Plastic/Cool to 4°C
Bromide (IC) - Water	300.0	40CFR	28 days from Sample Date	(1) 4 oz. Plastic/Cool to 4°C
		ASP2000	26 days VTSR	
Bromide (Titrimetric) - Water	320.1	40 CFR 136	28 Days from Sample Date	(1) 16 oz. Plastic/Cool to 4°C
Bromide (Titrimetric) - Water	320.1	ASP2000	26 Days VTSR	(1) 16 oz. Plastic/Cool to 4°C
Chemical Oxygen Demand - COD	410.4	40 CFR 136	28 Days from Sample Date	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Chemical Oxygen Demand - COD	410.4	ASP2000	26 Days VTSR	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Chloride (Colorimetric, Ferri-cyanide AAII Automated) - Water	300.0	40 CFR 136	28 Days from Sample Date	(1) 4 oz. Plastic/Cool to 4°C
	325.2			
	9251	SW846, 3rd Edition		

WET CHEMISTRY ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Chlorine, Total Residual - Water	330.4	40 CFR 136	24 Hrs. from Sample Date	(1) 8 oz. Plastic/Cool to 4°C
Chlorine Demand - Water	2350B	Standard Methods, 18th Edition	14 days from Sample Date	(1) 8 oz. Plastic/Cool to 4°C
Chlorine, Total Organic - Water	D-808-81	ASTM	N/A	(1) 4 oz. Plastic/Cool to 4°C
Chlorine, Total Organic - Soil	D-808-81	ASTM	N/A	(1) 4 oz. Widemouth Glass/ Cool to 4°C
Chlorine, Percent - Water	D-1253-87	ASTM	N/A	(1) 4 oz. Plastic/Cool to 4°C
Chlorine, Percent - Soil	D-1253-87	ASTM	N/A	(1) 4 oz. Widemouth Glass/Cool to 4°C
Color (Colorimetric, Platinum, Cobalt) - Water	110.2	40 CFR 136	48 Hours from Sample Date	(1) 8 oz. Widemouth Glass/Cool to 4°C
Color (Colorimetric, Platinum, Cobalt) - Water	110.2	ASP2000	24 Hours VTSR	(1) 8 oz. Widemouth Glass/Cool to 4°C
Combustion, Heat of (Bomb) - Water	D-240-76	ASTM	N/A	(1) 4 oz. Plastic
Combustion, Heat of (Bomb) - Soil	D-240-76	ASTM	N/A	(1) 4 oz. Glass
Conductance, Specific (25°C) - Water	120.1	CFR 136	28 Days from Sample Date	(1) 4 oz. Plastic/Cool to 4°C
	9050A	SW846, 3rd Edition		
Conductance, Specific (25°C) - Water	120.1	ASP2000	26 Days VTSR	(1) 4 oz. Plastic/Cool to 4°C
	9050A			
Conductance	9050A	AFCEE	Analyze Immediately	(1) 4 oz. Plastic

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PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Cyanide, Amenable - Water	335.1	40 CFR 136	14 Days from Sample Date	(1) 16 oz. Plastic/Sodium Hydroxide to pH>12, Cool to 4°C
	9010B 9012A	SW846, 3rd Edition/AFCEE		
Cyanide, Amenable - Water	335.1	ASP2000	12 Days VTSR	(1) 16 oz. Plastic/Sodium Hydroxide to pH>12, Cool to 4°C
	9010B 9012A			
Cyanide, Total - Water	335.2 335.4	40 CFR 136	14 Days from Sample Date	(1) 16 oz. Plastic/Sodium Hydroxide to pH>12, Cool to 4°C
	9010B 9012A	SW846, 3rd Edition/AFCEE		
Cyanide, Total - Water	CLP-WC	ASP2000 ILM04.1/5.2	12 Days VTSR	(1) 16 oz. Plastic/Sodium Hydroxide to pH>12, Cool to 4°C
	335.2			
	335.4			
	9010B/9012A			
Cyanide, Total - Soil	9010B 9012A	SW846, 3rd Edition AFCEE	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Cyanide, Total - Soil	CLP-WC	ASP2000	12 Days VTSR	(1) 4 oz. Glass/Cool to 4°C
		ILM04.1/5.2		
Density – Water	D-1298-80	ASTM	N/A	(1) 4 oz. Plastic

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PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Dissolved Oxygen - Water	360.1	40 CFR 136	Immediate	(1) 4 oz. Plastic/Cool to 4°C
Dissolved Oxygen	360.1	AFCEE	Analyze immediately	N/A
Dry Weight – Soil	D2216-19	ASTM	N/A	(1) 4 oz. Glass
EP Toxicity Extraction Procedure (Pesticides, Herbicides & Metals) - Soil	1310	SW846, 3rd Edition	14 Days from Sample Date	(1) 16 oz. Glass/Cool to 4°C
Ferrous Iron - Water	3500D	SM18	24 Hours from Sample Date	(1) 8 oz. Plastic/Cool to 4°C
Flashpoint - Water	1010	SW846, 3rd Edition	N/A	(1) 4 oz. Glass
		ASP2000		
Flashpoint - Soil	1010 1030	SW846, 3rd Edition	N/A	(1) 4 oz. Glass
		ASP2000		
Fluoride - Water	300.0 340.2	40 CFR 136	28 Days from Sample Date	(1) 4 oz. Plastic/Cool to 4°C
Fluoride - Water	300.0 340.2	ASP2000	26 Days VTSR	(1) 4 oz. Plastic/Cool to 4°C
Gravity, Specific - Water	D-1429-87	ASTM	N/A	(1) 4 oz. Plastic
Hardness, Total as $CaCO_3$ - Water	130.2	40 CFR 136	6 Mos. from Sample Date	(1) 4 oz. Plastic/Nitric Acid to pH<2
		ASP2000		
Methylene Blue Active Substances - Surfactants (Colorimetric) - Water	425.1	40CFR136	48 Hours from Sample Date	(1) 16 oz. Plastic/Cool to 4°C

WET CHEMISTRY ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Methylene Blue Active Substances (Colorimetric) - Water	425.1	ASP2000	24 Hours VTSR	(1) 16 oz. Plastic/Cool to 4°C
Moisture Content, Total - Soil	D2216-90	ASTM	N/A	(1) 4 oz. Glass
Nitrate – Water or Nitrite - Water	300.0	40 CFR 136	48 Hrs. from Sample Date	(1) 4 oz. Plastic/Cool to 4°C
	353.2			
Nitrate - Water or Nitrite - Water	300.0	ASP2000	24 Hours VTSR	(1) 4 oz. Plastic/Cool to 4°C
	353.2			
Nitrate-Nitrite - Water	353.2	40 CFR 136	28 Days from Sample Date	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Nitrate-Nitrite - Water	353.2	ASP2000	26 Days VTSR	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Nitrogen-Nitrate Nitrite	353.2	AFCEE	28 Days from Sample Date	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Nitrogen, Ammonia - Water	350.1	40 CFR 136	28 Days from Sample Date	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Nitrogen, Ammonia - Water	350.1	ASP2000	26 Days VTSR	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Nitrogen, Total Kjeldahl - Water	351.2	40 CFR 136	28 Days from Sample Date	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Nitrogen, Total Kjeldahl - Water	351.2	ASP2000	26 Days VTSR	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C

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PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Odor - Water	140.1	40 CFR 136	24 Hrs. from Sample Date	(1) 16 oz. Glass/Cool to 4°C
		ASP2000		
Oil and Grease, Total Recoverable - Water	413.1 1664A (HEM)	40 CFR 136	28 Days from Sample Date	(1) 1 Liter Glass/Sulfuric Acid to pH<2, Cool to 4°C
Oil and Grease, Total Recoverable - Water	413.1 1664A (HEM)	ASP2000	26 Days VTSR	(1) 1 Liter Glass/Sulfuric Acid to pH<2, Cool to 4°C
Oil and Grease, Total Recoverable - Water	(9070) 1664A (HEM)	SW846, 3rd Edition	28 Days from Sample Date	(1) 1 Liter Glass/Sulfuric Acid to pH<2, Cool to 4°C
Oil and Grease, Total Recoverable - Water	(9070) 1664A (HEM)	ASP2000	26 Days VTSR	(1) 1 Liter Glass/Sulfuric Acid to pH<2, Cool to 4°C
Oil and Grease, Total Recoverable - Soil	9071/9070	SW846, 3rd Edition	28 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Oil and Grease, Total Recoverable – Soil	9071/9070	ASP2000	26 Days VTSR	(1) 4 oz. Glass/Cool to 4°C
Organic Carbon, Total - Water	415.1	40 CFR 136	28 Days from Sample Date	(2) 40 ml Vial/HCL to pH<2, Cool to 4°C
	9060	SW846, 3rd Edition/AFCEE		
Organic Carbon, Total - Water	415.1	ASP2000	26 Days VTSR	(2) 40 ml Vial/HCL to pH<2, Cool to 4°C
	9060			

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PARAMETER/ SAMPLE TYPE/SOP#	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Organic Nitrogen, Total - Water	TKN-NH_3 351.2–350.1	40 CFR 136	28 Days from Sample Date	(1) 8 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Oxidizer Spot Test - Soil	Sect 7.1	SW846, 3rd Edition	N/A	(1) 4 oz. Glass
Paint Filter Test - Soil	9095A	SW846, 3rd Edition	N/A	(1) 4 oz. Glass
Petroleum Hydrocarbons, Total Recoverable - Water	418.1 1664A (SGT)	40 CFR 136	28 Days from Sample Date	(1) 1 Liter Glass/Sulfuric Acid to pH<2, Cool to 4°C
Petroleum Hydrocarbons, Total Recoverable - Water	418.1 1664A (SGT)	ASP2000	26 Days VTSR	(1) 1 Liter Glass/Sulfuric Acid to pH<2, Cool to 4°C
Petroleum Hydrocarbons, Total Recoverable - Soil	418.1	40 CFR 136	28 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Petroleum Hydrocarbons, Total Recoverable - Soil	418.1	ASP2000	26 Days VTSR	(1) 4 oz. Glass/Cool to 4°C
pH - Water	150.1	40 CFR 136	24 Hrs. from Sample Date	(1) 4 oz. Plastic/Cool to 4°C
	9040A/B	SW846, 3rd Edition		
pH - Water	150.1	ASP2000	24 Hours VTSR	(1) 4 oz. Plastic/Cool to 4°C
	9040B			
pH - Soil	9045C	SW846, 3rd Edition	14 Days from Sample Date	(1) 4 oz. Glass/Cool to 4°C
pH - Soil	9045C	ASP2000	14 Days VTSR	(1) 4 oz. Glass/Cool to 4°C
pH - Hydrogen Ion Water/Soil	9040B 9045C	AFCEE	Analyze immediately	N/A
Phenolics, Total Recoverable - Water	420.2	ASP2000	26 Days VTSR	(1) 4 oz. Glass Wide/Sulfuric Acid to pH<2, Cool to 4°C
	9066			

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PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Phenolics, Total Recoverable - Water	420.2	40 CFR 136	26 Days VTSR	(1) 4 oz. Glass Wide/Sulfuric Acid to pH<2, Cool to 4°C
	9066	SW846, 3rd Edition		
Phosphate, Ortho - Water	365.2	40 CFR 136	48 Hours from Sample Time	(1) 4 oz. Glass/Sulfuric Acid to pH<2, Cool to 4°C
Phosphorus, Total - Water	365.2	40 CFR 136	28 Days from Sample Date	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Phosphorus, Total - Water	365.2	ASP2000	26 Days VTSR	(1) 4 oz. Plastic/Sulfuric Acid to pH<2, Cool to 4°C
Reactivity, Hydrogen Cyanide Released from Waste - Water	Sect 7.3	SW846, 3rd Edition	N/A	(1) 4 oz. Plastic
Reactivity, Hydrogen Cyanide Released from Waste - Soil	Sect 7.3	SW846, 3rd Edition	N/A	(1) 4 oz. Glass
Reactivity, Hydrogen Sulfide Released from Waste - Water	Sect 7.3	SW846, 3rd Edition	N/A	(1) 4 oz. Plastic
Reactivity, Hydrogen Sulfide Released from Waste - Soil	Sect 7.3	SW846, 3rd Edition	N/A	(1) 4 oz. Glass
Redox Potential - Water	D-1498-76	ASTM	N/A	(1) 4 oz. Plastic
Residue, Filterable; TDS - Water	160.1	40 CFR 136/AFCEE	7 Days from Sample Date	(1) 16 oz. Plastic/Cool to 4°C
Residue, Filterable; TDS - Water	160.1	ASP2000	5 Days VTSR	(1) 16 oz. Plastic/Cool to 4°C
Residue, Non-Filterable; TSS - Water	160.2	40 CFR 136/AFCEE	7 Days from Sample Date	(1) 16 oz. Plastic/Cool to 4°C

WET CHEMISTRY ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Residue, Non-Filterable; TSS - Water	160.2	ASP2000	5 Days VTSR	(1) 16 oz. Plastic/Cool to 4°C
Residue, Settleable - Water	160.5	40 CFR 136	48 Hours from Sample Date	(1) 1 Liter Plastic/Cool to 4°C
Residue, Settleable - Water	160.5	ASP2000	24 Hours VTSR	(1) 1 Liter Plastic/Cool to 4°C
Residue, Total	160.3	40 CFR 136	7 Days from Sample Date	(1) 16 oz. Plastic/Cool to 4°C
Residue, Total (Gravimetric, 103-105°C)	160.3	ASP2000	5 Days VTSR	(1) 16 oz. Plastic/Cool to 4°C
Residue, Volatile - Water	160.4	40 CFR 136	7 Days from Sample Date	(1) 16 oz. Plastic/Cool to 4°C
Shake Extraction of Solid Waste with Water - Soil	D3987-85	ASTM	14 Days from Sample Date	(1) 16 oz. Glass/Cool to 4°C
Solids, Fixed - Soil	2540G	SM18	N/A	(1) 4 oz. Glass/Cool to 4°C
Solids, Total - Soil	2540G	SM18	N/A	(1) 4 oz. Glass/Cool to 4°C
Solids, Volatile - Soil	2540G	SM18	N/A	(1) 4 oz. Glass/Cool to 4°C
Sulfate - Water	375.4	40 CFR 136	28 Days from Sample Date	(1) 8 oz. Plastic/Cool to 4°C
	9038	SW846, 3rd Edition		
Sulfate - Water	375.4	ASP2000	26 Days VTSR	(1) 8 oz. Plastic/Cool to 4°C
	9038			
Sulfate - Water	300.0	40 CFR 136	28 Days from Sample Date	(1) 4 oz. Plastic/Cool to 4°C
		ASP2000	26 Days VTSR	

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PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Sulfide - Water	376.2	40 CFR 136	7 Days from Sample Date	(1) 16 oz. Plastic/Sodium Hydroxide to pH>9, 20 drops of Zinc Acetate/ Cool to 4°C
Sulfide - Water	376.1	ASP2000	5 Days VTSR	(1) 16 oz. Plastic/Sodium Hydroxide to pH>9, 20 drops of Zinc Acetate/ Cool to 4°C
Sulfite - Water	377.1	40 CFR 136	24 Hours from Sample Date	(1) 4 oz. Plastic/Cool to 4°C
Sulfur, Percent - Water	D-4239-85	ASTM	N/A	(1) 4 oz. Plastic
Sulfur, Percent - Soil	D-4239-85	ASTM	N/A	(1) 4 oz. Glass
Synthetic Leaching Procedure - SPLP (VOA) - Water	1312	SW846, 3rd Edition	14 Days from Sample Date	(4) 40 ml VOA Vials/Cool to 4°C
Synthetic Leaching Procedure - SPLP (SVOA, Pest, Herb, Metals) - Water	1312	SW846, 3rd Edition	Org = 14 Days from Sample Date Metals = 180 Days from Sample Date Mercury = 28 Days from Sample Date	(5) 1 Liter Amber Glass/Cool to 4°C
Synthetic Leaching Procedure - SPLP (VOA) - Soil	1312	SW846, 3rd Edition	14 Days from Sample Date	(2) 4 oz. Glass/Cool to 4°C
Synthetic Leaching Procedure – SPLP (SVOA, Pest, Herb, Metals) – Soil	1312	SW846, 3rd Edition	Org = 14 Days from Sample Date Metals = 180 Days from Sample Date Mercury = 28 Days from Sample Date	(1) 32 oz. Glass/Cool to 4°C

