UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

October 2, 2007

VIA FEDERAL EXPRESS

Matthew Love
Director, Environmental Affairs
Exide Technologies
3000 Montrose Avenue
Reading, PA 19605

Re: Reading Offsite Study Areas

Dear Mr. Love:

I have reviewed the Remediation Work Plan ("Work Plan") that you submitted on behalf of Exide Technologies ("Exide") by letter dated September 19, 2007. Section VI of the 2000 Administrative Order on Consent ("Order") between EPA and Exide requires the submission of a Work Plan but provides for the evaluation of Risk Assessment areas sequentially. Consistent with this sequential approach, EPA is hereby approving the September 19, 2007 Work Plan, with the clarifications provided in the attachment to this letter, as the first in a series of work plans. In accordance with the schedule in the Work Plan, sampling will begin in November 2007. This approval does not terminate any of Exide's remaining obligations for additional remedial work required by the Order. Please be advised that the approved Work Plan with clarifications is no longer considered a draft document and therefore will be available for release upon request.

The cleanup of occupied residential properties remains EPA's highest priority. However, EPA looks forward to working with Exide to address the remaining areas of concern in the Muhlenberg and Laureldale communities. EPA expects to meet with owners and representatives of properties not covered by the September 19, 2007 Work Plan to establish cleanup goals and to outline a tentative schedule that adheres to the priorities established in the Order. EPA will contact Exide shortly to discuss the details of this approach.

EPA has met with residents and local officials regarding the status of plans for the cleanup of Bernhart Park. As you know, the affected communities are anxious to complete a cleanup and reopen the park as quickly as possible. I plan to meet with you sometime in October to revise plans for the Bernhart Park cleanup with the goal of discussing the Park with Reading representatives within the next 60 days. EPA expects Exide representatives to be present at that meeting.

Region III has also received and considered the September 25, 2007 proposal from Mr. Robert Collings, counsel to Exide, regarding matters discussed with Exide during a September 17, 2007 meeting. In response to the September 25 proposal and Exide's September 19 Work Plan submission, EPA confirms its position that Exide's obligation to perform under the 2000 Order remains in full force and effect.

If you have questions regarding the attached Work Plan approval, please contact me. Questions regarding EPA's position on this matter should be addressed to either Susan Hodges at (215)814-2643 or Cynthia Nadolski at (215)814-2673.

Sincerely,

Khai Dao
Project Manager

cc: Robert Collings, Esquire
Susan Hodges (3RC43)
Cynthia Nadolski (3RC43)

The September 19, 2007 Remediation Work Plan is approved with the following clarifications:

1. EPA reserves the right to require additional soil samples within the study area to address anomalies in previous results, to clarify the boundary of the study area, and to respond to resident requests. In addition, residential property owners who refused access during past sampling events will be given another opportunity to participate.
2. EPA will approve all proposed removal areas and proposals to consolidate Exposure Areas for sampling or cleanup purposes. EPA reserves the right to add or remove properties listed in Table 3-2 Proposed Removal Areas.
3. Exide will notify EPA, Laureldale Borough, and Muhlenberg Township at least 2 weeks prior to the start of a remediation phase.
4. Sampling protocol will include at least one composite sample per Exposure Area taken from the 3" to 10" horizon. If an Exposure Area includes a garden, at least one composite sample will be taken from the garden area.
5. Exide will comply with all Pennsylvania Department of Environmental Protection regulations governing the preparation, transportation, and disposal of lead-contaminated soil generated during the residential phase cleanup.
6. Exide will be required to establish a grass cover on all remediated residential properties.

DRAFT
REMEDATION WORK PLAN

Prepared For:

EXIDE TECHNOLOGIES
Reading, Pennsylvania

REMEDIATION WORK PLAN

Prepared For:

EXIDE TECHNOLOGIES
Reading, Pennsylvania

Prepared By:

ADVANCED GEOSERVICES CORP.
West Chester, Pennsylvania

Project no. 2002-955--01
September ___, 2007

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APPENDIX

1.0 INTRODUCTION

This Remediation Work Plan for remediation of developed residential Exposure Areas (EAs) surrounding the Exide Technologies' Reading Complex (Work Plan) was prepared by Advanced GeoServices Corp. (Advanced GeoServices) for Exide Technologies (Exide) to satisfy requirements of the Administrative Order on Consent dated March 2, 2001 (the "Order") between Exide and the United States Environmental Protection Agency (USEPA).

1.1 PURPOSE OF WORK PLAN

This Work Plan addresses soil remediation activities to be performed in residential areas in the vicinity of Exide's facility in Muhlenberg Township and Laureldale Borough, Berks County, Pennsylvania (the "Facility"). Specifically, Exide will remediate developed residential exposure areas within a defined Study Area that have average lead concentrations in surface soils (0 to 3 – inches) greater than 650 mg/kg. The properties are located primarily east, west and north of the facility. In addition, this Work Plan includes requirements for characterization soil sampling on developed residential properties within the Study Area, as shown on Figures 1A and 1B, where access had previously not been obtained by Exide and its representatives, and where the USEPA has requested the Study Area be expanded.

Key features of the work include:

- Property access agreements for characterization soil sampling;
- Procedures for Exposure Area characterization sampling;
- Protocol for evaluation of characterization soil sampling results;
- Sequencing of remediation activities;
- Property access agreements for remediation, meetings with property owners, and landscape audits;
- Development of Exposure Area specific remediation plans;
- Required permitting and notifications;
- Mobilization and site preparation;
- Required permitting and notifications;

- Mobilization and site preparation;
- Remediation of surface soils as specified in the detailed exposure area specific remediation plan to achieve average total lead concentrations in surface soils less than 650 mg/kg;
- Characterization and off-site disposal of excavated soils;
- Confirmation sampling;
- Backfill and restoration of excavations;
- Demobilization; and
- Final Reporting.

1.2 PROJECT BACKGROUND

Since 1991, several phases of study and remediation have been performed on soil, sediment and groundwater in the vicinity of the Facility (Study Area) to investigate and remediate lead concentrations that may be attributable to past Facility operations. The current boundaries of the Study Area are shown on Figures 1A and 1B. These studies and remediations include:

- Soil sampling performed during 1992 (now referred to as the Phase I investigation);
- Soil sampling performed between completion of the Phase I investigation and July 2, 1993, designated as the Phase II investigation;
- Soil, sediment and groundwater sampling performed under the Phase III investigation in 1994;
- The Phase IV soil and sediment sampling event (1996);
- Soil sampling conducted during the summer of 1998 as part of the Act 2 Work Plan;

- Interim Remedial Measures (2000) which included soil removal and restoration activities on 24 residential properties in close proximity to the Facility;

- A 2001 study during which approximately 500 properties were sampled to determine the soil lead concentrations in each property in the Study Area;

- Interim Remedial Measures (2002) which included soil removal and restoration activities on 52 residential properties in the Study Area, and;

- Other miscellaneous soil and private water supply sampling performed at the request of individual property owners.

The Order allows for Exide to develop a site specific soil remediation standard for residential properties in the Study Area. Exide elected to develop such a standard and proceeded to do so. However, USEPA disagreed with Exide's conclusions. All dispute resolution procedures specified in the Order were completed to resolve this issue and the USEPA issued a decision on August 2, 2007 that a remediation standard of 650 parts per million lead in soil should be applied. While Exide disagrees with the USEPA's decision and maintains that a remediation standard of 650 ppm is overly conservative, Exide has agreed to apply this standard provided certain details regarding all aspects of investigation and remediation in the Study Area can be reached. This Work Plan identifies the Exposure Areas (EAs) on developed residential properties to be remediated and the procedures for remediation. An EA is the area of property where human contact with the soil will be experienced. Pursuant to USEPA Soil Screening Guidelines, EAs for residential properties are equal to or less than 20,000 sf. Because most developed residential properties in the Study Area are <20,000 sf the exposure area is the entire yard and for houses with small lots (<10,000 sf) and exposure area can actually be adjacent single family homes or adjacent twin homes with similar yard/exposure conditions. For properties >20,000 sf, the property may have two or more EAs. In those instances, the remediation proposed herein is applicable to the EA most frequented by the resident.

1.3 WORK PLAN ORGANIZATION

The remainder of this Work Plan is organized as follows:

- Section 2.0 - Project Organization
- Section 3.0 – Property Access, Characterization Sampling and Data Evaluation
- Section 4.0 – Sequencing and Exposure Area Specific Remediation Plans
- Section 5.0 - Premobilization Access and Permitting Activities
- Section 6.0 – Mobilization, Preparation and Soil Removal Activities
- Section 7.0 - Confirmatory Sampling
- Section 8.0 - Backfill, Restoration, and Demobilization Activities
- Section 9.0 - Project Schedule
- Section 10.0 - Health and Safety
- Section 11.0 - References

2.0 PROJECT ORGANIZATION

Several organizations, companies and individuals will be involved in implementation of this Work Plan. These parties are summarized below and are shown on the organizational chart on Figure 2.

