RCRA FACILITY INVESTIGATION MANAGEMENT PLANS
FORMER IBM KINGSTON FACILITY

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May 2009 Ref.: 083-87071

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1.0 INTRODUCTION

Golder Associates Inc. (Golder) has prepared this RCRA Facility Investigation (RFI) Management Plans document, on behalf of International Business Machines Corporation (IBM), for portions of the former IBM Kingston Facility (Facility or Site) located at 300 Enterprise Drive, Kingston, Ulster County, New York (see Figure 1). These RFI Management Plans were prepared as required by Section E.5(c) of Module III – Corrective Action Requirements for Solid Waste Management Units and Areas of Concern, of the October 4, 1996 Hazardous Waste Management Permit #3-5154-00067/00090 (6 NYCRR Part 373) and referenced herein as the RCRA Permit. Specifically, the RFI Management Plans were prepared pursuant to Appendix III-B, "Guidance for a RCRA Facility Investigation," of the RCRA permit.

1.1 Background

The Site is located north of the City of Kingston in the Town of Ulster, Ulster County, New York and is bounded by John M. Clarke Drive and Route 9W to the east, Old Neighborhood Road and Route 209 to the north, Esopus Creek to the west and Boices Lane to the south (see Figure 2). The approximately 258-acre property was first developed by IBM from farmland during the 1950s. The primary activities included the manufacturing of electric typewriters and the development, manufacture and testing of computer systems and related components and technologies. IBM ceased operations at the Facility during mid-1990s. In 1998 IBM sold the Facility to AG Properties of Kingston, LLC and Ulster Business Complex, LLC, who renamed the Site, TechCity, and subdivided the property into multiple parcels. The Site is currently owned and managed by TechCity Properties, Inc. (TechCity or Owner).

The portion of the Site located east of Enterprise Drive is referred to as the East Campus and includes the majority of the buildings associated with the Facility, many of which are vacant. The portion located west of Enterprise Drive was previously referred to as the West Campus and includes the Bank of America building (former IBM Facility Buildings B201, B202 and B203); a large parking area south and west of the Bank of America facility (Parcel 1); and generally undeveloped land further to the southwest (Parcel 2) and north (Parcel 3) of the Bank of America facility.

The Site is listed as a New York State Inactive Hazardous Waste Disposal Site (6 NYCRR Part 375) and Resource Conservation and Recovery Act (RCRA) Hazardous Waste Site. The Site is currently managed in compliance with the above noted RCRA Permit. The RCRA Permit

requires post-closure care and monitoring of the closed Industrial Waste Sludge Lagoon (IWSL) and implementation of Corrective Measures for groundwater exhibiting concentrations of volatile organic compounds (VOCs) above New York State Groundwater Quality (6 NYCRR Part 703) Standards (NYSGWQS). IBM completed extensive RCRA Facility Investigations (RFIs) during the 1990s to delineate the occurrence and extent of VOCs in groundwater beneath the Site.

Corrective Measures implemented by IBM include operation and maintenance of a groundwater perimeter control system (see Figure 2). The perimeter control system consists of a storm sewer system, an unsaturated portion of the surficial sand unit that underlies the Site, and a groundwater collection system (GWCS). IBM currently performs groundwater quality monitoring to evaluate the effectiveness of the perimeter control system. Annual monitoring reports are submitted to the New York State Department of Environmental Conservation (NYSDEC).

1.2 Purpose

Consistent with the RCRA permit, RFI Management Plans are required as part of any RFI Work Plans (RFIWPs) developed for the Site. These RFI Management Plans were developed specifically for the RFIWPs prepared for the following formerly inaccessible Solid Waste Management Units (SWMUs):

SWMU Type, Name and Letter Designation
Storage Tanks
G Former Waste PCE Tank
Spill Areas
V Portions of the Building 005 Plume
Industrial Waste Sewer System
M Portions of the Industrial Waste Sewer Lines
Solvent Recovery Units
AB Former Building 001 TCA Recovery Unit

IBM was recently notified by TechCity that access to these SWMUs will soon be available as a result of ongoing and proposed demolition activities.

A Site layout and investigation area map depicting the locations of each SWMU is provided in Figure 2. The main objectives of RFIWPs prepared for these SWMUs are to better define the nature and extent of the groundwater impacts at the Site and to evaluate whether additional Corrective Measures are needed to reduce or prevent the generation and/or migration of VOC-impacted groundwater.

In addition, these RFI Management Plans will be used to support further assessment of groundwater quality conditions in a portion of the Facility referred to as the "Triangle Plume Area," which is being investigated as part of a separate Investigation Work Plan (IWP). Existing site data indicate that a small portion of the groundwater plume emanating from the East Campus of the Facility may be migrating under Enterprise Drive to the Triangle Plume Area beneath Parcel 1. Therefore, IBM will undertake a supplemental assessment to better define the nature and extent of the groundwater impacts in the vicinity of the Triangle Plume Area and to evaluate whether additional Corrective Measures can be effectively implemented to reduce or prevent the migration of groundwater impacts beneath Parcel 1.

The following RFI Management Plans have been prepared and will be followed during the performance of the proposed work:

- **Project Management Plan** - includes a description of the project management approach, the Project Team Organization Chart and the proposed project schedule;
- **Data Management Plan** - includes a description of the process by which investigation data will be documented, tracked and presented;
- **Quality Assurance Project Plan (QAPP)** - includes a description of the data quality objectives; sampling and field measurement standard operating procedures (SOPs), and sample analysis procedures;
- **Health and Safety Plan (HASP) –** includes the health and safety procedures that will be followed during implementation of the work plans; and
- **Community Relations Plan** - includes a description of how information collected during the performance of this work will be disseminated to involved stakeholders.

These RFI Management Plans provided herewith have been specifically developed for the proposed work associated with SWMUs G, V, M and AB and the Triangle Plume Area and are

not intended to supersede or replace any RFI Management Plans developed previously for other portions of the Site subject to the RCRA permit. The existing RFI Management Plans are still considered in effect for routine and on-going groundwater monitoring, collection and treatment.

2.0 PROJECT MANAGEMENT PLAN

This section presents the Project Management Plan (PMP) that will be implemented during the performance of the RFIWPs for SWMUs G, V, M and AB and the IWP for the Triangle Plume Area. The PMP provides the overall project management approach that will be used during the performance of the proposed work, the proposed project organization, a description of the anticipated Project Team and their qualifications and the currently proposed project schedule.

2.1 Project Management Approach

The RFIWPs and the IWP include the performance of similar subsurface investigation tasks, the collection and analysis of field and laboratory data and the preparation of a report presenting findings and conclusions with recommendations regarding the need for further investigation and/or remediation of the subject SWMUs and the Triangle Plume Area.

Each work plan generally includes the following key project activities:

- Preparation and submittal of a RFIWP or an IWP for NYSDEC review and approval prior to the commencement of work. A meeting will be held with NYSDEC representatives as part of the review process, if necessary;
- Receipt of unencumbered site access notice from TechCity. Unencumbered access includes access to work areas that are free from physical impediments, free from the presence of hazardous materials and free from the presence of ambient air conditions requiring respirators of any type due to mold or other conditions;
- Contractor coordination;
- Mobilization;
- Performance of a field investigation that includes the collection of additional stratigraphic, chemical and hydraulic data utilizing Membrane Interface Probe/Electrical Conductivity (MIP/EC) investigation techniques; confirmatory soil, groundwater and/or sewer sampling; and the collection of select biogeochemical parameters to assist in the evaluation of potential corrective measures technologies;
- Data management and evaluation, including refinement of the existing Site conceptual model using Environmental Visualization System/Mining Visualization System (EVS/MVS®) modeling software;
- Report preparation, including both periodic progress reports and the preparation of the RFIWP and/or IWP Reports;
- Community and Owner relations; and

- Responding to NYSDEC comments and questions.

Each work plan has been specifically developed to address localized SWMU and area-specific requirements. To meet the study objectives presented in each work plan, investigation approaches have been proposed that include the collection and analysis of real-time data to allow for field adjustments of the number, location, and depth of samples based on investigation findings. This approach will allow for efficient assessment of Site conditions. As such, the scope and extent of investigations presented in the work plans are considered preliminary and subject to refinement during the course of the field investigation based on the judgment of the Project Team. Additional area-specific information and procedures are provided in the work plans, which are incorporated into the RFI Management Plans by reference.

The performance of this work will be organized and executed so that the activities required for successful project implementation are performed in a technically appropriate and timely manner, with NYSDEC oversight. Appropriate lines of communication will be maintained with the Owner and NYSDEC.

2.2 Project Organization

Figure 3 presents the proposed Project Organization Chart for the performance of the RFWIPs and IWP. Appropriate points of contact for both NYSDEC and IBM are noted along with the Project Team personnel currently assigned and envisioned to perform the work.

2.3 Project Personnel

The work described herein will be conducted by a multi-disciplinary Project Team personnel from both IBM and Golder. Golder will be assisted in the execution of the proposed field and analytical programs by qualified subcontractors. A brief summary of the experience of the assigned personnel and their role in the performance of the work are as follows:

Michael Kominek: IBM Project Coordinator

Michael Kominek is IBM's Project Coordinator and will be the primary liaison between IBM, NYSDEC and TechCity. Mr. Kominek has overall responsibility for IBM on the execution and performance of the RFIWPs and IWP.

Alistair Macdonald P.G., LSP, Principal: Golder Project Director

Alistair Macdonald, a Principal of Golder with over 23 years of experience, will serve as the Project Director for this work. Mr. Macdonald will be the senior Golder management representative responsible for the execution and performance of the RFIWPs and IWP and will provide overall project technical review and quality assurance (QA) functions. He will interact with NYSDEC and TechCity as needed and as directed by IBM, in addition to reviewing and approving major project report deliverables prior to submittal.

Anthony Savino: Golder Project Manager

Anthony Savino is a Senior Consultant at Golder with over 30 years of experience and will serve as the Golder's Project Manager for this work. Mr. Savino will be responsible for overall project management and schedule execution, providing appropriate technical input, interacting with NYSDEC and TechCity and the completion of project-related deliverables.

Christopher Hemingway, P.G.: Golder Senior Hydrogeologist

Christopher Hemingway is a Senior Hydrogeologist at Golder with over 12 years of experience. Mr. Hemingway will be responsible for technical direction and management of the field investigation program and coordination with subcontractors. He will be responsible for the preparation of project-related deliverables.

James Valenti, P.G: Golder Health and Safety Coordinator

James Valenti will serve as Golder's Health and Safety Coordinator. Mr. Valenti has over 18 years experience and will be responsible for overall direction and evaluation of health and safety issues related to implementation of field activities. He provided assistance and direction in the preparation of the Site-Specific Heath and Safety Plan (HASP) that is included in Section 5.0 of the RFI Management Plans.

Daniel Gorman: Golder Field Team Leader

The team leader for the field investigation work will be Daniel Gorman. Mr. Gorman has over 6 years of experience and will be responsible for the day-to-day-coordination of the environmental field activities. He will also be the in-field Health and Safety Officer (HSO) and will be responsible for implementation of the QAPP requirements related to field activities. He will also assist in data evaluation and interpretation activities.

Cindi Lucas: Golder Data Manager

The project chemist for this work will be Cindi Lucas. Ms. Lucas has over 8 years of experience and will be responsible for the coordination and review of laboratory sample analyses, the validation of analytical results, and for documenting compliance with the requirements and objectives of the QAPP. She will also prepare the Data Summary Usability Report (DUSR) for this effort.

Subcontractors

In addition to Golder staff, the execution of the work plans will require the use of qualified subcontractors, as noted in the Project Organization Chart, and will include the following service providers:

- Direct-push drilling subcontractor – Environmental Probing Investigations Inc.;
- MIP/EC investigation contractor – Peak Investigations;
- New York State Department of Health (NYSDOH)-certified analytical laboratory – Lancaster Laboratories;
- Soil physical properties analytical services – Oxidation Systems, Inc; and
- New York State Licensed Surveyor – Brinnier and Larios P.C.

Qualifications of these subcontractors will be submitted to NYSDEC upon request. IBM will advise NYSDEC of changes to this proposed Project Team as warranted during the performance of the work.

2.4 Project Schedule

Figure 4 presents the currently envisioned schedule for the performance of the RFIWPs and IWP.

Field activities are currently anticipated to begin April 13, 2009 within the Triangle Plume Area, following NYSDEC concurrence with the IWP, as this area is located atop open land (as opposed to beneath an existing structure as with the SWMUs) and is accessible to IBM and its consultants and contractors. Work in the SWMUs will occur subsequently upon receipt of NYSDEC approvals of the RFIWPs and unencumbered site access notice from TechCity for the buildings in question.

As investigation approaches have been proposed in the work plans to allow for the collection and analysis of real-time data and refinement of the work scopes during the course of the field investigations, the duration of the field investigations may differ from the project schedule presented herein.

IBM will advise NYSDEC of schedule variances that may occur and will provide alternative timeframes for the completion of project activities remaining as warranted.

3.0 DATA MANAGEMENT PLAN

This section presents the Data Management Plan (DMP) that will be implemented during the performance of the RFIWPs for SWMUs G, V, M and AB and the Triangle Plume Area.

This DMP provides the procedures that will be used to document investigation data and results generated by the work plans, project progress reporting and documentation activities, data recording procedures, analytical data presentation formats, and project document retention procedures.

3.1 Data Documentation Procedures

Field data generated will be documented following the procedures presented in the QAPP (see Section 4.0) and the SOPs included in Appendix A. The analytical laboratory, Lancaster Laboratories, will provide data following NYSDEC Analytical Services Protocol (ASP) Category B data deliverables requirements and will follow the documentation procedures identified in the Laboratory Quality Assurance Project Plan included in Appendix B.

3.2 Progress Reporting Procedures and Documentation

The work described in the RFIWPs and the IWP will be conducted by a multi-disciplinary Project Team of personnel from both IBM and Golder. Golder will also be assisted in the performance of the work by qualified subcontractors.

The Golder Field Team Leader will be responsible for summarizing the results of the MIP/EC investigations and recording the decisions and rationale made during the advancement of soil borings, the installation of temporary wells and the performance of groundwater sampling. The Field Team Leader will also record general progress, issues and corrective actions taken during the execution of the field program, including reporting this information to the Golder Project Manager.

Each day, the results of the MIP/EC work will be summarized and transmitted to key Project Team members for review and the locations for the next series of probes will be selected. In the event of unusual field conditions are encountered or unique MIP/EC results are obtained, the Golder Field Team Leader will contact the Golder Project Manager and/or the Golder Senior Hydrogeologist, upon discovery, so that appropriate field decisions, notifications and/or corrective measures may be implemented as needed.

The Golder Data Manager will be responsible for laboratory coordination, summarizing progress on data receipt and data deliverables. The Data Manager will also perform the evaluation of the data and identify issues and corrective actions taken to the Golder Project Manager for samples submitted to Lancaster Laboratories for characterization.

Progress reports will be provided to the Golder Project Manager on a weekly basis. The progress reports will be submitted to the Golder Project Manager via an e-mail memorandum that will describe the results of the field-derived data, the numbers and types of samples submitted for laboratory analysis, sample receipt confirmation, problems encountered and recommended solutions or corrective actions taken.

3.3 Analytical Data Record

Golder uses EQuIS® (Environmental Quality Information System) to electronically manage groundwater quality, water level elevation and soil analytical data. EQuIS® is a web-enabled environmental data management system written in the Microsoft .NET Framework, and is hosted at Golder in a Microsoft SQL Server environment. Only authorized Golder personnel have access to the database.

EQuIS® uses a variety of tools and customizable business rules to enforce data quality and provides links to many third-party tools commonly used for data visualizations and data analysis (e.g. EVS/MVS®). Laboratory analytical data will be acquired, checked and loaded into EQuIS® for secure tracking and reporting of data. The results of the MIP/EC investigations and physical characterization of soils will not be stored in EQuIS®, but will be stored and tracked as part of the analytical data records in Microsoft Excel® spreadsheets.

The following describes the method by which the laboratory analytical data will be acquired, checked and loaded into EQuIS®:

- Field samples will be collected following the procedures outlined in the RFIWPs, IWP, QAPP and SOPs;
- Samples will be delivered to the laboratory where analytical testing is completed. Copies of the chain of custody (COC) and field sample forms will be sent by overnight courier or scanned to electronic copy and e-mailed to the Golder Project Manager;
- Following sample analysis, Electronic Data Deliverables (EDDs) will be produced by the laboratory and e-mailed to the Golder Data Manager. The EDDs will be uploaded into the EQuIS® Data Processor (EDP) along with additional information from the field forms. The data added to the EDDs will include, but is not limited to:

- Sample location codes;
- Sample matrix codes;
- Sample type codes;
- Parent sample codes for replicate samples; and
- Sample delivery group codes.

The information will be checked and revised as necessary such as time stamps for proper format and test information. The EQuIS® EDP will check the EDDs for common laboratory errors, such as chronological event errors, duplicate rows, orphan samples, and inconsistencies with the EQuIS® system's valid value tables. Once the data are checked and reviewed, the EDD packages will be uploaded into the database. The data will then available to be queried and reported by EQuIS® Enterprise or EQuIS® Professional.

3.4 Data Presentation Format

EQuIS® Enterprise is a read-only web-based reporting function through which data will be processed and reported through a set of customizable pre-designed functions. EQuIS® Professional provides additional format functionality, such as cross-tabbing, trend graphs and isopleths for export to different formats, including Microsoft Excel®. Golder will use a combination of these tools to present analytical result data tables and trend graphs for the final RFIWP and IWP Reports.

Additionally, EVS/MVS® modeling will be used to evaluate the distribution of chemicals in soil and groundwater at the Site. Three-dimensional simulations of chemical distribution, along with chemical mass estimates, will be useful to help evaluate potential future corrective measures options and to illustrate the effectiveness/performance of these remedial options to NYSDEC and affected stakeholders.

Specifically, the use of EVS/MVS® will provide the following items in an efficient manner:

- Visual understanding of chemical distribution;
- Potential source areas and volumes to focus remedial technology evaluations;
- Soil volumes having chemical concentrations above selected criteria and standards; and
- Information that may be used during the assessment of future end use options (e.g., industrial/commercial and ecological enhancements).

A report will be prepared that summarizes and documents the investigations activities and results. Appropriate summary tables, figures (e.g. Site map showing locations of mass and volume

estimates and sample points used) and appendices (i.e. boring logs and well information) will be included in the report.

3.5 Project Filing Procedures

Field and analytical data, and associated reports generated by Golder and its subcontractors in performance of the work will be maintained in the Golder Newark, New Jersey office. A portion or all of the project files may also be maintained by Golder in a secure, off-site storage facility for a period of not less than seven (7) years. The types of project records and forms that will be maintained by Golder, include, but are not necessarily limited to, the items presented in the following table:

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records
Field Notes Sample Collection Forms Field Log Books Chain of Custody Forms Air Bills Telephone Logs and E-mails	Field Notes Sample Tracking Logs Equipment Calibration Logs Analytical Run Logs Equipment Maintenance Logs Corrective Action Reports Field Sample Results Progress Reports Telephone Logs and E-mails	Sample Receipt and Custody Forms Standards Logs Calibration Forms Sample Preparation Logs Analytical Run Logs Equipment Maintenance Logs Corrective Action Reports Sample QC Forms Instrument QC Forms Instrument Raw Data Electronic Data Deliverables	Data Review Checklists Data Usability Summary Reports Outlying QC Summary Forms Telephone Logs and E-mails

4.0 QUALITY ASSURANCE PROJECT PLAN

4.1 Introduction

This section provides the Quality Assurance Project Plan (QAPP) for the performance of the RFIWPs for SWMUs G, V, M and AB and the IWP for the Triangle Plume Area. The QAPP describes the data quality objectives, data reduction, reporting and evaluation procedures, sample and field measurement standard operating procedures (SOPs), sample analysis procedures and quality guidelines that will be followed by Golder and the analytical laboratory for the performance of the proposed work.

Tables 1 through 13 provide supplemental information pertaining to the following items:

- Target analyte parameter lists proposed for sampling and analysis;
- Sampling plans and data quality objectives for each SWMU and the Triangle Plume Area;
- Precision, accuracy, representativeness, completeness, comparability and sensitivity (PARCCS) measurement performance criteria;
- Laboratory precision and accuracy criteria;
- Laboratory detection and reporting limits; and
- Proposed analytical methods, sample containers, preservation and holding time requirements.

Appendix A includes the SOPs that will be used in the performance of the work plans. Appendix B includes the Laboratory QAPP that describes the procedures that will use in performing the chemical analysis of the environmental samples collected as part of the proposed work. The Laboratory QAPP is provided as a compact disc (CD). Lastly, additional area-specific information and procedures are provided in the work plans, which are incorporated into this QAPP by reference.

4.2 Data Quality Objectives

4.2.1 DQO Definition

The data quality objectives (DQOs) define the type, quantity and quality of data required to address specific environmental questions and support proper environmental decisions. DQOs are a common sense, graded approach to establish that the level of detail in planning is commensurate with the importance and intended purpose of the work and the use of available resources.

4.2.2 Types of Data to Be Collected

The following subsections identify the types of data that will be collected at the Site and the associated DQOs. Both screening level and laboratory analyzed environmental media sampling data will be generated in the performance of the work plans. Tables 1 through 6 present information related to the target analyte parameter lists proposed for sampling and analysis and sampling schedules and DOQs for each SWMU and the Triangle Plume Area.

4.2.3 Membrane Interface Probe/Electric Conductivity Investigation

Membrane Interface Probe/Electrical Conductivity (MIP/EC) Investigations will be conducted to better define the soil stratigraphy and distribution of VOCs in the subsurface. The MIP/EC system is an, in situ qualitative analytical tool for gathering large amounts of screening level data in a short period of time.

The DQO for this type of sampling is to gather real-time qualitative data that allows the field team to modify and expand the number, location and depth of boreholes, as needed, to allow for a more rapid and complete assessment of the nature and extent of VOC soil and groundwater impacts.

4.2.4 Soil Sampling

Soil samples will be collected for lithologic description and chemical characterization. Samples for laboratory analysis will be collected using an Encore® sampler (or equivalent) and submitted to the analytical laboratory under appropriate chain-of-custody (COC) for analysis of VOCs using EPA Method 8260B. In addition, a subset of the soil samples will be analyzed for parameters such as natural oxygen demand, grain size, and permeability.

The DQO for the soil sampling is to collect confirmatory VOC concentration information to verify the results of the MIP/EC screening data. The additional parameters analyzed in the soil samples will be used internally for evaluating potential corrective measure technologies, as warranted.

4.2.5 Groundwater Sampling

Three (3) types of groundwater samples will be collected during the field investigations, and analyzed in the laboratory as follows:

- Groundwater grab samples will be collected using GeoProbe® techniques (i.e., SP-15 Sampler or DT-21 Profiler) to confirm MIP/EC readings from specific zones in the boreholes advanced to collect the soil samples. These samples will be analyzed for VOCs using EPA Method 8260B. No purging or field parameter sampling will be performed prior to collecting these groundwater samples;

- Groundwater samples will be collected from temporary well casings installed at select locations using a GeoProbe® drill rig. Groundwater samples will be collected using low-flow purging and sampling techniques. Samples will be analyzed for VOCs using EPA Method 8260B. Select samples will also be analyzed for biogeochemical parameters (excluding metals); and

- Groundwater samples will be collected and analyzed for VOCs using EPA Method 8260B and biogeochemical parameters from existing Site monitoring wells in the vicinity of each SWMU and the Triangle Plume Area. Groundwater samples will also be collected using low-flow purging and sampling techniques.

The DQO for the groundwater grab sampling is to collect confirmatory VOC concentration information to verify the results of the MIP/EC screening data. The DQO for the groundwater VOC data generated from the temporary and existing monitoring wells is to assist with the assessment of the extent of groundwater impacts at the Site. The biogeochemical parameters collected for the groundwater data will be used for evaluating potential corrective measure technologies as warranted.

4.2.6 Storm Sewer Sampling

Water quality samples will be collected from two storm water catch basins and two storm sewer manholes for the Triangle Plume Area. Samples will be collected and submitted to the analytical laboratory under COC procedures for analysis of VOCs using EPA Method 8260B. The DQO for the storm sewer water sampling is to determine the presence or absence of VOCs in water within the sewer system.