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PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
TCLP Extraction Procedure (VOA, SVOA, Pest, Herb, Metals) - Water	1311	SW846, 3rd Edition	Org = 14 Days from Sample Date Metals = 180 Days from Sample Date Mercury = 28 Days from Sample Date	(4) 40 ml VOA Vials & (5) 1 Liter Amber Glass/Cool to 4°C
TCLP Extraction Procedure (VOA) - Water	1311	ASP2000	7 Days VTSR	(2) 40 ml VOA Vials/Cool to 4°C
TCLP Extraction Procedure (SVOA, Pest, Herb, Metals) - Water	1311	ASP2000	Org = 5 Days VTSR Metals = 180 Days VTSR Mercury = 26 Days VTSR	(5) 1 Liter Amber Glass/Cool to 4°C
TCLP Extraction Procedure (VOA, SVOA, Pest, Herb, Metals) - Soil	1311	SW846, 3rd Edition	Org = 14 Days from Sample Date Metals = 180 Days from Sample Date Mercury = 28 Days from Sample Date	(1) 32 oz. Glass & (2) 4 oz. Glass/Cool to 4°C
TCLP Extraction Procedure (VOA) - Soil	1311	ASP2000	7 Days VTSR	(2) 4 oz. Glass/Cool to 4°C
TCLP Extraction Procedure (SVOA, Pest, Herb, Metals) - Soil	1311	ASP2000	Org = 5 Days VTSR Metals = 180 Days VTSR Mercury = 26 Days VTSR	(1) 32 oz. Glass/Cool to 4°C
Turbidity - Water	180.1	40 CFR 136/AFCEE	48 Hours from Sample Date	(1) 8 oz. Plastic/Cool to 4°C
Turbidity (Nephelometric) – Water	180.1	ASP2000	24 Hours VTSR	(1) 8 oz. Plastic/Cool to 4°C

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PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION
Temperature	170.1	40 CFR 136	Analyze Immediately	N/A
		AFCEE		
Viscosity - Water	D2983-25	ASTM	N/A	(1) 4 oz. Glass

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METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Aluminum, Total - Water	200.7 200.8	40 CFR 136	6 Mos. from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Aluminum, Total - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Aluminum, Soluble - Water	200.7 200.8	40 CFR 136	6 Mos. from Sample Date	(1) 8 oz. Plastic/Filter on Site with .45um membrane, Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Aluminum, Soluble - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Filter with .45um membrane, Nitric to pH<2
		ILMO4.1/5.2		
Aluminum, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Aluminum, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

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PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Antimony, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Antimony, Total - Water (GFAA)	204.2	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	7041	SW846, 3rd Edition AFCEE		
Antimony, Total - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Antimony, Soluble - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Filter with .45um membrane, Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Antimony, Soluble - Water (GFAA)	204.2	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Filter with .45um membrane, Nitric to pH<2
	7041	SW846, 3rd Edition AFCEE		
Antimony, Soluble - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Filter with .45um membrane, Nitric to pH<2
		ILMO4.1/5.2		
Antimony, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

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PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Antimony, Total - Soil (GFAA)	7041	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Arsenic, Total - Water (ICP)	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Arsenic, Total - Water (GFAA)	206.2	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	7060/A	SW846, 3rd Edition AFCEE		
Arsenic, Total - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Arsenic, Total - Soil (ICP)	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Arsenic, Total - Soil (GFAA)	7060/A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Arsenic, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Barium, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Barium, Total - Water (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
Barium, Total - Soil (ICP)	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Barium, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
Beryllium, Total - Water)	200.7 200.8 6010B 6020A	40 CFR 136 SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
Beryllium, Total - Water (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
Beryllium, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Beryllium, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
Boron, Total - Water	200.7 200.8 6010B 6020A	40 CFR 136 SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Boron, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Cadmium, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Cadmium, Total - Water	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Cadmium, Total - Soil	6010B 6020A	SW846, 3rd Edition/AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Cadmium, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Calcium, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Calcium, Total - Water	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Calcium, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Calcium, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Chromium, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Chromium, Total - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Chromium, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Chromium, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Chromium, Hexavalent - Water	7196A	SW846, 3rd Edition AFCEE	24 Hours from Sample Date	(1) 4 oz. Plastic/Cool to 4°C
Chromium, Hexavalent - Soil	3060A/ 7196A	SW846, 3rd Edition AFCEE	30 Days Extraction/ 7 Days Analysis	(1) 4 oz. Glass/Cool to 4°C
Cobalt, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Cool to 4°C
	6010B 6020A	SW846, 3rd Edition AFCEE		

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Cobalt, Total - Water (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
Cobalt, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Cobalt, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
Copper, Total - Water	200.7 200.8 6010B 6020A	40 CFR 136 SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
Copper, Total - Water (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
Copper, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Copper, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
Iron, Total - Water	200.7 200.8 6010B 6020A	40 CFR 136 SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Iron, Total - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Iron, Total - Soil	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
	6010B 6020A	SW846, 3rd Edition AFCEE		
Iron, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Nitric to pH<2
		ILMO4.1/5.2		
Lead, Total - Water (ICP)	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Lead, Total - Water (GFAA)	239.2	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	7421	SW846, 3rd Edition AFCEE		
Lead, Total - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Lead, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Lead, Total - Soil (GFAA)	7421	SW846, 3rd Edition AFCEE	6 Months form Sample Date	(1) 4 oz. Glass/Cool to 4°C

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Lead, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Lithium, Total - Water	200.7	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B	SW846, 3rd Edition AFCEE		
Lithium, Total - Soil	200.7	40 CFR 136	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
	6010B	SW846, 3rd Edition AFCEE		
Magnesium, Total - Water	200.7	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B	SW846, 3rd Edition AFCEE		
Magnesium, Total - Water (CLP)	CLP-M	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Magnesium, Total - Soil	6010B	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Magnesium, Total - Soil (CLP)	CLP-M	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Manganese, Total - Water (ICP)	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Manganese, Total - Water (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
Manganese, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Manganese, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
Mercury, Total - Water (CV)	245.2 7470A	40 CFR 136 SW846, 3rd Edition AFCEE	28 Days from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
Mercury, Total - Water (CLP)	CLP-M	ASP2000 ILMO4.1/5.2	26 Days from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
Mercury, Total - Soil (CV)	7471A	SW846, 3rd Edition AFCEE	28 Days from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
Mercury, Total - Soil (CLP)	CLP-M	ASP2000 ILMO4.1/5.2	26 Days from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
Molybdenum, Total - Water	200.7 200.8 246.1 6010B 6020A 7480	40 CFR 136 SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Molybdenum, Total – Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Nickel, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Nickel, Total - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Nickel, Total - Soil (ICP)	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Nickel, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Potassium, Total - Water	200.7	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B	SW846, 3rd Edition AFCEE		
Potassium, Total - Water (CLP)	CLP-M	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH<2
		ILMO4.1/5.2		
Potassium, Total – Soil	6010B	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Potassium, Total - Soil (CLP)	CLP-M	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Selenium, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Selenium, Total - Water (GFAA)	270.2	40CFR136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH <2
	7740	SW846, 3rd Edition AFCEE		
Selenium, Total - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Selenium, Total – Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool 4°C
Selenium, Total – Soil (GFAA)	7740	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool 4°C
Selenium, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Silver, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH <2
	6010B 6020A	SW846, 3rd Edition AFCEE		

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Silver, Total - Water (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH <2
Silver, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Silver, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
Sodium, Total - Water (ICP)	200.7 6010B	40 CFR 136 SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH <2
Sodium, Total - Water (CLP)	CLP-M	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH <2
Sodium, Total - Soil	6010B	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Sodium, Total - Soil (CLP)	CLP-M	ASP2000 ILMO4.1/5.2	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
Strontium, Total – Water	200.7 6010B	40 CFR 136 SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Plastic/Nitric to pH <2

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Strontium, Total - Soil	200.7 6010B	40 CFR 136 SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz Glass/Cool to 4°C
Thallium, Total – Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH<2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Thallium, Total – Water (GFAA)	279.2	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH <2
	7841	SW846, 3rd Edition AFCEE		
Thallium, Total – Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH <2
		ILMO4.1/5.2		
Thallium, Total - Soil (ICP)	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Thallium, Total - Soil (GFAA)	7841	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(4 oz. Glass/Cool to 4°C
Thallium, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Tin, Total - Water	200.7	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH <2
	6010B	SW846, 3rd Edition AFCEE		

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Tin, Total – Soil	6010B	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. glass/Cool to 4°C
Titanium, Total – Water	200.7 6010B	40 CFR 136 SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH 2
Vanadium, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic/Nitric to pH <2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Vanadium, Total - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH <2
		ILMO4.1/5.2		
Vanadium, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Vanadium, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		
Zinc, Total - Water	200.7 200.8	40 CFR 136	6 Months from Sample Date	(1) 8 oz. Plastic Nitric to pH <2
	6010B 6020A	SW846, 3rd Edition AFCEE		
Zinc, Total - Water (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 8 oz. Plastic/Nitric to pH <2
		ILMO4.1/5.2		

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

METALS ANALYSES - METHOD INDEX

PARAMETER/ SAMPLE TYPE/SOP #	METHOD	PROTOCOL	HOLDING TIME	CONTAINER & PRESERVATION*
Zinc, Total - Soil	6010B 6020A	SW846, 3rd Edition AFCEE	6 Months from Sample Date	(1) 4 oz. Glass/Cool to 4°C
Zinc, Total - Soil (CLP)	CLP-M CLP-MS	ASP2000	6 Mos. from Sample Receipt	(1) 4 oz. Glass/Cool to 4°C
		ILMO4.1/5.2		

ICP = Inductively Coupled Argon Plasma Emission Spectrometer
GFAA = Graphite Furnace Atomic Absorption

* Minimum volume of 16 oz. when multiple methods/multiple analysts required for water samples.

ATTACHMENT C

X-RAY FLUORESCENCE PROCEDURES (XRF)

NITON

NITON Corporation

XL-309

&

*700*series

User's Guide Version 5.0 (HTML) Chapter 3

3: Analyzing bulk samples

Overview

The NITON XL-309 may be used to test lead in soil and ground-up paint chips if equipped with optional Lead In Soil Analysis software and hardware. 702, 702-A, 703 and 703-A Model Spectrum Analyzers are multi-element analyzers for bulk media, thick samples of materials such as soil, sludge, and various liquids. Applications include:

- in-situ soil testing,
- in-situ materials testing (e.g., contaminated concrete)
- bagged soil sample testing
- testing sludge, sediments, liquids, and dust in cups,
- testing prepared soil samples.

Choose the Bulk Sample mode from the Setup screen (Figure 3.01).

Note: Before testing in Bulk Sample mode, turn your NITON on at least 15 minutes prior to testing. This will give you more precise measurements.

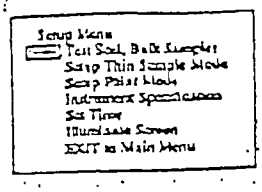


Fig. 3.01 Setup Menu
Test Soil, Bulk Samples

In general, testing methods for bulk media are of two types: Field screening and testing prepared samples. Understanding the difference between these two types of analysis is crucial to getting good data.

Field screening should be used to profile an area, to locate sources of contamination, to determine the boundaries of contamination, or to gather data that will subsequently be used to design a sampling plan. Field screening is usually only approximate; field screening will correlate very well with lab analysis for a highly-homogeneous sample, but may correlate extremely poorly for a non-homogeneous sample.

Note: For performance evaluation of field XRF results by comparing them to laboratory results (done to justify XRF usage), never use in-situ testing; always gather samples and prepare them before testing.

When comparing field screening to laboratory analysis, try to compare the same samples. For best results, collect a large sample in a zipper locking storage bag. Shake the bag to mix the sample. Test the bagged sample several times using the NITON and average the readings. Then compare this average reading with lab results.

If you must test in-situ for performance evaluation, take several XRF readings bracketing a spot. Then take a sample for laboratory testing from that spot. For further discussion of field screening, see EPA Method 6200, "Field Screening Using a Field-Portable XRF." Contact NITON for a copy. The EPA accepts field screening using the NITON if the screening is performed using Method 6200. Most states accept EPA Method 6200.

The measurement screen

On NITON XL-309s with optional Lead in Soil Analysis, *only* lead is displayed in bulk sample testing. On 700 models, only the two highest-concentration elements are displayed (in ppm, with the two-sigma confidence intervals) on the first Measurement screen (Figure 3.02a), with the x-ray spectrum. The black bars on the spectrum display highlight the presence or absence of lead or iron in the sample. The test time is also displayed in nominal (source) seconds.

The summary screen

When you end a reading, the Measurement Screen is replaced by the Summary Screen (Figure 3.02b). On 700 models, results are displayed for 14 elements. The elements are divided into two groups: elements that were detected in the sample, and elements that were not detected. Press the Arrow buttons to scroll through the elements.

Detection Limit: For an element to be detected by the NITON in a given sample, the measured concentration of the sample must be at least three times the standard deviation of the measurement. This detection limit will depend on the composition of the sample.

Precision: The measurement precision for each element displayed appears to the right of the measured concentration, under the heading "+-". The precision of each measurment is two times the standard deviation (sigma). An element is classified detected if the measured concentration (in ppm) is at least 1.5 times the precision.

Detected elements are displayed as in the Measurement screen. Non-detected elements are shown as < xx, where xx is the detection limit for that sample. The detection limit for each element is calculated from each sample.

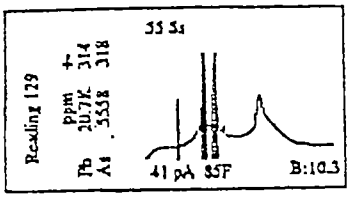


Fig. 3.02a Measurement Screen
Bulk Mode. In-progress screen.

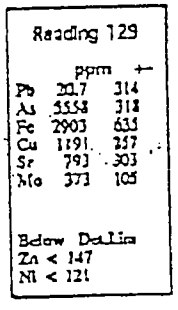


Fig. 3.02b Bulk Mode Summary Screen

In-situ surveys

Before you take your first measurement, you must decide whether to test the bulk material

- in-situ (in-place),
- as bagged samples (or, for liquids and sludge, in cups) with a minimum of preparation, or
- in an XRF cup after careful preparation.

Note: More sample preparation (drying, milling and sieving) will yield greater accuracy. The drier, finer, and more homogeneous the particles, the better the measurements.

If you are primarily interested in determining whether an element is present (rather than in accurately measuring how much is present), direct measurement is the quickest, simplest way to proceed. Even if you intend to take samples, preliminary direct measurements will help you to survey the site. The analysis of bagged samples is another screening technique.

The NITON test guard

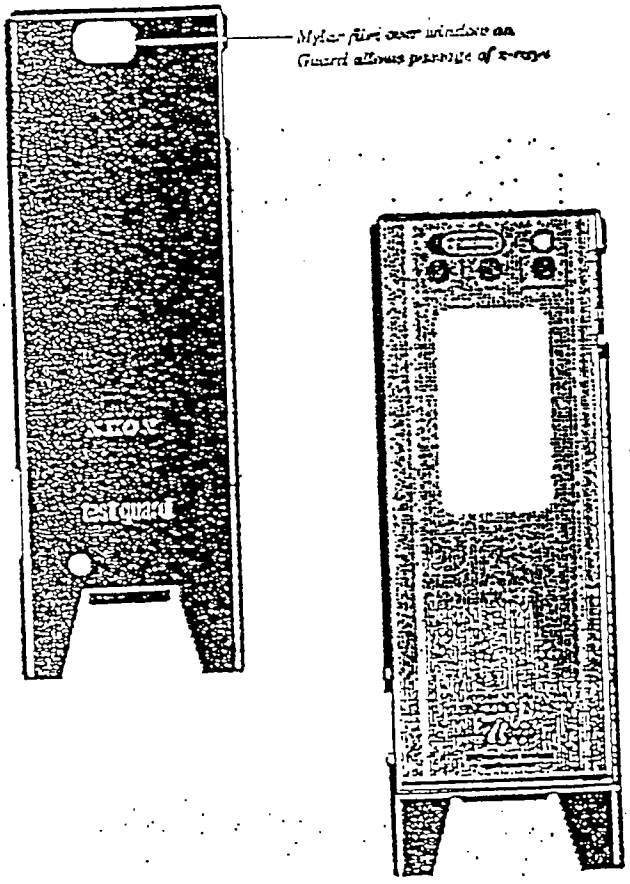


Fig. 3.03
The NITON
Test Guard

The NITON Test Guard (Figure 3.03) is a formed metal plate designed to be placed directly between the ground or other bulk media and the NITON. Use the Test Guard for surveys of bulk media *in-situ* or for testing bulk samples in bags. The Test Guard shields the unit from contamination and damage.