2.1 PROJECT COORDINATOR

The Project Coordinator for Exide will be Mr. Matthew Love. Mr. Love will be responsible for overall performance of the remediation including coordinating the efforts of the Engineer, Construction Quality Assurance (CQA), and Contractor, and apprising the Regulators of project status.

2.2 REGULATORS

The USEPA will be regulating and approving the remediation as well as ensuring its timely implementation. The USEPA representative is Mr. Khai Dao.

2.3 PROJECT MANAGER

Advanced GeoServices will manage and oversee the Work Plan activities on behalf of Exide and will also serve as the Design Engineer for remediation plans. Advanced GeoServices' representative will be Paul Stratman, P.E., P.G. (Advanced GeoServices Project Manager).

2.4 SAMPLING AND QUALITY ASSURANCE (QA) REPRESENTATIVES

Advanced GeoServices will provide qualified field representatives for securing access and collecting soil samples during the initial characterization sampling and on-site resident oversight of soil remediation activities. The QA Representative will be experienced in oversight of soil remediation activities and will communicate with the AGC Project Manager. As part of the QA services, the QA Representative will perform confirmatory soil sampling following completion of specified remediation activities.

2.5 REMOVAL CONTRACTOR

Exide will retain a contractor to conduct the removal operations (the "Contractor"). The Contractor will be responsible for providing on-site Health and Safety and Quality Control services. The Contractor will be experienced in residential soil remediation and removal and disposal of contaminated materials.

2.6 DATA VALIDATION

In conjunction with QA activities, Advanced GeoServices will provide data validation services for samples collected which are sent off-site for analysis. The laboratory data will be validated to the IM-1 level as described in the "Innovative Approaches to Data Validation", USEPA III, 1995 guidance document. The QA Manager will be Jennifer Stanhope.

2.7 SURVEYOR

Advanced GeoServices will perform pre-remediation condition surveys of the properties to be remediated. Information from this survey will form the basis of the Exposure Area specific remediation plans to be developed prior to the start of each phase of remediation. The surveyor will mark property lines in the field and establish control points on or near the property being surveyed that will be used by the Contractor during remediation. During remediation, the Contractor will be permitted to utilize their own personnel and equipment to establish vertical and horizontal removal limits specified on the Exposure Area specific remediation plan and to document that the restoration matches the pre-remediation conditions survey.

2.8 ANALYTICAL LABORATORY

Advanced GeoServices will utilize M.J. Reider Laboratory, of Reading, Pennsylvania, for analysis of soil samples. All post excavation and characterization sampling will be completed using laboratory analysis. An XRF unit may be utilized to guide excavation activities in the field.

3.0 PROPERTY ACCESS, CHARACTERIZATION SAMPLING AND DATA EVALUATION

Prior to finalizing the list of developed residential properties that will be remediated, USEPA has requested that Exide make an additional attempt to perform characterization sampling on those properties in the Study Area to which Exide and its representatives were unable to previously obtain access. USEPA has also requested that Exide expand the Study Area somewhat to the southwest and perform characterization sampling on properties in those properties in the expansion area. Procedures for conducting the required characterization sampling and evaluating the results are as follows.

3.1 PROPERTY ACCESS

Prior to sampling of a property, Exide will obtain written property access from the property owner. The request for access will be sent via certified mail to the owner of record for the property, as obtained from the Berks County Tax Assessors Office. The request for access will contain a letter describing sampling procedures to be performed, an authorization page to be signed by the property owner, and a stamped return envelope (an example Access Agreement is provided in Appendix A).

If a response is not received from a property owner within 14 days of mailing the request for access, an Advanced GeoServices representative will make a minimum of two attempts to call the property owners for whom phone numbers can be identified. The purpose of the call will be to answer any questions and encourage their participation in the sampling program. If contact cannot be made by telephone, an Advanced GeoServices representative will visit the property in person. If the owner is home, Advanced GeoServices will review the proposed work and request their consent. If the owner is not home, a letter will be left at the home explaining that attempts are being made to contact the owner and request they respond. The letter will indicate this is the last attempt that will be made to contact the owner and if not response is received within 10 days, Exide will not agree to, or be required to perform any additional sampling or remediation on that property. The letter will include a copy of the letter sent to them earlier via certified mail. After these attempts, properties for which access has not been obtained will be referred to USEPA.

3.2 PROPERTY CHARACTERIZATION SAMPLING

3.2.1 Rationale

Soil characterization sampling will be performed following the same procedures utilized during previous characterization sampling of other residential properties. These procedures are in general accordance with the USEPA's Soil Screening Guidance: Users Guide (9355.4-23, July 1996), consisting of a specific number of composite soil samples collected from across the area being sampled to provide representative results for that area.

Developed residential exposure areas to be characterized will be approximately 20,000 sf or less. On small (<10,000 sf lots) adjacent properties may be combined to create the Exposure Area to be characterized. The combining of properties will be limited to two pairs of twins or two singles. The area to be characterized will be divided into quadrants (sub-areas). Twelve grab samples will be collected from the Exposure Area and will be used to create three composite samples for laboratory analysis. This approach is justified because the alleged mode of deposition creates relatively uniform concentrations over short distances. Tax maps will be used to divide these properties along their defined borders.

3.2.2 Sample Locations

Per the general approach contained in the USEPA guidance sampling procedures, each Exposure Area is divided into four sub-areas. Three (3) discrete surface soil samples (0-3 inches in depth) will be collected from each sub-area. One discrete sample from each of the four sub-areas will be combined to form a composite sample. A total of three composite samples each comprises of four discrete samples (one from each sub-area) will be created in this manner. This procedure will be applied to each Exposure Area regardless of the size of the Exposure Area. The Coefficient of Variability (CV) for the composite sampling program will be determined by performing a CV calculation on selected areas within the Study Area. Multiple contiguous Exposure Areas will be selected based on similar characteristics such as distance from the Facility, topography, and vegetative cover. The 0- to 3-inch composite sample results from the selected Exposure Areas will be used to calculate the CV. It is expected that the CV will be less

than or equal to 1, which will support that three composite samples per property are adequate. Given that the lead in soil was allegedly aerially deposited, the CV for lead in soils is expected to be low. Furthermore, given that most of the Exposure Areas are much smaller than the soil screening guidance guidelines of 20,000 square feet, three composite samples are adequate to characterize the soil lead in each Exposure Area. In the event that the CV is greater than 1, Exide will collect additional samples such that the CV is below 1 or the DQOs in the soil screening guidance are met.

The Advanced GeoServices field supervisor will randomly choose the sample locations on a lot by lot basis. The individual discrete sample locations will be offset if they fall within the building structures or located to minimize contributions from other potential sources of lead based on the following protocols:

1. Soil samples will be collected at a minimum of 10 feet from painted permanent structures, roads and driveways;

2. Samples will be collected at a minimum of 5 feet from down-spouts and drainage features;

3. Samples will be collected at a minimum of 5 feet from potential property specific contamination sources (e.g., trash burning areas, barbecues, waste storage areas, etc);

4. Samples will be collected at a minimum of 5 feet from recently disturbed areas (i.e.., gardens, graded areas, utility excavations); and

5. Samples will not be collected beneath asphalt, concrete or crushed stone/gravel driveways or parking areas. Crushed stone/gravel driveways and parking areas are not to be sampled to avoid other potential lead sources, such as automobiles. Other stone/gravel-type features (e.g., walkways, etc.) will not be excluded from the characterization sampling.

3.2.3 Soil Sampling Frequency

Once the soil sample locations have been identified, sample collection will be implemented. Three discrete surface soil samples will be collected from each sub-area at a depth of 0 to 3-inches and combined with the respectively-numbered samples from the three other sub-areas to form three composite samples per the USEPA guidance. Deeper samples (e.g., 3-10 inches) may be collected in areas identified by the sampling team leader as being disturbed, sample locations on developed residential properties will be field located by Advanced GeoServices personnel using a tape measure, Brunton compass and local physical and topographic features. This information will be recorded by an Advanced GeoServices representative in a bound field logbook.

Composite soil samples will be analyzed for total lead using USEPA Method 6010. Quality control samples such as field duplicates, equipment blanks and matrix spike and matrix spike duplicates will be collected in accordance with the Quality Assurance Project Plan (QAPP) presented in Appendix B. The soil sampling procedures are described below.

3.2.4 Soil Sampling Procedures

Soil samples will be collected from 0-3 inches using a decontaminated hand auger or shovel. Discrete samples from each sub-area will be composited with discrete samples from the three other sub-area to form the sample to be submitted for lead analysis. Any existing vegetative cover will be carefully removed and loose dirt from the root mat will be placed into the sample mixing bowl. Following completion of the sampling, the resulting hole will be filled with clean topsoil and the vegetative cover returned. Soil characteristics (e.g., color, consistency, presence of debris) will be noted at each location. The soil sample placed into a mixing bowl will be homogenized for two minutes and then sieved through a #60 sieve. The soil portion passing through the sieve will be collected, placed into a sample container, and analyzed for total lead.