4.3 PARCCS Requirements

This section describes the approach to the measurement performance criteria using data quality indicators expressed as precision, accuracy, representativeness, completeness, comparability and sensitivity (PARCCS). Where possible, acceptance criteria are specified to establish minimum acceptability levels for use of data in the overall decision making process. Tables 7 through 11 present the PARCCS criteria, including detection and reporting limits that are proposed for this work.

4.3.1 Precision

Precision refers to the degree to which repeated measurements are similar to one another. Precision measures the agreement (i.e., reproducibility) among individual measurements, obtained under prescribed similar conditions. Measurements that are precise are in close agreement with one another.

Field precision is assessed through the collection and measurement of field duplicates, which will be collected at an approximate rate of one (1) duplicate per twenty (20) field analytical samples collected. A field duplicate sample is defined as two (2) or more representative portions taken from the same sampling location, homogenized, split and submitted for identical analyses. The field duplicate sample is submitted to the laboratory blind (i.e., submitted as an individual sample and not identified as a field duplicate) so as to impartially represent field precision. Field duplicates will be collected at an approximate frequency of 1 per every 20 primary samples (except grab groundwater samples collected using GeoProbe® techniques for MIP/EC confirmation purposes).

Precision in the laboratory is assessed through the calculation of relative percent differences (RPD) between sample results. The RPD is calculated according to the following formula:

$$\boldsymbol{RPD = \frac{2\times|Conc.Sample\ 1 - Conc.Sample\ 2|}{|Conc.Sample\ 1 + Conc.Sample\ 2|} \times 100}$$

General precision control limits for the work are provided in Tables 7 through 10. The precision control limits provided are based on the laboratory quality control (QC) limits, which are routinely re-evaluated following the procedures in the laboratory quality assurance (QA) policies and the requirements of the analytical methods. Should the laboratory QC limits change between the submission of this QAPP and the sample analyses, the limits in place at the time of sample analysis will be used to evaluate the data, and updated QAPP tables will be submitted as an addendum, as warranted.

Analytical precision will be determined through the analysis of laboratory control spike duplicates and field duplicates for organic analyses, and also through laboratory duplicates for inorganic analyses. Field precision will be determined through the analysis of field duplicate pairs for both organic and inorganic analyses. If the RPDs for field or laboratory duplicates are within evaluation criteria, the original field sample result should be used, and not the duplicate

sample result. If the RPDs for field or laboratory duplicates are not within evaluation criteria, the data will be qualified as estimated and the more conservative value should be used.

4.3.2 Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference or true value. The accuracy measurement is generally determined by the percent recovery (%R) of a known value. Accuracy as %R is determined by the following equation:

$$\%\ R = \frac{(Spike\ Sample\ Conc. - Sample\ Conc.)}{Spike\ Amount\ Added} \times 100$$

Accuracy in the field is assessed through the use of equipment rinsate and trip blanks to assess the potential of cross contamination. In addition, field accuracy is assessed by the adherence to all sample handling, preservation and holding time criteria.

Laboratory accuracy is assessed through the analysis of standard reference materials (SRM), laboratory control samples (LCS), Matrix Spike/Matrix Spike Duplicate (MS/MSD), surrogate compounds, and the determination of the %R for these measurements. General accuracy control limits for the contract laboratory are provided in Tables 7 through 10. Where accuracy criteria are not met, data will be qualified as either estimated (i.e., minor deviation from accuracy criteria) or rejected (i.e., major deviation from accuracy criteria). Data qualified as rejected should not be used for decision making purposes.

4.3.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary.

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the work plans are followed and that proper sampling techniques are used. The RFIWP and IWP sampling programs were designed to provide data representative of Site conditions. During development of these programs, consideration was given to historical activities, existing analytical data, physical setting and processes. Using the proper analytical procedures, appropriate methods, meeting sample holding times and meeting QC criteria for each parameter affirms representativeness in the laboratory. An additional assessment of representativeness will be made through field duplicates. While field duplicates are primarily

used to assess precision, these samples also indicate sample homogeneity and therefore the representativeness of the Site.

4.3.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount of data that was expected under normal conditions. Data is considered valid and complete if QC elements have met the criteria established in this QAPP. Qualified data may be considered usable and will be considered complete on a case-by-case basis.

Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\textbf{\textit{Completeness}} = \frac{(\textbf{\textit{number of valid measurements}})}{(\textbf{\textit{number of planned measurements}})} \times \mathbf{100}$$

The laboratory and field completeness goal for this work is greater than 90 percent. Field measurements not collected from a specified location, or samples not collected due to environmental conditions, will be identified in the RFIWP or IPW Reports. Data qualified by the laboratory or by the data reviewer as estimated is usable, and therefore considered complete; however, data qualified as rejected are not usable and do not count toward completeness goals.

4.3.5 Comparability

Comparability is an expression of the confidence with which one data set can be compared to another. Comparability of data is achieved by providing site-wide sample collection and analyses following the same protocol. Comparability depends upon the proper design of the sampling program and will be satisfied by following the work plans, SOPs, and using proper sampling techniques. The Field Team Leader will routinely oversee field activities and verify compliance with the work plans and SOPs.

Analytical data are comparable when similar analytical methods are used as identified in Tables 12 and 13. Appropriate laboratory personnel will review and have a working knowledge of the Laboratory SOPs to be used during the analysis of samples for the investigations. Additionally, the Laboratory QA Manager will review the data generated, verify compliance with method requirements, and verify that QA objectives are met.

Comparability between the data generated by fixed laboratory analysis and the data obtained through field measurements using MIP/EC methods will be assessed by submitting soil grab samples to the fixed laboratory for analysis.

4.3.6 Sensitivity

Sensitivity is defined as the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. Two measurement responses of interest in assessing sensitivity are the method detection limit (MDL) and the practical quantitation limit (PQL).

The MDL is defined as the minimum concentration of a substance that can be identified, measured and reported with a 99 percent confidence that the substance concentration is greater than zero for a specific matrix containing the substance. The MDLs are determined as outlined in 40 CRF Part 136. The PQL is defined as the level of measurement that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operations. The PQLs are generally 2-5 times greater than the MDLs.

The sensitivity for field measurements will be determined, in part, by the limitations of field instrumentation as described in the manufacturer's manual and specific field measurement SOPs. Other factors that will influence sensitivity include matrix and environmental conditions.

The MDL and PQL goals for this work are identified in Table 11. The laboratory will verify the PQLs defined by a point on the calibration curve which is at or below the stated PQL. Should the laboratory MDL or PQL change between the submission of this QAPP and the sample analyses, the limits in place at the time of sample analysis will be used to evaluate the data, and updated QAPP tables will be submitted as an addendum, as warranted.

4.4 Data Reduction and Reporting

Field data will be recorded on field data sampling sheets, field log book, and in the case of MIP/EC data, electronically. The field data will be summarized and reported, as appropriate, in the RFIWP and IWP Reports. Field data will be managed by Golder according to the DMP (see Section 3.0).

The laboratory will provide data following NYSDEC Analytical Services Protocol (ASP) Category B data deliverables requirements. The laboratory data will be managed by the Golder Data Manager following the DMP, and reported in the RFIWP and IWP Reports.

4.5 Data Evaluation Procedures

One hundred (100) percent of the laboratory-analyzed environmental media sampling data will undergo a Stage 2A data review by the Golder Data Manager.

The Stage 2A data review, as defined in the EPA 540-R-08-005 (January 13, 2009), will include the verification and examination of the following items:

- Chain of custody
- Cooler receipt form
- Laboratory case narrative
- Sample summary forms
- Holding times
- Method blanks
- Trip blanks (aqueous volatiles only)
- Field equipment rinsate blanks (for field decontaminated sampling equipment)
- Surrogate spikes (organics)
- Matrix spike/matrix spike duplicates (MS/MSDs)
- Post-digestion spikes (inorganics)
- Laboratory control samples (LCS)
- Serial dilutions (ICP only)
- Field duplicates

The data review will utilize the guidance provided by USEPA Region II Standard Operating Procedures (SOPs) HW-24, Revision 2 (Validating Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry SW846 8260B) and HW-2, Revision 13 (Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW – ILM05.3), where applicable to the analytical methodologies.

The data will be evaluated relative the specific QC criteria presented in this QAPP and in consideration of the NYSDEC ASP requirements. The QC criteria presented in this QAPP are derived from USEPA methodology and laboratory historical performance, and are subject to

change based on periodic laboratory re-evaluation as specified in the analytical methods. If the USEPA Region II Data Validation SOPs do not specifically address an analytical method, the QC criteria identified by the analytical method, ASP and this QAPP will be used. Data will be qualified as estimated (**J/UJ**) or rejected (**R**) based on the results of the data reviews.

If significant QC deficiencies that might require rejection of data are identified in the laboratory case narrative, the Golder Data Manager will address the issues identified by the laboratory. If required, data will be qualified as rejected (**R**).

4.6 Data Usability Summary Report

A Data Usability Summary Report (DUSR) will be prepared for the soil, groundwater and storm sewer samples collected and analyzed for VOCs and the biogeochemical parameters identified in Tables 2 through 6, following the completion of the data evaluation. The DUSR will be prepared following the guidelines described in the NYSDEC Division of Environmental Remediation (DER) *Draft DER-10 Technical Guidance for Site Investigation and Remediation (December 2002), Appendix 2B.*

In general, the DUSR will describe the results of the data review, identify the associated samples and analytical parameters, discuss any deficiencies noted during the data review, and identify any potential effects of QC deficiencies on the data.

The findings of the data evaluations described above will be presented the DUSR. The qualified data will be noted in the DUSR, along with associated QC deficiencies, and the qualified laboratory data will be incorporated into the Site chemistry database.

The laboratory will perform data reduction in accordance with the individual analytical methodologies used for this project, and following NYSDEC ASP. The Laboratory QAPP (see Appendix B) provides additional information regarding the laboratory data reduction procedures.

4.7 Sampling and Field Measurements

The specific sampling and field measurement activities proposed for each area of the Site are detailed in the individual RFIWPs and the IWP, which are incorporated into this QAPP by reference. The SOPs and field and sample documentation procedures that will be employed in the execution of the field work are summarized in the sections which follow.

4.7.1 Standard Operating Procedures

SOPs are written instructions that document routine or repetitive activities to be followed by an individual or organization. The development and use of SOPs are an integral part of a successful quality system as SOPs provide individuals with information to perform work properly, and facilitate consistency in the quality and integrity of work products and results. The proper use and execution of SOPs minimizes variation and promotes quality through consistent implementation of a process or procedure, even in cases of temporary or permanent personnel changes.

4.7.2 List of SOPs

Appendix A includes the SOPs that will be followed for the performance of the RFIWPs and IWP. These SOPs include specific procedures for the investigation activities, sample collection and documentation, decontamination, field calibration and analysis, and investigative-derived waste management.

The following SOPs describe procedures that will be used in field activities:

- SOP 1 - Utility Clearance Procedures
- SOP 2 - Temporary Well Installation and Groundwater Sample Collection
- SOP 3 – Chain-of-Custody Procedures
- SOP 4 - Log Books and Field Form Procedures
- SOP 5 - Equipment Decontamination
- SOP 6 - Soil Boring and Soil Sampling Procedures
- SOP 7 - Storm Sewer Sampling Procedures
- SOP 8 - Investigation Derived Waste Procedures
- SOP 9 - Membrane Interface Probe Procedures
- SOP 10 - Borehole and Temporary Well Decommissioning Procedures

4.8 Field and Sample Documentation

4.8.1 Sample Records

Each soil, groundwater and storm sewer sample collected as part of the work will be labeled with a unique sample identification (ID) which reflects the sample location, type of sample collected,

and depth from which the sample was collected, as applicable. Each sample label and container will also be marked with the Site name, data and time the sample was collected, analysis to be performed (e.g. EPA Method 8260B), and any relevant sample preservative used (e.g. HCl).

The specific sample IDs for each sampling type will be as follows:

MIP/EC — MIP-XX; where MIP indicates Membrane Interface Probe and XX represents the sample probe identification. MIP samples will be continuously logged in the field during probing activities. The MIP sample IDs will be noted in the field log book and on the MIP log output generated by the instrumentation.

Soil Borings — SB-XX BB-EE; where SB indicates soil boring sample, XX represents the sample location, BB indicates the beginning of the sample interval and EE indicates the end of the sample interval. The beginning and ending sample intervals shall be noted in the units of feet.

Groundwater — SBW-XX BB; where SBW indicates a groundwater grab sample from a soil boring, XX represents the sample location, and BB indicates the depth at which the water sample was collected.

TW-XX BB; where TW indicates a temporary well point, XX represents the sample location, and BB indicates the temporary well depth at which the water sample was collected.

MW-XX; where MW indicates an existing monitoring well and XX represents the existing monitoring well ID as noted on the appropriate RFIWP or IWP figures provided in the work plans.

Storm Sewer — CSXXX; where CS denotes catch basin or sewer manhole and XXX indicates the sample location. Note: These designations were used during the initial sewer system investigation performed by Groundwater Sciences Corporation in 1994 and will be retained for this work for consistency purposes.

4.8.2 Field Logs and Records

The Field Team Leader will be responsible for maintaining centralized daily records of significant field events, observations, and measurements made during the performance of the field program. Additionally, members of the field team are responsible for maintaining complete records of their actions, observations, etc., in the field and sample log books and providing this information to the Field Team Leader at the end of each day. The specific procedures employed and field data to be recorded for the work plans are noted in the SOPs provided in Appendix A.

4.8.3 Chain-of-Custody Procedures

Chain of custody (COC) procedures have been established to confirm sample traceability from the time of collection through completion of analysis.

COC forms shall accompany all field samples submitted to the analytical laboratory for chemical analysis. The specific COC procedures that will be used during the performance of the proposed work are provided in the SOPs included in Appendix A. Laboratory COC procedures are provided in the Laboratory QAPP included in Appendix B.

4.9 Laboratory Methods and Procedures

Lancaster Laboratories (Lancaster) of Lancaster, PA has been selected as the analytical laboratory to perform the chemical analytical procedures identified in the work plans and this QAPP. All analytical work performed by Lancaster will be conducted in accordance with the Laboratory QAPP included in Appendix B, which is incorporated into this QAPP by reference.

The Laboratory QAPP includes the procedures that will be employed to achieve the following objectives:

- Data generated in the laboratory are within the acceptable limits of accuracy and precision;
- Appropriate quality control measures are performed; and
- Data accountability is performed through appropriate sample and data management procedures.

The Laboratory QAPP includes information related to project management, data measurement and acquisition (i.e., analytical method requirements, instrumentation calibration, testing, inspection and maintenance, quality control, etc.), laboratory SOPs and data management, assessment and validation procedures.

Lancaster holds a current NYSDOH ELAP Certification for the parameters included in the methods identified below. A copy of the certification is included in Appendix C.

Soil samples will be analyzed for VOCs following EPA Method 8260B. The target compound list of VOCs, and associated method detection limits, reporting limits, and precision and accuracy criteria, are identified in Tables 1, 7, 8, and 11. Select soil samples will also be analyzed for natural oxidant demand, grain size, and permeability following American Society for Testing and Materials (ASTM) methods noted in Table 12.

Groundwater and sewer water samples will be analyzed for VOCs following EPA Method 8260B. The target compound list for VOCs, and associated method detection limits, reporting limits, and precision and accuracy criteria, are identified in Tables 1, 9, 10, and 11. Additionally, groundwater and sewer water samples analyzed for metals and biogeochemical parameters will be prepared and analyzed following EPA Methods and Standard Methods identified in Table 13.

5.0 HEALTH AND SAFETY PLAN

The Site-Specific Health and Safety Plan (HASP) for the performance of the field activities outlined in the work plans is included in Appendix D. This HASP presents the procedures that will be followed by Golder and its onsite subcontractors during the execution of the work. The HASP identifies the potential physical and chemical hazards that the field investigative team members may encounter and is designed to mitigate worker exposure through the use of personal protective equipment and safe work practices. Any visitors will be required to review the HASP and follow its procedures prior to observing or entering any work zones. The HASP will be reviewed and updated as warranted during the performance of the work in the event Site conditions and/or work activities changes.

6.0 COMMUNITY RELATIONS PLAN

A Citizen Participation Plan was prepared and submitted to NYSDEC in April 1995, addressing the RCRA permit activities (GSC, 1995). In addition to providing background information, this Citizen Participation Plan provides a description of citizen participation activities; identified document repositories; and provides project contact lists.

As the work proposed by the RFIWPs and IWP are a continuation of the work required under the RCRA permit, no modifications or revisions to the 1995 Citizen Participation Plan are proposed at this time. Therefore, the procedures and requirements noted in the 1995 plan will be followed. Addenda to the plan will be provided as warranted.

7.0 REFERENCES

Groundwater Sciences Corporation, "Citizen Participation Plan Revised", Prepared for International Business Machines Corporation, Kingston, New York, April 28, 1995

NYSDEC Division of Environmental Remediation, "Draft DER-10 Technical Guidance for Site Investigation and Remediation, Appendix 2B, Guidance for the Development of Data Usability Summary Reports", December 25, 2002.

U.S. Environmental Protection Agency, 1998. *Guidance for Quality Assurance Project Plans (QA/G-5)*, EPA/600/R-98/018, Office of Research and Development.

U.S. Environmental Protection Agency, 2000b. *Guidance for the Data Quality Objectives Process (QA/G-4)*, EPA/600/R-96/055, Office of Environmental Information.

U.S. Environmental Protection Agency, 2001. *EPA Requirements for Quality Assurance Project Plans (QA/R-5)*, EPA/240/B-01/003, Office of Environmental Information.

U.S. Environmental Protection Agency, 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*, EPA 540-R-08-005, Office of Solid Waste and Emergency Response.

TABLES

TABLE 1
TARGET ORGANIC, INORGANIC AND AQUEOUS BIOGEOCHEMICAL ANALYTE LIST
FORMER IBM KINGSTON FACILITY

TCL Volatile Organic Compounds	Biogeochemical Parameters
1,1,1,2-Tetrachloroethane	**Groundwater**
1,1,1-Trichloroethane	Alkalinity as $CaCO_3$
1,1,2,2-Tetrachloroethane	Ammonia as Nitrogen
1,1,2-Trichloro-1,2,2-Trifluoroethane	Biochemical Oxygen Demand (BOD)
1,1,2-Trichloroethane	Chemical Oxiygen Demand (COD)
1,1-Dichloroethane	Methane
1,1-Dichloroethylene	Nitrate/Nitrite as N
1,2,3-Trichloropropane	Phosphorous
1,2-Dichloro-1,2,2-Trifluoroethane	Sulfate
1,2-Dichlorobenzene	Sulfide
1,2-Dichloroethane	Total Dissolved Soilds (TDS)
1,2-Dichloroethylene, Total	Total Suspended Solids (TSS)
1,2-Dichloropropane	Total Organic Carbon (TOC)
1,3-Dichlorobenzene	**Metals**
1,4-Dichlorobenzene	Antimony
1-Chlorohexane	Arsenic
2-Chloroethylvinyl Ether	Barium
2-Chlorotoluene	Cadmium
4-Chlorotoluene	Chromium
Benzene	Copper
Benzyl Chloride	Iron
Bromobenzene	Lead
Bromodichloromethane	Manganese
Bromoform	Selenium
Bromomethane	**Major Cations**
Carbon Tetrachloride	Calcium
Chlorobenzene	Magnesium
Chlorodibromomethane	Potassium
Chloroethane	Sodium
Chloroform	**Major Anions**
Chloromethane	Fluoride
Cis-1,3-Dichloropropylene	Chloride
Dibromomethane	**Field Parameters**
Dichlorodifluoromethane	Dissolved Oxygen (DO)
Ethylbenzene	Oxidation-Reduction Potential (ORP)
Methylene Chloride	pH
Tetrachloroethylene	Specific Conductance
Toluene	Temperature
Trans-1,3-Dichloropropene	Water Level
Trichloroethylene	**Soil**
Trichlorofluoromethane	Natural Oxidant Demand
Vinyl Chloride	Grain Size Analysis
Xylene, Total	Permeability

TABLE 2
SWMU-G: FORMER WASTE PCE TANK
SAMPLING SCHEDULE
FORMER IBM KINGSTON FACILITY

Media	Number of Samples	Parameters of Interest	Frequency of Monitoring	Data Quality Objectives
Soil	12	VOCs (EnCore® or equivalent)	Once	Collect confirmatory VOC information to verify the results of the Membrane Interface Probe/Electrical Conductivity (MIP/EC) data.
	2	Biogeochemical Parameters	Once	Used for evaluating potential corrective measure technologies.
Groundwater (Grab and Temporary Wells)	8	VOCs	Once	Grab Samples- Collect confirmatory VOC information to verify the results of the MIP/EC data. Temporary Wells- Assessment of the extent of groundwater impacts.
	2	Biogeochemical Parameters (not including metals)	Once	Used for evaluating potential corrective measure technologies.
Groundwater (Existing Wells)	5	VOCs	Once	Assessment of the extent of groundwater impacts.
	2	Biogeochemical Parameters	Once	Used for evaluating potential corrective measure technologies.

Notes:

1. The Parameters of Interest are provided in Table 1.
2. The methodologies that will be used for analysis are listed in Tables 7 and 9.
3. QA/QC samples will be collected per matrix at the following frequency : 1 field duplicate per 20 primary samples; 1 MS/MSD pair per 20 primary + field duplicate samples (excluding groundwater grab samples); 1 rinsate blank per day per type of decontamination event where non-dedicated equipment is used. 1 trip blank per day when aqueous VOC samples are collected.
4. Field Parameters for groundwater monitoring include: pH, temperature, specific conductivity, dissolved oxygen, oxidation-reduction potential, and water levels.
   Field parameters for soil screening include: VOC vapors and visual characteristics.
5. During soil sampling, samples for biogeochemical parameters (natural oxidant demand, grain size determination, and permeability) will be collected.
6. Number of samples is approximate. Actual number of samples will be based on MIP/EC investigation results.

TABLE 3
SWMU-V: PORTIONS of the B005 PLUME
SAMPLING SCHEDULE
FORMER IBM KINGSTON FACILITY

Media	Number of Samples	Parameters of Interest	Frequency of Monitoring	Data Quality Onjectives
Soil	21	VOCs (EnCore® or equivalent)	Once	Collect confirmatory VOC information to verify the results of the Membrane Interface Probe/Electrical Conductivity (MIP/EC) data.
	2	Biogeochemical Parameters	Once	Used for evaluating potential corrective measure technologies.
Groundwater	12	VOCs	Once	Grab Samples- Collect confirmatory VOC information to verify the results of the MIP/EC data. Temporary Wells- Assessment of the extent of groundwater impacts.
(Grab and Temporary Wells)	2	Biogeochemical Parameters (not including metals)	Once	Used for evaluating potential corrective measure technologies.
Groundwater	4	VOCs	Once	Assessment of the extent of groundwater impacts.
(Existing Wells)	2	Biogeochemical Parameters	Once	Used for evaluating potential corrective measure technologies.

Notes:

1. The Parameters of Interest are provided in Table 1.
2. The methodologies that will be used for analysis are listed in Tables 7 and 9.
3. QA/QC samples will be collected per matrix at the following frequency : 1 field duplicate per 20 primary samples; 1 MS/MSD pair per 20 primary + field duplicate samples (excluding groundwater samples); 1 rinsate blank per day per type of decontamination event where non-dedicated equipment is used. 1 trip blank per day when aqueous VOC samples are collected.
4. Field Parameters for groundwater monitoring include: pH, temperature, specific conductivity, dissolved oxygen, oxidation-reduction potential, and water levels.
   Field parameters for soil screening include: VOC vapors and visual characteristics.
5. During soil sampling, samples for biogeochemical parameters (natural oxidant demand, grain size determination, and permeability) will be collected.
6. Number of samples is approximate. Actual number of samples will be based on MIP/EC investigation results.