Testing in-situ

Warning: When taking samples from a site where toxic chemicals may be present, always use gloves and respiration equipment for your own protection.

1. Select a measurement site. Lead-in-soil from paint, for instance, will be concentrated within a few feet of the painted structure. Valid results will depend on a sufficient and appropriate selection of sites to sample.

2. Clear any surface debris or vegetation. Use a flat area so that the NITON will contact the test medium. The finer and more homogeneous the material, the more accurate the measurement. (You can increase your accuracy when testing soil by loosening the soil and letting it dry in the sun before testing.)

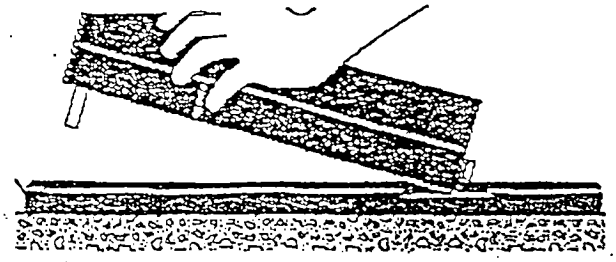


Fig. 3.04a
Place your NITON on the Test Guard.

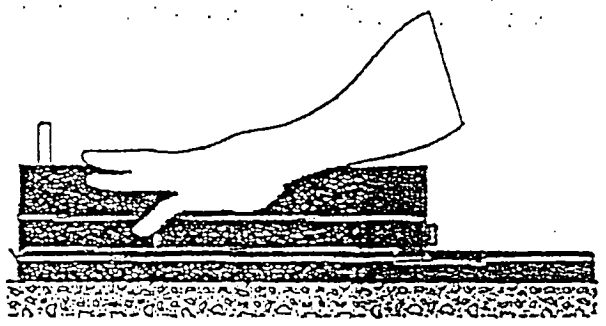


Fig. 3.04b
Firmly press your NITON flat against the surface.

3. Place the test guard on ground. Keep the top of the test guard clean.

4. Hold the NITON in one hand.

Warning: Always treat radiation with respect. Do not put your hand on the end plate of the NITON while measuring. Never point the NITON at yourself or anyone else when the shutter is open.

5. Push the safety slide (that locks the shutter release) out from under the shutter release. If the slide is still tucked in, you cannot press in the release nor will the instrument fit on the test guard correctly.

6. Place the NITON on the test guard so that the rectangular opening on the test guard is under the window of the NITON, squeeze the shutter release, and firmly press the instrument flat against the surface of the test guard (Figure 3.04 a,b). If you don't squeeze the shutter release, the plunger will not depress. If the plunger is not fully depressed, the window is not fully open and the NITON cannot measure accurately. The back of the unit must be flush with the test guard.

Note: During the measurement, you do not need to squeeze the shutter release continuously. Hold the NITON firmly against the test guard surface and it will continue to read. Once you lift the instrument, the plunger will back out the bottom, the shutter will close, and the test will be finished.

7. Watch for indications to decide when the test has reached the desired level of accuracy. A typical screening test will last 20-30 source seconds.

Warning: In the unlikely event that the plunger gets stuck in the open position, simply push it closed. Then call the NITON Service Department at (401) 294-1234.

In-situ depth profiling

An XRF soil test examines only the top millimeter or so of soil. To do depth profiling, simply remove a vertical slice of soil and test several samples from different depths. Doing so rapidly yields information about the depth of contamination.

Analysis of bagged bulk samples

Sometimes it is convenient to collect samples in plastic bags. Without further preparation of the sample, you can screen the site by testing each bag. Because you are testing through a bag, test results will tend to be 5-10% lower than test results obtained from direct analysis.

Taking bagged samples

1. Before sampling a site, size it up for differences in soil characteristics. Valid results depend on a sufficient and appropriate selection of sites to sample. Consider the site's topography, texture, drainage, color of topsoil, and past use.

2. Take a composite sample from each predetermined area. Do not combine samples from areas with different compositions or history. A composite sample made up of samplings from two distinctly different areas is not representative of either area.

Mix the sample. If it is too large, reduce the sample. Some techniques for reduction and homogenization are described in the section on analysis of prepared samples.

3. Fill a clean plastic bag with 50-100 grams of soil and close it securely (with a twist tie). The accuracy of your measurements will be limited by the thickness of the plastic in the bag you use. 1 mil-thick Polyethylene bags offer a reasonable compromise between accurate readings and bag durability. Be sure to label each bag with your name and the location of the sample site.

Testing samples in bags

Shape the bag of soil to form a continuous uniform layer of at least 1 cm. (0.4 inch) thickness. Place the NITON test guard on the bag (Figure 3.05). Then follow testing in-situ instructions.

Warning: Do not hold bagged bulk samples in your hand during testing.

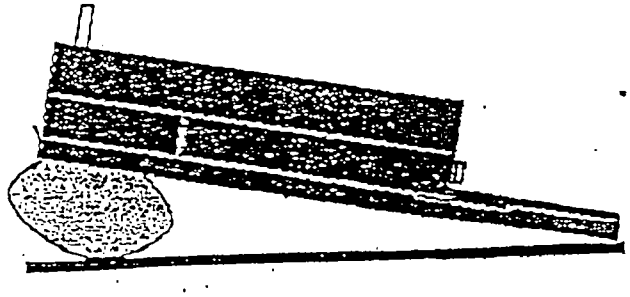


Fig. 3.05
To test a bag of soil, firmly press your NITON plus Test Guard flat against the surface of the bag (which should rest on a firm surface – not on your hand).

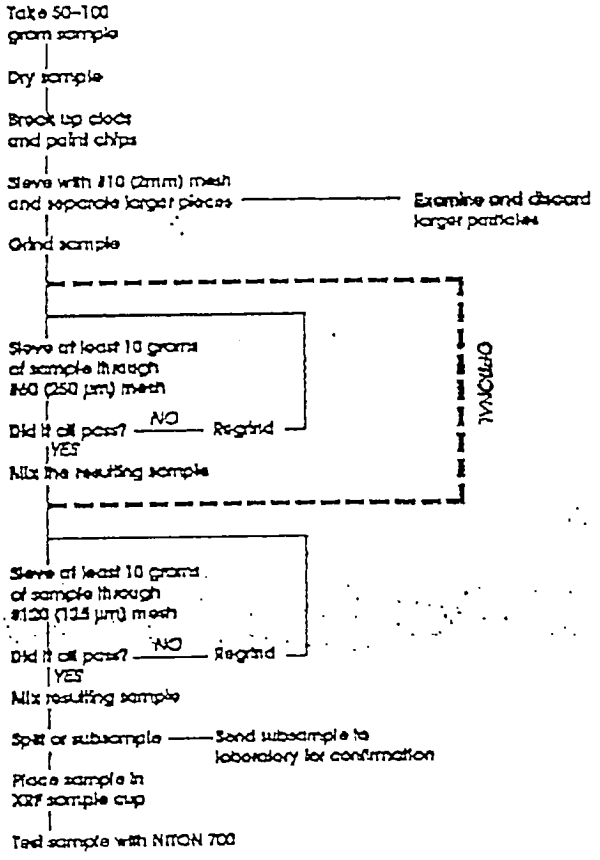
Analysis of prepared bulk samples

Prepared sample analysis is the most accurate method for determining the concentration of elements in a bulk medium using your NITON. Sample preparation will minimize the effects of moisture, large particle size and variations in particle size.

Warning: For your protection, when taking samples from a site where toxic chemicals may be present, always use gloves and respiration equipment.

NITON recommends a specific sample protocol. Following this protocol for preparing and testing samples is vital for achieving a level of accuracy comparable with laboratory results. See Figure 3.06 for a flow chart of the protocol.

Fig. 3.06 Flow chart of sample preparation protocol recommended by NITON.
Use of the #60 mesh sieve is optional.



Taking bulk samples

Note: When testing for lead-in-soil in a residential setting, it is standard practice to sample the top 4 to 6 inches of soil.

The soil probe or sampling tube is a very convenient sampling tool. It not only allows speed but it makes more accurate composite samples than any other tool as it may always be inserted to a marked depth and it removes the same amount of soil at each insertion. There are core sampling devices that remove an intact cylinder of undisturbed material.

A shovel, spade, dibble, narrow (1-1/2 inch) garden trowel, or other sampling tool can do the job. Take a half-inch soil slice. A satisfactory soil auger may be made by welding a 1-1/4 or 1-1/2 inch wood bit into a 1/2 inch pipe equipped with a T-handle.

Take 50-100 gram sample to insure that you have a sample large enough to be representative and unbiased after mixing, grinding, and straining it.

1. Before sampling a site, evaluate it for differences in soil characteristics. Valid results depend on a sufficient and appropriate selection of sites to sample. Test results may be worthless, even highly misleading, unless the samples tested actually represent the area.

Consider topography, texture, drainage, color of topsoil, and past use. Lead, for instance, is usually concentrated near a building with lead paint (within 4-6 feet).

2. If the individual samplings are taken with a spade or trowel, (Figure 3.07) reduce the samples by taking a vertical slice (so it is representative of the entire spadeful) about one inch wide.

Place the reduced samples in a clean pail. Then mix the sample thoroughly by stirring and by rotating the pail at an angle of 45 degrees. Don't shake. (You do not want to stratify the sample by weight).

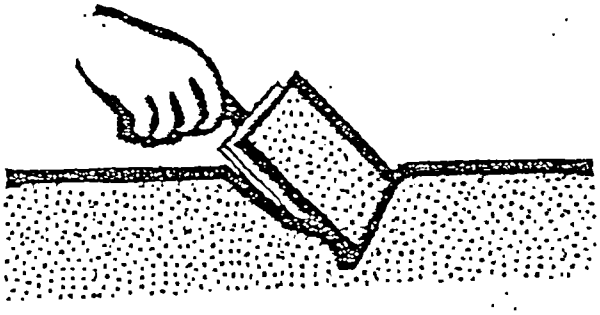


Fig. 3.07
Use a spade, trowel or garden dibble to take a half-inch thick slice of soil.

3. Take a composite sample from each predetermined area. Do not combine samples from areas with different compositions or history. A composite sample made up of samplings from two distinctly different areas is not representative of either area.

From each predetermined area, prepare a composite sample by taking several samplings consisting of vertical columns of material approximately 1 inch in diameter. The length of each column should be about 6 inches. Lead from paint is usually concentrated within the top 1-4 inches. The elements you wish to measure and the local history will determine how deep you need to sample.

Package samples from the following areas separately: samples close to painted structures, close to roads, samples close to where various types of waste have been stored, or near pressure-treated lumber.

4. Fill a clean plastic bag and close it securely (with a twist tie). Be sure to label it with the date, the site and the location where you took the sample

Preparing bulk samples

The equipment you need to prepare samples is included in your kit. Among these are a mortar and pestle (for the XL-309 with lead-in-soil-analysis), an electrically powered grinding mill (included with 700s), and several sized-sieves.

Caution: Keep all test equipment clean to prevent contaminated samples.

The mortar, pestle, and grinding mill may be cleaned with dry paper towels. Water will also clean the mortar, pestle, and the mill's container, but be sure each is absolutely dry before you use them on another sample. The mortar and pestle may be cleansed by grinding clean dry sand in the mortar. Use the short bristle brushes (included in your Bulk Testing Kit) to clean the sieves. When Soil Grinder

blades wear out, unbolt the worn blades and replace.

Cone and quartering

At various times while preparing a sample you may need to divide it. Cone and quartering is a method for splitting the sample into homogenous quarters. Slowly and carefully pour the dry material onto a flat sheet or pan forming a symmetrical cone. Using a flat thin-bladed tool, such as a knife or ruler, divide the cone into equal piles. Divide these in half again. Now you have four samples, each one-quarter the size of the original and each more homogenous than the original.

1. If the sample is moist and cohesive, dry it. To best prepare a sample for presentation to the XRF, the material should be dry and well homogenized. Ideally, the entire sample should be dried to constant weight, sieved to remove gravel and debris, and ground or milled to a fine powder.

The sample can be dried in any of several ways. Choose one of the following: Oven dry the sample for approximately 2 hours at 150° C., until the sample reaches a constant weight; air dry the sample overnight at room temperature in a shallow pan; gently stir and warm the sample in a pan over a hot plate or burner.

Oven drying is inappropriate when volatile compounds may be present in the sample. For example, lead present as tetraethyl lead would be driven off by the heat of drying. Some forms of mercury and arsenic are volatile. Air drying will preserve more of these volatile substances.

2. Grind the sample to break up dirt clods and/or paint chips.

3. Sieve with the #10 (2mm) mesh and separate out the larger pieces (stones, organic matter, metallic objects, etc. Examine the larger particles by eye (look for paint chips), but do not include in the sample.

4. Grind the sample so its particles will be finer and more homogenous. Use mortar and pestle, or an electrically powered grinding mill.

Warning: Grinding-and-sieving dried samples produces dust. Even clean soil contains silica, which may be hazardous when airborne. Prepare all samples in a ventilated area; wear a mask, gloves, and an apron; and spread a drop cloth.

5. Sieve at least 10 grams of the sample through #60 (250 um) and #120 (125 um) mesh. Re-grind the unpassed material until the required fraction is able to pass.

6. Mix the resulting sample.

Putting the sample in an XRF sample cup

The container holding the sample affects the accuracy of the measurement. Use a container with as thin-walled a window as is convenient and use the same kind of container and window for each sample. Consistency and careful attention to detail are keys to accurate measurement.

Note: The sample container should be a sample cup of a type that can be filled from the rear; that is, the side opposite the window (e.g. Chemplex #1330). NITON recommends using a 1/4 mil mylar film window (Figure 3.08). A supply of cups and windows are included.

1. Place a circle of mylar film on top of an XRF sample cup. The window goes on the end of the cup with the indented ring. Note that the window may be prepared ahead of time.

2. Secure the film with the collar. The flange inside the collar faces down and snaps into the indented ring of the cup. Inspect the installed film window for continuity and smooth, taut appearance.

3. Set the cup, window-side down, on a flat surface. Fill it with at least three grams of the prepared sample (no more than half-full). Take care that there are no voids or layering.

4. Placing the cup film-side down on a flat surface, tamp the sample into the cup. The end of the pestle makes a convenient tamper. If you intend to re-use the sample, you can, alternatively, place a filter-paper disk on the sample before tamping it.

5. Fill the cup with polyester fiber stuffing to prevent sample movement. Use aquarium filter or pillow filling as stuffing. A small supply of stuffing comes with your bulk sample kit.

6. Fasten the cap on the cup (Figure 3.09). Using an indelible pen, write an identifying number on the cup. Keep a record of the sample number, the site and location, the date of the sample, and any other relevant comments.

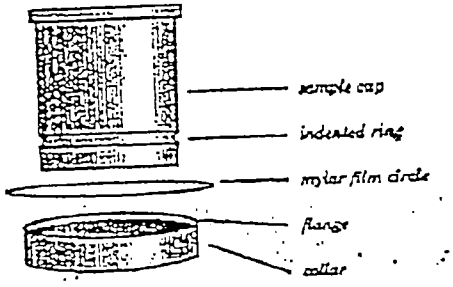


Fig. 3.08 Secure the film by snapping the collar on to the cup.

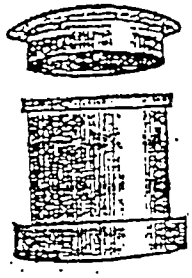


Fig. 3.09 Fasten the cap on the cup.

Preparing samples of liquids, sludges or dust

Liquids:

Fill an XRF sample cup with the liquid to be tested (Use no cotton). It is best if some overflows when the cap is put on, since the cup must be full.

Sludge:

Sludge can be placed directly in an XRF cup for screening. This is considered in-situ testing because no attempt has been made to prepare the sample. For more accuracy, the sludge can be dried, sieved, and ground.

Screening dust:

Use large dust samples taken from a home vacuum cleaner bag. Remove fibers, hairs, and debris. At least three grams of dust are needed to assure accurate analysis. Samples as small as one or two grams may be measured with less accuracy. Even smaller samples (0.3 to 1.0 grams) can be analyzed by applying a weight correction factor and by using a funnel to place the sample in the center of the sample cup.

Prepare in an XRF sample cup and test the same way you would with a soil sample. For risk analysis, it is advisable to use a 60-mesh sieve to isolate and test only fine particles.

The bulk testing platform

The test platform (Figures 3.10a,b) is an accessory fixture for holding bulk samples (such as soil or ground paint chips) in standard film-window XRF cups. This fixture snaps quickly and securely to your NITON instrument.