3.3 EVALUATION OF CHARACTERIZATION SAMPLE RESULTS

After achieving a Coefficient of Variability (CV) of less than 1 for an Exposure Area, the arithmetic mean (average) of the samples from the 0-3 inch sample horizon for the Exposure Area will be calculated. Those Exposure Areas that have an average total lead in soil concentration exceeding 650 mg/kg will be reviewed with USEPA to determine if any individual composite results appear to be statistical outliers compared to other composite samples for the Exposure Area and composite samples for Exposure Areas in the vicinity, and whether resampling might be warranted. If it is determined that resampling is not warranted, the property will be reviewed on an area by area basis with USEPA for a final decision regarding the requirements for remediation. If remediation is required, the Exposure Area will be added to the list of properties identified in Section 4.0 for remediation. Exposure Areas with an average total soil lead concentration <650 mg/kg will be eliminated from further study or action and No Further Action letters for these properties will be issued to the property owners by the USEPA with a copy to Exide. Results of the soil sampling results and averaging calculations will be provided to the homeowner after review and concurrence from USEPA.

4.0 SEQUENCING AND EXPOSURE AREA SPECIFIC REMEDIATION PLANS

The information presented in this Work Plan is intended to identify those developed residential Exposure Areas requiring remediation and establish the time for completion of that remediation. Prior to the start of each "phase" of remediation, Exposure Area specific remediation plans will be developed. The tentative sequence and contents of the remediation plans are described below.

4.1 SEQUENCING

Remediation of the developed residential properties is expected to occur over approximately three seasons of construction. Each season will be considered a phase and are referred to herein as Phase 1 (2008 Remediation); Phase 2 (2009 Remediation); and Phase 3 (2010 Remediation). The following list of properties has been developed using the average total soil lead concentration in the surface soil sample horizon for each Exposure Area. The list will be divided into roughly thirds for remediation over the 3 phases. Priority will be given to EAs frequented by children. Exposure Areas identified through the characterization sampling described above will be added to the lists as appropriate after completion of the characterization sampling.

4.2 EXPOSURE AREA SPECIFIC REMEDIATION PLANS

No later than 45 days prior to the start of each phase of remediation, Exide will submit for USEPA review Exposure Area specific remediation plans. The Exposure Area specific remediation plans will present the results of a field survey showing the location of surficial features (such as house, driveways, fences, sidewalks, play equipment, gardens and sheds/garages), topography, drainage features, trees and approximate location of property line. Over the base information obtained during the field survey will be the approximate locations of samples collected during characterization sampling and the proposed limits of remediation. The plan will also present information required by the Berks County Conservation District as part of the soil erosion and sediment control plan. The plan will be signed and sealed by a Pennsylvania Licensed Professional Engineer.

5.0 PRE-MOBILIZATION AND MOBILIZATION ACTIVITIES

The following section describes the tasks which will be conducted prior to and during mobilization and site preparation.

5.1 PRE-MOBILIZATION PREPARATION ACTIVITIES

5.1.1 Property Access

Prior to any surveying or intrusive preparation or remediation activities, Exide will obtain property access from each of the property owners. The approach to access will be similar to the procedures described in Section 3.1 for sampling access. A copy of the proposed access letter for remediation is provided in Appendix A.

5.1.2 Landscape Audits

As soil removal activities on some properties will require the removal of trees, shrubs, or similar ornamental vegetation, Advanced GeoServices or its subcontractor will perform a landscape inventory of each property. The audit will consist of an inventory of all trees, shrubs, bushes, ornamental groundcover (excluding turf), and similar landscaped plants graphically portrayed on an individual field sketch of each property. The auditor will provide a monetary replacement value as well as an installation cost for all landscaping items which are to be removed as part of the remediation. Replacement value will be based on average market value of a replacement item of nursery-stock age (e.g., a mature tree will have a replacement value equal to the cost of a non-mature nursery-stock tree of the same species). The property owner will be given the choice of receiving a check that includes the replacement cost for the removed items as well as the cost to have the landscaping installed by a local landscaping company or have Exide's Contractor retain the landscaper directly and coordinating replacement. The Contractor will be responsible for establishing the turf (grass) regardless of which option is chosen.

5.1.3 Pre-Removal Meetings

Prior to the start of removal activities on a given property, the QA Representative and a representative from the Contractor will meet with each property owner to describe the soil removal, confirmation, and restoration activities to be performed on his/her property, including a tentative schedule. At no time shall the Contractor discuss substitutions for restoration (e.g. gravel driveways, asphalt or concrete replacement) without the presence of Exide's Project Coordinator and a written description of the discussion and agreement submitted to the owner for approval before implementation.

5.1.4 Soil Characterization Sampling for Disposal

Soil characterization sampling for disposal purposes will be conducted by the Contractor on the properties specified in Section 4.1 for remediation prior to commencement of remediation activities. It is anticipated that disposal characterization sampling will consist of five aliquots collected from locations randomly-distributed over the Exposure Area proposed for remediation to depths equivalent to the target removal depth. Each aliquot will be taken from within the planned remediation area and composited together to represent the waste characterization for that area. Each remediation area characterized will be consistent with the disposal facility's requirements. The composite samples will be analyzed for parameters as specified by the proposed disposal facility.

5.2 SOIL REMOVAL PREPARATION ACTIVITIES

5.2.1 Mobilization and Set-Up

The Contractor will mobilize equipment, supplies, and support zone facilities to the site as needed to conduct remediation activities. Equipment and materials will be inspected for compliance with contract requirements, specifications, material quality and operability. Mobilization will occur following the Notice To Proceed and the submission of any required pre-construction submittals. Electric and water service will be supplied by the Contractor as needed in accordance with local, state, and federal regulations to conduct remediation operations.

Support zone facilities utilized by the Contractor will be removed at project completion. Location of support zone facilities will be proposed by the Contractor and submitted to Exide and the QA Representative for review and approval. The support zone area will be a stable and sufficient surface for office/equipment trailer placement. Operation of temporary sanitary facilities and disposal of sanitary wastes will be conducted by the Contractor in accordance with state and local regulations. Contamination Reduction Zones (CRZs) and exclusion zones will be identified and demarcated by the Contractor. It is anticipated that these zones will vary based on the active remediation area.

5.2.2 Permits, Certificates and Licenses

The Contractor will obtain all environmental and construction-related permits, licenses and/or certificates required by local, state and federal agencies. Copies will be provided to Exide and the QA Representative and all required permits, licenses, and certificates will be obtained prior to initiation of work requiring the permits.

5.2.3 Surveying and Delineation of Remediation Areas

Prior to initiation of remediation activities, the Contractor will review the proposed Exposure Area specific remediation plans for consistency with actual field conditions and notify the QA Representative in writing of any variability that will affect work. The Contractor will utilize existing property pins, physical features and boundaries as necessary to delineate excavation remediation limits. These remediation limits will be maintained throughout the duration of work in these areas. The Contractor will confirm pre-existing grades of each yard as necessary to verify features and established controls for proposed removal depths. This confirmation will include establishing spot elevations for soil remediation depth control and for restoration of the yard. Following completion of soil remediation, the Contractor will document final remediation depths. The spot elevations will be used to document that the work performed meets the Work Plan requirements. The information will be shown on the sketches developed by the Contractor. Survey information of each property remediated will be provided by the Contractor two weeks following completion of remediation activities. The Contractor is not required to hire a Licensed

Professional Surveyor unless required to resolve a dispute regarding the consistency of restoration versus pre-remediation conditions.

5.2.4 Utility Verification

Prior to remediation, the Contractor will coordinate with local utilities and private utility locator services to identify and mark all utilities (underground, surface and above-ground) in accordance with local, state and federal regulations. The sanitary sewer cleanouts will be marked as well and preserved throughout remediation and restoration. The Contractor will also request utility clearances from local utility companies, as needed. Care will be taken to protect all identified and unidentified utilities during operations. Locations of all utilities shall be documented by the Contractor and shown in the Final Report.

5.2.5 Erosion and Sediment Control

All erosion and sediment control features will be implemented and installed by the Contractor in accordance with the requirements of the Exposure Area specific remediation plans and erosion and sediment control permit. This shall include, but not be limited to, installation of silt fence and inlet protection to control erosion and contain sedimentation. Erosion and sedimentation control plans will be prepared in consultation with the Contractor and submitted to the Berks County Conservation District for their concurrence.

6.0 SOIL REMOVAL ACTIVITIES

The following section describes the soil removal activities to be performed during remediation.

6.1 VEGETATION REMOVAL

Vegetation removal methods will be proposed by the Contractor and approved by the QA Representative. It is anticipated that vegetation removal will be limited to landscaped items to be removed and replaced as well as miscellaneous standing brush. Soils attached to the roots of removed vegetation will be shaken off at the location of removal. Removed vegetation (excluding grass) will be stockpiled separate from excavated soil materials and will be disposed of at an approved facility and in accordance with local, state, and federal regulations. Mature trees (i.e., greater than 9" diameter at chest height) will be protected during remediation. However, if the excavation depth is too great, the trees may need to be removed.

6.2 EXCAVATION

The remediation areas will initially be excavated by the Contractor to the depths shown on the Exposure Area specific remediation plan. Further excavation beyond the initial depth will be dictated by field screening and confirmatory sampling as described in Section 7.0.