TABLE 4
SWMU-M: PORTIONS of the INDUSTRIAL WASTE SEWER LINES
SAMPLING SCHEDULE
FORMER IBM KINGSTON FACILITY

Media	Number of Samples	Parameters of Interest	Frequency of Monitoring	Data Quality Objectives
Soil	24	VOCs (EnCore® or equivalent)	Once	Collect confirmatory VOC information to verify the results of the Membrane Interface Probe/Electrical Conductivity (MIP/EC) data.
	2	Biogeochemical Parameters	Once	Used for evaluating potential corrective measure technologies.
Groundwater (Grab and Temporary Wells)	13	VOCs	Once	Grab Samples- Collect confirmatory VOC information to verify the results of the MIP/EC data. Temporary Wells- Assessment of the extent of groundwater impacts.
	2	Biogeochemical Parameters (not including metals)	Once	Used for evaluating potential corrective measure technologies.
Groundwater (Existing Wells)	8	VOCs	Once	Assessment of the extent of groundwater impacts.
	2	Biogeochemical Parameters	Once	Used for evaluating potential corrective measure technologies.

Notes:

1. The Parameters of Interest are provided in Table 1.
2. The methodologies that will be used for analysis are listed in Tables 7 and 9.
3. QA/QC samples will be collected per matrix at the following frequency : 1 field duplicate per 20 primary samples; 1 MS/MSD pair per 20 primary + field duplicate samples (excluding groundwater samples); 1 rinsate blank per day per type of decontamination event where non-dedicated equipment is used. 1 trip blank per day when aqueous VOC samples are collected.
4. Field Parameters for groundwater monitoring include: pH, temperature, specific conductivity, dissolved oxygen, oxidation-reduction potential, and water levels.
   Field parameters for soil screening include: VOC vapors and visual characteristics.
5. During soil sampling, samples for biogeochemical parameters (natural oxidant demand, grain size determination, and permeability) will be collected.
6. Number of samples is approximate. Actual number of samples will be based on MIP/EC investigation results.

TABLE 5
SWMU-AB: FORMER B001 TCA RECOVERY UNIT
SAMPLING SCHEDULE
FORMER IBM KINGSTON FACILITY

Media	Number of Samples	Parameters of Interest	Frequency of Monitoring	Data Quality Objectives
Soil	9	VOCs (EnCore® or equivalent)	Once	Collect confirmatory VOC information to verify the results of the Membrane Interface Probe/Electrical Conductivity (MIP/EC) data.
	3	Biogeochemical Parameters	Once	Used for evaluating potential corrective measure technologies.
Groundwater (Grab and Temporary Wells)	6	VOCs	Once	Grab Samples- Collect confirmatory VOC information to verify the results of the MIP/EC data. Temporary Wells- Assessment of the extent of groundwater impacts.
	1	Biogeochemical Parameters (not including metals)	Once	Used for evaluating potential corrective measure technologies.
Groundwater (Existing Wells)	3	VOCs	Once	Assessment of the extent of groundwater impacts.

Notes:

1. The Parameters of Interest are provided in Table 1.
2. The methodologies that will be used for analysis are listed in Tables 7 and 9.
3. QA/QC samples will be collected per matrix at the following frequency : 1 field duplicate per 20 primary samples; 1 MS/MSD pair per 20 primary + field duplicate samples (excluding groundwater samples); 1 rinsate blank per day per type of decontamination event where non-dedicated equipment is used. 1 trip blank per day when aqueous VOC samples are collected.
4. Field Parameters for groundwater monitoring include: pH, temperature, specific conductivity, dissolved oxygen, oxidation-reduction potential, and water levels.
   Field parameters for soil screening include: VOC vapors and visual characteristics.
5. During soil sampling, samples for biogeochemical parameters (natural oxidant demand, grain size determination, and permeability) will be collected.
6. Number of samples is approximate. Actual number of samples will be based on MIP/EC investigation results.

TABLE 6
TRIANGLE PLUME AREA
SAMPLING SCHEDULE
FORMER IBM KINGSTON FACILITY

Media	Number of Samples [7]	Parameters of Interest	Frequency of Monitoring	Purpose/Objective of Activity
Soil	18	VOCs (EnCore® or equivalent)	Once	Collect confirmatory VOC information to verify the results of the Membrane Interface Probe/Electrical Conductivity (MIP/EC) data.
	2	Biogeochemical Parameters	Once	Used for evaluating potential corrective measure technologies.
Groundwater (Grab and Temporary Wells)	12	VOCs	Once	Grab Samples - Collect confirmatory VOC information to verify the results of the MIP/EC data. Temporary Wells - Assessment of the extent of groundwater impacts.
	2	Biogeochemical Parameters (not including metals)	Once	Used for evaluating potential corrective measure technologies.
Groundwater (Existing Wells)	4	VOCs	Once	Assessment of the extent of groundwater impacts.
		Biogeochemical Parameters	Once	Used for evaluating potential corrective measure technologies.
Sewer Water	4	VOCs	Once	Assess the extent of groundwater impact and verify the perimeter groundwater control system.

Notes:

1. The Parameters of Interest are provided in Table 1.
2. The methodologies that will be used for analysis are listed in Tables 7 and 9.
3. QA/QC samples will be collected per matrix at the following frequency : 1 field duplicate per 20 primary samples; 1 MS/MSD pair per 20 primary + field duplicate samples (excluding groundwa samples); 1 rinsate blank per day per type of decontamination event where non-dedicated equipment is used. 1 trip blank per day when aqueous VOC samples are collected.
4. Field Parameters for groundwater monitoring include: pH, temperature, specific conductivity, dissolved oxygen, oxidation-reduction potential, and water levels.
   Field parameters for soil screening include: VOC vapors and visual characteristics.
5. During soil sampling, samples for biogeochemical parameters (natural oxidant demand, grain size determination, and permeability) will be collected.
6. Number of samples is approximate. Actual number of samples will be based on MIP/EC investigation results.

TABLE 7
PARCCS DATA FOR SOIL SAMPLES
FORMER IBM KINGSTON FACILITY

MEASUREMENT PARAMETER	METHOD REFERENCE	LABORATORY PRECISION	FIELD & LABORATORY PRECISION	ACCURACY	COMPLETENESS
Volatile Organics	SW846 8260B	see Table 8	100%	see Table 8	90%
Natural Oxidant Demand	ASTM D422	NA	NA	NA	90%
Grain Size Analysis	ASTM D422	NA	NA	NA	90%
Permeability	ASTM D5084	NA	NA	NA	90%

NOTES:

1. NA = Not applicable
2. The Parameters of Interest are provided in Table 1.
3. Precision expressed as either percent relative standard deviation (%RSD) or relative percent difference (%RPD).
4. Accuracy expressed as percent recovery (%R) of matrix spike or laboratory control sample.
5. Precision and accuracy for VOC parameters provided in Table 8.
6. Representativeness and Comparability are non-quantitative parameters.

TABLE 8
LABORATORY PRECISION AND ACCURACY CRITERIA FOR SOIL VOCs
FORMER IBM KINGSTON FACILITY

VOLATILE ORGANICS:	QC LIMITS	
Target Spike Compound	% Recovery	% RPD
1,1,1,2-Tetrachloroethane	52-130	0-30%
1,1,1-Trichloroethane	57-165	0-30%
1,1,2,2-Tetrachloroethane	40-152	0-30%
1,1,2-Trichloroethane	54-139	0-30%
1,1-Dichloroethane	63-142	0-30%
1,1-Dichloroethene	61-149	0-30%
1,2,3-Trichloropropane	38-155	0-30%
1,2-Dichlorobenzene	36-133	0-30%
1,2-Dichloroethane	53-143	0-30%
1,2-Dichloropropane	62-135	0-30%
1,3-Dichlorobenzene	34-134	0-30%
1,4-Dichlorobenzene	35-136	0-30%
2-Chlorotoluene	42-146	0-30%
4-Chlorotoluene	39-145	0-30%
Benzene	55-143	0-30%
Bromobenzene	43-139	0-30%
Bromodichloromethane	53-136	0-30%
Bromoform	38-124	0-30%
Bromomethane	32-153	0-30%
Carbon Tetrachloride	45-153	0-30%
Chlorobenzene	49-135	0-30%
Chloroethane	39-152	0-30%
Chloroform	61-142	0-30%
Chloromethane	51-163	0-30%
Dibromochloromethane	51-128	0-30%
Dibromomethane	57-130	0-30%
Dichlorodifluoromethane	38-191	0-30%
Ethylbenzene	44-141	0-30%
Methylene Chloride	47-145	0-30%
Tetrachloroethene	42-149	0-30%
Trichloroethene	53-144	0-30%
Trichlorofluoromethane	47-163	0-30%
Vinyl Chloride	50-154	0-30%
1,2-Dichloroethene (Total)	59-139	0-30%
2-Chloroethyl Vinyl Ether	32-139	0-30%
Freon 113	56-156	0-30%
Xylene (Total)	44-136	0-30%
cis-1,3-Dichloropropene	51-131	0-30%
trans-1,3-Dichloropropene	49-129	0-30%
Freon 123a	70-130	0-30%
Benzyl Chloride	30-130	0-30%
Surrogate Compound		
Dibromofluoromethane	71 - 114	NA
1,2-Dichloroethane-d4	70 - 109	NA
Toluene-d8	70 - 123	NA
4-Bromofluorobenzene	70 - 111	NA

NOTES:

1. NA- Not Applicable
2. Accuracy and precision criteria based upon Lancaster Laboratories established limits.

TABLE 9
PARCCS DATA FOR AQUEOUS SAMPLES
FORMER IBM KINGSTON FACILITY

MEASUREMENT PARAMETER	METHOD REFERENCE	LABORATORY PRECISION	FIELD & LABORATORY PRECISION	ACCURACY	COMPLETENESS
Volatile Organics	SW846 8260B	see Table 10	50%	see Table 10	90%
Inorganics	SW846 6010B	see Table 10	50%	see Table 10	90%
Alkalinity	SM20 2320B	20%	50%	75%-125%	90%
Ammonia as Nitrogen	SM20 4500 NH3 B&C	20%	50%	75%-125%	90%
Biochemical Oxygen Demand (BOD)	SM20 5210B	20%	50%	75%-125%	90%
Chemical Oxidant Demand (COD)	EPA 410.4	20%	50%	75%-125%	90%
Fluoride	EPA 300.0	20%	50%	75%-125%	90%
Chloride	EPA 300.0	20%	50%	75%-125%	90%
Methane	RSKSOP-175 mod	20%	50%	75%-125%	90%
Nitrate/Nitrite as Nitrogen	EPA 353.2	20%	50%	75%-125%	90%
Total Phosphorous	EPA 365.1	20%	50%	75%-125%	90%
Sulfate	EPA 300.0	20%	50%	75%-125%	90%
Sulfide	SM20 4500 S2D	20%	50%	75%-125%	90%
Total Dissolved Soilds (TDS)	EPA 160.1	20%	50%	75%-125%	90%
Total Suspended Solids (TSS)	EPA 160.2	20%	50%	75%-125%	90%
Total Organic Carbon (TOC)	SM20 5310C	20%	50%	75%-125%	90%
Oxidation-Reduction Potential	Electrode	NA	20%	NA	90%
Dissolved Oxygen	Electrode	NA	20%	NA	90%
Specific Conductance	Electrode	NA	20%	NA	90%
pH	Electrode	NA	+0.5 std pH units	NA	90%
Temperature	Electrode	NA	+0.5 deg C	NA	90%

NOTES:

1. NA = Not applicable
2. The Parameters of Interst are provided in Table 1.
3. Precision expressed as either percent relative standard deviation (%RSD) or relative percent difference (%RPD).
4. Accuracy expressed as percent recovery (%R) of matrix spike or laboratory control sample.
5. Precision and accuracy for VOC/Inorganic parameters provided in Table 10.
6. Accuracy and precision criteria for laboratory measurements will be consistent with the criteria cited in the individual methodologies for the natural attenuation parameters.
7. Field parameters are only sampled for temporary and existing monitoring wells.

TABLE 10
LABORATORY PRECISION AND ACCURACY CRITERIA FOR AQUEOUS VOCs AND METALS
FORMER IBM KINGSTON FACILITY

VOLATILE ORGANICS:	QC LIMITS	
Target Spike Compound	**% Recovery**	**% RPD**
1,1,1,2-Tetrachloroethane	82-119	0-30%
1,1,1-Trichloroethane	85-151	0-30%
1,1,2,2-Tetrachloroethane	73-119	0-30%
1,1,2-Trichloroethane	77-124	0-30%
1,1-Dichloroethane	84-129	0-30%
1,1-Dichloroethene	87-134	0-30%
1,2,3-Trichloropropane	76-118	0-30%
1,2-Dichlorobenzene	83-113	0-30%
1,2-Dichloroethane	66-141	0-30%
1,2-Dichloropropane	83-124	0-30%
1,3-Dichlorobenzene	82-115	0-30%
1,4-Dichlorobenzene	83-113	0-30%
2-Chlorotoluene	82-118	0-30%
4-Chlorotoluene	76-124	0-30%
Benzene	80-126	0-30%
Bromobenzene	82-115	0-30%
Bromodichloromethane	78-125	0-30%
Bromoform	62-113	0-30%
Bromomethane	48-136	0-30%
Carbon Tetrachloride	81-138	0-30%
Chlorobenzene	86-118	0-30%
Chloroethane	58-134	0-30%
Chloroform	81-134	0-30%
Chloromethane	67-154	0-30%
Dibromochloromethane	74-116	0-30%
Dibromomethane	83-119	0-30%
Dichlorodifluoromethane	63-187	0-30%
Ethylbenzene	77-125	0-30%
Methylene Chloride	79-120	0-30%
Tetrachloroethene	80-128	0-30%
Toluene	80-125	0-30%
Trichloroethene	88-125	0-30%
Trichlorofluoromethane	73-152	0-30%
1,2-Dichloroethene (Total)	85-125	0-30%
2-Chloroethyl Vinyl Ether	10-151	0-30%
Freon 113	89-148	0-30%
Xylene (Total)	79-125	0-30%
cis-1,3-Dichloropropene	77-117	0-30%
trans-1,3-Dichloropropene	74-119	0-30%
Benzyl Chloride	62-120	0-30%
Freon 123a	70-130	0-30%
Surrogate Compounds		
Dibromofluoromethane	80 - 116	NA
1,2-Dichloroethane-d4	77 - 113	NA
Toluene-d8	80 - 113	NA
4-Bromofluorobenzene	78 - 113	NA

TARGET ANALYTE LIST:	QC LIMITS	
Target Spike Compound	**% Recovery**	**% RPD**
Metals	75%-125%	20%

NOTES:

1. NA - Not Applicable
2. Accuracy and precision criteria based upon Lancaster Laboratories established limits.
3. Precision criteria for metals is ±CRDL (reporting limit) for results less than 5xCRDL.

TABLE 11
TARGET ANALYTE SENSITIVITY LIMITS
FORMER IBM KINGSTON FACILITY

TARGET PARAMETERS	MDL	PQL	MDL	PQL
	AQUEOUS DETECTION LIMITS	AQUEOUS REPORTING LIMITS	SOIL DETECTION LIMITS	SOIL REPORTING LIMITS
Volatile Organic Compounds	[ug/l]	[ug/l]	[ug/kg]	[ug/kg]
1,1,1,2-Tetrachloroethane	1	5	1	5
1,1,1-Trichloroethane	0.8	5	1	5
1,1,2,2-Tetrachloroethane	1	5	1	5
Freon 113	2	10	2	10
1,1,2-Trichloroethane	0.8	5	1	5
1,1-Dichloroethane	1	5	1	5
1,1-Dichloroethene	0.8	5	1	5
1,2,3-Trichloropropane	1	5	1	5
Freon 123A	2	5	2	5
1,2-Dichlorobenzene	1	5	1	5
1,2-Dichloroethane	1	5	1	5
1,2-Dichloroethene (Total)	0.8	5	1	5
1,2-Dichloropropane	1	5	1	5
1,3-Dichlorobenzene	1	5	1	5
1,4-Dichlorobenzene	1	5	1	5
1-Chlorohexane	NA	NA	NA	NA
2-Chloroethyl Vinyl Ether	2	10	2	10
2-Chlorotoluene	1	5	1	5
4-Chlorotoluene	1	5	1	5
Benzene	0.5	5	0.5	5
Benzyl Chloride	1	5	1	4
Bromobenzene	1	5	1	5
Bromodichloromethane	1	5	1	5
Bromoform	1	5	1	5
Bromomethane	1	5	2	5
Carbon Tetrachloride	1	5	1	5
Chlorobenzene	0.8	5	1	5
Dibromochloromethane	1	5	1	5
Chloroethane	1	5	2	5
Chloroform	0.8	5	1	5
Chloromethane	1	5	2	5
cis-1,3-Dichloropropene	1	5	1	5
Dibromomethane	1	5	1	5
Dichlorodifluoromethane	2	5	2	5
Ethylbenzene	0.8	5	1	5
Methylene Chloride	2	5	2	5
Tetrachloroethene	0.8	5	1	5
Toluene	0.7	5	1	5
trans-1,3-Dichloropropene	1	5	1	5
Trichloroethene	1	5	1	5
Trichlorofluoromethane	2	5	2	5
Vinyl Chloride	1	5	1	5
Xylene (Total)	0.8	5	1	5

TABLE 11
TARGET ANALYTE SENSITIVITY LIMITS
FORMER IBM KINGSTON FACILITY

TARGET PARAMETERS	MDL	PQL	MDL	PQL
	AQUEOUS DETECTION LIMITS	AQUEOUS REPORTING LIMITS	SOIL DETECTION LIMITS	SOIL REPORTING LIMITS
Volatile Organic Compounds	[ug/l]	[ug/l]	[ug/kg]	[ug/kg]
Inorganics List	[mg/l]	[mg/l]	[mg/kg]	[mg/kg]
Antimony	0.0097	0.02	NA	NA
Arsenic	0.0102	0.02	NA	NA
Barium	0.00062	0.005	NA	NA
Cadmium	0.002	0.005	NA	NA
Calcium	0.0702	0.2	NA	NA
Chromium	0.003	0.015	NA	NA
Copper	0.0027	0.01	NA	NA
Iron	0.0522	0.2	NA	NA
Lead	0.0069	0.015	NA	NA
Magnesium	0.0322	0.1	NA	NA
Manganese	0.00084	0.005	NA	NA
Potassium	0.0503	0.5	NA	NA
Selenium	0.0107	0.02	NA	NA
Sodium	0.433	1	NA	NA

Notes:

1. NA - Not Applicable
2. The Parameters of Interest are provided in Table 1.
3. VOC and Inorganic reporting limits are from Lancaster Laboratories established lists.
4. Reporting Limits will be modified on an individual sample basis depending upon dilution, percent solids, and sample matrix considerations.
5. MDL - Method Detection Limit
6. PQL - Practical Quantitation Limit

TABLE 12
ANALYTICAL METHODS, SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES FOR SOIL SAMPLES
FORMER IBM KINGSTON FACILITY

PARAMETER	METHODOLOGY	CONTAINER	MINIMUM SAMPLE	PRESERVATION	HOLD TIME
Volatile Organics	SW846 8260B	4 EnCore® samplers	20 gm	Cool 4 ^{o}C	14 days
Natural Oxidant Demand	ASTM D422	16 oz glass	1000 gm	None	None
Grain Size Analysis	ASTM D422	16 oz glass	1000 gm	None	None
Permeability	ASTM D5084	Shelby tube sample	N/A	None	None

Notes:

1. Sample Preservation is performed by sampler immediately upon sample collection except for VOCs which is performed by laboratory upon receipt.
2. Hold time based upon day of sample collection not verified time of sample receipt.
3. Hold time is 48 hours for preservation using Encores ® and 14 days to analysis.

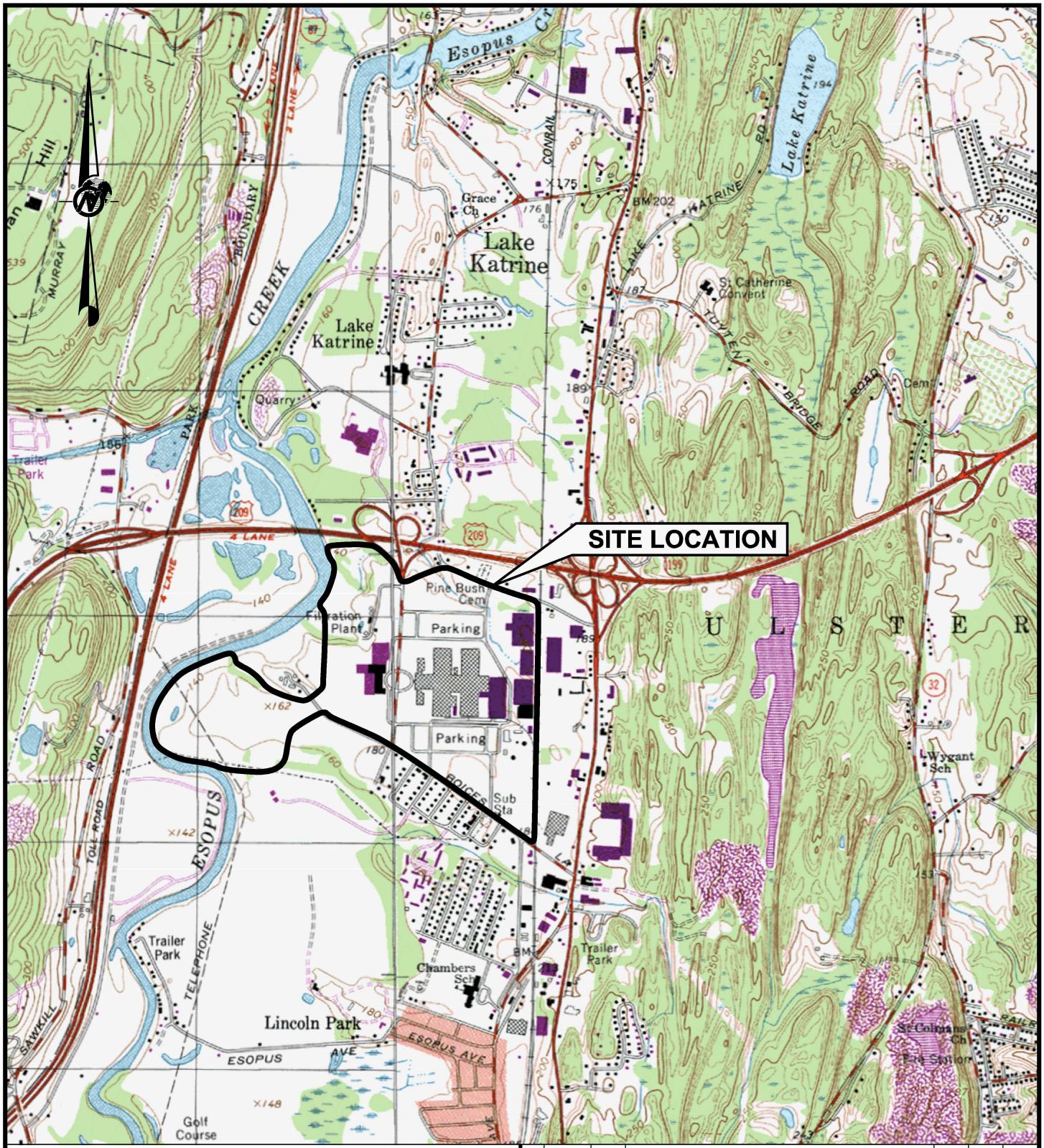
TABLE 13
ANALYTICAL METHODS, SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES FOR AQUEOUS SAMPLES
FORMER IBM KINGSTON FACILITY

PARAMETER	METHODOLOGY	CONTAINER	MINIMUM SAMPLE	PRESERVATION	HOLD TIME
Volatile Organics	SW846 8260B	3-40 ml glass	3 - 40 ml	Cool 4 ^{o}C;HCl,pH<2	14 days
Inorganics	SW846 6010B	1-500ml plastic	250 ml	Cool 4^{o} C; HNO_3, pH<2	180 days
Alkalinity	SM2320B	round plastic	250 ml	None	14 days
Ammonia as Nitrogen	SM4500	round glass	750 ml	H2SO4	28 days
Biochemical Oxygen Demand (BOD)	SM5210	round plastic	500 ml	None	48 hours
Chemical Oxidant Demand (COD)	SM5220	round glass	100 ml	H2SO4	28 days
Fluoride	SM4500	glass vial	40 ml	None	28 days
Chloride	SM4500	glass vial	40 ml	None	28 days
Methane	SW846 8015M	3-40ml glass	3-40ml	Cool 4^{o} C	7 days
Nitrate/Nitrite as Nitrogen	EPA 353	glass vial	40 ml	None	28 days
Total Phosphorous	EPA 365.1	round glass	100 ml	H2SO4	28 days
Sulfate	SM4500	round glass	200 ml	NaOH/ZnAc	7 days
Sulfide	SM4500-S2	round glass	200 ml	NaOH/ZnAc	7 days
Total Dissolved Soilds (TDS)	SM2540	round plastic	350 ml	None	7 days
Total Suspended Solids (TSS)	SM2540	round plastic	350 ml	None	7 days
Total Organic Carbon (TOC)	SM5310	round plastic	350 ml	None	7 days
Oxidation-Reduction Potential	Electrode	NA	NA	None	Field Measurement
Dissolved Oxygen	Electrode	NA	NA	None	Field Measurement
Specific Conductance	Electrode	NA	NA	None	Field Measurement
pH	Electrode	NA	NA	None	Field Measurement
Temperature	Electrode	NA	NA	None	Field Measurement

Notes:

1. NA - Not Applicable
2. Sample preservation is performed by sampler immediately upon sample collection.
3. Hold time based upon day of sample collection not verified time of sample receipt.
4. If sample cannot be preserved due to foaming, unpreserved sample will be collected and analyzed within 7 days.
5. Field measurements will be collected using a flow-through cell equipped with a field meter and parameter specific electrodes.