The platform latch screws underneath for storage. Before using the test platform, unscrew the latch and rescrew it on the end of the platform nearest the receptacle for the sample cup.

The test stand securely holds the XRF sample cup in place.

Testing the sample;

Set the NITON test platform on a flat, solid surface. Place the sample cup in the receptacle of the sampler. Included in your kit are some foam disks that you can put in the receptacle under the cup for firmer contact between the NITON and the sample cup window. Attach the NITON to the test stand and follow in-situ bulk sample instructions (Figures 3.11 a,b).

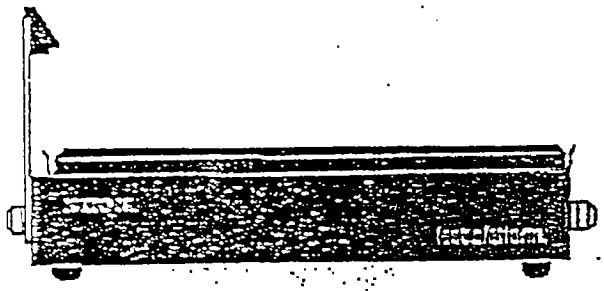


Fig. 3.10a
The Niton
Test Platform

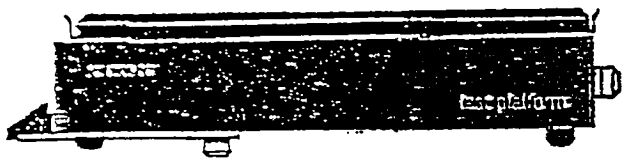


Fig. 3.10b
The Niton
Test Platform
with its latch in
the stored position.

NITON Corporation

XL-309

&

*700*series

User's Guide Version 5.0 (HTML) Chapter 5

Chapter 5: Analyzing lead paint

Overview

Lead paint mode is standard on NITON XL-309, 701-A, 702-A and 703-A Spectrum Analyzers. In addition to the silicon PIN-diode detector standard in all NITON analyzers, all NITON analyzers equipped to test lead in paint have a second detector: a cadmium-zinc-teluride (CdZnTe) detector optimized to measure lead K-shell x-ray fluorescence.

Caution: The Standard Thin Sample Mode (on 701, 701-A, 703 and 703-A analyzers, and available as an option on XL-309s) should not be used for quantitative lead-paint testing. Use only the three Paint Testing Modes (on 701-A, 702-A, 703-A, and XL-309 analyzers) to test lead-based paint.

Getting started

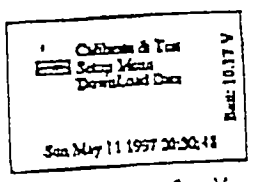


Fig. 5.01 Main Menu Setup Menu

1. Turn on your NITON Analyzer

2. Use the Arrow buttons to select

Setup menu

from the **Main** menu. Press Clear/Enter (Figure 5.01).

3. Use the Arrow buttons to select

Setup Paint mode

from the **Setup** menu. Press Clear/Enter (Figure 5.02).

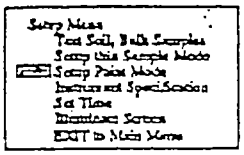


Fig. 5.02 Setup Menu
Setup Paint Mode

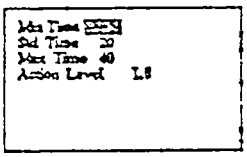


Fig. 5.03 Paint Protocol Screen

4. Go to ***step 5*** unless you want to change the Action-level or *beep* time settings. If they are not changed, the NITON will default to the last settings entered. To change settings, enter Setup Paint Protocol from the Setup Paint screen. The Setup Paint Protocol screen allows you to set the Action-level and *beep* times (Figure 5.03). When you have set the paint protocol, the instrument will return automatically to the Setup Paint screen.

5. From the Setup Paint screen (Figure 5.04), select one of the three paint testing modes: Standard Paint Mode, Standard Mode + Spectra or K & L Readings + Spectra. When you have selected a paint testing mode, the instrument will return automatically to the Main Menu.

6. Select Calibrate and Test. The instrument will then initiate its auto-calibration sequence. This will take one to two minutes. When calibration is complete, the instrument will beep and display the Ready to Test screen for whichever of the three paint modes you selected in *Step 5* (Figure 5.05). The Ready to Test screen displays the paint testing mode you have selected, the date and time, the instrument serial number, the action-level, the instrument energy resolution and the current source strength.

Caution: Check the *Date* and *Time* displayed on the Ready to Test screen. If they are not correct, reset them before taking any measurements. Your readings will not be accurate unless the date and time are correct.

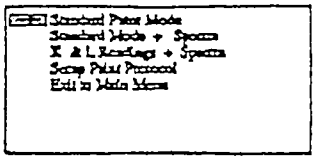


Fig. 5.04 Setup Paint screen

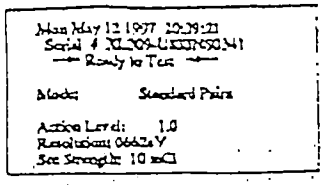


Fig. 5.05 Ready to Test
Standard Paint Mode

Taking a measurement

Warning: Always treat radiation with respect. Do not put your hand on the end plate of the NITON while measuring. Never point the NITON at yourself or anyone else when the shutter is open.

Caution: When testing the *exterior* of the window sash from the inside of a room, avoid standing in the path of the NITON's radiation beam. The direction of the beam is drawn on the cover of the instrument (Figure 5.06 a,b). It is easier to avoid the radiation beam if you hold the instrument in your right-hand.

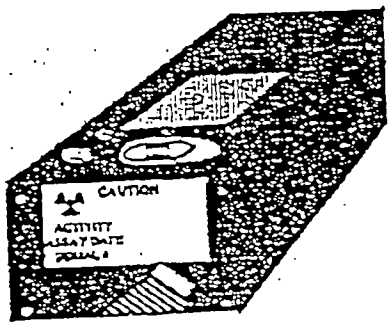


Fig. 5.06a Frontview view of XL showing
the position of the inspection window and the source.

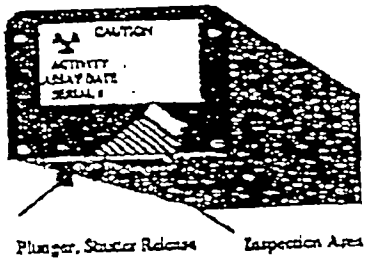


Fig. 5.06b. Front/bottom view of XL showing
the position of the inspection window and the source.

How to take a measurement

1. Push the safety slide (that locks the shutter release) out from under the shutter release. When the slide is in place, you cannot press in the release (Figure 5.07).

2. When you are using the Barcode Data Entry System: Attach the light pen bar-code reader and wrist-mounted bar codes. Flick the Barcode Reader across one of the bar codes to display the Data Entry screen (Figure 5.08). Enter the test location and other test information with the Barcode Reader.

3. Place the NITON on the painted surface, squeeze the shutter-release, and press the NITON against the surface.

Note: The shutter-release trigger must be activated and the window at the back of the instrument must be flush against the surface for instrument to take reliable readings. The instrument must be held against the surface throughout each measurement. You do not need to hold the shutter release continuously.

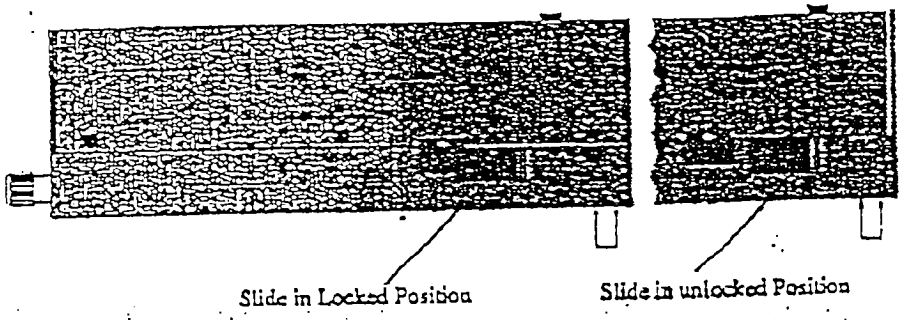


Fig. 5.07 Slide lock shown in locked position (left) and unlocked position (right).

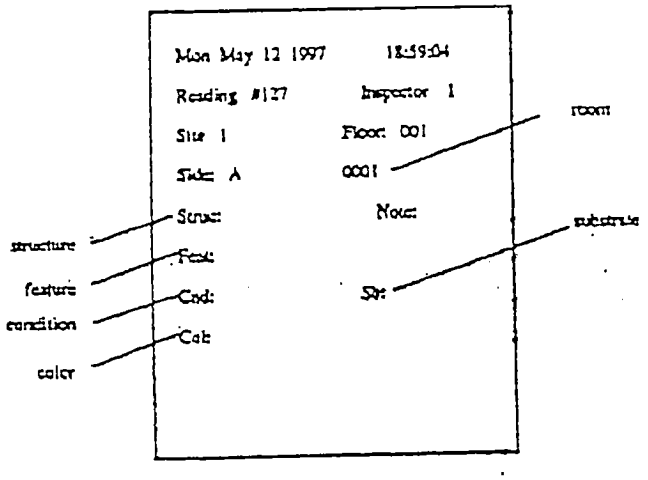


Fig. 5.08 Barcode Data Entry Screen

4. Please refer to Reading the display (see Page 69) for screen descriptions in each paint mode.

5. When the test is finished, lift the NITON from the surface. The shutter will close automatically.

Warning: In the unlikely event that the plunger gets stuck in the open position, simply push it closed. Then call the NITON Service Department at (401) 294-1234.

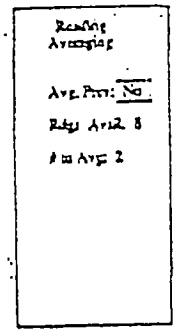


Fig. 5.09
Reading Averaging Screen

6. Your NITON Analyzer can average up to 100 readings at a time. To set up the Averaging Screen, hold down the Clear/Enter button to toggle through the testing and data entry screens to the Reading Averaging screen (Figure 5.09). If you select Yes to average readings, you will be prompted to select the number of readings you wish to average. To take additional readings, simply repeat steps 3 through 5. Your NITON will display both the average of the current and previous readings and the number of readings being averaged.

Using the NITON on flat and curved surfaces

Using your NITON, you can take measurements of any surface a child can mouth; only $^{5}/_{8}$ inch (1.6 cm) is required.

1. A sketch of the window is printed on the front of the NITON's case so you can position the instrument properly (Figure 5.10) The window of the instrument must be flat against the paint surface or it cannot read properly.

3. Your NITON Analyzer can measure accurately many curved surfaces. Position the instrument so that its window is flat on the surface. The rest of the instrument doesn't have to lie flat. E.g., on slightly rounded clam shell trim, turn the NITON at right angles to the trim so that its window runs parallel with the length of the trim (Figure 5.11). On a cast iron radiator, find a spot against which the NITON's window can lie flat.

Note: On *very* highly curved surfaces (such as quarter-round moldings or balusters) the NITON will tend to underestimate the amount of lead present. On very highly curved surfaces, your NITON can only be used to positively identify high concentrations of lead.

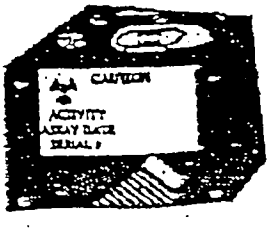


Fig. 5.10 (Right) Sketch of the front of your NITON

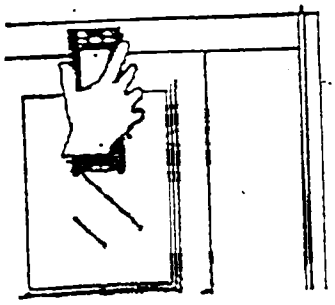


Fig. 5.11 (Far Right) How to position your NITON to measure a

How long is a Test

In any of the three paint testing modes, your NITON can measure paint samples in as little as one second; most readings take less than ten seconds. The testing time will depend primarily on the amount of lead in the sample that you are testing compared to the action level you have set. The closer the actual lead concentration in the sample is to the action level, the longer it will take the NITON do make a 95% confident "Positive" or "Negative" determination.

In Standard Paint Mode and Standard Paint Mode + Spectra, the instrument will measure the paint sample only until a 95% confident reading of "Positive" (greater-than-or-equal-to) or "Negative" (less-than) versus the action-level you have set has been attained. In K & L Mode + Spectra, the instrument will also display a "Positive" or "Negative" result and will beep as soon as a 95% confident reading is attained. You then have the option to continue readings until you have achieved a given reading time or degree of precision.

Note: For all paint testing modes, if you terminate a test *before* a "Positive" or "Negative" determination is attained by the instrument, it will display a "Null" test result.

Reading the display

In Standard Paint mode, the instrument displays Please Wait until a 95% confident reading is achieved. If there is lead in the sample, the instrument will indicate Lead present on the Please Wait screen.

When a 95% confident reading is achieved, the instrument will display the reading number; either a "Positive" or "Negative" reading; the result in mg/cm^2; the reading time in nominal (source) seconds; and will display Surface lead for all positive readings where the lead is not shielded by layers of non-leaded paint (Figures 5.12 a,b).

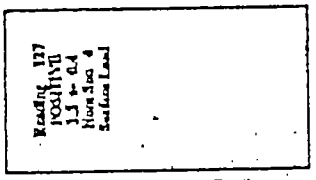


Fig. 5.12a Instrument Reading Standard Paint Mode

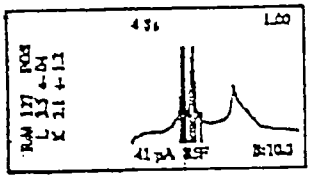


Fig. 5.12b Instrument Reading With Spectrum Displayed

Standard Mode + Spectra is identical to Standard Mode except that the x-ray spectra is displayed with each reading.

In K & L Mode + Spectra, the instrument displays the following information, updated continously during each reading: the reading number, the nominal seconds, the L-shell reading (displayed as L) with the two-sigma confidence interval, the K-shell reading (displayed as K) with the two-sigma confidence interval, the combined reading (displayed as Pb) with the two-sigma confidence interval, the full x-ray spectrum, and the Depth Index (Figure 5.13).

Note: During each reading in K & L + Spectra mode, *before* a 95% confident Positive or Negative determination has been made, the instrument displays a "Null" test result (Figure 5.14). When a 95% confident determination has been made, the instrument beeps, and the reading classification switches from Null to either Positive or Negative.

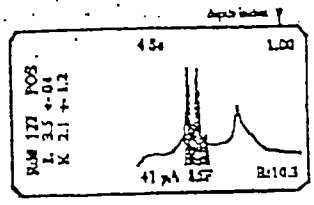


Fig. 5.13 Instrument Reading With Spectrum Displayed

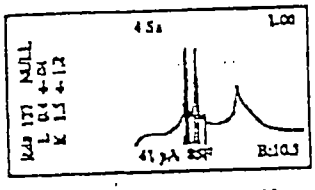


Fig. 5.14 Instrument Reading NULL Reading in Progress

The Depth Index (K & L + Spectra mode)

The Depth Index (DI) is a numerical indication of the amount of non-leaded paint covering the lead detected by the instrument. The position of the DI on the screen is indicated by an arrow painted on the front of the NITON (Figure 5.13). A DI less than 1.5 indicates lead very near the surface layer of paint. A DI between 1.5 and 4.0 indicates moderately covered lead. A DI greater than 4 indicates deeply buried lead.

Averaging readings

Two or more readings may be averaged by specifying the parameters in the Averaging Screen (Figure 5.15). To start or stop averaging, go to the Averaging Screen by holding down the Clear/Enter button until the screen appears. You may enter the Averaging Screen whenever the instrument in one of the paint testing modes. Once in the Averaging Screen, press Clear/Enter *briefly* to move the cursor between lines on the screen. Press the Arrow buttons to change averaging parameters. If, for example, you set the # to avg at two, subsequent tests will be grouped in twos and averaged.

To add the next measurement to the current average, enter Avg YES; if you enter Avg NO the next reading will not be averaged. Use the Arrow buttons to toggle between Avg YES and Avg NO.

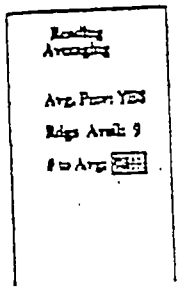


Fig. 5.15
Reading Arranging Screen

Toggling between paint modes

At any time when a reading is displayed, you may toggle from the paint mode you are in to one of the other paint modes by pressing Clear/Enter until that paint reading is displayed in the desired paint mode.