Excavations will be conducted using traditional construction equipment proposed by the Contractor and approved by the QA Representative. In addition, hand excavations will be conducted in close proximity to structures, utilities, mature trees or other areas that would be difficult to excavate with or that may become damaged by heavy equipment.

No removal will be performed beneath structures, roads, sidewalks, driveways or other inaccessible or permanent features.

6.3 MATERIALS HANDLING, STAGING, AND DISPOSAL

Excavated materials will be direct-loaded into transport vehicles for transportation to the approved off-site disposal facility or temporary staging facility on the Exide property approved by USEPA. Appropriate local, state, and federal regulations will be followed for documentation, placarding, and transporting of the material. It will be the responsibility of the Contractor to locate, negotiate, and select a USEPA-approved disposal facility. The Contractor will also be responsible for transportation of the material, which will include coordination with the disposal facility as well as a full-time crew member to document manifest and volume/weight of the material. The disposal facility should be able to accept all waste generated for any given day or the following morning. Small quantities (<22 tons) are acceptable for temporary stockpiling on the property as long as the remaining stockpile is removed within 24 hours after generation.

The Contractor will also be responsible for a secondary disposal facility in the event that the primary declines acceptance for unforeseen reasons. If in any event, the excavated soil cannot be offloaded and excavation is halted, the Contractor will take full responsibility for any "down time" (including Exide's consultants) that is incurred as a result and agrees that Exide is not liable for any costs associated with this delay. The disposal facility approval must be obtained before any excavation is initiated.

When temporary soil staging is permitted, the materials will be covered with 10-mil (min.) polyethylene sheeting to eliminate rainwater contact and to provide dust control. Temporary covers will be anchored with sandbags or similar methods to prevent uplift. The Contractor will install appropriate containment structures in and around the staging area (e.g. hay bales).

6.4 SEQUENCE OF CONSTRUCTION

It is anticipated that excavation work will occur one property or contiguous groups of properties at a time, depending on a practical sequence of work and schedule. The Contractor will determine the order and direction in which excavations are conducted and will submit the sequence to the QA Representative and Exide for review a minimum of 2 weeks prior to

initiation of excavation in the subject area. Excavation sequencing will be based on minimization of potential cross-contamination, efficient transport travel routes, and scheduling.

6.5 RELATED EXCAVATION ACTIVITIES

6.5.1 General Equipment Decontamination

Within each excavation area, a decontamination pad will be constructed and will provide for containment of decontamination wash water out of the exclusion zone. A high-pressure washer or other pressure water source will be provided for equipment decontamination, as well as an adequate supply of brushes, shovels, and similar decontamination equipment.

Proper zone transfer procedures will be performed between the exclusion zone and the contamination reduction zone/decontamination pad. All vehicles, equipment, and tools that have been in a designated exclusion zone will be thoroughly cleaned to remove soil from the excavation activities. Dry cleaning techniques (using brooms and shovels) will be permitted to achieve required cleaning. Dry cleaning shall be sufficient to eliminate the potential for contaminated soil and materials to be transported from the excavation area. When the Contractor prepares to demobilize a piece of equipment or tool from the project, it shall be decontaminated using dry and wet cleaning techniques. Wet cleaning may be performed at a location established on the Exide facility, provided that dry cleaning be completed before transporting the equipment or tool from the final area of use. The wet cleaning area shall allow for the collection and treatment of decontamination water for processing through the Exide facility wastewater treatment plant.

6.5.2 Air Monitoring Equipment and Dust Control

The Contractor will install on-site and downwind ambient air monitors at perimeter areas to be determined and shown in its Health and Safety Plan. The Contractor will also operate real-time aerosol monitors (mini-Rams or similar) to monitor particulates during all on-site activities involving the handling of lead-impacted soil. Mini-Ram results shall be checked at approximately 1 hour increments through out the day and results that exceed a pre-established

action level must be provided to the QA Representative as soon as the result is obtained to allow discussion of requirements for immediate action between the Contractor and QA Representative. At a minimum, immediate action shall consist of modifying the techniques utilized by the Contractor to reduce the amount of dust generated and additional wetting of the work zone with water to suppress the dust. The data from the Mini-RAMs will be downloaded daily and a record will be submitted to the QA Representative for approval. The records will also be included in the Final Report. The Contractor will use water to minimize dust during remediation activities. When dust monitors exceed action results established in the Health and Safety Plan, aggressive dust suppression will be implemented until results return to acceptable (i.e., below action levels) levels. All efforts will be made to prevent dust during preparation, excavation, backfill and restoration activities. Allowable levels for dust will be established in the HASP.

6.5.3 Protection of Existing Property

Throughout site preparation, removal, and restoration activities, the Contractor will implement precautions to protect existing property features from damage. Precautions will include safe working distances, warning tape, bollards, and temporary fencing and barriers. At no time will equipment be allowed to cross or remain stationary on concrete or asphalt driveways or sidewalks. Special care will be taken by the Contractor to ensure that no damage is done to existing structures. All driveways and sidewalks will be cleared using a dry method (e.g. brooms). If a wet method is necessary (e.g. power spray), the Contractor will ensure that the water is collected in a manner such that no sediment is conveyed to stormwater inlets or other structures. It is recommended that the Contractor perform photo documentation on all properties prior to activities. Any claims for damage to public or private properties will be addressed by the Contractor at no expense to Exide or its representatives.

7.0 CONFIRMATORY SAMPLING

7.1 CONFIRMATORY SAMPLING GUIDANCE

The cleanup standard being applied to the EAs proposed for remediation in the Work Plan is a post remediation average lead concentration in the shallow surface (0-3 inches) soils of 650 mg/kg and an average bottom of excavation value below 650 mg/kg. The average lead concentration in surface soil will be determined by the following calculation:

1. Determine the square footage of the portion of the exposure area being remediated and the portion not being disturbed. These areas should be calculated excluding the house, permanent structures, driveways, sidewalks and other surface that prevent direct contact to soil.
2. Determine the average lead concentration in the soil being used to restore remediated areas of the EA.
3. Multiply the area of the portion not being remediated by the starting (pre-remediation) average soil concentration for the EA; and multiply the area of the portion being remediated by the average concentration of the soil used for restoration. Add the two products together and divide by the combined area. The resulting value will represent the average lead in surface soil concentration across the entire EA. The resulting value must be less than 650 mg/kg.

To document that the average lead concentration remaining in the bottom of the excavation area is below 650 mg/kg, a composite soil sample will be collected. The composite sample will consist of quartering the excavation area into roughly equal areas and collecting one aliquot from each quadrant from a depth of 0 to 3 inches. The four aliquots will be composited in a mixing bowl following the same protocol established for compositing Characterization samples. Only one composite will be required to characterize the bottom of the excavation. Samples will be collected from 0 to 3 inches using a hand auger, stainless steel trowel or disposable scoop. Each sample will be analyzed by M.J. Reider Associates using Method 6010 to determine the total lead concentrations. Specific sample collection and analysis procedures are provided in the QAPP in Appendix B.

8.0 BACKFILL AND RESTORATION

8.1 BACKFILL

Once cleanup criteria have been achieved within the soil remediation areas, each excavation will be backfilled to 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. Backfill materials will be temporarily stored in clean areas of the site, as needed. The material will also be staged in a manner that minimizes disruption to the adjacent residents. Both structural soil fill and topsoil will be used during backfill as described below. The Contractor will have a suitable approved backfill and topsoil source available before any excavation is initiated.

8.1.1 Structural Soil Fill

Structural soil fill material will be used to achieve backfill grades to within no less than 3 inches of final grade. Soil fill samples will be collected periodically and submitted by the Contractor for laboratory analysis to determine that the soil fill meets the requirements of PADEP safe fill criteria. The soil fill will have no more than a background lead content of 50 ppm. Soil fill materials will be free from roots and other organic matter, trash, debris, and stones larger than 3 inches in dimension. Soil fill materials will be placed in a maximum 12-inch loose lift if the excavation depth allows and compacted by mechanical methods as approved by the QA Representative.

8.1.2 Topsoil

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 and not greater than 5% of total by weight. Topsoil samples will be collected periodically and submitted by the Contractor for laboratory analysis to determine that the topsoil meets clean fill criteria and that the topsoil has appropriate soil nutrients and organic content. The topsoil will have no more than a

background lead content of 50 ppm. Topsoil materials will be placed to an approximate 3-inch depth over the structural soil fill material.

8.2 FINAL GRADING

All soil removal areas and areas disturbed by soil removal operations will be uniformly smooth-graded to mimic the pre-excavation grades to +/-0.10 feet, except as necessary to permit adequate drainage. Following placement, the topsoil will be aerated by hand (or similar low-ground-pressure mechanical method) for acceptance of seed, fertilizer, and mulch.

8.3 SEEDING

The Contractor will install sod in surface water drainage features and play areas as established on the Exposure Areas specific remediation plans. In other areas, the Contractor will apply Kentucky 31 Fescue, Perennial Rye or equivalent seed to the restored areas. Straw or hay mulch will be applied upon completion of seeding. Erosion control devices will remain in-place until vegetation has been established in disturbed areas. The Contractor will be responsible for the turf establishment and will prepare and implement a maintenance schedule to ensure that grass is established before the onset of winter.