Figures



2000 0 2000

SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE

SITE LOCATION MAP

REFERENCE

1.) BASE MAP TAKEN FROM USGS 7.5 MINUTE SERIES QUADRANGLES OF KINGSTON EAST, NY, DATED 1963, PHOTOREVISED 1980, AND KINGSTON WEST, NY, DATED 1997.

NJ Authorization #24GA28029100

Golder Associates
Newark, New Jersey

PROJECT No.		083-87071	FILE No.	08387071A005	
DESIGN	CEJ	03/09/09	SCALE	AS SHOWN	REV. 0
CADD	RG	03/09/09			
CHECK					
REVIEW					

FIGURE 1

Drawing file: 08387071A005.DWG Mar 09, 2009 - 12:23pm

LEGEND

- PROPERTY/PARCEL BOUNDARY
- RIVER/STREAM
- 42-INCH DIAMETER SEWER SYSTEM (SITE PERIMETER CONTROL SYSTEM)
- UNSATURATED SURFICIAL SAND UNIT (SITE PERIMETER CONTROL SYSTEM)
- GROUNDWATER COLLECTION SYSTEM (SITE PERIMETER CONTROL SYSTEM)
- 60-INCH DIAMETER SEWER SYSTEM (SITE PERIMETER CONTROL SYSTEM)
- B003 BUILDING NUMBER
- (1) ENVIRONMENTAL PARCEL NUMBER AND APPROXIMATE ACREAGE

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL CAD FILE SITEMAP.DWG, DRAWING NUMBER 93002-SITEMAP/2 ENTITLED "SITE MAP," DATED MAY 9, 2005, PROVIDED BY GROUNDWATER SCIENCES CORPORATION.

2.) PROPERTY LINES/PARCEL BOUNDARIES DIGITIZED FROM A HARD COPY FIGURE ENTITLED "ENVIRONMENTAL PARCELS," DATED DECEMBER 12, 2006, FIGURE 2, PREPARED BY DIVNEY TUNG SCHWALBE.

ROUTE 209
ROUTE 209
OLD NEIGHBORHOOD ROAD
ESOPUS CREEK
ENTERPRISE DRIVE
JOHN M CLARK DRIVE
BOICES LANE
(3) 30.0 ACRES
(4A) 18.6 ACRES
(1) 24.7 ACRES
(2) 57.5 ACRES
(30) 1.6 ACRES
B036
B049
B029
B001
B052
B202
B203
B201
B023
B021
B022
B034
B064
B043
B005N
B002
B003
B004
B042
B024
B035
B005
B033
B051
B038
B056
B031
B025
B070
B047
B032
COOLING TWRS.
Former B058 Area

SWMU-AB FORMER B001 TCA RECOVERY UNIT

TRIANGLE PLUME AREA

SWMU-M PORTIONS OF THE INDUSTRIAL SEWER LINES

SWMU-V PORTIONS OF THE B005 PLUME

SWMU-G FORMER WASTE PCE TANK

200 0 200 400
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

FORMER IBM FACILITY
KINGSTON, NEW YORK

TITLE

SITE LAYOUT AND INVESTIGATION AREA MAP

NJ Authorization #24GA28029100
Golder Associates
Newark, New Jersey

PROJECT No.		083-87071	FILE No.		08387071F001
DESIGN	CDH	03/23/09	SCALE	AS SHOWN	REV. 0
CADD	RG	03/23/09			
CHECK					
REVIEW					

FIGURE 2

Drawing File: 08387071F001.dwg | Layout: 11x17_08-2006 | Modified: 03/23/09 3:07pm | Plotted: 03/23/09 3:07pm | Plotted by: rgrams

Figure 3
Project Organization Chart
Former IBM Kingston Facility

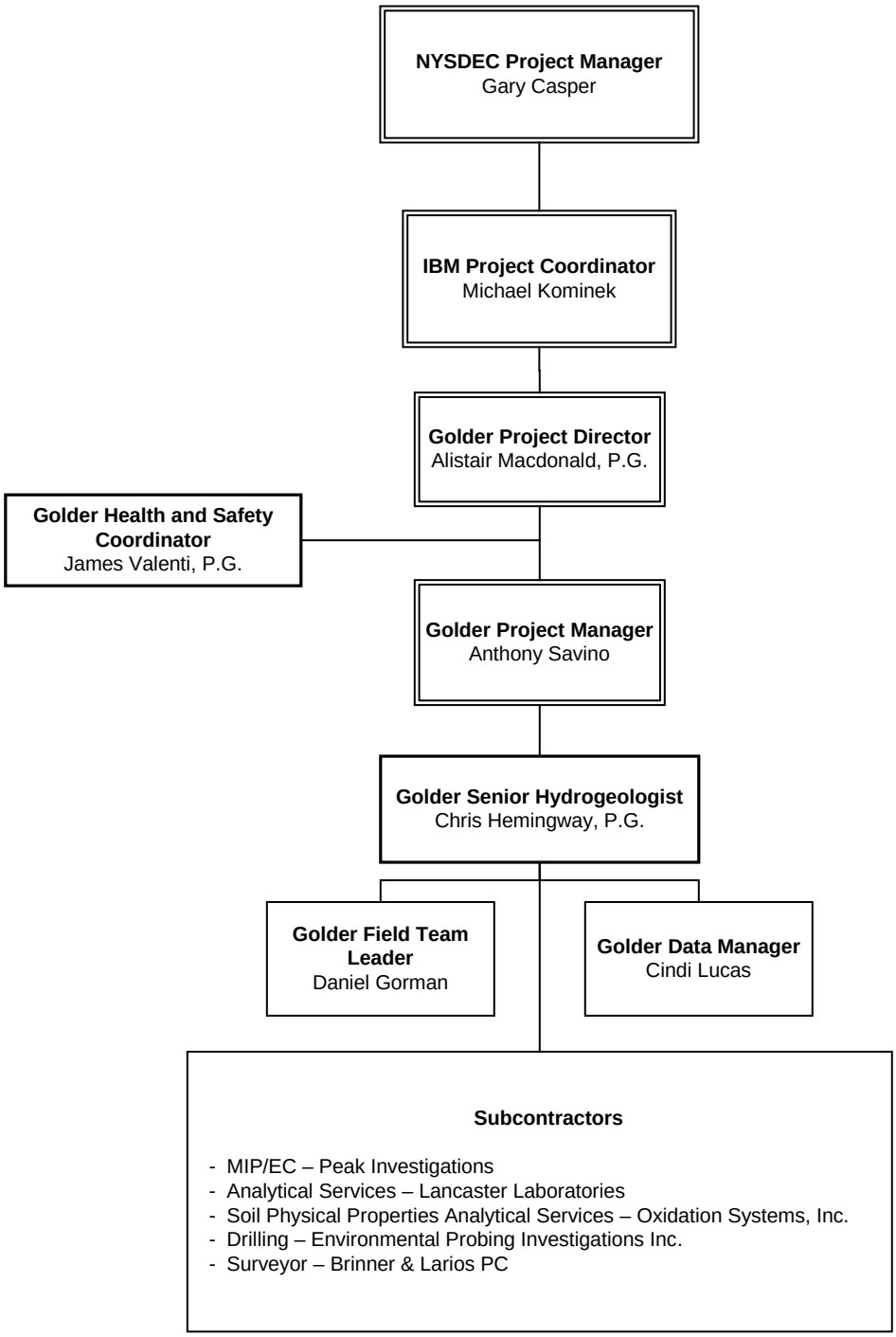
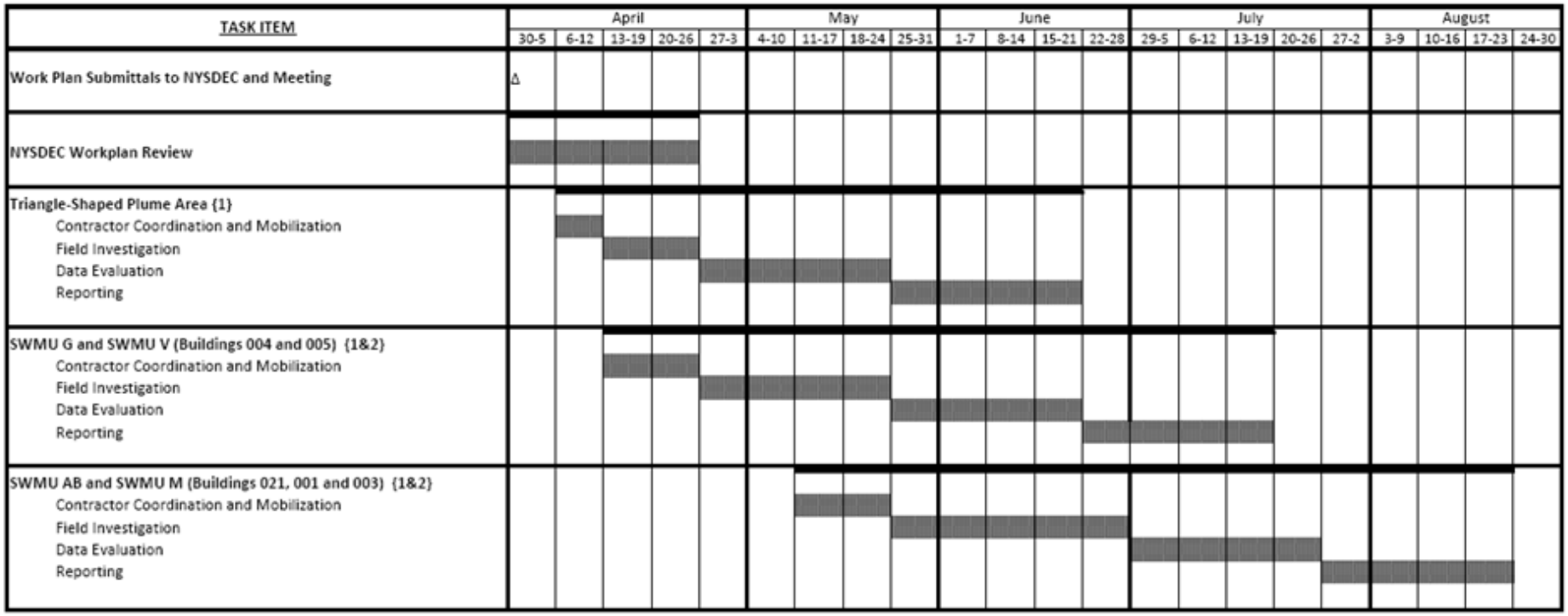


FIGURE 4

SWMU INVESTIGATION SCHEDULE
Former IBM Kingston Facility



Notes
(1) Assumes general concurrence with NYSDEC
(2) Assumes TechCity provides unencumbered access
SWMU G - Former Waste PCE Tank
SWMU V - Portions of B005 Plume Beneath Building B005
SWMU AB - Former Waste TCA Recovery Unit
SWMU M -Portions of Industrial Waste Sewer Lines

APPENDIX A

STANDARD OPERATING PROCEDURES

1.0 GENERAL APPLICABILITY

The purpose of this Standard Operating Procedure (SOP) is to describe the methods for clearing utility locations on Site. The scope of this document is limited to field operations and protocols applicable during advancement of soil borings, temporary well installation, or Membrane Interface Probes (MIP). Based on a review of utility maps for the Site, Golder anticipates that buried water, sewer, stormwater, natural gas, electrical, and communication lines may exist in the proposed investigation areas.

2.0 RESPONSIBILITIES

The Field Team Leader is responsible to oversee the utility clearance procedures to reduce the potential for encountering a utility during the subsurface assessment activities. Field personnel are required to follow this SOP and adhere to utility mark out locations.

3.0 PROCEDURES

The utility locating procedures will include:

- Contact DigSafely to clear utilities within the public right-of-ways. The Field Team Leader will use the DigSafely clearance field form (attached) to record the DigSafely number and list the utilities contacted by DigSafely. DigSafely does not contact local utilities including municipal water and sewer companies. The field team leader or his/her designee will be responsible to contact the local utility companies. Utility color coding for DigSafely companies include:

    1. Red = Electric lines;
    2. Yellow = Gas-oil-steam;
    3. Orange = Communication - Cable TV;
    4. Blue = Potable water;
    5. Violet = Reclaimed water; and
    6. Green = Sewer and drainage.

- Review existing Site utility maps;
- Conduct interviews with Site personnel knowledgeable about the subsurface utilities, if available;

- Advance the boring outside the area of a marked utility; and

- Prior to advancing the GeoProbe® boring, the boring location will be further "cleared" using hand-auger or soft dig techniques (i.e., vacuum extraction) to a depth of approximately five feet below ground surface (bgs). Soil cuttings generated during the utility clearance procedures will be placed with the soil cuttings generated during the subsurface assessment activities (see SOP-8).

DIGSAFELY Contact Record

1-888-344-7233

A copy of this completed form should be kept onsite during the field activities for which DIGSAFELY was contacted, and a copy of this competed form should be placed in the project file.

Date DIGSAFELY contacted: DIGSAFELY Ticket Number:

Project Name: Project Number:

Golder Employee contacting DIGSAFELY: Project Manager Name:

The following section should be completed prior to contacting DIGSAFELY.

Name and City/State of boring/excavation contractor:

Address/location where work will be completed (address, city, state):

Closest Cross Street:

Type of Work: Depth of excavation/boring:

Has the excavation/boring location been premarked with white paint? Yes ☐ No ☐
Marking Personnel: Date:

Where on property will the work will be completed: Dates work to be completed:

The following section should be completed with information provided by DIGSAFE.

Utilities to be located under this DIGSAFELY ticket (provided by DIGSAFELY):

1. 2.
3. 4.
5. 6.
7. 8.

Utilities not contacted by DIGSAFE:

Town Sewer:	Date Contacted:	Contacted by:
Town Water:	Date Contacted:	Contacted by:
NHDOT Utilities:	Date Contacted:	Contacted by:

Date OK to begin work (provided by DIGSAFELY):
DIGSAFE Ticket expiration date (provided by DIGSAFELY):

DIGSAFELY will not contact Town Water and Sewer Departments for markouts. It is the responsibility of the Golder employee who contacts DIGSAFELY to also contact the Town Water and Sewer Departments for markouts. This form should be completed by the Golder employee who contacts DIGSAFELY. A copy of this form should be put in the file and a copy should be kept onsite for the duration of the field activity for which DIGSAFELY was contacted.

1.0 GENERAL APPLICABILITY

The purpose of this Standard Operating Procedure (SOP) is to describe the methods to be used in the collection of groundwater quality samples. The scope of this document is limited to field operations and protocols applicable during groundwater sample collection. The intent of this investigation is to collect groundwater data for screening and assessment purposes. Groundwater samples obtained during this investigation will be collected in existing wells, temporary wells and/or directly through the direct push technology (DPT) rig.

As described in the Work Plans, three (3) types of groundwater samples will be collected as follows:

- Groundwater grab samples collected using GeoProbe® techniques (i.e., SP-15-Sampler or DT-21-Profiler) to confirm MIP readings from specific zones in the boreholes advanced to collect the soil samples. These samples will be analyzed for VOCs using EPA Method 8260B. No purging or field parameter sampling will be performed prior to collecting these groundwater samples.

- Groundwater samples collected from temporary wells constructed of dedicated PVC screen and casing and natural or pre-packed filter materials. Groundwater from these wells will be sampled using low-flow purging techniques and analyzed for VOCs. Groundwater samples for biogeochemical parameters will also be collected from selected temporary well locations.

- Groundwater samples collected from existing Site monitoring wells for analysis of VOCs and biogeochemical parameters via EPA Method 8260B.

2.0 RESPONSIBILITIES

The Field Team Leader and field sampling personnel have the shared responsibility to oversee and ensure that groundwater sampling is performed in accordance with the project-specific sampling program and this SOP. The Field Team Leader shall ensure that field sampling personnel understand and comply with this SOP.

3.0 SAMPLING EQUIPMENT DESCRIPTION

Reusable and expendable equipment and materials required for groundwater sampling includes, but may not be limited to:

Reusable:

- Peristaltic pump;
- YSI 600XL flow-through cell or equivalent field water quality meter;
- Dissolved oxygen (DO) meter;
- Electric groundwater level monitoring meter graduated in increments of 0.01 feet;
- Groundwater Collection Form – an example of this form is included as Attachment 1;
- First-aid kit – present on-Site at all times;
- Fire extinguisher – present on-Site at all times;
- Monitoring well keys – provided by the client; and
- Calculator.

Expendable:

- Sample containers - three 40-milliliter (mL) glass sample containers (vials) for each VOC sample. The sample bottles will either be newly purchased or pre-cleaned and certified by the laboratory and pre-preserved with hydrochloric acid (HCl);
- Sample containers for the biogeochemical analysis. The sample bottles will either be newly purchased or pre-cleaned and certified by the laboratory and pre-preserved as required for the analytical method;
- Coolers and ice – coolers are provided by the laboratory. The sampler will purchase ice as necessary to maintain sample temperatures less than 4°C;
- Latex or Nitrile gloves as appropriate – purchased by the sampler as needed;
- Alconox®/Liquinox® (mild detergent) – purchased by the sampler as needed;
- Distilled water – purchased by the sampler as needed; and

- Dedicated Teflon-lined polyethylene and silicon tubing.

4.0 PURGING AND SAMPLING PROCEDURES

Groundwater samples will be collected as follows:

- Calibrate the YSI 600XL or equivalent field water quality meter in accordance with the manufacturer's recommendations each day prior to collecting groundwater samples and check the meter calibration at the end of each sampling day;
- Place dedicated Teflon-lined polyethylene tubing into the sampling point to the approximate center point of the screened interval;
- Connect the Teflon-lined polyethylene tubing into the silicon tubing running through the peristaltic pump;
- Connect the discharge end of the silicon tubing to a second piece of Teflon-lined polyethylene tubing (water discharge tubing);
- To remove sediment materials from the screened interval and assure representative formational groundwater is sampled, the sampling point will be purged under low flow conditions for approximately two minutes, or until a minimum of three well volumes are removed. Collect the purge water in a five-gallon bucket and manage in accordance with SOP-8-IDW Management;
- After removing sediment from the sample point, connect the discharge end of the Teflon-lined polyethylene tubing to the YSI 600XL or equivalent field water quality meter and measure and record pH, specific conductance, Eh, and temperature of the purge water. Field personnel will record the field water quality parameters once the flow-through cell is completely full. Do not wait for stabilization of the field water quality parameters before recording the readings from the field water quality meter;
- Fill the dissolved oxygen (DO) field water quality sample bottle and measure and record the DO concentration on the groundwater sample collection form;
- Following measurement of the field water quality parameters, cut the discharge end of the silicon tubing (just in front of the discharge end of the Teflon-lined polyethylene tubing) and collect groundwater samples for analysis of major cations and biogeochemical parameters specified in the Work Plan (except for VOCs) using pre-preserved sample containers;
- After collecting the non-volatile groundwater samples, turn off the peristaltic pump, remove the tubing from the sample point making sure that the influent end of the tubing does not contact the ground and that the effluent (pump) end remains attached to the pump to prevent loss of sample water from the tubing. Remove the tubing from the pump and collect the groundwater sample directly from the influent end of the tubing by allowing water to slowly drain by gravity into the pre-preserved laboratory VOC sample vials. Alternatively, disposable bailers may be used to collect groundwater for VOC samples following completion of purging;

- Continue to fill the VOC sample vials until a meniscus forms on the lip of the container;
- Quickly place the plastic cap (containing a Teflon septum) on the container and screw the cap on the container;
- The filled bottle shall be turned upside down and tapped several times to ensure that no air bubbles are present in the sample container;
- If air bubbles are present, reopen the container and add additional sample volume to again achieve a meniscus on the lip of the VOC vial;
- Repeat these steps described above until no bubbles remain in any of the VOC sample vials;
- Following sample collection, the groundwater sample will be placed in a cooler on ice for preservation during shipment to a laboratory for analysis in accordance with Chain-of-Custody procedures in accordance with SOP-3; and
- Following sample collection, equipment shall be properly discarded in accordance with SOP-8-IDW Management.

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) REQUIREMENTS

Various quality assurance/quality control (QA/QC) samples shall be collected in accordance with the QAPP. QC samples are used to monitor sampling and laboratory performance and include trip blanks and field replicates. Each of these QA/QC samples is described in the QAPP and summarized below.

Trip Blanks

Trip blanks are used to verify that the VOC bottles and samples are not contaminated in transit between the lab to the Site, while on-Site, and from the Site back to the lab. The lab will supply pre-preserved and pre-prepared trip blanks. Trip blanks shall accompany the VOC samples throughout the event from collection through shipment to the laboratory and are recorded on the Chain-of-Custody along with the primary samples. A trip blank shall be shipped with each cooler that contains VOC samples.

Field Replicates

Field replicates are collected to assess the laboratory equipment accuracy. Field replicates are collected for all required analyses at a frequency of not less than 20% of the total number of primary

samples collected. Field replicates are collected by sampling the same location twice. However, the field replicate is assigned a unique sample identification number which does not identify the sample location. Field replicate samples shall be collected by alternating primary and field replicate sample bottles during sample collection. Field replicates are recorded on the Chain-of-Custody along with the primary samples.

GROUNDWATER SAMPLE COLLECTION FORM

SITE DESCRIPTION

Project Name: IBM/Kingston
Project Number: 083-87071
Location: Kingston, NY

WEATHER CONDITIONS

Temperature: _____
Wind: _____
Precipitation: _____

SAMPLE DESCRIPTION

Sample ID: _____
Date: _____
Time at Well Site: _____
Time of Sample Collection: _____
Sampled by: _____
Sampling Method: Peristaltic Pump
Type of Sampling Equipment: Poly & Silicon tubing

FIELD BLANK NOTES

Field Blank Name: _____
Field Blank /Rinse Water type: _____

Lot Number: _____
Analyses: _____

VOLUME OF WATER TO BE PURGED

Casing Inside Diameter: _____ inches
Casing Volume: _____ gal/ft
Column of Water in Well: _____ feet
Volume of Water in Well: _____ gallons
Well Volumes to Purge: _____
Min. Volume to be Purged: _____ gallons
Method of Purging: _____
Well Purged Dry?: Yes No

COLUMN OF WATER IN WELL BEFORE PURGE

Total Depth of Well: _____ ft TOC
Depth to Water : _____ ft TOC
Column of Water in Well: _____ ft
Depth to Water after Purge: _____ ft TOC

Appearance of Sample: _____

WELL PURGE CONTROL

	Purge 1	Purge 2	Purge 3	Purge 4	Purge 5	Purge 6
Time:						
Volume Removed (liters):						
pH:						
Specific Conductance (uS/cm):						
Temperature (Degrees C):						
Turbidity (NTU):						
Eh (millivolts):						
DO (mg/l) :						

Starting Purge Time: _____ Average Purge Rate: _____ ml/min
Ending Purge Time: _____ Total Volume Purged: _____ liters

SAMPLE CONTAINERS REQUIRED

Analysis	Container Number, Type and Size	Filter	Preservative and Source
Volatiles (8260B)	(2) 40 ml vials	NA	HCL

Chain of Custody #: _____
Shuttle ID: _____
Trip Blank ID: _____
Lab Name: _____
Air Bill #: _____

REMARKS: 2" - 0.163 gal/ft 1" - 0.014 gal/ft

Field Team Leader: _____

1.0 GENERAL APPLICABILITY

The chain-of-custody form provides evidence and documentation of sample collection, shipment, laboratory receipt, and laboratory custody until disposal of the sample. The chain-of-custody form identifies each sample collected and the individuals responsible for sample collection, shipment, and receipt. The intent of the Chain-of-Custody Procedure is to provide guidance to maintain sample integrity.