Note: Your NITON will continue to take readings in the most recently displayed paint mode until another paint mode is selected. If you scroll to previous readings using the Arrow buttons, the instrument will also display the readings in the *current* paint mode being being displayed, regardless of the paint mode that was used when the readings were taken. You toggle between paint modes after any reading simply by pressing and holding the Clear/Enter button until the paint mode you want to see appears on the screen.

SpectraView

SpectraView is standard on all 700 models. SpectraView comes with XL-309s equipped with either the optional Lead-in-Soil Analysis package or the Dust Wipe Analysis package. SpectraView is also available on XL-309s as a separate option. With SpectraView, you can quickly scan the entire x-ray spectrum for a non-quantitative assessment of dozens of elements.

How to use SpectraView:

After taking a paint measurement in any mode, you can toggle to the SpectraView screen (Figure 5.16) with the Clear/Enter button. Once in the SpectraView screen, use the Arrow buttons to scroll through the spectrum. The vertical curser-line indicates the current position along the spectrum.

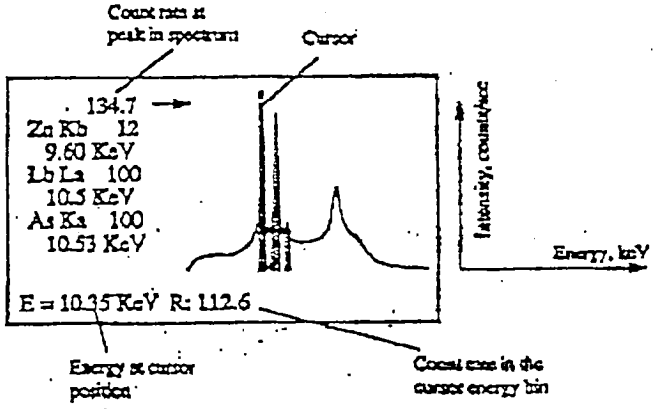


Fig. 5.16 SpectraView Screen
Cursor (dashed line) is at 10.35 KeV

In SpectraView mode, the spectrum is displayed in a linear scale, auto-scaled so that the highest peak on the screen reaches the top of the scale. To the *left* of the spectrum is a list of the elements with XRF energies close to where you are currently looking on the spectrum. (Figure 5.17). To determine if a given element is present, look at the bottom of the screen. Next to the number

indicating the position of the Spectraview cursor on the energy-level scale (from 4 to 100 keV) is a number representing the x-ray count rate (in counts per second) at that energy-level.

Note: SpectraView cannot be used to determine exact element concentrations in a sample.

SpectraView zoom

To look at a part of the spectrum in greater detail, use the SpectraView zoom feature.

1. Use the Arrow buttons to move the cursor to the *center* of a spectral peak.

2. Push Clear/Enter four times in rapid succession.

3. The part of the spectrum you were looking at will appear in expanded form so you can look at it in detail (Figure 5.18).

To exit SpectraView

To exit SpectraView and continue testing, simply start another measurement. The measurement will be taken in the last paint testing mode you used.

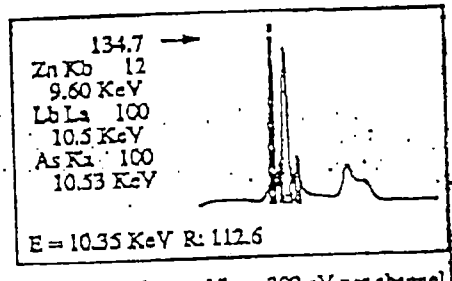
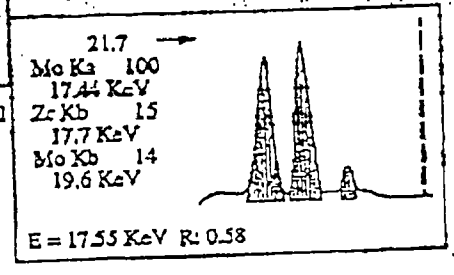


Fig. 5.17 SpectraView 300 eV per channel



5.18 SpectraView Expanded spectrum, 100 eV per channel

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APPENDIX B

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN FOR

THE NL INDUSTRIES/ DEPEW PLANT SITE
SOIL REMOVAL ACTION
DEPEW, NEW YORK

Prepared by:

ADVANCED GEOSERVICES ENGINEERING, P.C.
West Chester, Pennsylvania

Project No. NY02-927
March 30, 2005

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1.0 INTRODUCTION

On behalf of NL Industries, Inc., Advanced GeoServices Engineering (AGE) developed this Health and Safety Plan (HASP) to reflect current health and safety procedures with regard to performing Removal Action (RA) activities at the former NL Industries/Depew Plant Site (the Site) located in Depew, New York as shown on Figure HASP-1 and Figure HASP-2. This HASP identifies procedures designed to reduce the risk of exposure to chemical substances that may be present and other potential physical, environmental, and biological hazards associated with RA activities at the Site.

This HASP provides the minimum health and safety requirements for contractors and subcontractors during the RA activities at the Site. The procedures set forth herein were developed in accordance with the provisions of 29 CFR 1910.120 (Hazardous Waste Operations and Emergency Response). Contractors and/or subcontractors performing RA activities may choose to use this HASP as a guide in developing their own plan (which shall be reviewed and approved by NL Industries, Inc.), or may choose to adopt and comply in full with this HASP when performing RA activities at the Site. At a minimum, all provisions of this HASP will be followed. If the contractor and/or subcontractor adopts this HASP, all personnel assigned to field activities for the project must read and sign the HASP Acknowledgment Form (Attachment 1) before commencing site activities. AGE reserves the right to review and revise this HASP at any time.

AGE notes that other ancillary personnel conducting work not related to the RA activities at the Site are not bound by the procedures presented in this HASP. AGE does not accept any liability or responsibility for the actions of NL Industries, Inc. employees, contractors or subcontractors and other ancillary personnel conducting activities at the Site.

1.1 NATURE OF CONTAMINATION

The primary constituent of concern at the Site is lead in soil. The investigations conducted at the Site indicate that residential soils contain total lead concentrations from below detection levels to over 1,200 parts per million (ppm).

1.2 POTENTIAL REMEDIAL ACTION (RA) ACTIVITIES

The potential RA activities anticipated at this time are summarized as follows:

- Site walks;
- Soil sampling for waste characterization and lateral limit delineation;
- Site boundary/utility survey.
- General removal action construction activities (construction trailers, soil staging area, etc.);
- Excavation of surface soils with total lead concentrations greater than the applicable clean-up level;
- Characterization and off-site disposal of excavated soils;
- Confirmatory soil sampling;
- Backfill and restoration of properties; and
- Demobilization

1.3 KEY REGULATIONS

Key regulations that are or may be applicable to the proposed RA field activities are listed below. Field activities and operations associated with this project (if applicable) will be conducted in general accordance with these regulations.

Government Regulations	Subject
29 CFR 1904	Recording and Reporting Occupational Injuries and Illness
29 CFR 1910.120	Hazardous Waste Site Operations
29 CFR 1910.20	Record Keeping/Recording
29 CFR 1910.1000	OSHA Permissible Exposure Limits
29 CFR 1926.62	Lead in Construction
29 CFR 1926.650 - .652	Excavations
29 CFR 1910.134	Respirator Protection

1.4 HASP ORGANIZATION

The remainder of this HASP, which describes project activities, is formatted into the following sections:

- Section 2.0 - Key Personnel and Management
- Section 3.0 - Site Access and Control
- Section 4.0 - Training
- Section 5.0 - Medical Monitoring
- Section 6.0 - Project Hazard Analysis
- Section 7.0 -Personal Protective Equipment
- Section 8.0 –Decontamination

2.0 KEY PERSONNEL AND MANAGEMENT

This section identifies the key personnel of the Contractor under this HASP.

2.1 PROJECT COORDINATOR

The Project Coordinator (PC) shall be responsible for the overall successful and safe completion of all RA field activities. The PC shall be responsible for the following tasks as related to health and safety:

- Confirming the Project Manager and the Site Health and Safety Officer (HSO) are performing field tasks in a safe manner.

- Ensuring that all Site personnel have been properly trained in accordance with OSHA 1910.120 and are familiar with the applicable provision of 1926.62 and 1926.650 - 652.

- Maintaining communication with client representatives and representatives of regulatory agencies.

2.2 PROJECT MANAGER

The Project Manager (PM) shall be directly responsible for the completion of all RA related field activities. The PM will assist the PC with all tasks described above. The PM has responsibility for all field activities and shall enforce safe work practices by all individuals present on the project site. The HSO and the PM may be the same individual. The PM will be an employee of the contractor.

2.3 SITE HEALTH AND SAFETY OFFICER (HSO)

The PM will designate a HSO for this project to implement and enforce the Site health and safety program described in this HASP. During field activities, the HSO will conduct daily safety meetings and will interface as required with other Site representatives. The HSO shall be responsible for the following tasks:

- Performing routine RA Site activity inspections to document that all work is being performed safely.
- Ordering the immediate shut-down of RA Site activities in the case of a medical emergency or unsafe work practice.
- Confirming protective clothing and equipment are used, maintained, and stored properly.
- Maintaining exclusion zones.
- Conducting daily safety meetings.
- Contacting the appropriate authorities in the event of an emergency (injury/accident).
- Designating an area and providing employee accounting in case of site evacuation.
- Conducting or overseeing required monitoring activities.
- The HSO will function as the competent person in accordance with the OSHA Lead in Construction and Excavation Standards.

The HSO will maintain a daily safety log detailing all relevant daily RA activities in a bound field book. This log will include daily safety meeting topics, training administered, air monitoring information, the names of site personnel and visitors, accidents and injuries, and any other incidents pertaining to health and safety. The HSO shall confirm that all employees on-site are participants in a medical surveillance program compliant with OSHA 1910.120 and 1926.62, as applicable.

2.4 EQUIPMENT OPERATORS

Equipment operators will be appropriately trained in the safe operation of their equipment, and responsible for the maintenance, and daily inspection of their equipment.

2.5 EMPLOYEE SAFETY RESPONSIBILITY

Each employee is responsible for their own safety as well as the safety of others in the area. The employee shall use all equipment provided in a safe and responsible manner as directed by their supervisor. All personnel involved with this project will follow the health and safety procedures set forth in this HASP. Visitors will not be permitted entry to RA activity areas until they have read this HASP and signed the Acknowledgment Form provided in Attachment 1, and only as approved by the PC or PM.

2.6 EMERGENCY CONTACTS

Table HASP-1 lists the emergency contacts and corresponding telephone numbers for the project and the Site. The emergency route to the closest hospital is shown on Figure HASP-3. Both Table HASP-1 and Figure HASP-3 will be displayed prominently in a central area within the support zone.

3.0 TRAINING

3.1 PERSONNEL TRAINING

Site workers (such as equipment operators, general laborers, and supervisory personnel) engaged in hazardous substance activities or other RA field activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of health and safety training (29 CFR 1910.120) off the Site. Supervisors shall have received an additional 8 hours of specialized supervisory training. Additionally, 8 hours of refresher training is required annually for all Site personnel. The Project Manager may provide exemptions to this requirement (e.g., decreasing the number of training hours to 24 is possible for workers, like surveyors, who are doing non-intrusive work or workers conducting activities entirely in the support zone). An exemption may be provided by the Project Manager for visitors to the Site who will not be performing intrusive activities and will be accompanied by trained personnel at all times. A more detailed discussion of training requirements is included in Attachment 2. Documentation of personnel meeting the required training will be maintained by the Project Manager.

This HASP will be distributed to all project personnel prior to the start of field activities. A pre-operation meeting for each task will be held to discuss the contents of the HASP. Specialty training will be provided on an as necessary basis based on task and responsibility. All training of personnel will be conducted under direct supervision of a trained HSO or his/her designee.

3.2 SITE-SPECIFIC TRAINING TOPICS

All personnel entering the Site will be trained, as applicable, on the following site-specific topics:

- Site hazards;
- Emergency procedures;
- Insect and animal hazards;

- Lead in Construction Standard, 29 CFR 1926.62
- Excavation Standard, 29 CFR 1926.650 - .652;
- Personal protective equipment (PPE);
- Safe work practices; and
- Decontamination procedures.

4.0 AIR MONITORING

Air monitoring will be performed to monitor dust particles due to soil disturbance operations. Ambient air monitors will be installed upwind and downwind of active operations and at the primary entranceway into the residences for residential work areas. Real time aerosol monitors (mini-Rams or similar) will be co-located and operated during active operations. The Air Monitoring Plan (Attachment 3) details the air monitoring action levels and procedures.

5.0 SITE CONTINGENCY

A Site Contingency Plan has been developed and is included as Attachment 4.

6.0 MEDICAL MONITORING

Personnel conducting RA field activities associated with this project shall be active participants in a medical monitoring program that complies with the requirements of 29 CFR 1910.120. Documentation of the medical monitoring program for each individual shall be maintained at the individual employer's office.

Contractors and subcontractors will be required to adhere to the applicable medical monitoring requirement of CFR 1910.120 and provide documentation of compliance. Exemptions to this requirement may be granted in specific situations where this monitoring is determined to be unnecessary by the Project Manager or HSO. An example of such an exemption would be a delivery driver who makes a delivery to the Site in an area which has been characterized as having no contamination or no significant potential for exposure to constituents. General information on medical monitoring is provided in Attachment 5.

Medical monitoring in accordance with 29 CFR 1926.62 will also be required.

7.0 PROJECT HAZARD ANALYSIS

This section discusses chemical, physical, and environmental hazards with respect to performing RA field activities at the Site.

7.1 CHEMICAL HAZARDS

Table HASP-2 identifies the exposure limits and recognition qualities for lead at the Site in terms of human health impacts. Table HASP-3 summarizes health hazards and symptoms associated with lead.

To provide appropriate protection, employees shall wear appropriate PPE, as detailed in Section 8.0, when undertaking site RA activities. Levels of PPE for employees working on this project will be selected and utilized based on the direct reading of monitoring instruments (as necessary), physical/health hazards and on-site assessment by the PM or HSO.

7.1.1 General Precautions

If signs of contamination are encountered that differ from those addressed in this plan, such as visible soil stains or unusual odors, contractor(s) will stop all work in the area, barricade or otherwise isolate the area, and immediately contact the Project Manager or the Health and Safety Officer. Protection of worker health and safety shall be the first priority. Continuation of work in the area and the amount of, if any, personal protective equipment shall be determined by the Health and Safety Officer. Other precautions to be undertaken to ensure a safe work place on this project where the potential for chemical exposure may exist include:

- No smoking, eating, or drinking in areas where contaminants may be present.
- Avoid the area immediately downwind of any excavation.

- Contact with potential contaminated materials should be minimized through the knowledge of Site conditions and the location of potential contamination based on previous Site investigation reports.

- Minimize the creation of dust, through dust suppression such as water application.

- Adequately barricade all work zones to ensure public safety.

7.2 PHYSICAL HAZARDS

In addition to the potential chemical hazards, physical hazards may be encountered when conducting specific activities on-Site and are described in Table HASP-4. In order to minimize physical hazards, standard safety procedures which are also described in this table will be followed at all times. Failure to comply with safety procedures or continued negligence of these policies will result in expulsion of an employee from the project Site. The work practices of all employees will be carefully monitored by the HSO to confirm that all work is performed in a safe and professional manner.

7.3 ENVIRONMENTAL HAZARDS

Identification of environmental hazards and procedures to monitor and reduce these hazards are listed in Table HASP-4.

7.4 BIOLOGICAL HAZARDS

Identification of biological hazards and procedures to monitor and reduce these hazards are listed in Table HASP-4.

7.5 RADIOLOGICAL HAZARDS (XRF)

The XRF portable analyzer contains radiation sources that require specific handling procedures. For this reason, use of the portable analyzer will be limited to those personnel who have been trained in its use. A standard operating procedure is included with the equipment. A Radiation Safety Officer located in the AGE West Chester office is available to assist with questions.

7.6 SPECIAL HAZARDS/CONSIDERATIONS

During the excavation, treatment, or backfill operations, trenching and/or shoring may become necessary. It is not anticipated that these types of operations will be required; however Attachment 6 describes precautions to be used in the event of said operations.

8.0 PERSONAL PROTECTIVE EQUIPMENT

This section identifies the required PPE to be used on this project and may be modified, as appropriate, by the HSO. The initiation and anticipated PPE requirements for all RA field activities conducted on-Site is Level "D" PPE. Upgrades to PPE monitoring will be based on air monitoring readings as discussed below.