8.4 SKETCHES

A sketch of each Exposure Area post-restoration grades will be completed by the Contractor. These sketches will be included in the Final Report.

8.5 LANDSCAPE RESTORATION

Unless the homeowner elects to perform his/her own landscaping restoration, the Contractor will retain the services of a qualified local landscape company to restore landscaped areas in accordance with landscape audits performed for each property as part of property restoration. This will include replacement of bushes, shrubs, trees, similar plantings removed during the soil removal, and site features such as fences removed during the operations. If, however, the

homeowner accepts the issued check, the homeowner will have sole responsibility for landscaping restoration. The Contractor will be responsible for the establishment of grassy areas.

9.0 PROJECT SCHEDULE

The project schedule and sequence properties will be cleaned during each Phase of the work will be proposed by the Contractor and submitted to Exide for review and approval. At this time, Advanced GeoServices has prepared a tentative schedule which shows characterization sampling being performed in late 2007 or early 2008. Each phase of soil removal will be scheduled to begin in the spring (April through June) of the respective year (e.g. Phase 1 2008 Remediation will begin in spring 2008.

10.0 HEALTH AND SAFETY

10.1 HEALTH AND SAFETY PLAN

A site-specific Health and Safety Plan (HASP) will be developed by the Contractor and submitted for review by Exide and USEPA to be an addendum to this Work Plan. The HASP will cover key Contractor personnel, a site description, a hazard analysis, personnel training requirements, personal protective equipment, medical surveillance requirements, air surveillance, site controls, decontamination, and emergency response at a minimum. The HASP will be submitted prior to initiation of intrusive operations and intrusive operations will not be permitted until the HASP has been reviewed by all parties.

10.2 DECONTAMINATION FACILITIES

The Contractor will establish decontamination facilities for personnel and equipment sufficient to support site activities. Decontamination of personnel, equipment, and materials will be performed in accordance with applicable USEPA and OSHA regulations. Additional detail for decontamination facilities and procedures will be provided in the Contractor's HASP.

10.3 TRAFFIC CONTROL

The Contractor will control vehicular traffic at the site and ensure safe and efficient operations. Speed limits will be established and enforced to minimize dust generation. Traffic routes will be marked and implemented for all vehicles. All material delivery and personnel traffic will be restricted to paved areas unless direct loading at the site of excavation is required.

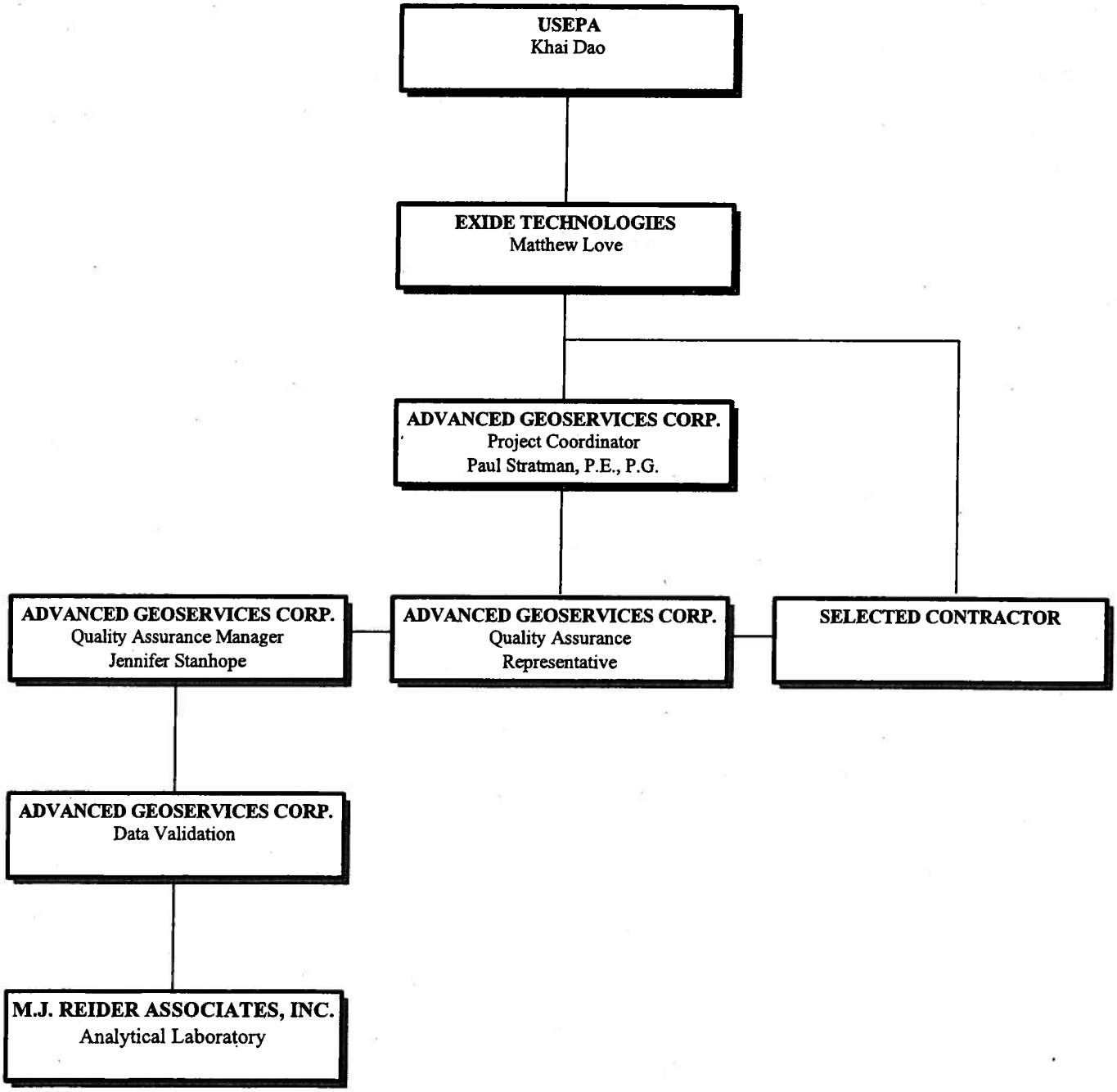
11.0 REFERENCES

U.S. EPA. 1996 Soil Screening Guidance: User's Guide Office of Solid Waste and Emergency Response Washington, D.C. 20460 EPA/9355.4-23.

TABLES

FIGURES

FIGURE 2-1
REMEDIATION WORK PLAN
DEVELOPED RESIDENTIAL EXPOSURE AREAS
Exide Technologies
Reading, Pennsylvania



EXAMPLE LETTER

September ___, 2007 2002-955-00

VIA REGULAR MAIL

Property Owner
Street Address
Reading, PA 19605

RE: Exide Technologies – Reading, Pennsylvania
Characterization Soil Sampling

Dear _____:

On behalf of Exide Technologies (Exide), Advanced GeoServices Corp. (AGC) will be conducting characterization soil sampling on properties surrounding the Exide facility located in Muhlenberg Township and Laureldale Borough. As part of this study, Advanced GeoServices will be conducting soil sampling at nearby properties such as yours where permission to sample was not previously obtained or not required. The study is required by an Administrative Order on Consent between the United States Environmental Protection Agency (USEPA) and Exide.

Soil sampling will involve digging several 4-inch diameter holes no greater than 10-inches deep at various locations in your yard. The holes will be dug with a hand trowel, hand auger and/or shovel. Upon completion, the holes will be backfilled with the excess soil and packaged potting soil if necessary, and seeded. The samples will then be analyzed for total lead content. Soil sampling is expected to occur during the months of November and December. Actual sampling dates will be coordinated with you at least one week before the sampling on your property will begin.

We are hereby requesting your permission for Advanced GeoServices employees to enter your property (located at _____) to collect these soil samples. Enclosed you will find a "Landowner Consent Form" which we ask you to sign and return in the postage paid envelope to grant us permission to perform soil sampling on your property. Your participation is needed for successful completion of this study. There will be no cost to you, and sample results will be provided to you by Advanced GeoServices.

If you have any questions, please call Matthew Potter (AGC) at (610) 840-9128. Exide and Advanced GeoServices thank you for your cooperation.

Very truly yours,

ADVANCED GEOSERVICES CORP.

Paul G. Stratman, P.E., P.G.
Senior Project Consultant

PGS:vm

Enclosure

LANDOWNER CONSENT FORM

We hereby consent to the entry upon our premises by representatives, or contractors of Exide Technologies (Exide) and Advanced GeoServices Corp. for the purpose of conducting a soil sampling program. We understand that sample collection will require digging small holes which will be backfilled immediately upon completion of sampling activities and that a bare spot may be present as a result of these activities until seed has had time to germinate.

The sample locations may be marked by placing a metal peg or stake into the ground. Any peg or stake placed on a lawn area will be flush with the ground, so it will not interfere with regular activities such as lawn mowing. All costs associated with the soil sampling will be paid by Exide. Upon completion of the project, all sample location stakes or pegs will be removed. We agree not to remove the stakes or pegs ourselves. A copy of the results will be provided to the landowner.