2.0 RESPONSIBILITIES

It is the responsibility of the field personnel who collect the samples to initiate the chain-of-custody protocol. Upon sample collection, but prior to storage, shipment, or transportation, the field personnel shall properly and completely fill out the chain-of-custody form with a waterproof ink pen. The field team leader shall review the form prior to sample storage, shipment, or transportation. If an error is made during the completion of the chain-of-custody form, a line shall be drawn through the error and the correction entered. The field personnel completing the form shall initial and date the error. Under no circumstances is white-out or erasing acceptable. The field sampling personnel are responsible for making a copy of the completed chain-of-custody form and giving the form to the Project Manager. The Project Manager or designee shall review the form and place it in the project file with the field sampling forms. Upon receipt by the laboratory, the laboratory sample custodian shall assume responsibility for completing the chain-of-custody procedures. Upon completion of analysis, the laboratory shall submit a copy of the completed chain-of-custody form with the analytical data to the Project Manager who will place it in the project file.

3.0 EQUIPMENT DESCRIPTION

- Chain-of-custody forms; and
- A waterproof ink pen.

4.0 PROCEDURES

The chain-of-custody forms shall be completed with a waterproof ink pen. Preparation of the chain-of-custody form shall be as follows:

- Complete the chain-of-custody form. The project name, client name, laboratory name and address, the person to whom the chemical analyses results shall be reported, and invoicing information shall be identified at the top of the form;

- Sample-specific information shall include the field identification number (in accordance with the QAPP), the date and time the sample is collected, the depth at which the sample was taken, the type of sample (e.g., groundwater, soil, etc), the type of analyses requested, and preservatives used. Samples shall be grouped for shipment with other samples for the same analysis and a common form used. More than one chain-of-custody form shall be used if the number of samples that are to be included in a cooler is greater than the number of entry spaces on the chain-of-custody form;

- Each person taking possession of the sample shall sign and date the chain-of-custody both as a recipient and as a relinquisher of the samples. When the samples have been delivered to the laboratory, the laboratory sample custodian will sign the chain-of-custody as the last recipient of the samples;

- If the samples are directly transported to the laboratory, the chain-of-custody shall be kept in the possession of the person delivering the samples. Upon receipt by the laboratory, the sample receiver(s) shall open the shipping containers, compare the contents with the chain-of-custody form, assign laboratory sample identification number(s), record the laboratory sample identification number on the chain of custody, and sign and date the form. Any discrepancies shall be noted on the chain-of-custody form and the Project Manager notified immediately;

- Prior to shipment by a commercial carrier, make a copy of the chain-of-custody form. If the samples are delivered directly to the laboratory by field personnel, a copy of the form shall be made after the laboratory representative signs and dates the chain-of-custody form; and

- Chain-of-custody forms shall be maintained with the analytical data.

1.0 GENERAL APPLICABILITY

The log book provides a means to record daily significant events, observations, and measurements during sampling and monitoring activities. Sufficient data and observations shall be recorded in the log book and/or field forms to enable reconstruction of field events.

2.0 RESPONSIBILITIES

It is the responsibility of the Field Team Leader to maintain centralized daily records of all significant field events, observations, and measurements during field investigations. Members of the field team are responsible for maintaining complete records of their actions, observations, etc., in the field log books and providing this information to the Field Team Leader at the end of each day. If observations and measurements are taken in an area where the field log book may become contaminated or if the field personnel are spread over a large area, separate waterproof bound and numbered field log books may be maintained. The Field Team Leader will make photocopies of all field data entries on a regular basis (preferably at the end of each day but at least on a weekly basis) and submit the copies to the Project Manager for inclusion with the project file. The entries shall be signed and dated at the completion of each task or at the end of each day. The field team members will retain the individual field log books until the logbook is filled or the completion of the project, at which time possession of the log books is transferred to the Project Manager. The Project Manager and/or Field Team Leader are responsible for collecting the forms and entering them into the project file. Field personnel are responsible for assuring that forms are completed in waterproof ink.

Errant field entries shall have a single line drawn through them and the correct information entered above it. Corrections shall be initialed and dated by the appropriate field personnel. Individual pages shall not be removed from bound log books.

3.0 EQUIPMENT DESCRIPTION

- A waterproof, bound field log book;
- A waterproof, bound sample log book; and

- A waterproof ink pen.

4.0 PROCEDURES

Field Log Book

The Field Team Leader and field staff are responsible for logging dates, times, subcontractors, field personnel, field activities, and any other pertinent information during field activities. Field log book entries shall be legible and include, at a minimum, the following information:

- Date;
- Project name and number;
- Weather and temperature;
- List of personnel present including subcontractors and visitors. The time of arrival and departure shall be noted next to each name;
- Name and times of visit by unauthorized personnel to the site;
- Business phone calls along with the name of the field personnel making the call and the phone call recipient, time, and a brief description of the topic of conversation;
- A description of the activities of subcontractors (e.g., drillers, backhoe contractor, survey contractor, etc.) and subcontractor down-time. Next to the entry, note the reason for the down-time. Log information or observations regarding the subcontractor's performance in the field log book;
- Description of all field activities completed including soil boring advancement, monitoring well installation and sampling activities, sewer sampling, MIP assessment including all measurements; and
- The time of any photographs taken along with the direction and descriptions of the photographs and weather conditions.

If page numbers are not pre-printed in the field log book, sequential page numbers shall be written at the top of each page.

Calibration Forms

Equipment calibration forms are required to record and track daily calibration of each instrument. Instructions on the proper calibration procedure are found in the equipment manual and/or may be provided separately. Calibration Forms should generally include the following:

- Date and time of calibration;
- Equipment calibrated with model number and/or identification number;
- Media used to calibrate instrument (e.g., solutions or gas);
- Calibration media information, lot numbers, and concentration; and
- Pre and post calibration readings.

Follow the provided instructions and record the necessary information on the calibration field form (attached). The original Calibration Forms should be provided to the Project Manager and placed in the office project files.

Groundwater Sample Collection Field Forms

Use groundwater sample collection field forms in addition to field log books. The groundwater sample collection field form provides a record of the sampling methods and equipment, site and decontamination procedures, and chemical analyses performed. These field sampling records are intended to provide accurate descriptions of sampling procedures to ensure the integrity of the samples. The sampling procedure may alter the chemical results; therefore, documenting sampling steps is important. Each groundwater sample collection form will include the following information:

- Date and time of purging and sampling;
- Sampling location designations;
- Depth to water;
- Total depth of well;

- Standing water column;
- Well inside diameter;
- Volume of standing water in well;
- Purging and sampling device;
- Pump capacity;
- Decontamination procedure;
- Purge volume;
- Sample depth interval;
- Sample time;
- Field observations such as odor, color, and apparent turbidity;
- Field water quality data including pH, Eh, specific conductivity, temperature, and dissolved oxygen;
- Chemical analyses requested; and
- Number of samples provided for each laboratory analysis.

The groundwater sample collection field forms shall be legible, dated, and signed by the person making the entry. The Field Team Leader will collect all the groundwater collection field forms and place these forms into the project file (attached).

Soil Boring Logs

Use soil boring logs in addition to field log books. Soil boring logs provide a record of the boring advancement methods and equipment, lithology, site and decontamination procedures, field screening readings, and chemical analyses performed. These boring logs are intended to provide accurate descriptions of the lithology and sampling procedures to ensure the integrity of the samples. The soil boring logs will include the following information:

- Date and start/end time of boring advancement;

- Type of equipment used and drillers name and company information;
- Lithologic descriptions including lithology (i.e., Unified Soil Classification System), color, texture, moisture, and weathering;
- Field screening readings;
- Sampling depth and designations;
- Depth to water;
- Total depth of boring;
- Well installation methods, if required; and
- Well inside diameter.

The soil boring logs shall be legible, dated, and signed by the person making the entry. The Field Team Leader will collect the soil boring logs and place these logs into the project file. A sample soil boring log is provided is attached. Well installation information will be included on the soil boring log as appropriate.

GROUNDWATER SAMPLE COLLECTION FORM

SITE DESCRIPTION

Project Name: IBM/Kingston
Project Number: 083-87071
Location: Kingston, NY

WEATHER CONDITIONS

Temperature: _____
Wind: _____
Precipitation: _____

SAMPLE DESCRIPTION

Sample ID: _____
Date: _____
Time at Well Site: _____
Time of Sample Collection: _____
Sampled by: _____
Sampling Method: Peristaltic Pump
Type of Sampling Equipment: Poly & Silicon tubing

FIELD BLANK NOTES

Field Blank Name: _____
Field Blank /Rinse Water type: _____

Lot Number: _____
Analyses: _____

VOLUME OF WATER TO BE PURGED

Casing Inside Diameter: _____ inches
Casing Volume: _____ gal/ft
Column of Water in Well: _____ feet
Volume of Water in Well: _____ gallons
Well Volumes to Purge: _____
Min. Volume to be Purged: _____ gallons
Method of Purging: _____
Well Purged Dry?: Yes No

COLUMN OF WATER IN WELL BEFORE PURGE

Total Depth of Well: _____ ft TOC
Depth to Water : _____ ft TOC
Column of Water in Well: _____ ft
Depth to Water after Purge: _____ ft TOC

Appearance of Sample: _____

WELL PURGE CONTROL

	Purge 1	Purge 2	Purge 3	Purge 4	Purge 5	Purge 6
Time:						
Volume Removed (liters):						
pH:						
Specific Conductance (uS/cm):						
Temperature (Degrees C):						
Turbidity (NTU):						
Eh (millivolts):						
DO (mg/l) :						

Starting Purge Time: _____ Average Purge Rate: _____ ml/min
Ending Purge Time: _____ Total Volume Purged: _____ liters

SAMPLE CONTAINERS REQUIRED

Analysis	Container Number, Type and Size	Filter	Preservative and Source
Volatiles (8260B)	(2) 40 ml vials	NA	HCL

Chain of Custody #: _____
Shuttle ID: _____
Trip Blank ID: _____
Lab Name: _____
Air Bill #: _____

REMARKS: _____

Field Team Leader: _____

CALIBRATION FORM

GAI Project Name: _____ Project Number: _____

Golder Personnel Present: _____

Date: _____

Meter Type: YSI

Model Number: 600XL(M)

S/N _____

Specific Conductivity **Lot #:** **Expire Date:**

Standard	Unit	Meter reading		Time	
1.413	mS/cm				Initial
					Check
					Check

Acceptable Range 1.342-1.484

Dissolved Oxygen

Baro Pressure	Temp °C	% D.O.	mg / L D.O.	D.O. Charge	Time	
						Initial
						Check
						Check

pH

4.01 Buffer: Lot #: **Exp. Date:** **7.01 Buffer: Lot #:** **Exp. Date:**

Standard	Meter reading		Meter reading		Meter reading
	Initial		Check		Check
Time		Acceptable Range			
4.01		3.81-4.21			
7.01		6.75-7.36			
10.00		9.50-10.50			

10.00 Buffer: Lot #: **Exp. Date:**

ORP **Lot#:** **Expire Date:**

Standard	Meter reading		Meter reading		Meter reading
	Initial		Check		Check
Time		Acceptable Range			
240.0		228-252			

Turbidity

Meter Type: LaMotte

Model Number: 20/20

S/N

Standard	Meter reading		Meter reading		Meter reading
	Initial		Check		Check
Time		Acceptable Range			
1.00		0.95-1.05			
10.00		9.50-10.5			

Comments:

Sampler Signature: Date:

GOLDER
ASSOCIATES
GAS CALIBRATION FORM

GAI Project Name: IBM/Kingston, NY Project Number: 083-87071

Golder Personnel Present: _____

Date: _____

Meter Type: _____

Model Number: _____

S/N _____

Meter Type: _____

Model Number: _____

S/N _____

Lot # Manufacture Date: Expire Date:

			Allowable Range	Reading	Time
H_2S	25 ppm		**23.75-26.25**		
CH_4	2.5%	50% LEL	**2.4-2.6**		
CH_4	5.0%	100% LEL	**4.75-5.25**		
CH_4	15%	>100% LEL	**14.25-15.75**		

Lot # Manufacture Date: Expire Date:

			Allowable Range	Reading	Time
CH_4	50%	>100% LEL	**47.5-52.5**		
CO	50 ppm		**47.5-52.5**		
CO_2	15%		**33.25-36.75**		
N_2	Balance				
O_2	20.90%		**19.86-21.94**		

Lot # Manufacture Date: Expire Date:

			Allowable Range	Reading	Time
Isobutylene	100 ppm		**95-105**		

Weather Conditions: _____

Note: Red cylinders valid for 3 years after manufacture date
Aluminum cylinders valid for 13 months after manufacture date

Sampler Signature: Date:

FIELD BORING LOG

Golder Associates
MANCHESTER, NEW HAMPSHIRE

Sep 26, 2001 - 4:14pm

DEPTH HOLE	JOB NO. 083-87071	PROJECT IBM/KINGSTON			BORING NO.
DEPTH SOIL DRILL	GA INSP.	DRILLING METHOD			SHEET
DEPTH ROCK CORE	WEATHER	DRILLING COMPANY			SURFACE ELEV.
NO. DIST. SA. UD. SA.	TEMP.	DRILL RIG	DRILLER		DATUM
DEPTH WL.	HRS. PROD.	WT. SAMPLER HAMMER	DROP		STARTED
TIME WL. ----------	HRS. DELAYED	WT. CASING HAMMER	DROP		COMPLETED

Drawing file: FieldLog.dwg

SAMPLE TYPES

A.S.	AUGER SAMPLE
C.S.	CHUNK SAMPLE
D.O	DRIVE OPEN (SPLIT SPOON)
D.S.	DENISON SAMPLE
P.S.	PITCHER SAMPLE
R.C.	ROCK CORE
S.T.	SLOTTED TUBE
T.O.	THIN-WALLED OPEN
T.P.	THIN-WALLED PISTON
W.S.	WASH SAMPLE

ABBREVIATIONS

BL	BLACK	M	MEDIUM	SA	SAMPLE
BR	BROWN	MIC	MICACEOUS	SAT	SATURATED
C	COARSE	MOT	MOTTLED	SD	SAND
CA	CASING	MP	NON-PLASTIC	SI	SILT
CL	CLAY	OG	ORANGE	SIY	SILTY
CLY	CLAYEY	ORG	ORGANIC	SM	SOME
F	FINE	PH	PRESSURE-HYDRAULIC	TR	TRACE
FRAG	FRAGMENTS	PM	PRESSURE-MANUAL	WL	WATER LEVEL
GL	GRAVEL	R	RED	WH	WEIGHT OF HAMMER
LYD	LAYERED	RES	RESIDUAL	Y	YELLOW
LI	LITTLE	RX	ROCK		

SOIL DESCRIPTION RANGE OF PROPORTITION

"TRACE"	0-10%
"LITTLE"	10%-20%
"SOME"	20%-35%
"ADJECTIVE" (e.g. "SILTY", "SANDY")	35%-50%
"AND"	50%

CONSISTENCY - BLOWS/FT.

NON-COHESIVE SOILS

VL	VERY LOOSE	0-4
LS	LOOSE	4-10
CP	COMPACT	10-30
DN	DENSE	30-50
VD	VERY DENSE	>50

COHESIVE SOILS

VS	VERY SOFT	0-2
S	SOFT	2-4
FM	FIRM	4-8
ST	STIFF	8-30
H	HARD	>30

ELEV. / DEPTH	WELL CONSTRUCTION	PID (ppm)		SAMPLES NO.	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6" (FORCE)	SAMPLES REC. / ATT.	DEPTH	SAMPLE DESCRIPTION AND BORING NOTES

1.0 GENERAL APPLICABILITY

The purpose of this Standard Operating Procedure (SOP) is to describe the methods for decontaminating equipment and tools used during the investigation. The scope of this document is limited to field operations and protocols applicable during advancement of soil borings, temporary well installation, or Membrane Interface Probes (MIP), and sampling equipment.

2.0 DECONTAMINATION EQUIPMENT AND SOLUTIONS

Cleaning procedures in this section are intended for cleaning sampling and other equipment in the field. Deviations from these procedures should be documented in the field records and investigative reports. Specifications for standard cleaning materials are as follows:

- Soap shall be a phosphate-free laboratory detergent such as Liquinox® or Alconox.® Use of other detergent must be justified and documented in the field logbooks and investigative reports.

- Solvent shall be pesticide-analysis grade isopropanol. Use of a solvent other than pesticide-analysis grade isopropanol for equipment cleaning purposes must be justified and documented in field logbooks and investigation reports.

- Tap water may be used from any municipal water treatment system. Use of an untreated potable water supply is not an acceptable substitute for tap water.

- Analyte free water (deionized water) is tap water that has been treated with activated carbon and a standard deionizing resin column. At a minimum, the finished water should contain no detectable heavy metals or other organic or inorganic compounds (i.e., at or above analytical detection limits). This water is usually provided along with sample bottles by the analytical laboratory for the project.

- Nitric Acid shall be trace-metal analysis grade or better. Nitric acid used to decontaminate non-dedicated and soil sampling equipment, shall be a one percent solution.

- Other solvents may be substituted for a particular purpose if required. For example, removal of concentrated waste materials may require the use of either pesticide-grade hexane or petroleum ether. After the waste material is removed, the equipment must be subjected to the standard cleaning procedure. Because these solvents are not miscible with water, the equipment must be completely dry prior to use.

Solvents, laboratory detergent, and rinse waters used to clean equipment shall not be reused during field decontamination and shall be collected and stored in DOT-approved 55-gallon drums for proper off-Site disposal unless directed otherwise (see SOP-8 Investigation Derived Waste).

3.0 SAMPLING EQUIPMENT DECONTAMINATION PROCEDURES

Use the procedures in this section to decontaminate all non-dedicated sampling equipment (e.g., stainless steel bowls and spoons) used to collect and/or homogenize soil samples and include:

1. Clean with tap water and soap using a brush to remove particulate matter and surface films;
2. Rinse thoroughly with tap water;
3. Rinse thoroughly with distilled and analyte free water;
4. Rinse with dilute (one percent) trace-metal analysis nitric acid if metal analysis will be performed;
5. Rinse with analyte free water;
6. Allow to air dry; and
7. Wrap equipment in aluminum foil until needed for sampling.

4.0 FIELD WATER QUALITY METER AND WATER LEVEL METER DECONTAMINATION PROCEDURES

Use the procedures in this section to decontaminate all non-dedicated monitoring equipment (e.g., field water quality meter and water level meter) used to collect field water quality measurements and include:

1. Rinse thoroughly with distilled or deionized water prior to each use.

5.0 SEWER WATER SAMPLING EQUIPMENT DECONTAMINATION PROCEDURES

Use the procedures in this section to decontaminate all non-dedicated monitoring equipment used during the sewer sampling activities and include:

1. Scrub the dipper with a brush and deionized water and Alconox mixture followed by a deionized water rinse;
2. Spray the dipper with isopropyl alcohol; and
3. Complete a final deionized water rinse.

Alternatively, disposal bailers may be used to obtain the sewer water samples.

6.0 DRILL RIG, TOOL, AND WELL MATERIAL DECONTAMINATION PROCEDURES

The procedures in this section are to be used by the drilling contractor to decontaminate the drill rig and drilling tools used to advance the soil borings and include:

1. The driller shall construct a decontamination pad to collect solids and liquids generated during the decontamination process. Thoroughly pressure steam-clean the drill rig and tools (e.g., macro-core tubes) upon arrival on Site over a dedicated decontamination pad. Downhole tools will be decontaminated between each boring location.

2. During temporary well installation, the driller must use a new pair of disposal vinyl or latex gloves while handling the well materials; and

3. Well materials used on Site must be new, decontaminated, and wrapped in plastic.

1.0 SOIL BORING AND INSTALLATION PROCEDURES

1.1 Soil Boring Area Preparation

Prior to any sub-grade soil sampling, the Field Team Leader or his/her designee will be responsible to contact DigSafely to locate any subsurface utilities within the public right-of-ways. The utility clearance will be conducted in accordance with the Utility Clearance Procedures (SOP-1).

1.2 Soil Borings

Confirmatory soil borings will be advanced near the Membrane Interface Probes (MIP) locations to compare contaminant soil concentrations with the MIP results. At each soil boring location, a track-mounted Geoprobe® Direct Push Technology (DPT) rig will push and pneumatically hammer a soil boring to the target depth. The driller will collect continuous five-foot long soil samples from the ground surface (or approximate base of the asphalt or concrete pavement) to the bottom of the boring using a Geoprobe® steel macro-core sampler with dedicated inner polyethylene sleeves. After removal of the macro-core sampler from the ground, the driller will extract the dedicated inner polyethylene sleeve with the soil core from the steel sampler and cut the polyethylene tube lengthwise to expose the soil core for lithologic description (i.e., Unified Soil Classification System [USCS]) and collection of field screening or laboratory samples. A soil boring log template is attached.

Field personnel will screen the soil samples for the presence of volatile organic compounds (VOCs) in the field with a Photovac MiniRae 2000 organic vapor analyzer (OVA) or equivalent equipped with a photoionization detector (PID). Subsequent to the soil OVA screening results, field personnel will collect soil samples for laboratory analyses at the interval with the highest OVA reading, or from the interval with visual or olfactory indication of a release or from the interval identified by the MIP assessment as having impacted soil. Field personnel will record the field OVA readings and lithologic descriptions in the boring logs.

1.3 Soil Sampling Procedures

Depending on the parameters being analyzed the soil sample may be obtained in three different ways:

- Undisturbed sample via Encore® or equivalent;
- Homogeneous sample using stainless steel bowls and spoons; or
- Undisturbed samples in accordance with the appropriate method requirements (i.e., laboratory permeability).

Sample the soils for VOCs using laboratory-provided Encore® samplers. Upon determination of sample location, collect three (3) Encores® within a six inch interval along with a moisture bottle for laboratory analysis. The QAPP provides guidance on soil sample labeling. Following sample collection, sample containers will be placed on ice and maintained at approximately 4° Celsius (C) and transported by overnight courier to the laboratory. Samples must be logged on a chain-of-custody form which is kept with the samples (see SOP-3). Maintain chain-of-custody procedures throughout the sampling and transportation process.

Other non-VOC soil samples will be collected using stainless steel bowls and spoons or dedicated sample containers per the appropriate method requirements. All non-dedicated sampling equipment will be decontaminated prior to sampling activities and before each subsequent sample location in accordance with the decontamination procedures provided in SOP-5. Decontamination water and solids will be containerized and managed as described in SOP-8.