8.1 LEVEL D PPE

It is anticipated that all activities on-Site will be conducted in Level D PPE. Personnel conducting site activities in Level D will wear the following:

1. Cotton coveralls or Tyvek coveralls
2. Boots, steel toe and shank (may use plastic or rubber booty cover)
3. Safety glasses with side shields or goggles (ANSI approved) (as necessary per HSO)
4. Hard hat (ANSI approved) (as necessary per HSO)
5. Ear plugs will be worn when working near heavy equipment
6. Nitrile gloves will be worn when the potential for direct contact is made with soils
7. Personal flotation device (when working on or near open water bodies)

8.2 LEVEL C PPE

AGE does not anticipate the need to upgrade from Level D on this project. This type of upgrade would only be done after consulting with the USEPA Project Manager.

Level D PPE will be upgraded to Level C if air sampling indicates the following in the breathing zone:

- Respirable particulate matter concentrations measured with the aerosol monitor are greater than 5.0 milligrams per cubic meter (mg/m^3) and less than 10.0 mg/m^3.

- Personal air monitoring analytical laboratory results indicate lead concentrations greater than 0.025 mg/m^3 and less than 0.25 mg/m^3.

Personnel conducting Site activities in Level C will wear the following:

1. Full-face air purifying respirators equipped with combination HEPA/organic vapor filter cartridges (NIOSH approved).
2. Chemical-resistant clothing (disposable chemical-resistant coveralls).
3. Gloves, nitrile.
4. Boots, steel toe and shank.
5. Boot-covers, outer, chemical-resistant (disposable or washable).
6. Hard hat (ANSI approved).
7. Ear plugs will be worn when working near heavy equipment.
8. Personal flotation device (when working on or near open water bodies)

8.3 LEVEL B PPE

AGE does not anticipate the need to upgrade from Level D on this project. This type of upgrade would only be done after consulting with the USEPA Project Manager.

PPE levels will be upgraded from Level C to Level B if the following are measured in the breathing zone:

- Respirable particulate matter is 10.0 mg/m^3 or greater.
- Personal air monitoring lead concentrations greater than 0.25 mg/m^3.

As described below, Level B PPE includes a positive pressure, full face piece SCBA.

Personnel conducting Site activities will wear the following Level B protection.

1. Positive pressure, full-face piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved).
2. Hooded chemical-resistant clothing (disposable chemical-resistant coveralls).
3. Gloves, outer, nitrile (neoprene for personnel handling drums).
4. Gloves, inner, latex.
5. Boots, steel toe and shank.
6. Boot-covers, outer, chemical-resistant (disposable).
7. Hard hat (ANSI approved).
8. Ear plugs will be worn when working near heavy equipment.
9. Five minute escape pack.
10. Personal flotation device (when working on or near open water bodies)

8.4 MODIFICATIONS TO PPE LEVEL

Levels of protection utilized for all tasks shall be adjusted and/or confirmed as significant new information becomes available. Any changes or adjustments will be amended in this HASP.

8.5 RESPIRATORY PROTECTION

All respiratory protection equipment and cartridges used on this project shall be NIOSH/MSHA approved or equivalent. Workers required to wear respiratory protection shall be trained in the use, maintenance and limitations of their assigned respirators. This review will include the information described below.

8.5.1 Supplied-Air Respirators

If it is necessary to upgrade to level B, workers shall be issued either a self-contained breathing apparatus (SCBA) or an air line respirator. In addition, workers shall be equipped with a 5-minute escape bottle.

8.5.2 Breathing-Air Quality

Code of Federal Regulations 29 CFR 1910.134 states breathing air shall meet the requirements of the specification for Grade "D" breathing air as described in the compressed Gas Association Specification G 7-1966. AGE will require a certificate of analysis from vendors of breathing air in order to show that the air meets this standard.

All compressed air cylinders must be tested in accordance with the US Department of Transportation (USDOT) (49 CFR 178) and labeled to identify their contents in accordance with ANSI standard Z48.1, Federal Specifications BB-A-103a, or Interim Federal Specification GG-B-00675b.

Airline couplings must be incompatible with other gas systems to prevent accidental introduction of non-respirable gases.

The preferred method for creating breathing air shall be to mix liquid oxygen and liquid nitrogen. Air compressors located at project sites are not acceptable because of possible contamination at the intake of the pump and excessive analytical costs of sampling the air.

8.5.3 Air-Purifying Respirators

All air purifying respirators used by personnel working at the Site shall meet NIOSH/MSHA approval. Air purifying respirators used on this project shall include full-face, negative pressure, and full-face, powered air purifying respirators.

8.5.4 Filter Cartridge Changes

All filter cartridges will be changed a minimum of once daily. Changes will occur when personnel begin to experience increased inhalation resistance, or breakthrough of a chemical warning property.

8.5.5 Inspection and Cleaning

Respirators shall be checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after use. It is the responsibility of the wearer to clean and maintain his/her respirator.

8.5.6 Fit Testing

Qualitative fit testing will be performed annually for all employees required to wear a negative pressure respirator.

8.5.7 Facial Hair

No personnel with facial hair which may interfere with the respirator's sealing surface will be permitted to wear a respirator.

8.5.8 Medical Certification

Only workers who have been medically cleared by a physician as being physically capable of wearing a respirator will be issued a respirator. Documentation of the medical clearance for respirator work shall be retained at the Site.

9.0 DECONTAMINATION

This section describes the personnel and equipment decontamination procedures to be used for the various tasks to be performed on-site. Decontamination associated with sampling equipment is provided in the Quality Assurance Project Plan (QAPP).

9.1 PERSONNEL DECONTAMINATION: LEVEL B, C AND D WORK

The general guide for the decontamination sequence of each level of protection to be used on-site is presented below. Workers assisting in decontamination procedures shall don a level of protection that is one grade below that of field personnel utilizing the Contaminant Reduction Zone (CRZ).

Level B	Level C	Level D
Step 1 Wash outer boots	Wash outer boots	Remove coveralls/Tyvek®
Step 2 Remove outer gloves	Remove outer gloves	Wash boots
Step 3 Wash inner gloves	Remove coveralls	Remove nitrile gloves
Step 4 Remove coveralls	Remove outer boots	Wash hands/face
Step 5 Remove boots	Remove respirator	
Step 6 Remove respirator	Remove inner gloves	
Step 7 Remove inner gloves	Wash hands/face	
Step 8 Wash hands/face	Clean respirator	
Step 9 Clean Respirator		

9.2 TOOLS AND EQUIPMENT

Tools and hand equipment, as necessary, should be decontaminated prior to removal from the exclusion zone. Decontamination procedures shall include washing with a low pressure sprayer and a mild detergent such as Alconox. Tools and hand equipment that cannot be decontaminated properly should be discarded.

9.3 RESPIRATORS AND PPE

Employees shall be responsible for cleaning and maintaining their respirators. A clean area shall be established to clean and store respirators. Respirators should be cleaned with mild soap and warm water.

Reusable PPE will be stored at the CRZ in drums or plastic bags and will be decontaminated at the end of each shift by a designated individual at the CRZ using water and Alconox.

9.4 HEAVY EQUIPMENT

Heavy equipment such as drill rigs, trucks, bulldozers and backhoes that are used inside the exclusion zone shall be decontaminated. Decontamination of heavy equipment will be conducted using hand tools and dry decontamination techniques. If this is not adequate to remove the accumulated soil debris, a pressure washer using non-phosphate detergent will be used. Prior to using the pressure washer, gross contamination (i.e., soil in wheels or tracks) will be minimized by removal with hand tools (e.g., shovels, stiff-bristle brushes). The HSO will determine the need for additional decontamination in excess of hand tools and dry decontamination techniques.

TABLES

Table HASP-1
Emergency Phone Numbers

ORGANIZATION	TELEPHONE
Ambulance	911
Police	911
Fire	911
Hospital: St. Joseph Hospital	(716) 891-2400
HazMat Response Team	911
Chris Reitman, Project Director, AGE Barbara Forslund, Project Manager, AGE	(610) 840-9100 (work) - (610) 701-0670 (home) (610) 840-9100
USEPA On-Scene Coordinator – Dan Harkay	(732) 321-6614
USEPA Region 2 Hotline	1-800-424-8802
Project Officer, NYSDEC - Martin Doster	(716) 851-7220
NYSDEC Spills Hotline (24-hour)	1-800-457-7362 or (518) 457-7362
Representing NL Industries, Terry Casey	(281) 351-9441

Table HASP-3
Health Hazards and Symptoms

COMPOUND	ROUTES OF ENTRY	EYE IRRITATION	SYMPTOMS	TARGET ORGANS
Lead	Inhalation, ingestion, skin, and/or eye contact	Yes	Weakness, insomnia, weight loss, malaise, constipation, abdominal pain, colic, anemia, kidney disease, eye irritation and hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue and peripheral nervous system

GENERAL FIRST AID TREATMENT

- Eye: Irrigate immediately
- Skin: Soap wash promptly
- Inhalation: Move to fresh air
- Ingestion: Get medical attention

Table HASP-2
Exposure Limits and Recognition Qualities

	EXPOSURE STANDARDS				RECOGNITION QUALITIES		
COMPOUND	PEL (mg/m^3)	TLV mg/m^3	STEL (c) mg/m^3	IDLH (a) mg/m^3	Odor/(d) Threshold	LEL (b) (%)	Ionization Potential (eV)
Lead	0.05	0.05	--	100	Odorless	--	--

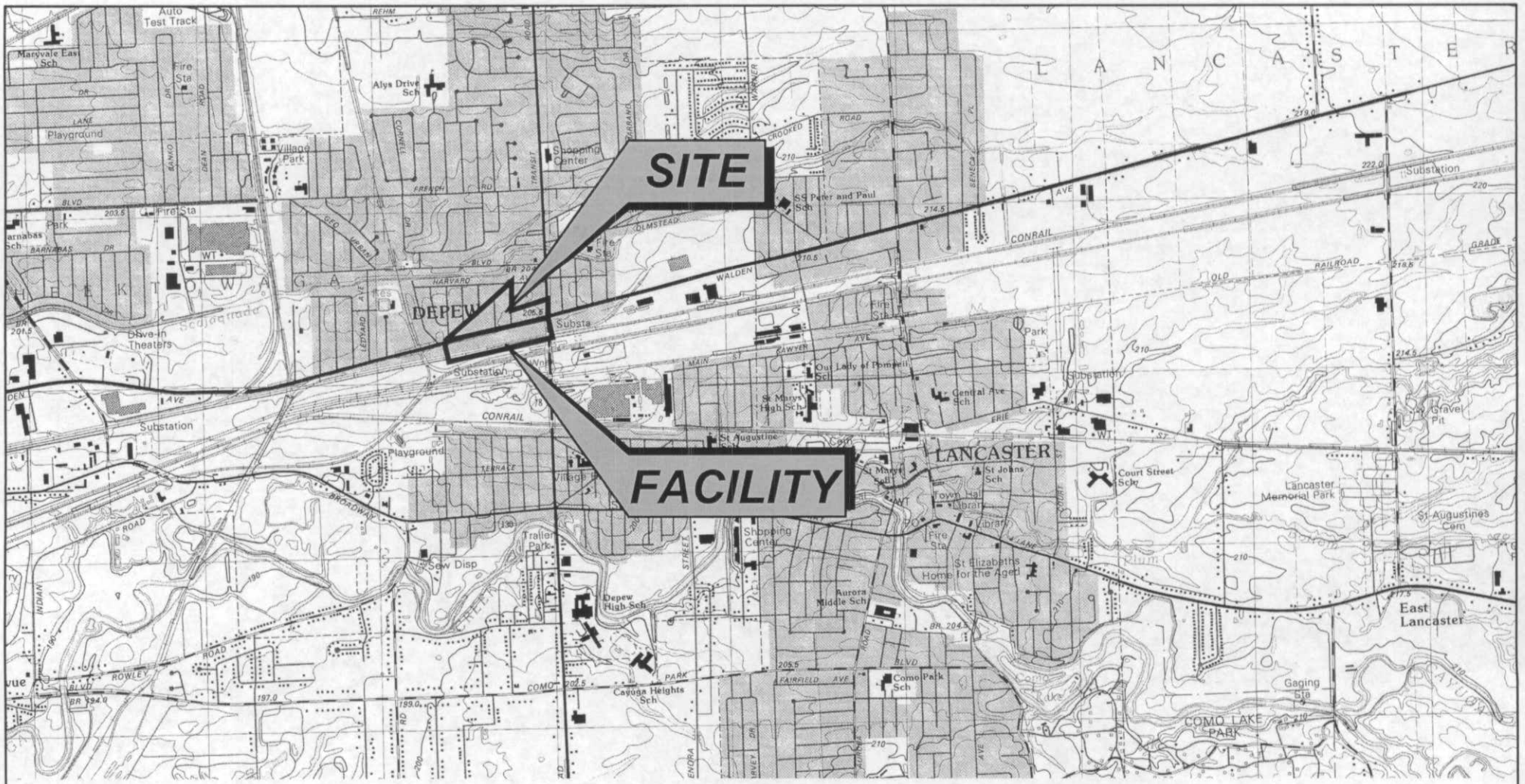
Notes:

(a) Immediately Dangerous to Life and Health.
(b) Lower Explosive Limit.
(c) OSHA Short Term Exposure Limit - 15 minute exposure.
(d) Sense of smell becomes rapidly fatigued and cannot be relied upon to warn of the continuous presence of contaminants.

Table HASP-4
Activity Hazard Analysis

HAZARD	DESCRIPTION	LOCATION	PROCEDURE USED TO MONITOR/REDUCE HAZARD
Heavy equipment	Front end loader, backhoes, and trucks	Throughout the Site	Personnel maintain eye contact with operators: hard hats, safety shoes, and eye and ear protection worn (as appropriate) during equipment operation
Refuse and soil	Construction material	Throughout the Site	Maintain clean work areas, dispose of refuse immediately; do not block access routes with materials. No one will enter excavations. Temporary fences will be placed around any excavations left open overnight
Heat producing/electrical equipment	Generators, vehicles, steam cleaners, power tools	Throughout the Site	Operate equipment away from vegetation and other materials that may ignite. Maintain fire-fighting equipment in the vicinity of operating equipment
Heat stress/cold exposure	Personnel working under temperature extremes are subject to adverse effects	Throughout the Site	Employ buddy system. Each worker is responsible for visually monitoring his/her partner for signs for heat stress or cold exposure. Site safety personnel will also monitor site conditions and establish work/rest regimes.
Chemical exposure	Personnel may be exposed to lead dust associated with the Site. Also chemicals from equipment decontamination.	Throughout the Site	Follow guidelines in HASP. Be familiar with signs and symptoms of exposure and first aid procedures. Report suspected over-exposure to Site Safety Officer immediately
Biological hazards	Snakebites, bee stings, tick bites, poisonous plants	Throughout the Site	Be familiar with signs and symptoms of exposure and first aid procedures. Report suspected exposure to Site Safety Officer immediately
Slips, trips, and falls	Miscellaneous debris	Throughout the Site	Use caution when traversing site and be aware of trip hazards
Drowning	Falling into open water bodies	Near open water bodies	Use caution when taking sediment samples. Utilize buddy system during sampling. Wear life preservers if drowning is a risk.
Using XRF	Working with or near XRF	Near XRF	Follow safety guidelines in manufacturer's user's guide. Open shutter on XRF only when performing a test.

FIGURES



Basemap source:
U.S.G.S. 7.5 minute quadrangle maps
of Lancaster New York, dated 1982.

NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: N.T.S.	SITE LOCATION MAP
Originated By: K.O.	
Drawn By: P.S.G.	
Checked By: K.O.	
Project Mgr: B.L.F.	
Dwg No. NY02-927-11	
MAR 30 2005	Project No. NY02-927 — HASP-1

Advanced GeoServices Engineering P.C.
1055 Andrew Drive Suite A
West Chester, Pennsylvania 19380
(610) 840-9100
FAX: (610) 840-9199

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LEGEND

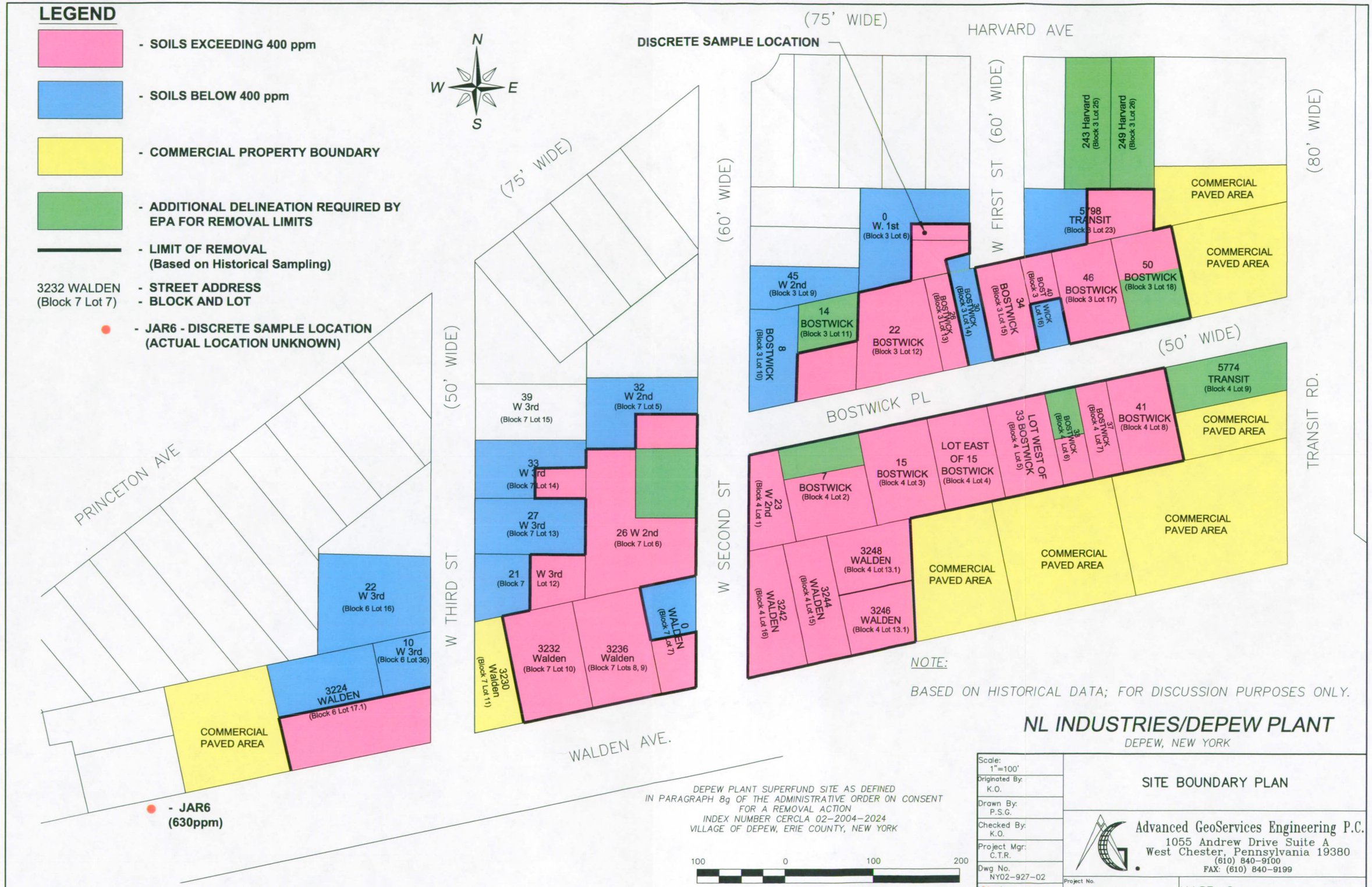
- SOILS EXCEEDING 400 ppm
- SOILS BELOW 400 ppm
- COMMERCIAL PROPERTY BOUNDARY
- ADDITIONAL DELINEATION REQUIRED BY EPA FOR REMOVAL LIMITS
- LIMIT OF REMOVAL (Based on Historical Sampling)

3232 WALDEN (Block 7 Lot 7) - STREET ADDRESS - BLOCK AND LOT

- JAR6 - DISCRETE SAMPLE LOCATION (ACTUAL LOCATION UNKNOWN)

N W E S

DISCRETE SAMPLE LOCATION



NOTE:

BASED ON HISTORICAL DATA; FOR DISCUSSION PURPOSES ONLY.

DEPEW PLANT SUPERFUND SITE AS DEFINED IN PARAGRAPH 8g OF THE ADMINISTRATIVE ORDER ON CONSENT FOR A REMOVAL ACTION INDEX NUMBER CERCLA 02-2004-2024 VILLAGE OF DEPEW, ERIE COUNTY, NEW YORK

100 0 100 200

SCALE IN FEET

NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: 1"=100'	SITE BOUNDARY PLAN
Originated By: K.O.	
Drawn By: P.S.G.	
Checked By: K.O.	
Project Mgr: C.T.R.	
Dwg No. NY02-927-02	
Issued: MAR 3 0 2005	Project No. NY02-927 — HASP-2

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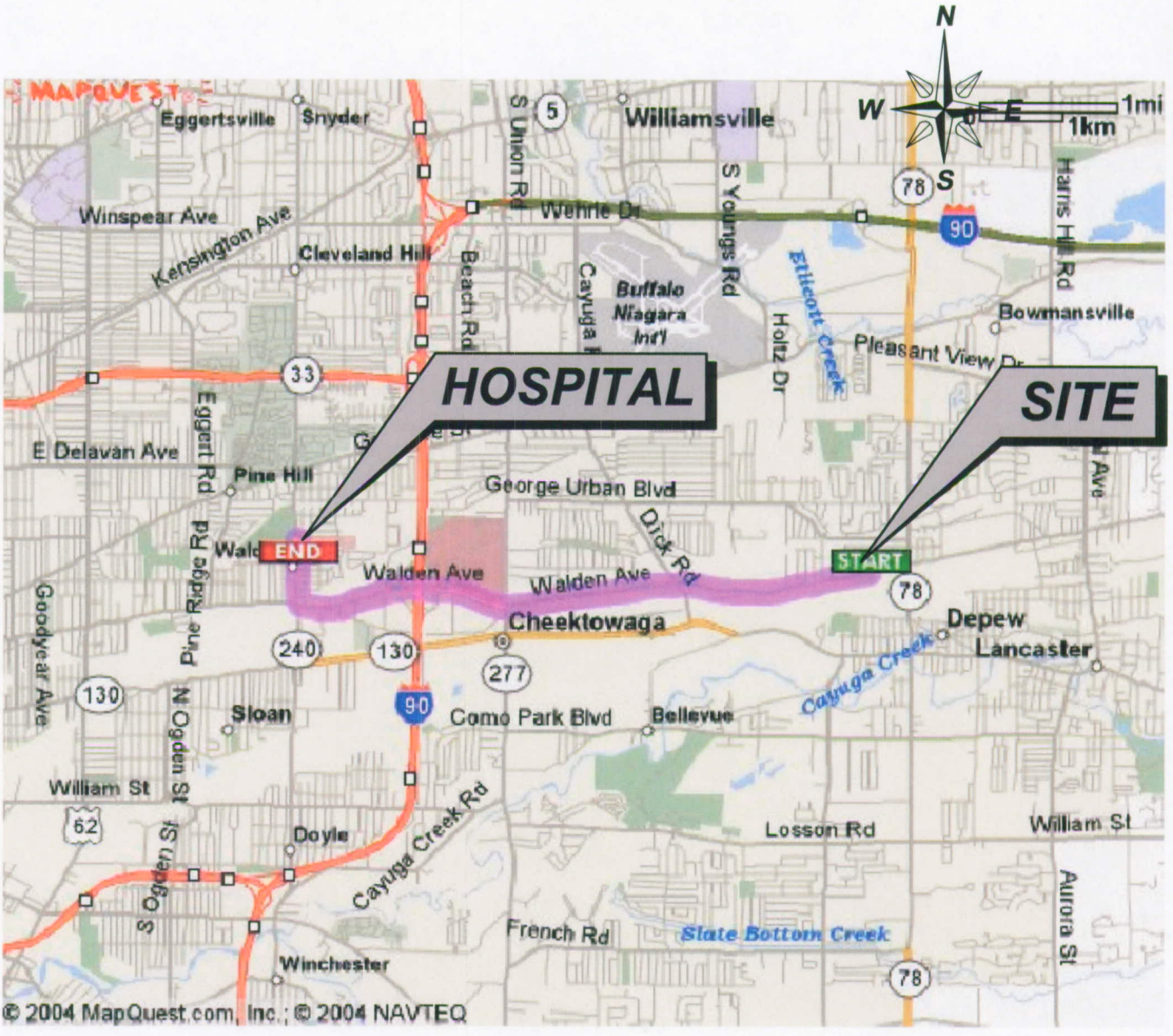

DIRECTIONS TO HOSPITAL:
TRAVEL WEST ON WALDEN AVE,
TURN RIGHT ON NY-240/HARLEM ROAD,
ARRIVE 2605 HARLEM ROAD (ST. JOSEPH HOSPITAL).

DISTANCE: 4.74 MILES

NL INDUSTRIES/DEPEW PLANT

DEPEW, NEW YORK

Scale: N.T.S.	HOSPITAL ROUTE
Originated By: J.M.S.	
Drawn By: P.S.G.	
Checked By: J.M.S.	
Project Mgr: B.L.F.	
Dwg No. NY02-927-12	
Issued: MAR 3 0 2005	

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Project No. NY02-927

HASP-3

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ATTACHMENTS

ATTACHMENT 1 TO HASP

ACKNOWLEDGMENT

ATTACHMENT 1
Acknowledgment

NL Industries/Depew Plant Site
Depew, New York

I have read, understand and agree with the information set forth in this Health and Safety Plan and will adhere to the protocols specified herein. I have been trained in accordance with OSHA 1910.120 and participate in a medical monitoring program.

Field Manager	Signature	Date
Site Health and Safety Officer	Signature	Date
Site Worker	Signature	Date
Site Worker	Signature	Date
Site Worker	Signature	Date
Site Worker	Signature	Date
Site Worker	Signature	Date
Site Worker	Signature	Date
Site Worker	Signature	Date

SUBCONTRACTORS/VISITORS:

Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date

ATTACHMENT 2 TO HASP

PERSONNEL TRAINING

ATTACHMENT 2
Personnel Training

General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance activities or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of classroom instruction. The training course must have included the following material at a minimum:

1. Health and Safety Officer and Site Management Responsibilities - personnel must understand Health and Safety Officer and Site Management responsibilities and authority.

2. Site-Specific Health and Safety Hazards - personnel must be informed of specific hazards related to site and site operations.

3. Personal Protection Equipment (PPE) - personnel must be trained in proper use of personal protective equipment.

4. Safe Work Practices/Engineering Controls - personnel must be informed of appropriate work practices and engineering controls that will reduce the risk of exposure to site hazards.

5. Safety Equipment Use - personnel must understand the use of monitoring instruments and other safety equipment.

6. Medical Surveillance Program - personnel must be informed of requirements for medical surveillance of hazardous waste site employees.

7. Site Control Methods - personnel must understand site methods used to reduce exposure to on-site personnel.

8. Decontamination Procedures - personnel must be trained in proper decontamination operation and procedures.

9. Emergency Response - personnel must be trained in proper emergency response operation and procedures.

10. Confined Space Entry/Special Hazards - personnel involved in specific hazardous activities, such as confined space entry and drum handling, must receive training in appropriate techniques to employ during such operations.

Workers on-site only occasionally for a specific limited task (such as, but not limited to, land surveying or site walk through) and who are unlikely to be exposed over permissible exposure limits and published exposure limits shall receive a minimum of 24 hours of classroom instruction and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

Workers regularly on-site who work in areas which have been monitored and fully characterized indicating that exposures are under permissible exposure limits, where respirators are not necessary, and the characterization indicates that there are no health hazards or the possibility of an emergency developing, shall receive a minimum of 24 hours of instruction off the site and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

Workers with 24 hours of training who meet the criteria for 24 hour training cited above, and who become general site workers or who are required to wear respirators, shall have the additional 16 hours and two days of training necessary to total the training specified for the 40 hour training criteria.

Health and Safety training programs shall comply with criteria set forth by OSHA as per final regulation 29 CFR 1910.120. This program will instruct employees on general health and safety principles and procedures, proper operation of monitoring instruments, and use of personal protective equipment.

In addition, field employees will undergo site-specific training prior to the start-up of any given task. As activities change at a particular site, related training will address potential hazards and associated risks, site operating procedures, emergency response, and site control methods to be employed.

Specialized training will be provided as dictated by the nature of the project activities. Specialized training will be provided for activities such as confined space entry, excavations and handling of unidentified substances.

This Health and Safety Plan must be distributed to all contractor/subcontractors prior to the start of field activities. A pre-operation meeting will be held to discuss the contents of the Plan. Specialty training will be provided as determined by task and responsibility. All training of project personnel will be conducted under direct supervision of the HSO or their designee. Exemption from training may be approved by the HSO in conjunction with the Project Manager.

ATTACHMENT 3 TO HASP

AIR MONITORING PLAN

ATTACHMENT 3 TO HASP

AIR MONITORING PLAN FOR

DEPEW, NEW YORK PROPERTIES

Prepared By:

ADVANCED GEOSERVICES ENGINEERING, P.C.
West Chester, Pennsylvania

NY02-927
March 30, 2005

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2.0 Air Monitoring Program AMP-2

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2.2 Real-Time Particulate Monitoring AMP-3
2.3 Personal Air Monitoring During Site Activities AMP-4

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AMP-1 Air Monitoring Equipment
AMP-2 Air Monitoring Methods, Action Levels and Protective Measures

1.0 INTRODUCTION

This Air Monitoring Plan (the AMP) was prepared by Advanced Geoservices Engineering, P.C. (AGE) on behalf of NL Industries, Inc. for the former NL Industries/Depew Plant Site in Depew, New York. This Plan is Attachment 3 of the Health and Safety Plan.

The purpose of the AMP is to provide the reader with a description of the proposed air monitoring program to be conducted to monitor dust emissions during implementation of remedial action (RA) activities at the Site, specifically, sampling, excavation, stockpiling, transportation, soil treatment and backfill activities.

2.0 AIR MONITORING PROGRAM

2.1 INTRODUCTION

An air monitoring program will be performed for the following reasons:

A. To determine the presence of hazardous atmospheres and ensure that workers are wearing appropriate PPE. (PPE requirements are discussed in Section 8.0 of the Health and Safety Plan (HASP)). As discussed in Section 8.0, workers during the RA field activities will be wearing Level D PPE at the initiation of work.

B. To document the potential migration of dust and demonstrate whether adequate dust suppression methods are being employed.

This AMP identifies the procedure, instruments, and analytical methods to be used during the air monitoring program. Table AMP-1 summarizes the air monitoring equipment which may be used on this project and their function.

The air monitoring program will consist of real-time air monitoring and personal air monitoring for lead will be conducted in active work areas during the following RA field activities. The planned activities include soil sampling, excavation, stockpiling, soil treatment, transportation and backfilling. Air monitors will be placed upwind and downwind of active work areas, and for work areas on residential yards, at the closest commonly used point of ingress/grass.

The Health and Safety Officer (HSO) shall be responsible for all aspects of the air monitoring program including sample collection and informing the Project Manager (PM) of results. On-site calibrations of instruments will be performed as necessary and appropriate by the HSO in accordance with the instructions of the equipment manufacturer.

Lead has been identified as the main inorganic contaminant of concern during intrusive RA activities at the Site. The following sections discuss the air monitoring program to be conducted during the RA field activities.

2.2 REAL-TIME PARTICULATE MONITORING

Periodic, real-time particulate (dust) monitoring will be conducted utilizing a real-time aerosol monitor (RAM) which provides a reading of total dust in mg/m^3. The HSO will take periodic readings during the RA field activities to document dust emissions. These measurements will dictate whether an upgrade in PPE is required or if additional dust control is necessary.

The allowable dust levels on-site can be calculated for the compounds of concern using the following equation:

{Total Allowable Particulate of Concern Concentration (mg/m^3) = (estimated lead concentration) x (total particulate)}

This equation can be solved for the total allowable particulate as described below.

Lead has a TLV of 0.05 milligrams per cubic meter (mg/m^3). A safety factor of two provides an action level for lead of 0.025 mg/m^3. This is considered the total allowable particulate of concern concentration. Based on a 95 % confidence interval of the mean site soil lead concentration above 400ppm, a reasonable high site soil lead concentration is determined to be 5,000 mg/kg which is equivalent to 0.5% lead. The amount of airborne dust (total particulate) required to reach 0.025 mg/m^3 of lead is based a high site soil lead concentration of 5,000 mg/kg is as follows:

{Total Allowable Particulate Dust Concentration = 0.025 mg/m^3 x {1 mg/kg} / {0.005 mg/kg} = 5.0 mg/m^3}

The above calculation allows an accurate interpretation of the dust monitor data, relative to the chemical concentrations of concern at the Site. Personal protection levels will be increased in the event of total particulate levels measured above the specified action levels presented in Table AMP-2.