_____ _____

Owner/Signature Date

_____ _____

PLEASE PRINT NAME Property Address

Phone Number: _____

Best Time to Call: _____

EXAMPLE LETTER

September ____, 2007

RE: Residential Remedial Action

Dear Landowner:

On behalf of Exide Technologies (Exide), Advanced GeoServices Corp. (Advanced GeoServices) is providing environmental services in the community of Muhlenberg Township and Laureldale Borough.

Advanced GeoServices is managing soil lead removal activities on residential properties such as yours surrounding the Exide facility located in Muhlenberg Township and Laureldale Borough. To that end, we are hereby requesting your permission for Advanced GeoServices employees and contractors of Exide to enter your property to conduct soil removal and restoration activities.

The soil removal operations are being performed at the direction of the United States Environmental Protection Agency (USEPA) and involve the removal of surface soil from select areas of your property and the subsequent restoration of the disturbed areas. Prior to any removal operations, representatives from Advanced GeoServices and the selected contractor will meet with you to discuss the specifics of the operations including schedule, landscaping, and methods of removal and restoration.

Enclosed you will find a "Landowner Consent Form" which we ask you to sign and return in the postage paid envelope to grant us permission to perform soil removal operations. Again, actual removal operations 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 will be provided to you by Advanced GeoServices.

If you have any questions, please call Kevin O'Rourke (Advanced GeoServices) at (610) 840-9100. Exide and Advanced GeoServices thank you for your cooperation.

Very truly yours,

ADVANCED GEOSERVICES CORP.

Kevin O'Rourke
Staff Professional

KO:vm

Enclosure

LANDOWNER CONSENT FORM

We hereby consent to the entry upon our premises by representatives, or contractors of Exide Technologies (Exide) and Advanced GeoServices Corp. for the purpose of soil removal operations. We understand that pre-removal surveys will be performed once this form is signed; however, actual soil removal operations will not be performed until Advanced GeoServices Corp. and Exide meet with us to discuss the specifics. All costs associated with the soil removal and related operations will be paid by Exide.

_____ _____

Owner/Occupant Date

_____ _____

PLEASE PRINT NAME Property Address

Phone No._____

(Required)

APPENDIX B

Quality Assurance Project Plan (QAPP)

DRAFT

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN
INTERIM REMEDIAL MEASURES 2002 WORK PLAN

Prepared For:

EXIDE TECHNOLOGIES
Reading, Pennsylvania

Prepared By:

ADVANCED GEOSERVICES CORP.
West Chester, Pennsylvania

Project No. 2002-955-01
September ___, 2007

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1.0 INTRODUCTION

The Quality Assurance Project Plan (QAPP) presented in this attachment provides the policies, organization, objectives, functional activities, and specific Quality Assurance/Quality Control (QA/QC) procedures that shall be employed by Exide and Advanced GeoServices Corp. (Advanced GeoServices) personnel during sampling associated with the Remediation of Developed Residential Exposure Areas Work Plan to ensure that the technical data generated during the sampling are accurate and representative.

2.0 PROJECT DESCRIPTION

2.1 PROJECT BACKGROUND

Exide Technologies operates a secondary lead smelter and battery manufacturing facility (Facility) in Muhlenberg Township and Laureldale Borough, Berks County, Pennsylvania. In February 2000, Exide prepared a draft IRM Proposal to address lead contamination on specific residential properties around the facility, which subsequently became the basis of discussions between PADEP, Exide and the U.S. Environmental Protection Agency (USEPA). In 2000, Exide remediated 24 properties southeast and southwest of the facility. In 2001, over 800 properties were sampled to ascertain lead levels for each prospective property. In the spring and summer of 2002, Exide remediated 52 properties. This Work Plan addresses the higher lead level properties that are scheduled for remediation. This QAPP presents the sampling and analysis procedures to be performed during the implementation of this Work Plan.

2.2 SAMPLING PARAMETERS

Based on past sampling data, the primary constituent of concern at the Site is lead. Surface soil samples will be analyzed for lead. Sampling parameters and quantitation limits (QLs) are listed on Table 1.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The overall responsibility for the soil removal during the Work Plan activities is assigned to the Advanced GeoServices Project Manager, who will be responsible for overseeing the QA/QC for the sampling and removal activities. The Work Plan provides detailed project organization and field personnel assignments.

The project team will perform the project planning, sample collection, and data summary tasks. On-site investigation will be conducted by the project team under the supervision of Mr. Matthew Love, the Exide Project Director. The project team members assigned for the Site work are health and safety trained under OSHA (29 CFR 1910.120). Advanced GeoServices personnel will participate in the removal oversight, soil screening sampling, quality management, and local coordination activities. The subcontracted laboratory will be certified by USEPA for analysis of metals in soils.

4.0 QUALITY ASSURANCE/QUALITY CONTROL OBJECTIVES

Site activities performed by the project team at the Site will incorporate, but not be limited to, the QA/QC procedures established herein during the removal activities.

In combination, QA and QC represent a set of procedures designed to produce analytical data of known and acceptable quality. A useful distinction between QA and QC programs can be made as follows: the QA program ensures that all information, data, and decisions resulting from the investigation are technically sound and properly documented, while the QC program assures that the QA program achieve its goals.

Data Quality Objectives (DQOs) are quantitative and qualitative 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 between any problems found in the system can be isolated with respect to cause. 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. To achieve this, specific data requirements such as detection limits, criteria for precision and accuracy, sample representativeness, data comparability and data completeness (PARCC) are specified below.

4.1 PRECISION

Precision measures the reproducibility of data or measurements under specific conditions. Precision is a quantitative measure of the variability of a group of data compared to their average value. Precision is usually stated in terms of relative percent difference (RPD) or relative standard deviation (RSD). Measurement of precision is dependent upon sampling technique and analytical method. Field duplicate and laboratory duplicate samples will be used to measure precision for project samples. Both sampling and analysis will be as consistent as possible. For a pair of measurements, the RPD will be used to evaluate precision. For a series of measurements, RSD will be used to evaluate precision. The total precision of a series of measurements can be related by the

additive nature of the variances. Equations for RPD and RSD are presented in Section 13.1 of this QAPP.

QC samples, including field and laboratory duplicate samples will be analyzed and used to monitor precision for this project. One field duplicate will be collected for every 20 soil composite samples. A matrix spike sample and laboratory duplicate sample will be collected at a frequency of one set per 20 samples per matrix. All duplicate results will be evaluated during data validation with respect to the applicable DQO criteria listed in Table 2 and the Region III Modifications to the USEPA *National Functional Guidelines for Inorganic Data Review* (USEPA, 1994).

Precision will be evaluated for all lead analyses performed in this program using the results of field and laboratory duplicate samples.

4.2 ACCURACY

Accuracy is defined as the degree of agreement of a measurement or average of measurements with an accepted reference value. Accuracy measures the bias in a measurement system which may result from sampling or analytical error. Sources of error that may contribute to poor accuracy are:

- laboratory error;
- sampling inconsistency;
- field and/or laboratory contamination;
- sample handling;
- matrix interference; and
- preservation.

Equipment blanks, as well as matrix spike (MS) QC samples, will be used to measure accuracy for project samples. The field component of accuracy will be negligible if the sampling, preservation, and handling techniques described in this QAPP are followed. Accuracy in laboratory methods and procedures will be evaluated by use of calibration and calibration verification procedures, and instrument performance solutions, at the frequency specified in the USEPA "Test Methods for

Evaluating Solid Waste Physical/Chemical Methods", April 1998, SW-846 revision 5 for lead analyses. Accuracy is calculated using the equation presented in Section 13.2 of this QAPP.

Field and laboratory blanks, matrix spike samples and Laboratory Control Samples (LCS)s will be used to measure accuracy for the project samples. Blanks will be used to evaluate whether laboratory or field procedures represent a possible source of contamination. Equipment blanks will be collected one per week per soil sampling matrices. Matrix spike samples and laboratory duplicates will be analyzed at a frequency of one pair per soil per 20 samples. LCSs will be analyzed for lead at a frequency of one per matrix per 20 samples or per laboratory preparation batch, whichever is more frequent. Accuracy will be evaluated based upon blank and spiked sample results with respect to the applicable DQO criteria listed in Table 2 and the Region III Modifications to the USEPA *National Functional Guidelines for Evaluating Inorganic Data Review* (USEPA, 1994).

The laboratory method and calibration blanks will be required to meet specific criteria for compliance as listed in SW846 methodology.

In the data validation, all blank samples will be evaluated. The general procedure for assessing blank samples will be as follows:

- Lead results will be reviewed for all blank samples.
- All blank samples for which lead is reported above the MDL will be identified.
- If lead is not detected in any of the blank samples, the data will be reported unqualified for blank contamination.
- If lead is found in any of the blank samples, the sample lead concentration(s) will be reported in the data validation narrative and assessed according to the Region III Modifications to the USEPA's *National Functional Guidelines for Inorganic Data Review* (USEPA, 1994).