FIELD BORING LOG

Golder Associates
MANCHESTER, NEW HAMPSHIRE

Sep 26, 2001 - 4:14pm

DEPTH HOLE	JOB NO. 083-87071	PROJECT IBM/KINGSTON			BORING NO.
DEPTH SOIL DRILL	GA INSP.	DRILLING METHOD			SHEET
DEPTH ROCK CORE	WEATHER	DRILLING COMPANY			SURFACE ELEV.
NO. DIST. SA. UD. SA.	TEMP.	DRILL RIG	DRILLER		DATUM
DEPTH WL.	HRS. PROD.	WT. SAMPLER HAMMER	DROP		STARTED
TIME WL. ----------	HRS. DELAYED	WT. CASING HAMMER	DROP		COMPLETED

Drawing file: FieldLog.dwg

SAMPLE TYPES

A.S.	AUGER SAMPLE
C.S.	CHUNK SAMPLE
D.O	DRIVE OPEN (SPLIT SPOON)
D.S.	DENISON SAMPLE
P.S.	PITCHER SAMPLE
R.C.	ROCK CORE
S.T.	SLOTTED TUBE
T.O.	THIN-WALLED OPEN
T.P.	THIN-WALLED PISTON
W.S.	WASH SAMPLE

ABBREVIATIONS

BL	BLACK	M	MEDIUM	SA	SAMPLE
BR	BROWN	MIC	MICACEOUS	SAT	SATURATED
C	COARSE	MOT	MOTTLED	SD	SAND
CA	CASING	MP	NON-PLASTIC	SI	SILT
CL	CLAY	OG	ORANGE	SIY	SILTY
CLY	CLAYEY	ORG	ORGANIC	SM	SOME
F	FINE	PH	PRESSURE-HYDRAULIC	TR	TRACE
FRAG	FRAGMENTS	PM	PRESSURE-MANUAL	WL	WATER LEVEL
GL	GRAVEL	R	RED	WH	WEIGHT OF HAMMER
LYD	LAYERED	RES	RESIDUAL	Y	YELLOW
LI	LITTLE	RX	ROCK		

SOIL DESCRIPTION RANGE OF PROPORTITION

"TRACE"	0-10%
"LITTLE"	10%-20%
"SOME"	20%-35%
"ADJECTIVE" (e.g. "SILTY", "SANDY")	35%-50%
"AND"	50%

CONSISTENCY - BLOWS/FT.

NON-COHESIVE SOILS

VL	VERY LOOSE	0-4
LS	LOOSE	4-10
CP	COMPACT	10-30
DN	DENSE	30-50
VD	VERY DENSE	>50

COHESIVE SOILS

VS	VERY SOFT	0-2
S	SOFT	2-4
FM	FIRM	4-8
ST	STIFF	8-30
H	HARD	>30

ELEV. / DEPTH	WELL CONSTRUCTION	PID (ppm)		SAMPLES NO.	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6" (FORCE)	SAMPLES REC. / ATT.	DEPTH	SAMPLE DESCRIPTION AND BORING NOTES

STANDARD OPERATING PROCEDURE
SOP-7

1.0 GENERAL APPLICABILITY

The purpose of this Standard Operating Procedure (SOP) is to describe the methods used in the collection of representative water quality samples from the Site's exiting sewer system. The scope of this document is limited to field operations and protocols applicable during sewer water sample collection.

2.0 SAMPLE AREA PREPARATION

Field personnel will conduct a visual inspection of the area surrounding the catch basin and sewer manholes prior to sampling to identify potential hazards. The catch basins and sewer manholes shall be considered confined spaces. Field personnel shall not enter the catch basin or sewer line for any reason. Sampling should be engineered to allow access without entry to confined spaces. Field personnel will perform air monitoring around the catch basin and sewer opening while opening and sampling water using a Photo Ionization Detector (PID) and multi-gas meter. Sensors on the multi-gas meter will include hydrogen sulfide, oxygen, lower explosive limit (LEL), and carbon dioxide. The meter calibration field form is attached.

3.0 EQUIPMENT REQUIREMENTS

Field personnel will use the following sewer water sampling equipment:

- Decontaminated polyethylene hand dipper to collect a grab sample, or;
- Disposable Teflon bailer and twine;
- Air monitoring equipment (e.g., PID, Multi-gas meter);
- Fire extinguisher;
- First Aid kit;
- Laboratory pre-preserved bottles;
- Latex or Nitrile disposable gloves; and
- Field book and meter calibration form.

4.0 WATER SAMPLE COLLECTION PROCEDURES

The water sample collection procedures include:

- Calibrate the PID, multi-gas meter, and field water quality meters in accordance with the manufacturer's recommended procedures and record the calibration information on the Calibration Forms;
- Place orange traffic cones and caution tape around the catch basin and/or sewer manhole to restrict access to the sampling area;
- Use a crow bar or similar piece of equipment to carefully open the catch basin grate or sewer manhole. Follow safe lifting practices to reduce the potential for back injury and wear steel-toed boots to reduce the potential for injury to their feet;
- Screen the air surrounding the catch basin and/or manhole using the PID and multi-gas meter. Log the meter readings into the log book in accordance with SOP-4. Also note if water is flowing in the sewer pipe, odors emanating from the sewer pipe, and the condition of the sewer pipe;
- Lower the decontaminated polyethylene hand dipper or disposable Teflon bailer into the catch basin and/or manhole opening to the water surface. The sampling equipment should be lowered into the sewer opening so that field personnel are not required to lean over the catch basin and/or sewer manhole;
- Slowly allow the dipper and/or bailer to fill with water while not stirring up the sediment on the bottom of the pipe;
- If sampling with a Teflon bailer, slowly lower the bailer into the water without contacting the sediments on the bottom. Pour the water sample into laboratory-prepared sample containers and placed on ice;
- For VOC samples, continue to fill the VOC sample vials until a meniscus forms on the lip of the container;
- Quickly place the plastic cap (containing a Teflon septum) on the container and screw the cap on the container;
- The filled bottle shall be turned upside down and tapped several times to ensure that no air bubbles are present in the sample container;
- If air bubbles are present, reopen the container and add additional sample volume to again achieve a meniscus on the lip of the VOC vial;

- Repeat these steps described above until no bubbles remain in any of the VOC sample vials;

- Following sample collection, the groundwater sample will be placed in a cooler on ice for preservation during shipment to a laboratory for analysis in accordance with Chain-of-Custody procedures (see SOP-3);

- Following sample collection, the sampling equipment shall be properly discarded (see SOP-8 for IDW procedures); and

- Replace the catch basin and/or manhole cover securely over the opening. Do not leave the sampling area until the covers are securely placed over the opening.

CALIBRATION FORM

GAI Project Name: _____ Project Number: _____

Golder Personnel Present: _____

Date: _____

Meter Type: YSI

Model Number: 600XL(M)

S/N _____

Specific Conductivity **Lot #:** **Expire Date:**

Standard	Unit	Meter reading		Time	
1.413	mS/cm				Initial
					Check
					Check

Acceptable Range 1.342-1.484

Dissolved Oxygen

Baro Pressure	Temp °C	% D.O.	mg / L D.O.	D.O. Charge	Time	
						Initial
						Check
						Check

pH

4.01 Buffer: Lot #: **Exp. Date:** **7.01 Buffer: Lot #:** **Exp. Date:**

Standard	Meter reading		Meter reading		Meter reading
	Initial		Check		Check
Time		Acceptable Range			
4.01		3.81-4.21			
7.01		6.75-7.36			
10.00		9.50-10.50			

10.00 Buffer: Lot #: **Exp. Date:**

ORP **Lot#:** **Expire Date:**

Standard	Meter reading		Meter reading		Meter reading
	Initial		Check		Check
Time		Acceptable Range			
240.0		228-252			

Turbidity

Meter Type: LaMotte

Model Number: 20/20

S/N

Standard	Meter reading		Meter reading		Meter reading
	Initial		Check		Check
Time		Acceptable Range			
1.00		0.95-1.05			
10.00		9.50-10.5			

Comments:

Sampler Signature: Date:

1.0 INVESTIGATION DERIVED WASTE PROCEDURE

The purpose of this SOP is to provide guidance on proper management of investigation-derived waste (IDW) generated during investigations.

1.1 Soil Cuttings and Decontamination Solids Management

Soil generated during the advancement of the soil borings and solids generated during the decontamination process (e.g., soils from the drill rig) will be placed in 55-gallon, Department of Transportation (DOT)-approved drums prior to characterization and proper off-Site disposal in accordance with local, state, and federal regulations. Field personnel will label each drum with a weather-proof marker (e.g., permanent paint marker or equivalent) identifying the contents of the drum (e.g., soil boring location), date of generation, and IBM Site information. The driller will place the 55-gallon drums in an area near the generation point designated by IBM.

1.2 Purge and Decontamination Water Management

Purge water from monitoring points and water generated during the decontamination steam-cleaning process shall be placed in 55-gallon, DOT-approved drums prior to characterization. The water placed inside these drums will be either treated on-Site in the IBM groundwater treatment system or characterized and transported off-Site for disposal in accordance with local, state, and federal regulations.

1.3 Personal Protective Equipment and Investigation Equipment Waste Management

Personal protective equipment (e.g., latex gloves) and investigation equipment (e.g., used plastic macro-core sample tubes and temporary monitoring well materials) will be containerized in a separate 55-gallon drum prior to off-Site disposal.

1.0 MEMBRANE INTERFACE PROBE PROCEDURES

1.1 Membrane Interface Probe Area Preparation

Prior to any sub-grade soil assessment activities, the field team leader or his/her designee will be responsible to contact DigSafe to locate any subsurface utilities within the public right-of-ways. The utility clearance will be conducted in accordance with the Utility Clearance Procedures detailed in SOP-1.

1.2 Membrane Interface Probe Installation

A membrane interface probe/electrical conductivity (MIP/EC) investigation will be conducted to better define the stratigraphy and distribution of VOCs in the subsurface. MIP/EC is a direct-sensing tool that is advanced into the subsurface using direct-push equipment (e.g., GeoProbe®). The MIP detects the presence of total VOCs in the vapor, sorbed, and dissolved phases using a series of two separate gas detectors located at the surface including a photo-ionization detector (PID) and an electron capture detector (ECD). The EC element measures soil conductivity with depth as the probe is driven into the ground. Conductivity data can be used to identify changes in lithology, the presence of contaminants, and/or other subsurface conditions (e.g. soil moisture) that change subsurface conductivity. The conductivity data are electronically logged along with depth and rate of penetration.

Because the MIP and EC tools are combined into one probe, simultaneous collection of both MIP and EC data are achieved in a single push and permit the field team to correlate stratigraphy and chemistry data. In addition, the real-time analysis of data allows the field team to modify and expand the depth and location of boreholes as needed to allow for a more rapid and complete assessment of the nature and extent of soil and groundwater impacts.

MIP/EC points will generally extend to the base of the surficial sand aquifer through the silty sand transition zone to the top of the varved silt and clay unit. Borings will be advanced approximately one (1) to two (2) feet into the upper portion of the varved clay unit to further evaluate the transition

zone between the two units. Field personnel will evaluate the MIP/EC data daily and modify the probe locations and depths as appropriate based on the findings.

The DPT operator will conduct the MIP/EC investigation in general accordance with American Society for Testing and Materials (ASTM) *Standard Practice for Direct Push Technology for Volatile Contaminant Logging with the Membrane Interface Probe (MIP) –D7532-07* and this SOP. The field personnel will record the MIP information on a field (attached).

Given the nature of the surficial sand unit, it is anticipated that the boreholes will collapse upon removal of the probe. In the event the resultant boreholes remain open, the borehole will be grouted with a cement-bentonite slurry following completion in accordance with SOP-10. The majority of these borings are anticipated to be advanced through concrete or an asphalt parking lot. These areas will be patched with concrete or asphalt upon completion.

Decontamination of the down-hole direct push tools will be performed between boring locations in accordance with SOP-5. Investigation-derived waste (IDW) generated, during the MIP/EC investigation will be managed in accordance with SOP-8.

MIP FIELD INFORMATION FORM

SITE DESCRIPTION

Project Name: IBM/Kingston

Project Number: 083-87071

Location: Kingston, NY

WEATHER CONDITIONS

Temperature: _____

Wind: _____

Precipitation: _____

BORING DESCRIPTION

MIP Boring ID: _____

Date: _____ Start Time: _____

Date: _____ End Time: _____

MIP Contractor: _____

MIP Operator: _____

INSTRUMENT INFORMATION

Detectors Used: _____

Probe Type: MP4510 MP6510

Probe S/N: _____

LOGGING INFORMATION

MIP File Name: _____

Pre-Log Response Test File Name: _____

Response Test Compound: _____ Concentration: _____

Trip Time (seconds): _____

Final Depth of Penetration: _____

Post Log Response Test File Name: _____

Response Test Compound: _____ Concentration: _____

Trip Time (seconds): _____

OBSERVATIONS

_____

_____

_____

_____

_____

Adopted from ASTM D 7352-07

STANDARD OPERATING PROCEDURE
SOP-10

1.0 GENERAL APPLICABILITY

The purpose of this Standard Operating Procedure (SOP) is to describe the methods for decommissioning membrane interface probe/ electric conductivity (MIP/EC) borings and temporary monitoring wells following the subsurface assessment activities. The scope of this document is limited to field operations and protocols applicable during advancement of the MIP/EC investigation activities.

2.0 RESPONSIBILITIES

Field personnel are responsible to oversee the MIP/EC and temporary well decommissioning procedures such that these borings are decommissioned in accordance with New York State Department of Environmental Conservation (NYSDEC) procedures[1], or recognized industry practice.

3.0 PROCEDURES

The MIP and temporary monitoring well decommissioning procedures will be completed as follows:

- Remove the temporary monitoring well or MIP equipment from the borehole;
- Use tremie well decommissioning methods by placing the tremie pipe to the bottom of the borehole and pouring/pumping a cement/bentonite slurry through the tremie pipe while slowly extracting the tremie pipe from the borehole to allow the slurry to fill the borehole to approximately three inches from the ground surface or pavement. If the borehole collapses ten a depth of less than 10 feet below ground surface, the cement/bentonite slurry may be poured from the ground surface;
- Cover the borehole with an orange traffic cone and allow the slurry to settle/harden for approximately one hour;
- Add slurry to the borehole if the grout level dropped in the borehole due to settling;
- Seal the upper three inches of the borehole with Portland cement or asphalt patch, as needed; and
- Place the temporary monitoring well materials in a 55-gallon drum for off-Site disposal in accordance with SOP-8-IDW Management.

[1] New York State Department of Environmental Conservation, Division of Environmental Remediation, "Groundwater Monitoring Well Decommissioning Procedures," October 1996.

APPENDIX B

LANCASTER LABORATORY QUALITY ASSURANCE PROJECT PLAN

LABORATORY QUALITY ASSURANCE PROJECT PLAN

May 16, 2002
(Revised August 21, 2007)

GROUP A

PROJECT MANAGEMENT

A1. Title and Approval Sheet

Laboratory Quality Assurance Project Plan

Lancaster Laboratories, Inc.

Approving Official:

Kathleen M. Loewen

Kathleen Loewen, B.S., Quality Assurance Director

8/21/07

Date

A2. Table of Contents

A3. Distribution List

This is a generic QA Project Plan; therefore, a distribution list will not be included. A list of organizations and persons that receive the generic QA Project Plan is maintained at Lancaster Laboratories.

A4. Project/Task Organization

The objectives of the laboratory Quality Assurance Program are to establish procedures which will ensure that data generated in the laboratory are within acceptable limits of accuracy and precision, to ensure that quality control measures are being carried out, and to ensure accountability of the data through sample and data management procedures. To this end, a Quality Assurance Department has been established. The Quality Assurance Director reports directly to the President of Lancaster Laboratories and has no direct responsibilities for data production, thus avoiding any conflict of interest. The Quality Assurance Director is the responsible party for maintaining the official, approved QA project plan.

The attached organizational charts show key managerial personnel. Resumes of key individuals may be found in the *Environmental Quality Policy Manual.*

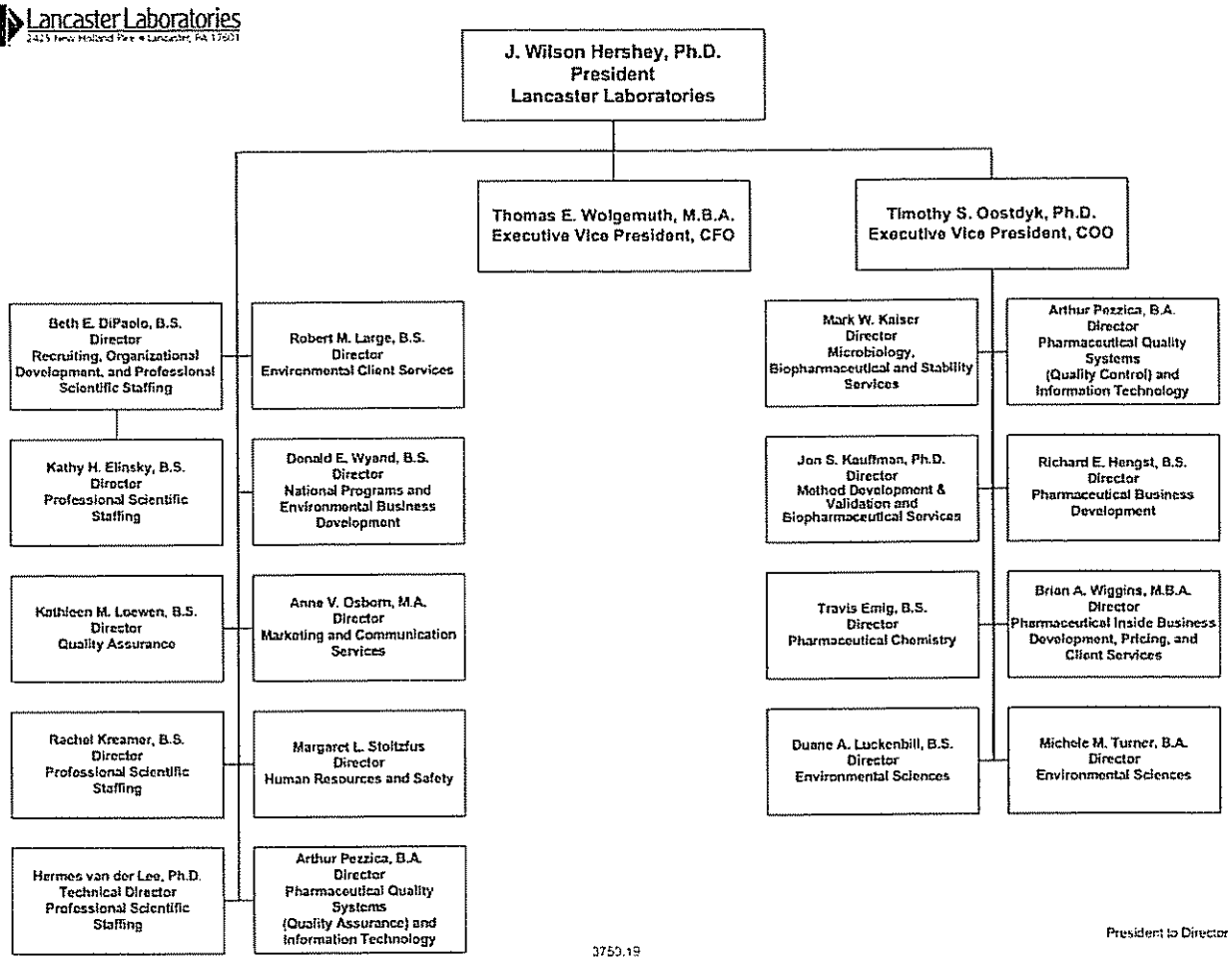
The Sample Administration Group will be responsible for receiving samples, signing the external chain of custody, checking sample condition, assigning unique laboratory sample identification numbers, and initiating internal chain-of-custody forms if requested. Sample Support personnel will be responsible for assigning storage locations, checking and adjusting preservation, homogenizing the sample as needed, and discarding samples. The Bottles Group is responsible for pre-preserving bottles as required by the method, preparing trip blanks and field blanks when required, and packing the bottle kits, then sending them to the client's requested location.

Managers listed in each technical area are responsible for performing laboratory analyses, quality control as specified in the methods, instrument calibration, and technical data review. Data is reported using a computerized sample management system, which tracks sample progress through the laboratory and generates client reports when all analyses are complete. Quality control data is entered onto the same system for purposes of charting and monitoring data quality.

The Quality Assurance Department is responsible for reviewing quality control data, conducting audits in the laboratory and reporting findings to management, maintaining current copies of all analytical methods, reviewing and approving Standard Operating Procedures (SOPs), submitting blind samples to the laboratory, and ensuring that appropriate corrective action is taken when quality problems are observed.

Data package deliverables are available upon request. The Quality Assurance Department reviews a representative sampling of the deliverables for completeness and to ensure that all quality control checks were performed and met specifications. This step includes a review of holding times, calibrations, instrument tuning, blank results, duplicate results, matrix spike results, surrogate results, and laboratory control samples (where applicable). Every attempt to meet specifications will be made, and any item outside of the specifications will be noted in the narrative. The laboratory will not validate data with regard to usability since this generally requires specific knowledge about the site. All data is archived according to corporate procedures.

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

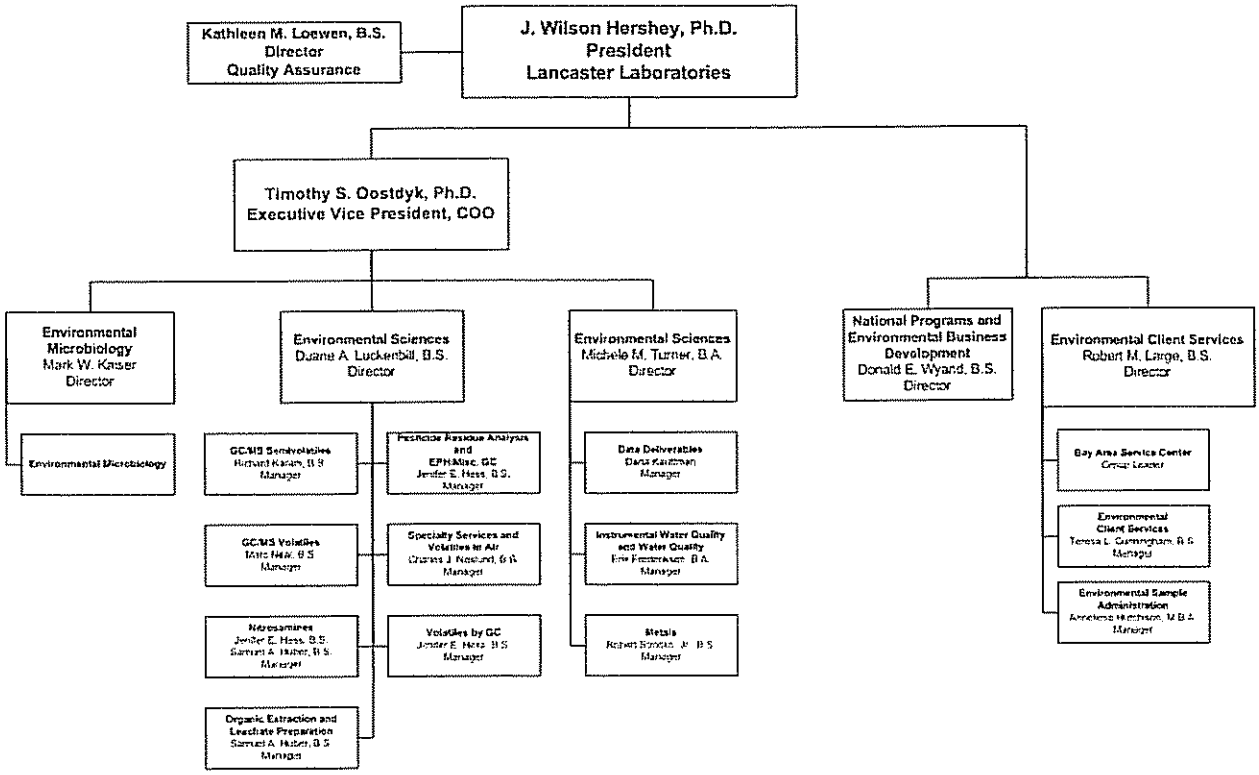


3750.19

President to Director

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

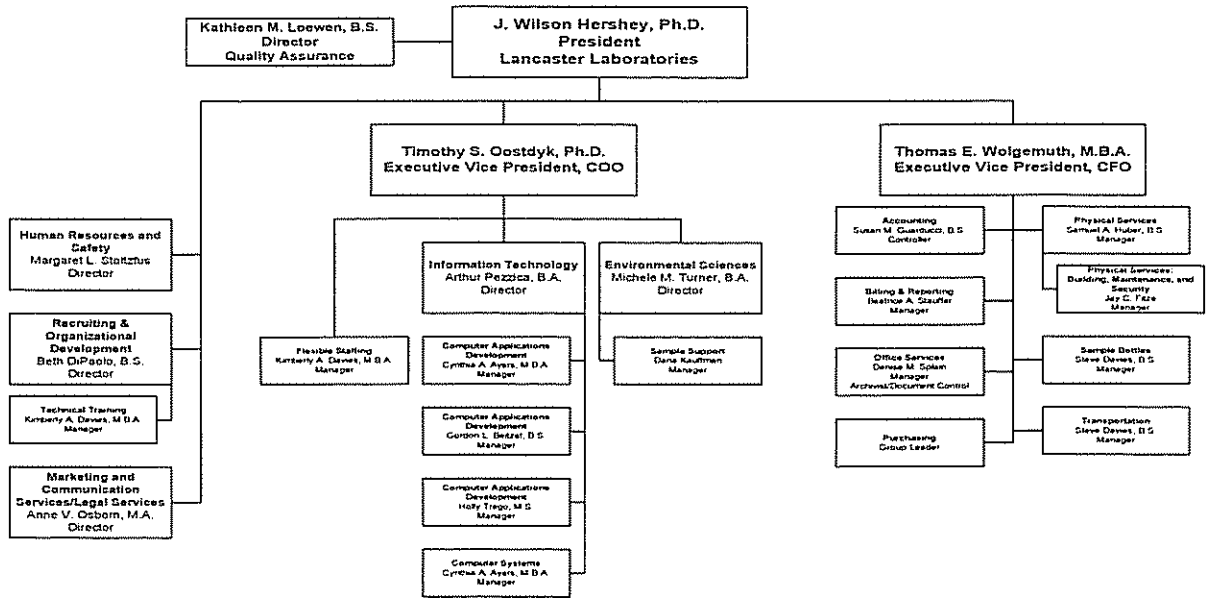
Environmental Sciences



3760.14

Lancaster Laboratories

Support Services



3762.09

A5. Problem Definition/Background

The purpose of this generic QA Project Plan is to provide specific quality assurance and quality control procedures involved in the generation of data of acceptable quality and completeness. This QA Project Plan provides the laboratory requirements to meet *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5, March 2001 and EPA's *Guidance for Quality Assurance Project Plans*, EPA QA/G-5, December 2002.