2.3 PERSONAL AIR MONITORING DURING SITE ACTIVITIES

The HSO will perform time-weighted average (TWA) air monitoring for lead exposure during the initiation of intrusive RA field activities. NIOSH Method number 7300 or equivalent will be used to collect, prepare, and analyze the samples to be collected for TWA considerations. One person for each job classification (i.e., backhoe operator, laborer) will be monitored in accordance with the Lead Construction Standard, 29 CRF 1926.62.

Sampling pumps will be calibrated before use to the appropriate flow rate. Pumps will be recalibrated after use to ensure that a constant flow rate is maintained during sampling. Calibration and maintenance of all sampling equipment will be performed by the HSO.

Air sampling will be performed for a minimum of seven hours during any eight hour work shift. Sampling results will be calculated as an eight hour time-weighted average and compared to the TLV for lead of 0.050 mg/m^3. The results of the air monitoring will be presented to the Project Manager and submitted to the QA Official. Results, as interpreted by the HSO and PM will dictate whether continued monitoring is necessary.

TABLES

Table AMP-1
Air Monitoring Equipment

INSTRUMENT	HAZARD MONITORED	APPLICATION	DETECTION METHOD	GENERAL CARE AND MAINTENANCE	OPERATING DURATION
Dust Monitor (Mini-Ram™)	Dust, aerosols, fumes, mist	Measures total or respirable particulate matter in air	Provides real time measurements of total or respirable particulate in a known volume of air	Recharge or replace battery	Battery life - 12 hrs. per charge
Personnel Air Monitor	Lead	Provides time-weighted averages (TWA) of concentration in milligrams per cubic meter	Laboratory analysis	Recharge battery, calibrate immediately before and after use	8 to 10 hours

Table AMP-2
Air Monitoring Methods, Action Levels and Protective Measures

Hazard	Monitoring Method	Action Level	Monitoring Schedule	Protective Measures (See Section 8.0)
Particulate Matter	Particulate monitor	Initially 2.5 mg/m^3 until the personal air monitoring data has been received, correlated to risk levels and discussed with EPA. Up to 5.0 mg/m^3 (respirable fraction) above background in the breathing zone after receipt of initial personal air monitoring results (if appropriate).	At the initiation of each task/operation and periodically (every 60 minutes) during invasive field activities and every 60 minutes near the property line (see Note 1)	Level D
		5.0-10.0 mg/m^3 (respirable fraction)	Periodically (every 60 minutes) during invasive field activities and every 60 minutes near the property line	Level C
		>10.0 mg/m^3 (respirable fraction)	Periodically (every 60 minutes) during invasive field activities and every 60 minutes near the property line	Level B
Lead	Personal Air Monitoring Laboratory Analysis Method #7300	0-0.025 mg/m^3	During first 7 days of operations and 1 day per month thereafter	(Level D)
		0.025-1.25 mg/m^3	Continuously during intrusive operations as identified in HASP	Implement full face respirator use (Level C)
		>1.25 mg/m^3	Continuously during intrusive operations as identified in HASP	Implement powered air purifying respirator use (Level B)

Note 1

1. Monitoring frequency may be modified (increased/decreased) based on field conditions, HSO's observations and professional judgement (i.e., more monitoring on windy days - less monitoring on rainy days). All changes in monitoring frequency must be approved by the Project Manager.

ATTACHMENT 4 TO HASP

SITE CONTINGENCY PLAN

ATTACHMENT 4 TO HASP

SITE CONTINGENCY PLAN FOR

DEPEW, NEW YORK PROPERTIES

Prepared By:

ADVANCED GEOSERVICES ENGINEERING, P.C.
West Chester, Pennsylvania

NY02-927
March 30, 2005

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2.8 Medical Emergencies SCP-4

3.0 Emergency Situations SCP-5

3.1 Fire or Explosion SCP-5
3.2 Spill Control SCP-5

4.0 Incident Reporting SCP-6

1.0 INTRODUCTION

This Site Contingency Plan (SCP) was prepared by Advanced GeoServices Engineering, P.C. (AGE) on behalf of the Respondent (NL Industries, Inc.) for the NL Industries/Depew Plant Site (the "Site") in Depew, New York to describe procedures during an emergency situation at the Site. This Plan is Attachment 4 of the Health and Safety Plan.

2.0 CONTINGENCY PLANNING

In the event of an emergency situation, the following order of notification will take place:

1. Person(s) witnessing an emergency will contact either the Project Manager or the Health and Safety Officer (HSO).

2. The Project Manager or HSO will immediately contact emergency assistance organizations (if necessary) and inform the site QA Official.

3. The QA Official will contact the EPA Case Manager and other local and regulatory agencies as required.

Emergency phone numbers are listed in Table HASP-1. This list will be kept current during the Remedial Action (RA) activities and will be clearly posted at the Site.

2.1 PRE-EMERGENCY PLANNING

Emergency evacuation routes will be designated upon arrival at the Site. During site orientation, all workers will be trained regarding the provisions of the emergency response plan, communication systems, and evacuation routes.

2.2 PERSONNEL ROLES AND LINES OF AUTHORITY

The HSO has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public, such as evacuation of site personnel and adjacent residents. The HSO shall also provide that corrective measures have been completed.

2.3 EMERGENCY RECOGNITION

Personnel should be familiar with techniques of hazard recognition from pre-assignment training and site-specific briefings.

2.4 EMERGENCY WARNING SIGNAL

The emergency signal shall be a continuous 30 second horn blast from a hand held air horn or a vehicle horn. Following the emergency signal, all personnel shall assemble in the support zone for an accounting and further direction by the HSO or the most senior field person present. If personnel are working in the exclusion zone, they shall exit by a safe and practical means. Decontamination shall be accomplished by the most practical means available.

2.5 EMERGENCY ESCAPE ROUTES

Site layout maps shall be available at the exclusion zone. Prior to commencement of work in a particular area, site personnel will be briefed on the escape route(s) for that area by the HSO. Figure HASP-2 shows the ingress and egress off-site and Figure HASP-3 shows the emergency route to the local hospital.

2.6 EMERGENCY CONTACTS

In the event of an emergency, the appropriate contacts from the list in Table HASP-1 will be made. This list of emergency phone numbers will be available at the Site.

2.7 EMERGENCY EQUIPMENT

The following equipment shall be available on-site during RA activities for use in the event of an emergency:

1. First Aid Kits
2. Fire Extinguishers
3. Telephone
4. Horn

2.8 MEDICAL EMERGENCIES

Any person who becomes ill or injured in the exclusion zone must be decontaminated to the maximum extent possible. If the injury is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed. First aid should be administered while awaiting emergency medical services.

Any person being transported to a clinic or hospital for treatment should take with them information on the COCs they may have potentially been exposed to at the Site. This information is included in Table HASP-2. A map to the St. Joseph Hospital can be found in Figure HASP-3.

Directions to Hospital:

1. Go west on Walden Avenue toward Princeton Avenue
2. Turn right on NY-240/Harlem Road
3. End at 2605 Harlem Road, Cheektowaga, NY

3.0 EMERGENCY SITUATIONS

Emergency situations on-site can take the form of fire, explosions, or spills of hazardous liquids. The procedures below dictate what should be performed in the event of an emergency situation.

3.1 FIRE OR EXPLOSION

In the event of a fire or explosion, the local fire department should be contacted immediately. Upon their arrival, the designated personnel will advise the fire commander of the location, nature, and identification of the hazardous materials on-site.

If it is safe to do so, site personnel may:

- Use fire fighting equipment available on-site to control or extinguish the fire; and
- Remove or isolate flammable or other hazardous materials which may contribute to the fire.

3.2 SPILL CONTROL

Containers that have spilled shall be inspected and their integrity assured prior to being moved. If the integrity of the container is in question, it shall be over packed or the contents transferred. Operations shall be organized so as to minimize movement. Where spills, leaks, or ruptures may potentially occur, a supply of sorbents shall be stationed in the immediate area.

In the event of a spill or leak, site personnel will:

- Inform their supervisor and the HSO immediately;
- Locate the source of the spillage and stop the flow if it can be done safely; and
- Begin containment and recovery of the spilled materials with sorbent (vermiculite, etc.).

4.0 INCIDENT REPORTING

All accidents regardless of severity shall be reported immediately to the HSO and an incident report must be completed. This report shall be immediately forwarded to the Project Manager and QA Official for investigation and follow up. The HSO is responsible for ensuring corrective action(s) are taken to reduce the potential for recurrence.

ATTACHMENT 5 TO HASP

MEDICAL MONITORING

ATTACHMENT 5

Medical Monitoring

The Occupational Safety and Health Administration (OSHA) has established requirements for a medical surveillance program designed to monitor and reduce health risks for employees potentially exposed to hazardous materials (29 CFR 1910.120). This program has been designed to provide baseline medical data for each employee involved in hazardous waste operations including field activities, and to determine his/her ability to wear respiratory protection and be medically certified before he/she performs designated duties. Where medical requirements of 20 CFR 1910.120 overlap those of 29 CFR 1910.134, the more stringent of the two will be enforced.

The medical examination must be administered on a pre-employment and annual basis and as warranted by symptoms of exposure or specialized activities. These examinations shall be provided by employers without cost or loss of pay to the employee.

The medical examination shall include the following:

1. Medical History and Physical, including:

    - Medical questionnaire;
    - Completion of medical history with occupational risk factor analysis;
    - Examination by physician;
    - Evaluation of test results; and
    - Brief report sent to employer covering specific requested areas as well as pertinent positive findings; report sent to family physician and employee by request.

2. Pulmonary Function Testing;

3. Electrocardiogram (baseline, and at the discretion of examining physician);

4. Chest X-Ray (baseline, and at the discretion of examining physician);

5. Lab Tests, including:

- Urinalysis;
- Blood Chemistry Profile;
- Complete blood count with differential;

6. Vision Screen; and

7. Audiogram.

The examining physician is required to make a report to the employer of any medical condition which would place such employee at increased risk of wearing a respirator or other personal protective equipment. Each employer engaged in site work shall assume the responsibility of maintaining site personnel medical records as regulated by 29 CFR 1910.120, where applicable. Exemption from the medical surveillance program may be allowed by the HSO in conjunction with the Project Manager. These exemptions will be based on their interpretation of the requirements of 1910.120 relative to each individual exemption request.

Basically, an employee is required by federal regulation to have medical monitoring if the employee is or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits for these substances, without regard to the use of respirators, for 30 days or more a year.

All employers contracted to work at the Site designated by this plan will be responsible to ensure their employees have received the proper medical tests as regulated by 29 CFR 1910.120 and shall provide the QA Official with certification of same.

ATTACHMENT 6 TO HASP

SPECIAL HAZARDS/CONSIDERATIONS EXCAVATION, TRENCHING, SHORING

ATTACHMENT 6

Special Hazards/Considerations

Excavation, Trenching, Shoring

Excavation and trenching activities may occur at the Site during the RA activities. The following minimum procedures shall be followed when excavation and trenching activities are performed.

- The main concerns of trenching and excavation are ground control and fall prevention. Before an excavation is made, a thorough effort should be made to determine whether underground obstructions (such as sewer, telephone, fuel, water, or electrical lines) or above ground hazards may be encountered. Utility lines should be properly supported during excavation. The appropriate utility personnel should be contacted to inform them of the proposed site excavation work and to receive any additional advice based on their experience. Natural hazards such as boulders and trees should be removed or controlled before excavation begins if they might create a hazard to workers.

- Very specific guidelines exist to protect employees from moving ground during excavation. They are based on ground type and excavation depth. The walls and faces of all excavations to which employees are exposed should be guarded by a shoring system, a sloping of the ground, or another equivalent means. All slopes should be excavated to a degree which accommodates the ground's unique ability to slide. Soil types, listed below from most likely to least likely to slide, include:

    - well-rounded loose sand,
    - compacted sharp sand,
    - average soils,
    - compact angular gravel, and
    - solid rock, shale, or cemented sand and gravels.

Not all excavations need to be shored or sloped. The purpose of these precautions is to prevent

crushing injury or suffocation. Banks more than five feet high shall be shored with materials in good condition or laid back to a stable slope based on ground type. Trenches less than five feet deep should also be protected if it appears that an injury may be caused by hazardous ground movement. Walkways, sidewalks, and runways should be free of excavated materials to prevent falls; planks used for raised walkways should be securely fastened at each end.

It is necessary to consider unexpected events or past ground work which might affect the security of the excavation site.

Additional precautions should be taken to prevent slides or cave-ins when trenches or excavations are made near backfilled excavations or where excavations are subject to external vibrations such as railway or highway traffic or machinery. Rain storms may seriously compromise the stability of excavation surfaces; a competent person should ensure that no weather-related decrease in safety has occurred.

Diversion ditches, dikes, or other suitable means should be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Water should not be allowed to accumulate in an excavation. If it is necessary to place or operate power shovels, derricks, trucks, materials, or other heavy objects on a level above and near an excavation, the side of the excavation should be braced as necessary to resist the extra pressure from such loads. When mobile equipment is used next to excavations, substantial stop logs or barricades shall be installed. If possible, the grade should be away from the excavation.

The federal regulations on excavations and trenches are very specific. Refer to 29 CFR 1926.650-652 (Occupational Safety and Health Standards-Excavations; Final Rule) for complete details on excavation and trenching safety requirements.

APPENDIX C

SAMPLE ACCESS AGREEMENT

VIA CERTIFIED MAIL

March 30, 2005

NY02-927-00

Name
Owner Mailing Address
City, State, Zip

RE: Depew Plant Site
Consent for Access

Dear Property Owner:

On behalf of the Respondent (NL Industries Inc.), Advanced GeoServices Engineering, P.C. (AGE) is providing environmental services in the community of Depew, New York. These services consist of soil sampling and, if necessary, clean up work in your neighborhood. AGE is requesting permission to come onto your property located at **Property Address** to sample soils in your yard or conduct removal activities in your yard, if the soil lead concentrations warrant, or both. Current plans call for sampling properties that have not previously been sampled and photo-documentation of all properties in the fall of 2004. Soil removal will not occur until the spring of 2005. Representatives from AGE will be in contact with you shortly to let you know what is planned for your property. These activities are being performed according to an Administrative Order on Consent between the United States Environmental Protection Agency (USEPA) and the Respondent.

We are asking your permission for AGE employees, and contractors hired by the Respondent, and USEPA to come onto your property (yard only) to conduct soil sampling, soil removal (if necessary) and replacement of any landscaping that might be disturbed. The soil sampling involves hand-digging several small holes in your yard to collect samples. All of the sampling holes will be filled after the sampling with topsoil and the grass returned or new grass seed planted. The soil removal operations, if necessary, would involve the removal of surface soil, typically to a depth of about 6 inches, from your yard, replacement with clean soil, replacement of grass with seed and replacement of any trees, shrubs, bushes, etc., that might be removed to complete the work.

Prior to any soil removal operations, representatives from AGE or the selected remedial Contractor will meet with you to discuss the specifics of the activities including schedule, landscaping, and methods of removal and restoration.

Enclosed you will find a "Property Owner Consent Form" which we ask you to sign and return in the postage paid envelope to grant us permission to perform a survey of your property (if necessary), collect soil samples, and conduct soil removal operations. Again, actual soil removal operations, if necessary, will not be performed until we meet with you to discuss the specifics. Your participation is needed for successful completion of this phase of work. There will be no cost to you, and results of any testing performed on your property will be provided to you by AGE.

If you have any questions, please call myself at (610) 840-9159 or my assistant Kim Keenan (610)-840-9183. The Respondent and AGE thank you for your cooperation.

Very truly yours,

ADVANCED GEOSERVICES ENGINEERING, P.C.

Kevin O'Rourke
Senior Staff Professional

KO:kk

Enclosure

PROPERTY OWNER CONSENT FORM

I hereby consent to the entry upon our premises by representatives, or contractors of the Respondent, Advanced GeoServices Engineering, P.C. (AGE), the United States Environmental Protection Agency (USEPA), and the New York State Department of Environmental Conservation (NYSDEC) for the purpose of soil sampling and potential soil removal operations. We understand that pre-removal surveys, photo-documentation and sampling may be performed once this form is signed; however, actual soil removal operations, if necessary, will not be performed until AGE or the selected remedial Contractor meet with me to discuss in detail the work that is to be performed. There is no cost to me, the property owner, and all costs associated with the soil sampling, removal, and related operations will be paid by the Respondent.

Owner (Please Print)	Date
Signature	**Property Address** Street Address
Phone Number **(required)**	City, State, Zip Code

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Email: agc@agcinfo.com • Web Site: www.agcinfo.com