4.3 DATA REPRESENTATIVENESS

Representativeness expresses the degree to which sample data represent the characteristics of the environment from which they are collected. Samples that are considered representative are properly collected to accurately characterize the contamination at a sample location. Therefore, an adequate number of sampling locations have been chosen, and the samples will be collected in a standardized method. Representativeness will be measured by the collection of field duplicates. Comparison of the analytical results from field duplicates will provide a direct measure of individual sample representativeness.

Comparison of the analytical results from field duplicate samples will provide a direct measure of the representativeness of individual sample results. The RPDs of the field duplicate results will be compared to the project-specific DQOs as given in Table 2.

4.4 DATA COMPLETENESS

Completeness is defined as the percentage of data that is judged to be valid to achieve the objectives of the investigation compared to the total amount of data. Data gaps will be continuously addressed when/if they occur by systematic resampling, as needed. Deficiencies in the data may be due to sampling techniques, or poor accuracy, precision, and laboratory error. While deficiencies may effect certain aspects of the data, usable data may still be extracted from applicable samples. The level of completeness, with respect to usable data, will be measured during the data assessment process by comparing the total number of data points to the number of data points determined to be usable. A usability criteria of 90 percent has been set for this project. The equation used for completeness is presented in Section 13.3 of this QAPP.

4.5 DATA COMPARABILITY

Comparability expresses the confidence with which one data set can be compared with another data set from a different phase or from a different program. Comparability involves a composite of the above parameters as well as design factors such as sampling and analytical protocols. Data

comparability will be ensured by control of sample collection methodology, analytical methodology and data reporting.

4.6 SENSITIVITY

All samples will be analyzed for lead. Analytical methods have been selected which can provide the DLs (sensitivity), accuracy and precision criteria defined for this project. Soil samples will be prepared according to USEPA's SW846 (USEPA, 1998) method 3050B, while all field and equipment blanks will be prepared according to SW846 3010A, both hot-acid digestion procedures. All samples will be analyzed using method SW 846 Method 6010B (inductively couples plasma [ICP] spectroscopy).

Specific QLs are highly matrix-dependent and may not always be achievable. See Table 1 for parameters to be analyzed and the corresponding methods and DQO QLs.

4.7 PROCEDURES FOR MONITORING PARCC PARAMETERS

PARCC parameters will be monitored through the submission and analyses of various types of field and laboratory QC samples. These will include appropriate equipment blanks, laboratory method blanks, field duplicates or replicates, matrix spikes, matrix spike duplicates, instrument performance solutions, and a careful examination of all calibration and check standards. See Table 2 for data quality objectives.

The frequency by which the laboratory QC samples will be prepared and submitted is specified in Section 5.0 of this QAPP.

5.0 SAMPLING PROCEDURES

5.1 CHARACTERIZATION SAMPLING

Per the USEPA guidance sampling procedures, each Exposure Area (EA) is divided into four subareas. Advanced GeoServices proposes collection of three (3) discrete soil samples (0-3 inches in depth) from each subarea which will be combined to form three (3) composite samples to represent each EA at a depth of 0-3 inches. This procedure will be applied to each EA, regardless of the size of the EA.

The location of the discrete soil samples in each subarea will be determined through systematic random sampling. Systematic random sampling is a grid sampling design with a random starting point. The grid will be developed in accordance with the procedures outlined n the USEPA's guidance document "Methods for Evaluation the Attainment of Cleanup Standards, Volume 1:Soils and Solid Material" (EPA/PB89-234959). The field supervisor will randomly choose the sample locations on a lot by lot basis.

The individual discrete sample locations will be offset if they fall within the building structures or located to minimize contributions from other sources of lead based on the following protocols:

1. Soil samples will be collected at a minimum of 10 feet from painted permanent structures, roads and driveways in order to minimize contributions from other potential sources of lead;

2. Samples will be collected at a minimum of 5 feet from down-spouts and drainage features;

3. 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;

4. Samples will be collected at a minimum of 5 feet from recently disturbed areas, i.e. gardens, graded areas, utility excavations; and

5. Samples will not be collected beneath asphalt, concrete or crushed stone/gravel paved areas.

Soil samples will be collected from 0-3 inches at a minimum of nine locations using a decontaminated hand auger or shovel. Each discrete sample will be composited with the other discrete samples from the same depth increment to form the sample to be submitted for lead analysis. Any existing vegetative cover will be carefully removed and loose dirt from the root mat will be placed into the sample mixing bowl. Following the completion of sampling, the area will be filled with clean topsoil and the vegetation cover returned. Soil characteristics will be noted at each location.

5.2 CONFIRMATORY SOIL SAMPLING

Confirmatory samples will be collected following excavation in an area, typically an individual property or group of properties. Exide proposes to use the nodes of a 25-foot square grid system for confirmatory sampling locations; a smaller grid may be used in order to obtain the minimum number of samples required to demonstrate attainment with the 75%/10X rule. Samples will be collected from 0 to 3 inches using a hand auger, steel trowel or disposable scoop. Each sample will be homogenized, sieved through a #10 sieve, and shipped to a laboratory for total lead analysis

5.3 SOIL SAMPLING PROCEDURES

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 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 5.4 of this Attachment. During the collection of each

sample, the physical characteristics of the soil materials shall be recorded. Samples will be thoroughly mixed by the quartering method or by stirring in a stainless steel bowl. The homogenized sample will be split and one aliquot placed in a sample container, labeled, and archived. The remaining soil will be sieved through a #10 sieve and then shall be contained in a zip lock baggy.

Field personnel will record the soil's physical characteristics, 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 5.5 of this Attachment).

5.4 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. Unless otherwise specified in the site-specific field plan and work plan, decontamination procedures for 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;
- Nitric acid rinse (10% solution);
- Triple 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 QC. A description of the types and frequency of QC samples is included in Section 5.7.

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

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

5.5 FIELD SAMPLING DOCUMENTATION PROCEDURES

Field sampling operations and procedures will be documented by on-site personnel in bound field logbooks. Where 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;
- Reasons why 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.

5.6 SAMPLE CONTAINERS AND PRESERVATION

Table 3 lists the appropriated sample containers, preservation methods, and holding times for sample analysis. Samples will be labeled in the field according to the procedures outlined in Section 6.2 of this Attachment.

5.7 QUALITY CONTROL SAMPLES

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 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 duplicate, rinsate and MS/MSD samples in the final report.

A summary of the field QA/QC samples to be collected during the sampling program are presented as follows:

- Field blanks for soil samples consisting of laboratory supplied deionized water;
- Equipment blanks consisting of laboratory supplied deionized water poured over sampling equipment for soil; and
- Duplicate samples for the composite soil samples.

5.7.1 Duplicate Samples

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 homogenity, handling, shipping, storage, preparation and analysis.

Soil sample 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 per soil sampled will be duplicated.

5.7.2 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 (spoon, auger, corer, 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 week for soil samples collected and sent to the off-site lab for lead analysis.

5.7.3 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 analysis 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 investigative and duplicate soil samples collected and sent to the off-site lab for analysis.

6.0 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 EPA sample handling protocol. All sample control and chain-of-custody procedures applicable to the subcontracted laboratory will be presented in the laboratory's procedures.

6.1 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.

6.1.1 Field Custody Procedures

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 Site team leader will determine whether proper custody procedures were followed during field work and decide if additional samples are required.

6.1.2 Sample Labels

Identification labels are to be attached to the field sample containers. The labels shall not obscure any QA/QC lot numbers on the bottles. 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 6-1 depicts a field sample label.

6.1.3 Chain-of-Custody

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 6-2 depicts a typical chain-of-custody record.

6.1.4 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 Advanced GeoServices Project Manager. Freight bills, Postal Service receipts and bills of lading are retained as permanent documentation.

6.1.5 Custody Seals

Custody seals are preprinted adhesive-backed seals with security slots designed to break if the seals are disturbed. Seals are placed on all shipping containers, and seals shall be signed and dated before use.

6.2 SAMPLE DESIGNATION

Sampling locations at the Site will be marked with stakes or flags and surveyed to determine the coordinate and elevation where possible. Once the stake is marked and in place, the area will be photographed.

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample container. 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.

Each sample will be identified as followed: location, matrix, station number, depth (if applicable), and phase number. For example, a sample number such as AREA1-SU01-1.0 would identify an Exide removal area 1 surface soil sample taken at location 1 and one foot depth.

6.3 SAMPLE HANDLING, PACKAGING, AND SHIPPING

Regulations for packaging, marking, labeling, and shipping hazardous materials are promulgated by the USDOT in the Code of Federal Regulations, 49 CFR 171 through 177. Samples obtained from the Site are anticipated to be environmental samples which are not expected to contain high levels of hazardous substances. Therefore, the shipment of samples designated as environmental samples are not regulated by DOT.