The procedures in this QA Project Plan have been standardized to make them applicable to all types of environmental monitoring and measurement projects. However, under certain site-specific conditions, not all of the procedures discussed in this document may be appropriate. In such cases, it will be necessary to adapt the procedures to the specific conditions of the investigation.

The analyses in this document are representative of what the laboratory performs but are not all encompassing. It is intended to provide a client with an overview of systems and procedures at Lancaster Laboratories. It is not project or site-specific and may not address all analyses required for a particular project. If additional analytical information is necessary, arrangements can be made with Lancaster Laboratories to generate a project specific or site specific QAPP.

A6. Project/Task Description

Tests will be performed according to the analytical methodology set forth in the *USEPA Test Methods for Evaluating Solid Waste—Physical/Chemical Methods, SW-846, 3rd edition, Update III, December 1996; Methods for Chemical Analysis of Waters and Wastes, USEPA, 600/4-79-020; and Standard Methods for the Examination of Water and Wastewater, 20th edition.* SW-846 provides specific analytical procedures to be used and defines the specific application of these procedures. Proven instruments and techniques will be used to identify and measure the concentrations of volatiles, semivolatiles, and pesticide compounds and/or the inorganic elements. The laboratory will employ state-of-the-art GC/MS and/or GC techniques to perform all organic analysis. Inorganic analyses will be performed using inductively coupled plasma (ICP), cold vapor AA, and ICP-MS. Instrumental wet chemistry will be using an auto-analyzer spectrophotometer, TOC analyzer, and Ion Chromatography. Classic wet chemistry will use appropriate instrumentation. The client is responsible for providing specifics on the project site. In addition to the technical references noted, LLI processes are in accordance with the current NELAC standards.

A7. Quality Objectives and Criteria

Quality assurance is the overall program for assuring reliability of monitoring and measurement data. Quality control is the routine application of procedures for obtaining set standards of performance in the monitoring and measurement process. Data quality requirements are based on the intended use of the data, the measurement process, and the availability of resources. The quality of all data generated and processed during this investigation will be assessed for precision, accuracy, representativeness, comparability, and completeness. These specifications will be met through precision and accuracy criteria as specified in Element B5. Detection limits are presented in Element B4.

To ensure attainment of the quality assurance objectives, SOPs are in place detailing the requirements for the correct performance of laboratory procedures. As described in LOM-SOP-LAB-201, "Writing and Reviewing Lancaster Laboratories Policies and Operating Procedures," the laboratory SOPs are written and organized into a four-tiered hierarchy:

1. Corporate policies and *Quality Policy Manuals*

2. Laboratory Operations Manual SOPs

3. Departmental Procedures

4. Quality Records (notebooks, logbooks, forms, etc.)

All SOPs are approved by the QA Department prior to implementation. The distribution of current SOPs and archiving of outdated ones are controlled by the Office Services Group through a master file. Additional information is provided in the *Environmental Quality Policy Manual* (*EQPM*), including general information on Document Control, Archiving, an index of our SOPs, etc. Table A7-1 provides an index of SOPs in place in support of the Quality Assurance objectives. These requirements are supplemented by the procedures in the laboratory and analytical SOPs.

Table A7-1

Document #	Document Title
EQPM	Environmental Quality Policy Manual
LOM-SOP-ES-209	Investigation and Corrective Action of Noncompliant Data
LOM-SOP-ES-212	Internal Chain-of-Custody Documentation
LOM-SOP-ES-213	Quality Control Records
LOM-SOP-ES-215	Subcontracting to Other Laboratories
LOM-SOP-ES-216	Proficiency Test Samples
LOM-SOP-ES-219	Documentation for the Parallax Analysis Information Function
LOM-SOP-ES-220	Sample Storage and Discard
LOM-SOP-ES-221	Analytical Methods for Nonstandard Analyses
LOM-SOP-ES-222	Instrument and Equipment Maintenance and Calibration
LOM-SOP-ES-223	Missed Holding Time Reports
LOM-SOP-ES-224	Data Rounding, Parallax Entry, Verification and Reporting
LOM-SOP-ES-225	Reagents and Standards
LOM-SOP-ES-226	Validation and Authorization of Analytical Methods
LOM-SOP-LAB-201	Writing and Reviewing Lancaster Laboratories Policies and Operating Procedures
LOM-SOP-LAB-202	Document Control
LOM-SOP-LAB-203	Data and Record Storage, Security, Retention, Archival, and Disposal
LOM-SOP-LAB-204	Regulatory Training
LOM-SOP-ES-229	Employee Training Program
LOM-SOP-ES-230	Investigation and Corrective Action Reporting for Laboratory Problems
LOM-SOP-LAB-218	Procurement of Laboratory Supplies

Table A7-1 – Continued

Document #	Document Title
LOM-SOP-LAB-220	Laboratory Notebooks, Logbooks, and Documentation
LOM-SOP-ES-231	Handling of Client Technical Complaints (Investigations and Response)
LOM-SOP-LAB-224	Compliance with Good Laboratory Practice (GLP) Regulations
LOM-SOP-LAB-226	Guidelines for Analytical Decision Making
SOP-CS-049	Implementation of the Computer Services Division Validation Master Plan

A8. Specialized Training/Certification

Lancaster Laboratories has a core curriculum of training that contains the basic courses relevant to all the employees. This in part, includes teaching the quality policy, quality assurance/quality control, ethics training, chemical hygiene training, health and safety classes, and any function specific training (i.e. GC, Statistics). Much of this training is performed at Lancaster Laboratories through the Human Resources Group. The following list shows examples of course offerings:

- Laboratory Technician Program: Designed for new employees who need to develop laboratory skills or who need a refresher on laboratory basics.
- Practical Process Improvement Training: This course introduces why quality is important, explains Lancaster Laboratories quality philosophy and processes, and shows how to apply quality thinking and techniques on the job.
- Putting Our Values to Work: This seminar is designed to introduce new employees to the Statement of Values by examining how it translates to everyday jobs and includes ethical decision making.
- Chemical Hygiene Plan: Introduces the new employee to LLI's Chemical Hygiene Plan and the OSHA Lab Standard regulation and requirements.
- CPR: This course includes CPR history, relevance of CPR, cardiovascular disease, adult one-rescuer CPR, airway obstruction, safety in CPR, and use of the Automated External Defibrillator (AED).
- 24-hour HAZWOPER Emergency Response: Part of a proactive safety and emergency preparedness effort, this training is provided to a core group of people and volunteers who may respond to emergencies.
- Statistical Analysis: Topics include: rounding, mean standard deviation, normal distribution, z-scores, estimate, confidence intervals, hypothesis testing, one sample t-test, F-test, two sample t-test, paired t-test, ANOVA, outlier, calibration, etc.
- Gas Chromatography: Principles in GC, separation, qualitative/quantitative analysis, hardware, software, troubleshooting techniques, and the applications for GC use at Lancaster Laboratories.
- GC/MS Basics: Review of the fundamentals for GC/MS analysis.
- HPLC: Principles and practices on HPLC and the applications at Lancaster Laboratories.

If the training can not be accomplished at Lancaster Laboratories, then the employee may have off-site training. Within each technical or support group, the employee also receives on-the-job training before performing work independently. The details of this training are noted in each departmental group's SOPs.

The analysts must perform an initial demonstration of capability before using any test method; this is reviewed and signed by the technical department's management and Quality Assurance. The analyst must also complete an annual demonstration of capability for each test method per matrix.

All training and proficiencies are documented in each employee's training records as described in LOM-SOP-ES-229, "Employee Training Program."

A9. Documents and Records

The group leaders in each technical area are responsible for overseeing the performance of analysis, quality control as specified in the method, instrument calibration, and technical data review. There is a secondary review on 100% of all data by a supervisor or experienced analyst prior to reporting the results. The Laboratory Information Management System (LIMS) tracks sample progress through the laboratory and generates client reports. During analysis, raw data must be recorded in indelible ink in bound notebooks or on printouts from instruments and is then entered into the LIMS against sample number and analytical method. Many instruments' data systems can transfer data directly to the LIMS, eliminating manual transcription. Quality control data is entered into the same system for purposes of charting and monitoring data quality. When all analyses are completed and have been verified by a supervisor or designee, the computer generates a report. The client receives a copy of the report containing the results of the analysis plus comments entered by the analyst where necessary. Copies of the reports and associated raw data are retained in secured archives.

Currently Lancaster Laboratories has over fifteen different reporting formats. Table A9-1 shows some of the formats available. Unless a specific report format is requested, the standard laboratory procedure is to report results to the limit of quantitation (LOQ) using report type 0 (see Table A9-1). However, it is possible to estimate to a value below the LOQ, if lower values are needed. Estimates are made to the reported method detection limit (MDL) which is based on annual MDL studies performed per method/matrix and instrument. An example analysis report is included in Appendix A.

The data packages are consistent with EPA CLP, NJDEP, and other state or agency formats. Custom formats are also accommodated. The data package types differ in the level of raw data and QC that would be submitted. Table A9-2 shows the formats offered and the information that can be included in a data package. Appendix A shows examples of the data package forms used for various types of methodology (i.e., GC/MS Volatiles, pesticides, etc.) The data packages are available as hard copy deliverables or a *.pdf* file on CDROM.

After the data package has been compiled, a content review and QA/QC compliance review on 100% of the data packages is performed by the Data Deliverable department or by other fully-trained staff. During the content review, the field chain of custody is compared to the reports to check the analysis performed, dates/times of collection, and sample designation. In addition to making sure data from all the appropriate departments is present, the following are also checked: method summary/reference, title page, table of contents, sample reference list, sample administration receipt documentation logs, and internal chains of custody (if required). In addition to making sure the data for all analyses are included, the following are also checked during the QA/QC compliance review: spot check results on the report against the raw data, ensure analyses performed within holding time, check quality control summary forms for compliance issues, and read the case narrative to make sure all nonconformances and anomalies are addressed.

In addition, the Quality Assurance Department reviews a representative sampling of the deliverables for completeness and to be sure that all batch quality control checks were performed and met specifications. This step includes review of holding times, calibrations, instrument tuning, blank results, duplicate results, matrix spike results, surrogate results, and laboratory control samples (where applicable). Every attempt to meet specifications will be made, and any item outside of the specifications will be noted in the case narrative. The laboratory will not validate data with regard to usability since this generally requires specific knowledge about the site.

Analytical results are delivered to the client in several electronic formats. LLI supports more than twelve industry-standard EDD formats and well over 100 custom EDD formats. The data for the EDD and hardcopy reports are retrieved directly from our LIMS. LLI offers data deliverables in many custom formats using a standard ASCII formatted structure (tab-delimited text; comma-delimited text; fixed length), structures for Microsoft Excel spreadsheets, and Microsoft Access database tables. In addition, LLI offers these industry standard EDD formats:

- EDF (California/COELT)
- Enviro Data (Geotech)
- EquIS, and its many variations, including:
  - Delaware "3DM"
  - EPA Region 2 "MEDD"
  - EPA Region 5 "ED MAN"
- ERPIMS (AFCEE)
- GIS/Key
- HazSite (HZRESULT table) for NJDEP
- Locus EIM
- TerraBase (Integrate)

We ensure the quality of our electronic data by providing 100 percent manual quality review of all data fields for new formats and a 10 percent review thereafter.

LLabWeb.com allows a client to access their verified analytical results round-the-clock through Lancaster Laboratories computer system using a secure Internet browser. Only analytical results on samples that are completed and verified can be accessed by this system.

A corporate procedure is in place for documentation, error correction, and control of logbooks (LOM-SOP-LAB-220, "Laboratory Notebooks, Logbooks, and Documentation"). The Office Services Group is responsible for maintaining the document and version control of the QA project plan and SOPs. All documents are assigned a revision number and date by the Office Services Group. They record all individuals or departments that have been issued a copy of a document and track that old versions are returned when the new one is issued. They are also responsible for maintaining the archive system to securely store records from all areas of the laboratory. LOM-SOP-LAB-203, "Data and Record Storage, Security, Retention, Archival, and Disposal" describes procedures for transferring data from the laboratories to the archives and maintaining the archives (including record retention schedule and disposal). The length of time for retention of hardcopy data is 10 years. All copies that are disposed of are incinerated. The Data Deliverables Group scans copies of the data packages onto CD-ROM for archiving. Electronic data files are saved and stored off-site for a minimum of 5 years.

Table A9-1
Data Reporting Formats

Report Format	Entered Result					
	Negative	Exactly Zero	MDL	LOQ	Above LOQ	Limit Shown on Report
0	<LOQ				Rounded Result	LOQ
1	N.D.		<LOQ		Rounded Result	LOQ
3	N.D.		Result with "J" Qualifier		Rounded Result	LOQ
4	N.D.		Result with "J" Qualifier		Rounded Result	MDL
10	N.D. if TMDL >MDL N.D. # if MDL >TMDL				Rounded Result	Greater of MDL or TMDL
12	MDL with "U" Qualifier		Result with "J" Qualifier		Rounded Result	MDL

Key:

MDL = Method Detection Limit
LOQ = Limit of Quantitation
BMQL = Below Minimum Quantitation Limit
TMDL = Target Method Detection Limit
J = Estimated Value
U = Client requested replacement for "<"

Table A9-2
Data Package Formats

Type I, NJ Regulatory (non-CLP)

- Title page
- Sample reference list
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- Method summary/references
- Analysis reports/laboratory chronicles
- Case narrative
- Quality control summary; duplicates, matrix spike, matrix spike duplicate, blank, LCS, and surrogate recovery summary forms; GC/MS tuning summary and internal standard area summary
- Sample data; all raw sample data including instrument printouts and MDL summary form
- Standard Data; initial and continuing calibration summary forms, all raw initial and continuing calibrations and standardization data including instrument printouts
- Quality control raw data; all raw quality control sample data including printouts, preparation logs, run logs

Type III, NJ Reduced Deliverables (non-CLP)

- Title page
- Sample reference list
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- Method summary/reference
- Analysis reports/laboratory chronicles
- Case narrative and conformance/nonconformance summary
- Quality control summary; duplicate, matrix spike, matrix spike duplicate, blank, LCS, and surrogate recovery forms; GC/MS tuning summary and internal standard area summary; summaries for calibration and standardization
- Sample data; MDL summary form, all raw sample data including instrument printouts for GC, GC/MS, and TPH only (including calibration raw data)
- Quality control raw data; blank raw data for GC, GC/MS, and TPH only, preparation logs

Type IV, Full CLP Deliverables

- Title page
- Sample reference list
- Case narrative
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- All CLP reporting forms; QC analytical results and calibration summaries
- Sample data; all raw data including instrument printouts
- Standard Data; all raw initial and continuing calibrations and standardization data including instrument printouts
- Quality control raw data; all raw quality control sample data including printouts, preparation logs, run logs

Table A9-2 – Continued
Data Package Formats

Type V, Reduced CLP Deliverables

- Title page
- Sample reference list
- Case narrative
- Analysis request form, field chain of custody
- Sample administration receipt and documentation log
- Internal chain of custody (if required)
- All CLP reporting forms; QC analytical results and calibration summaries
- Sample raw data; all raw sample data including instrument printouts for organics only
- Quality control raw data; blank raw data for organics only, preparation logs

Type VI, Raw Data Only

- Title page
- Sample data; all raw sample data including instrument printouts
- Quality control raw data; blank raw data, LCS raw data

GROUP B

MEASUREMENT/DATA ACQUISITION

B1. Sampling Process Design

In order for meaningful analytical data to be produced, the samples analyzed must be representative of the system from which they are drawn. It is the responsibility of the client to ensure that the samples are collected according to accepted or standard sampling methods. The client should evaluate the number, location, and type of samples to be collected. The appropriate number and frequency of field QC samples should also be determined by the client.

For non-standard matrices such as fish, worms, biota, large concrete or wood chunks, or other assorted waste, a discussion should take place with the laboratory to identify special handling requirements and confirm method performance for the particular matrix.

B2. Sampling Methods

The sampling methods should be selected by the client with regard to the intended application of the data.

The laboratory will provide the appropriate sample containers, required preservative, chain-of-custody forms, shipping containers, labels, and custody seals for the sampling. Trip blanks will be prepared by the laboratory and accompany sample containers at the project required frequency. Analyte free water will also be provided for field blanks. Temperature blanks will be included for monitoring cooler temperature upon receipt of the samples back at the laboratory. Pre-cleaned containers, with vendor supplied traceability documentation are available upon request. Because the laboratory does not stock this type of traceable container, 2 weeks prior notice is required.

Before use, each lot of preservative is documented and checked for contaminants. The appropriate bottle will be preserved with the new preservative and filled with deionized water to represent a sample. A similar container (that does not contain preservative) will be filled with deionized water to be used as a blank check. Analysis results are documented and reviewed for each preservative lot number.

A list of containers, preservatives, and holding times follows in Table B2-1.

Table B2-1
Sample Containers, Preservatives, and
Holding Times for Aqueous and Solid Samples

Fraction	Vol. Req. (mL) / Wt. Req. (g)	Container P=Plastic G=Glass	Preservation[a]	Holding Time[d] From Date of Collection Water	Soil
Volatiles	3 × 40 mL / 100 g[f]	G	Cool, 4°C[b] pH <2 w/ HCl	14 Days	14 Days
Pesticides	2 × 1000 mL / 100 g	G	Cool, 4°C[b]	7 Days to extraction[e]	14 Days to extraction[e]
Herbicides	2 × 1000 mL / 100 g	G	Cool, 4°C[b]	7 Days to extraction[e]	14 Days to extraction[e]
Halocarbons (Volatiles by GC)	3 × 40 mL / N/A	G	Cool, 4°C[b] pH <2 w/ HCl[c]	14 Days	N/A
Aromatics/Petroleum (Volatiles by GC)	3 × 40 mL / 100 g[f]	G	Cool, 4°C[b] pH <2 w/ HCl	14 Days	14 Days
Semivolatiles (Acid/Base Neutrals)	2 × 1000 mL / 100 g	G	Cool, 4°C[b]	7 Days to extraction[e]	14 Days to extraction[e]
PAHs (HPLC)	2 × 1000 mL / 100 g	G	Cool, 4°C $Na_2S_2O_3$	7 Days to extraction[e]	14 Days to extraction[e]
Metals	100 mL / 100 g	P,G	HNO_3 to pH <2	6 Months Hg 28 Days	6 Months Hg 28 Days
Cyanide	500 mL / 100 g	P,G	Cool, 4°C NaOH to pH >12 ascorbic acid	14 Days	14 Days
Sulfide	500 mL / 100 g	G	Cool, 4°C (NaOH, ZnAC Waters Only)	7 Days	N/A
Phenol	1000 mL / 100 g	G	Cool, 4°C H_2SO_4 to pH <2	28 Days	28 Days
TPH	2 × 1000 mL / 100 g	G	Cool, 4°C pH <2 w/ HCl	7 Days	14 Days
Hexane Extractable Materials (HEM)	2 × 1000 mL / 100 g	G	Cool, 4°C pH <2 w/ HCl	28 Days	28 Days
TPH-GRO	3 × 40 mL / 100 g	G	Cool, 4°C pH <2 w/ HCl	7 Days	14 Days
TPH-DRO	2 × 1000 mL / 200 g	G	Cool, 4°C pH <2 w/ HCl	14 Days to extraction[e]	14 Days to extraction[e]
TOC	125 mL / 20 g	G	Cool, 4°C H_2SO_4 to pH <2	28 Days	28 Days
Total Nitrite/Nitrate	120 mL	P,G	Cool, 4°C H_2SO_4 to pH <2	28 Days[g]	N/A

[a]pH Adjustment with acid/base is performed on water samples only.

[b]Sodium thiosulfate needed for chlorinated water samples

[c]Due to the inaccurate recovery of 2-chloroethyl vinyl ether in the presence of HCl, Halocarbon samples analyzed for this compound should not be preserved.

[d]Samples will be analyzed as soon as possible after collection. The times listed are the maximum times that samples will be held before analysis and still be considered valid.

[e]Analysis 40 days from extraction.

[f]This is for soil bulk jars for method 5030A. For methods 5035 and 5035A see below.

[g]Holding time is 48 hours from time of collection for unpreserved samples.

NOTE: For volatiles analysis, the container should be filled completely, with no headspace. All sample containers, preservatives, and mailers will be supplied at no additional charge upon request, except for the special containers with traceability documentation. There is an additional charge for this type of container.

Soil Sampling for Volatile Organics by SW-846 5035 and 5035A

These are methods for collection and analysis of soils and solid waste samples for volatile organic compounds. Method 5035 is described in Update III to the Third Edition of SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, and is required for all analytical methods using purge and trap techniques (8021B, 8015B, and 8260B). Method 5035A is published by EPA on their website and provides more detail and clarification (e.g. temperature preservation).

The volatile analysis is performed over two ranges:

	GC/MS (8260)	GC (8021 or 8015B)
Low Level	5 – 300 µg/kg	Not Available
High Level	>250 µg/kg	>20 µg/kg

The different levels require different sampling techniques. The low-level method can only handle samples within a specific concentration range (these samples CANNOT be diluted); therefore, a high-level sample MUST be collected to ensure that all the target analytes can be quantified.

Naturally occurring carbonates in some soils may cause effervescence (foaming) on contact with the sodium bisulfate ($NaHSO_4$) solution used as preservative for the low-level preparation. This interference makes it necessary for the laboratory to use the high-level prep or an alternative technique for low level.

Lancaster Laboratories supports the following options for the two levels:

Low-Level (LL) Options		No. of Containers*	Sample Size (g)	Holding Time†
1	LL EnCore	2	5	48 hours
	HL EnCore	1	5	48 hours
2	LL Field Preserved $NaHSO_4$	2	5	14 days
	HL Field Preserved Methanol	1	5	14 days
3	LL VOA Vial with Water	2	5	48 hours
	HL Methanol VOA Vial	1	5	14 days
High-Level (HL) Options		**No. of Containers***	**Sample Size (g)**	**Holding Time†**
4	Field Preserved Methanol	1	10	14 days
5	Field Preserved Methanol	1	5	14 days
6	Field Preserved Methanol	1	15	14 days
7	HL Encore	1	5	48 hours
8	HL Encore	1	25	48 hours

*Additional containers will be needed for MS/MSD.