Samples collected by the project team will be relinquished to the laboratory courier or shipped to the laboratories using the method described below. Environmental samples shall be packed prior to shipment by air using the following procedures:

- Select a sturdy cooler in good repair. Secure and tape the drain plug with fiber or duct tape.
- Allow sufficient outage (ullage) in all bottles to compensate for any pressure and temperature changes (approximately 10 percent of the volume of the container).
- Be sure the lids on all bottles are tight (will not leak), and baggies are sealed.
- Put "blue ice" (or ice that has been placed in heavy duty polyethylene bags and properly sealed) on top of or between the samples. Pack samples securely to eliminate breakage during shipment.
- Place chain-of-custody and applicable Report Forms into a plastic bag, tape the bag to the inner side of the cooler lid and then close the cooler and securely tape (preferably with fiber tape) the top of the cooler shut. Custody seals should be affixed to the top and side of the cooler so that the cooler cannot be opened without breaking the seal.

- The shipping containers must be marked "THIS END UP". A label containing the name and address of the shipper shall be placed on the outside of the container.

6.4 SAMPLE PRESERVATION AND HOLDING TIMES

When needed, sample containers will be obtained from the subcontracting laboratory and shall be prepared with a predetermined amount of preservative for each specified sample unless otherwise stated in the site specific field plan. A list of preservatives and holding times for each type of analysis are included Table 3 of this Attachment. Additional preservation requirements and holding times for other analytical parameters are listed, in 40 CFR, Part 136, July 1, 1987.

6.5 LABORATORY SAMPLE CUSTODY PROCEDURES

Once the sample arrives at the laboratory, custody of the samples will be maintained by laboratory personnel. Upon receipt of the samples, the sample receipt personnel will remove the chain-of-custody from the sealed cooler and sign and record the date and time on the chain-of-custody. The samples received will be verified to match those listed on the chain-of-custody. The laboratory will document and notify Advanced GeoServices QA Scientist immediately if any inconsistencies exist in the paperwork associated with the samples. The laboratory at a minimum will document the following stages of analysis: sample receipt, sample extraction/preparation, sample analysis, data reduction, and data reporting.

Samples will be given a unique laboratory identification number and logged into the Laboratory Information Management System (LIMS). The analyst will enter the analytical data into the LIMS upon analysis completion and validation. The LIMS tracks the sample until completion of the report and invoice mailing. The data archived from the LIMS will be transferred to magnetic tape and retained for five years from the completion of sample analysis.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

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.

8.0 LABORATORY QUALITY ASSURANCE PROGRAM

The quality assurance program for the selected analytical laboratory will be submitted following laboratory selection. The quality assurance program documents are anticipated to include the following:

- Title page;
- Table of contents;
- QA policy statement;
- Laboratory organization and responsibility;
- Sampling procedures and equipment;
- Sample custody;
- Data reduction, validation, and reporting;
- Performance and systems audit;
- Preventive maintenance;
- Corrective action; and
- Resumes.

9.0 DATA REDUCTION VALIDATION AND REPORTING

9.1 DATA REDUCTION

All analytical data will be permanent, complete and retrievable. The analyst will enter the analytical data into the 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 micrograms per liter (µg/l) for aqueous samples or milligrams per kilogram (mg/kg) for solid and housedust samples. Equations to calculate concentrations are found in the 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 soil samples analyzed at the off-site laboratory in general accordance with the guidelines identified in Section 9.2. 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 Advanced GeoServices office maintained by the Project Manager. 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.

9.2 DATA VALIDATION PROTOCOL

Validation of analytical soil data as received from the off-site laboratory will be performed by an Advanced GeoServices QA Scientist. Validation will be performed in general accordance with the following data validation guidance documents, where applicable:

- National Functional Guidelines for Inorganic Data Review, Multi-Media, Multi-Concentration. USEPA, February 1994.

- Region III Innovative Approaches to Data Validation. USEPA, June 1995.

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, instrument performance check sample results, MS/MSD recoveries and RPD 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 Manager in making decisions based on the analytical results.

9.3 DATA VALIDATION REPORTS

Data validation reports, along with copies of all support documentation, validated data summary tables, and analytical data packages, will be submitted periodically as data are validated.

9.4 DATA REPORTING

All data deliverables from each laboratory must be paginated in ascending order. The laboratory must keep a copy of the paginated package in order to be able to respond efficiently to data validation inquiries. Any errors in reporting identified during the data validation process must be corrected by the laboratory as requested. All data validation inquiries to the laboratory must be addressed by a written response from the laboratory in question. CLP-like deliverables are required for this project and must be 100 percent complete from a deliverables standpoint. CLP-like deliverables will include all appropriate CLP summary forms, chain-of-custody documents, and copies of digestion records and analysis (instrument) run logs.

10.0 INTERNAL LABORATORY QUALITY CONTROL CHECK SAMPLES AND CALCULATIONS

All QC procedures employed by the laboratory will be, at a minimum, equivalent to those required in the specified analytical methods. Laboratory QC checks are accomplished through the analyses of laboratory blanks, calibration verifications, laboratory control standards and performance evaluation samples. When internal QC results fall outside method acceptance criteria, the data will be reported, and the analysis repeated, flagged or accepted according to the specified analytical methods. The following sections describe internal laboratory QC check samples.

10.1 LABORATORY BLANKS

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 been actually 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.

10.2 CALIBRATION VERIFICATIONS

Initial calibration of the inductively coupled plasma (ICP) instrument will be completed prior to sample analysis following the specified analytical methods. Additionally, continuing calibration standards will be analyzed at least once every tenth sample for ICP instrumental analysis. Recalibration is required if the continuing calibration standards do not meet USEPA method criteria.

For specific calibration standard concentrations and calibration requirements, refer to USEPA SW-846 Method 6010B.

10.3 MATRIX SPIKE/MATRIX SPIKE DUPLICATES

MS analyses are performed in association with metal analyses. MS are prepared by placing a known quantity of selected target analytes into a second aliquot of an actual field sample. The spiking occurs prior to sample preparation and analysis. The MS is then processed in a manner identical to the field sample. Recovery of each of the spiked compounds reflects the ability of the laboratory and method to accurately determine the quantity of that analyte in that particular sample.

MSD samples are identical to MS samples. Another aliquot of the field sample used for the MS is fortified with the same quantity of the spiking compounds and is processed in an identical manner. In addition to providing a measure of accuracy of the determination, the results for the MS/MSD pair provide a measure of precision of the determinations by assuring the availability of positive results for comparison.

10.4 LABORATORY CONTROL SAMPLE

The 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). 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 reanalyzed or data will be flagged.

11.0 PERFORMANCE AND SYSTEM AUDITS

11.1 LABORATORY AUDITS

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.

11.1.1 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.

11.1.2 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.

12.0 PREVENTATIVE MAINTENANCE

12.1 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 ensuring that the equipment is operating properly prior to use 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.

12.2 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.

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 QA Manual.

13.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

13.1 PRECISION

The precision of laboratory test results will be expressed as RPD or RSD. RPD is derived from the absolute difference between duplicate analyses divided by the mean value of the duplicates. The percent RSD is obtained by dividing the standard deviation by X. Equations for RPD and RSD are presented below:

$$RPD = \frac{|D1 - D2|}{(D1 + D2)/2} \times 100$$

Where:

D1 and D2 = the two replicate values

$$RSD = \frac{S}{X}; \text{ and } S = \left[\sum_{i-1} n (x_i - x)^2/n-1\right]^{1/2}$$

Where:

S = standard deviation

x_i = each observed value

x = the arithmetic mean of all observed values

n = total number of values

13.2 ACCURACY

Accuracy will be calculated on the average percent recovery of spiked samples. Reference materials are essential to the evaluation of accuracy. Stock solutions for accuracy spikes and QC standards (if possible) shall be traceable to a source independent from the calibration standards. Accuracy is calculated using the following equation:

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

Where:

%R	=	% recovery
SSR	=	spike sample result
SR	=	sample result
SA	=	amount of spike

13.3 DATA COMPLETENESS

Completeness is evaluated by dividing the total number of verifiable data points by the maximum number of data points possible and expressing the ratio as a percent. A usability criteria of 90 percent has been set for this project. The equation used for completeness is presented below:

$$C\,(\%) = \frac{D}{P \times n} \times 100$$

Where:

D	=	number of confident quantifications
P	=	number of analytical parameters per sample requested for analysis
n	=	number of samples requested for analysis

14.0 CORRECTIVE ACTION

When field sampling activities or laboratory QC results show the need for corrective action, immediate action will take place and will be properly documented. 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.

14.1 FIELD SAMPLING CORRECTIVE ACTION

The on-site Principle Investigator 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 Principle Investigator will immediately notify the Advanced GeoServices Quality Assurance (QA) Manager. The Advanced GeoServices QA Manager and Principle Investigator will investigate the situation and determine who will be responsible for implementing the corrective action. Corrective action will be implemented upon approval by the Advanced GeoServices QA Manager. The QA Manager 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 on-site Principle Investigator. Any deviations from the QA protocol in the QAPP must be justified, approved by the Advanced GeoServices QA Manager (and the USEPA, if necessary), and properly documented.

14.2 LABORATORY SITUATION CORRECTIVE ACTION

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 Advanced GeoServices 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 Advanced GeoServices 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.

14.3 DATA VALIDATION QA CORRECTIVE ACTION

Upon completion, sample data packages will be sent from the laboratory to the Advanced GeoServices 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.