†Because of the need to preserve the samples within 48 hours of collection, it is imperative that samples be returned to the laboratory within one day of sample collection. Once preserved the holding time is 14 days from collection. Although not recommended, samples can be submitted in bulk containers. The holding time for these samples is 14 days from collection.

If samples are collected in EnCore or other approved core samplers, a small quantity of soil must be collected for a moisture determination and to determine if the soil effervesces with the addition of sodium bisulfate. If the soils do react, they will be frozen until analysis in place of chemical preservation.

Options 1, 2, 6, 7, 8, and 9 follow EPA 5035. Options 3, 4, and 5 follow EPA method 5035A.

B3. Sampling Handling and Custody Requirements

Samples are unpacked and inspected in the sample receipt area. At this time, the samples are examined for breakage and agreement with the associated client paperwork. The cooler temperatures will be checked upon receipt and recorded. As the samples are unpacked, the sample label information will be compared to the chain-of-custody record and any discrepancies or missing information will be documented. If necessary, the cooler will be closed and placed in cold storage until instructions and resolution of any discrepancies are received from the client.

A member of our Sample Administration Group will act as sample custodian for the project. To ensure accountability of our results, a unique identification number is assigned to each sample as soon as possible after receipt at the laboratory. Upon entry into our LIMS and assignment of the seven digit sample number, labels are generated, along with an acknowledgement summarizing samples entered and the analyses scheduled. When samples requiring preservation by either acid or base are received at the laboratory, the pH will be checked and documented, with the exception of samples designated for volatile analysis, which are checked at the time of analysis. Samples requiring refrigeration will be stored at 2° to 4°C. The use of our computer system in tracking samples (by the Lancaster Labs sample number assignment) will control custody of the sample from receipt until the time of its disposal. The security system on our laboratory building allows us to designate the entire facility as a secure area since all exterior doors are either locked or attended. Therefore, hand-to-hand chain-of-custody is not part of our routine procedure, but is available upon request. If requested, hand-to-hand chain-of-custody will be provided as per attached LOM-SOP-ES-212, "Internal Chain-of-Custody Documentation." The laboratory chain-of-custody will begin with the preparation of bottles. The procedures for sample log-in, storage, and chain-of-custody documentation are detailed in the *EQPM* (see sections 5.2 and 5.3 in Figure B3-2) and the QA standard operating procedures included in Element B3 (LOM-SOP-ES-220, "Sample Storage and Discard" and LOM-SOP-ES-212, "Internal Chain-of-Custody Documentation"). Examples of sample labels and a custody seal are shown in Figure B3-1.

Figure B3-1

Sample Label (Field)

CLIENT

If you do not have an account with us, results will not be released until payment is received.

SAMPLE IDENTIFICATION / LOCATION CL. RES:

COLLECTION INFORMATION:

☐ COMPOSITE
☐ GRAB

DATE TIME BY:

TESTING REQUIRED PRESERVATIVE(S) ADDED

Lancaster Laboratories
2425 New Holland Pike, Lancaster, PA 17601-5994

LL #

Sample Label (Laboratory)

TL 4258264 ASR-000 41B 4/21/04
GRP-882948 EMP-0210

STANDARD_FORM#: 2607
Results_due 04/30/04 15:00
Group_form_#:_2607_Sample_form_#:_1722

00649-Lancaster Labs
14111
Batch# 04111-1457-8782 SPLP Volatile Blank
Extraction Fluid: DI H2O Vessel ID: 60
Tumble Batch Blank
01163 03636

Outgoing on Cooler or Kit (blue)

Lancaster Laboratories
Where quality is a science.

CUSTODY SEAL
2425 New Holland Pike, Lancasater, PA 17601-5994 (717) 656-2300

DATE:
SIGNATURE:

Incoming on Cooler Containing Samples (yellow)

Lancaster Laboratories
Where quality is a science.

137603
CUSTODY SEAL
2425 New Holland Pike, Lancasater, PA 17601-5994 (717) 656-2300

DATE:
SIGNATURE:

Figure B3-2

5.2. Sample Receipt and Entry

Samples can be received at the laboratory 24 hours a day, 7 days a week, 365 days of the year. Receipt can occur in one of three ways:

- Lancaster Laboratories courier services (i.e., Transportation Department)
- Personal delivery
- Commercial courier

All samples received for testing are delivered to the Sample Administration Department immediately upon arrival. This group is responsible for the unpacking and organizing of the samples. This process includes checking custody seals if present, paperwork agreement, signing the chain of custody, recording cooler temperatures, documenting the condition of containers, accounting for all sample bottles, observing any safety hazards, and reporting any problems to Client Services for communication to the client. For non-compliant samples, the client is given the option to resample or have the sample analyzed and reported with a comment. This receipt process is documented.

As soon as practical after sample receipt, all samples are entered into our laboratory information management system (LIMS). Samples awaiting log-in are stored in temporary holding areas, at appropriate storage conditions to maintain sample integrity. If there is doubt about the suitability of items received or if items do not conform to the description provided or the testing required is not clear or specified, the client will be contacted and the conversation documented.

At the time of entry, the LIMS will assign a unique Lancaster Laboratories' identification number to each sample. This number is sequentially assigned. Upon entry of pertinent client information and assignment of a unique sample number, a label will print identifying each container, which is attached to the sample container.

Samples are tracked to the minute upon arrival. This will allow the client to see exactly how long it took the samples to pass through receipt, unpacking, and entry.

A sample acknowledgement will print from the LIMS per sample delivery group (SDG). This notification is sent to the client to confirm sample receipt and entry on the day following sample log-in. Internally, appropriate personnel will audit all applicable sample entry and client paperwork.

5.3. Sample Identification and Tracking

A sample label is generated for each sample and; in addition to the assigned Lancaster Laboratories' sample number, the following information is printed on the label: client name, sample identification assigned by the client, sample collection information, storage area, bottle code ID, analyses requested, and any applicable notes to laboratory personnel.

To ensure accountability of results, the unique sample number assigned is used to identify the sample in all laboratory data documentation, including notebooks, instrument printouts, and final reports. The sample number will also be used to identify additional containers of the sample that may be created during sample preparation and analysis (e.g., subsamples, extracts, digests).

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

LOM-SOP-ES-220.03
Supersedes Date: 11/08/04
Effective Date: NOV 15 2006
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LABORATORY OPERATIONS MANUAL – ENVIRONMENTAL SCIENCES
Sample Storage and Discard

Table of Contents

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

LOM-SOP-ES-220.03
Supersedes Date: 11/08/04
Effective Date: NOV 15 2006
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Approvals

Prepared by: Barbara Reedy — Senior Specialist — Date: 10/31/06

Approved by: Dawn M Thompson — Environmental Sciences Management — Date: 10-31-06

Approved by: Dorothy M Love — Quality Assurance — Date: 11/1/06

Revision Log:

Ver. #	Effective Date	Change
00	08/15/02	Previous Issue – SOP-QA-103.04
01	11/12/03	Major changes are as follows: • Updated to LOM-SOP format. • Separated out Pharmaceutical references.
02	11/08/04	Major changes are as follows: • Update the cross references section and the SOPs referenced within the SOP • Update the procedure section
03	NOV 15 2006	Major changes are as follows: • Made some minor wording changes to Section A of the procedure

LOMSOPES220_03.DOC
103106

Reference:

Chemical Hygiene Plan, Lancaster Laboratories, current version.

Cross Reference:

Document	Document Title
LOM-SOP-ES-201	Forensic Laboratory Services
LOM-SOP-ES-212	Internal Chain-of-Custody Documentation
LOM-SOP-LAB-220	Laboratory Notebooks, Logbooks, and Documentation

Purpose:

Sample integrity can be compromised by improper storage conditions. The objective of this procedure is to prevent sample deterioration and mix-up prior to analysis. The laboratory information management system (LIMS) is used to assign storage locations to assist in the orderly storage of samples. Systems are also in place to ensure organized retrieval of samples for analysis and discard/return to client at an appropriate date.

Scope:

This procedure applies to Lancaster Laboratories Environmental Business units. The content of this procedure will describe general systems that are in place for sample storage, retrieval, return, and discard. Additional procedures within Sample Support describe the specific storage operations and requirements. Forensic storage is described in LOM-SOP-ES-201.

Safety Precautions:

Refer to the corporate *Chemical Hygiene Plan* which provides safety information. Contact your supervisor if you have questions or concerns about a sample.

Personnel Training and Qualifications:

Personnel who handle client samples must be familiar with the requirements of this procedure.

Procedure:

A. Sample storage and transfer

1. Sample Administration will gather information into the LIMS at the time of sample entry about the approximate size of samples to be received in a group and the type of storage they require (e.g., refrigerator, freezer, or room temperature).

2. The LIMS will assign a storage location for each container and record the length of time the samples must be retained after the analysis report has been issued.

3. Samples will be stored in a assigned storage location, when not in the laboratory area.

4. In the event that a sample storage location change is needed due to a temperature adjustment, a sample custodian or sample administrator will access the appropriate LIMS program and choose a new location. After a successful change in location has occurred, a new label will be reprinted and adhered to the sample. The sample containers will then be transferred to the new storage location.

5. Analysts requiring the use of a sample container may determine its location by referring to a departmental sample status sheet, LIMS, or SA entry paperwork.

6. To prevent unnecessary deterioration of the samples, the contents needed for analysis shall be removed and the sample returned to storage with a minimum of delay.

B. Security of storage areas

There are varying degrees of additional security requirements for storage areas, which are in addition to the building security. This additional security may be driven by various regulatory agencies or client requirements. The following are different levels of security which are in place at the laboratory.

1. Samples are stored in a controlled access area and are tracked by an automated sample retrieval storage system (ASRS). Samples are barcoded in and out of this system to track retrieval, return, and disposal.

2. Forensic storage areas are locked and admission to these areas is permitted only to sample custodians. See LOM-SOP-ES-201 for further details on forensic storage. Most of the samples stored in these areas require chain-of-custody documentation as outlined in LOM-SOP-ES-212. Samples may not be removed from this area without signing a chain-of-custody form. A chain-of-custody record may also be kept for samples, at the request of the client, even if the samples are not for forensic purposes.

C. Sample discard

1. When the retention time for sample storage has expired, a discard list will be generated from the LIMS. The retention dates are based upon client requirements or defaulted to a given number of days past the date when the final analysis report is generated, if no client requirement is given.

2. These samples will be removed from their assigned storage area by a sample custodian or analyst, and either disposed of or returned to the client.

3. Hazardous samples shall either be returned to clients, decontaminated, or disposed of by personnel trained in hazardous waste discard assessment or health and safety personnel.

D. Storage conditions

1. The temperature of each sample storage location requiring a temperature control is continuously monitored by the Andover system or it is checked during each normal working day by an assigned person responsible for the sample storage area. This information shall be recorded. Temperature monitoring documentation shall be recorded in ink and changes shall be made in accordance with the error correction procedure outlined in LOM-SOP-LAB-220.

2. The following temperature ranges need to be maintained within storage units, unless otherwise specified.

Refrigerator Storage	Freezer Storage	Room Temperature
2° to 4°C	-10° to -20°C	NA

NOTE: Storage conditions of -40° ± 10°C and -80° ± 10°C are also available.

3. If the temperature recorded does not fall within these ranges, corrective action must be taken and documented as per policy.

4. Temperature records must be reviewed by a second qualified person and this information must be permanently archived.

5. In the event that additional storage areas are needed as "overflow" storage, systems must be put into place before samples can be stored. These areas must also be monitored for acceptable storage conditions.

6. If a client requests storage conditions which are outside the temperature ranges defined above, arrangements will be made to accommodate the request, if possible.

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2425 New Holland Pike • Lancaster, PA 17601

LOM-SOP-ES-212.03
Supersedes Date: 03/23/05
Effective Date: APR 14 2006
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LABORATORY OPERATIONS MANUAL – ENVIROMENTAL SCIENCES SECTION
Internal Chain-of-Custody Documentation

Table of Contents

Approvals

Prepared by: Elaine Stoltzfus — Specialist — Date: 3/31/06

Approved by: [signature] — Executive Management — Date: 3/31/06

Approved by: Dorothy McGuire — Quality Assurance — Date: 3/31/06

Revision Log:

Ver. #	Effective Date	Change
		Previous Issue: SOP-QA-104.05
01	02/20/03	Major changes are as follows: • Removed Pharmaceutical Information • Updated to LOM-SOP format • Minor clarifications throughout • Updated Figure 3 and 5
02	03/23/05	Major changes are as follows: • Updated Cross Reference section • Clarified Procedure section A Initial documentation • Updated Figures 2, 4, and 5 • Incorporated Procedural Amendment
03	APR 14 2006	Major changes are as follows: • Updated Form numbers in Cross Reference section • Revised Procedure, Section B, Number 3 concerning filing the original copy of the external client COC/analysis request • Updated employee titles • Updated Figures • Updated computer terms Parallax and Evolution to Laboratory Information Management System (LIMS) • Updated and clarified wording throughout document

LOMSOPES212_03.DOC
033106

Reference:

Environmental Quality Policy Manual, Lancaster Laboratories, Inc., current version.

Cross Reference:

Document	Document Title
LOM-SOP-LAB-220	Laboratory Notebooks, Logbooks, and Documentation
Form 2016	Secure Storage Chain of Custody Original Sample
Form 2102	Analysis Request/Environmental Services Chain of Custody
Form 2174	Sample Administration Receipt Documentation Log
Form 2231	Department Storage Chain of Custody Metals
Form 2236	Secure Storage Chain of Custody Leachates
Form 2237	Department Storage Chain of Custody Water Quality
Form 2349	Chain-of-Custody Transfer Record
Form 2354	Secure Storage Chain of Custody Supplemental Information
Form 2355	Secure Storage Chain of Custody Subsample
Form 2365	Master List of Chains of Custody
Form 2667	Sample Storage Off-Shift Entry Logbook

Purpose:

In order to demonstrate reliability of data which may be used as evidence in a legal case, required by a regulatory agency, or required by a client, an accurate written record tracing the possession of samples must be maintained from the time they are received at the laboratory until the last requested analysis is verified. The purpose of a chain of custody (COC) is to ensure traceability of samples while they are in the possession of the laboratory.

Scope:

This procedure describes the initiating and maintaining of COC documentation for samples that require this level of traceability. It applies to the Environmental Division of Lancaster Laboratories when a client or regulatory agency requests an accurate written record tracing the possession of samples from the time they are received at the laboratory until the last requested analysis is verified.

Definitions:

A sample is in custody if it is in any one of the following states:

1. In actual physical possession
2. In view after being in physical possession
3. Locked up so no one can tamper with it
4. In a secured area, restricted to authorized personnel (e.g., in the ASRS).

Personnel Training and Qualifications:

Training for this procedure consists of reading this SOP. Supervisory review of all COC documentation should be done until the trainer is satisfied that proficiency has been achieved. Training of all laboratory personnel is the responsibility of the department manager. Documentation that this training has been completed must be kept in the employee's training record.

Procedure:

NOTE: Many of the COC forms listed in this SOP are available on Lab Links; therefore, they are not attached to the end of this SOP. Forms 2016, 2231, 2236, 2237, 2349, 2354, 2355, 2365 should be printed from Lab Links when needed to ensure the latest version of the form is being used at all times.

A. Initial documentation

1. Chain-of-custody documentation shall be kept upon the request of the client or for any samples that are known to be involved in a legal dispute. As with all analytical data, it is extremely important that this documentation is filled out completely and accurately with every sample bottle transfer. Everyone who handles the COC is responsible to check for documentation compliance to the point of their acquisition. If changes need to be made to the COC, they must be made in accordance to the error correction procedure addressed in LOM-SOP-LAB-220. It is the responsibility of the person who made an error in documentation to correct the error.

2. If requested by the client, the COC documentation will begin with the preparation of sampling containers. The person packing the bottle order for shipment to the client initiates Form 2102 (Figure 1). If the delivery of containers is via Lancaster Laboratories Transportation Department, the Sample Container Record (SCR) Number (written on Form 2102, Section 6) will be utilized to track the person preparing the bottle order. The Lancaster Laboratories' drivers must sign Form 2102, Section 9 when they relinquish the bottles to the client. Drivers must also sign COC forms when they pick up samples from the client for transportation to the laboratory.

3. When samples arrive at the laboratory for analysis, a member of the Sample Administration (SA) personnel will receive them and sign the external COC form that accompanies the samples, if provided. If our Transportation department picked up the samples, the driver must sign the COC to relinquish the samples to Sample Administration.

4. The Sample Administration Group will track the custody of samples between receipt and entry into LIMS on Form 2174 (Figure 2). The client's sample designation will be used for identification purposes until a unique Lancaster Laboratories number is assigned.

5. Samples will be entered into the Sample Management System as described in *Environmental Quality Policy Manual.* Sample Administration will enter an analysis number for "Laboratory Chain of Custody" if requested. A lab note will print to inform analysts of the need for COC documentation. This note will also be automatically printed on the sample labels.

B. Creating the Internal COC

1. At the time of sample entry, Sample Administration personnel shall initiate Form 2365 for each sample group. They shall also initiate an Internal Laboratory Chain of Custody Form 2016 (Figure 3) for each type of bottle in the sample group.

2. The samples will then be temporarily stored in a secure location that is named SA HOLD. This change of custody from sample entry personnel to SA HOLD shall be documented on the chain, as well as any interim exchanges for rush analysis. The internal COC forms will then accompany the samples until the last requested analysis is verified.

3. If samples need to be checked out from the Sample Administration Group (for rush or short hold time analyses) before Lancaster Laboratories' numbers have been assigned to them, SA is responsible for starting a Form 2016 COC form. They will note the available header information and the samples being relinquished (documented by the client sample designation).

4. After the original copy of the external client COC/analysis request form is scanned into LIMS, it will be filed within Client Services. If requested, the original copy of the external client COC/analysis request form will be sent to Billing and Reporting to be sent to the client with their report.

C. Documentation of custody changes

1. The COC needs signed each time the sample bottle is placed into storage and removed from storage. The sample bottle exchange may be person to person or person to place, but never place to place. A person's signature is required on each line of the COC. Two examples of how to document changes in sample custody are shown in Figures 3 and 4. Each change-of-sample custody must be accurately documented in a consistent format. All signatures documenting changes of custody will use the following format:

Signatures: First initial, full last name, employee number
Date: Month/day/year
Time: Documented as military time
Ink: Black ink is preferred, red ink and pencil are not acceptable

a. The samples will be moved from temporary SA HOLD storage to the permanent storage area known as MAIN STORAGE. Sample Storage personnel shall document this transfer of custody from SA HOLD to MAIN STORAGE on the COC. Any movement within the MAIN STORAGE area itself is tracked through bar codes and a validated LIMS tracking system.

b. When an analyst receives samples from Main Storage, they must completely and accurately fill out the information requested on the COC for each sample bottle. In the technical areas, the COC needs signed each time the sample bottle physically changes hands.

c. When samples are returned to storage, this process must again be followed.

2. Sample handling should be kept to a minimum. Analysts requiring use of a sample will requisition it through the LIMS requisition program. During the hours when the Sample Storage area is staffed, Sample Support personnel will receive the computerized requisition and remove the sample from the ASRS. The Sample Support personnel will ensure that the sample number and bottle type listed on the COC form matches the sample number and bottle type being distributed.

3. Each analyst must accurately document each specific test (analysis) that is performed in conjunction with the associated sample numbers before the samples are returned to MAIN STORAGE.

4. When an analyst requires the use of samples during hours when the Sample Storage area is not normally staffed (such as weekends or holidays), the analyst must place a requisition for the required samples earlier in the day or on the previous day. The requisition should be for the real time and date needed.

   If a Sample Support staff member or a Sample Support designee is not available when an analyst needs the samples from MAIN STORAGE, he/she will contact the security person on duty to unlock the Main Storage unit. The analyst must sign Logbook Form 2667 (Figure 5) and fill out the required information to document entry into the storage unit. The security person must co-sign as a witness. Once the notebook is signed, the analyst may enter MAIN STORAGE and retrieve the samples. The analyst retrieving the samples must also completely and accurately fill out the information requested on the COC for each COC sample bottle.

   When the analyst is ready to return his/her samples to MAIN STORAGE, security must again be contacted. The process of signing Logbook Form 2667 must again be followed. The analyst returning the samples must again completely and accurately fill out the information requested on the COC for each COC sample bottle.

5. The following changes of custody will be handled as noted below:

   a. Documentation is required for all shift changes. Signatures involving transfers from one shift to another shall be the responsibility of the analyst who originally acquired the samples from MAIN STORAGE.

b. Occasionally, a sample container will be needed for analysis by an analyst in one department while it is in the custody of an analyst in another department. It will be the responsibility of the first person who received the sample to note on the COC the specific sample numbers requested by the second person and to sign the "Released By" column. The second person will sign the "Received By" column and note the time, date, and reason for sample transfer. After the second person is finished with the sample, the sample will be returned back to the first person or to MAIN STORAGE.

c. In situations when a sample group needs to be split between departments working on different analyses, Sample Support personnel are responsible for starting a Form 2354 supplemental COC. The supplemental chain will accompany that portion of the sample group that is needed by a second department, when the first department has part of the sample group and the original sample COC. This supplemental COC will be created only when absolutely necessary to minimize paperwork and confusion. This chain must also be documented on the master list of chains (Form 2365).

d. If COC samples are stored in other areas of the laboratory or in a specific department, they must be stored in a secured area. When samples are entered into to this area, the "Received By" column will be noted as "Department XX storage." When samples are taken from a departmental storage area, the "Released By" column of the COC is documented as "Department XX storage."

D. Additional COC issues

1. Analysts in possession of samples shall remove the aliquot required for their analysis and return the samples to MAIN STORAGE with a minimum of delay. During this time of possession, samples must fall under the definition of sample custody.

2. If additional containers of the sample are created (e.g., subsamples, extracts, distillates, leachates, digests, etc.), then an additional COC form must be created by the department if they do not document this information on the original COC form. This form will be marked with the container type and will be initiated to accompany the new sample container. Many departments in the lab have specifically designed COC forms that will be used if new containers are created (Forms 2231, 2236, 2237, 2355 are examples). All changes of custody involving new containers in the department (e.g., analysis, storage, vials on instruments, etc.) must be documented on a departmental specific COC form or on the original COC form.

E. Completion of the process

1. After sample analysis, COC samples shall be returned with their proper chains to the Sample Support Group as soon as possible. At this time, it is the responsibility of the Sample Support Group to review the COC forms to ensure that all documentation on the forms is complete before they file the forms in their area.

   All chains should either end with a note of "All Sample Consumed," "Discard," or "Storage" for the final reason of transfer.

2. All completed COC forms for the original sample containers will be retained in files within Sample Support until the Data Deliverables Group personnel retrieves these forms so a copy can be included in the data package. The personnel retrieving the COC needs to fill out Form 2349 so the Sample Support Group has a record of the COC leaving their area. The Data Deliverables Group also retrieves all departmental created COC forms so a copy can be included in the data package. The original copy of all COC forms will be retained on file by the laboratory.

   NOTE for the Data Deliverables Group personnel who collect COC forms for data packages: If you find a completed COC form that does not get a data package, send the COC form to the project manager for that account. The project manager will determine whether copies of the COCs get sent to the client with the reports.

3. All personnel who handle sample containers shall make every attempt to ensure that all changes of custody are accurately and completely documented. Disciplinary action may be taken for employees who fail to comply with these important requirements.

4. In the event that a signature or other information is inadvertently not recorded on a COC form, then the Sample Support Group and the Data Package Group, in conjunction with the technical groups, shall determine what information is missing. Checking computer requisition records, raw data, or the Sample Support work schedule are useful tools for this. The responsible party shall add the missing information or make the necessary correction at the bottom of the COC form, in addition to noting the situation that caused the error in documentation. The person making this note needs to sign and date the information using the current date. Any errors in COC documentation that cause noncompliances must be noted in the case narrative of the sample data package.

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Figure 1

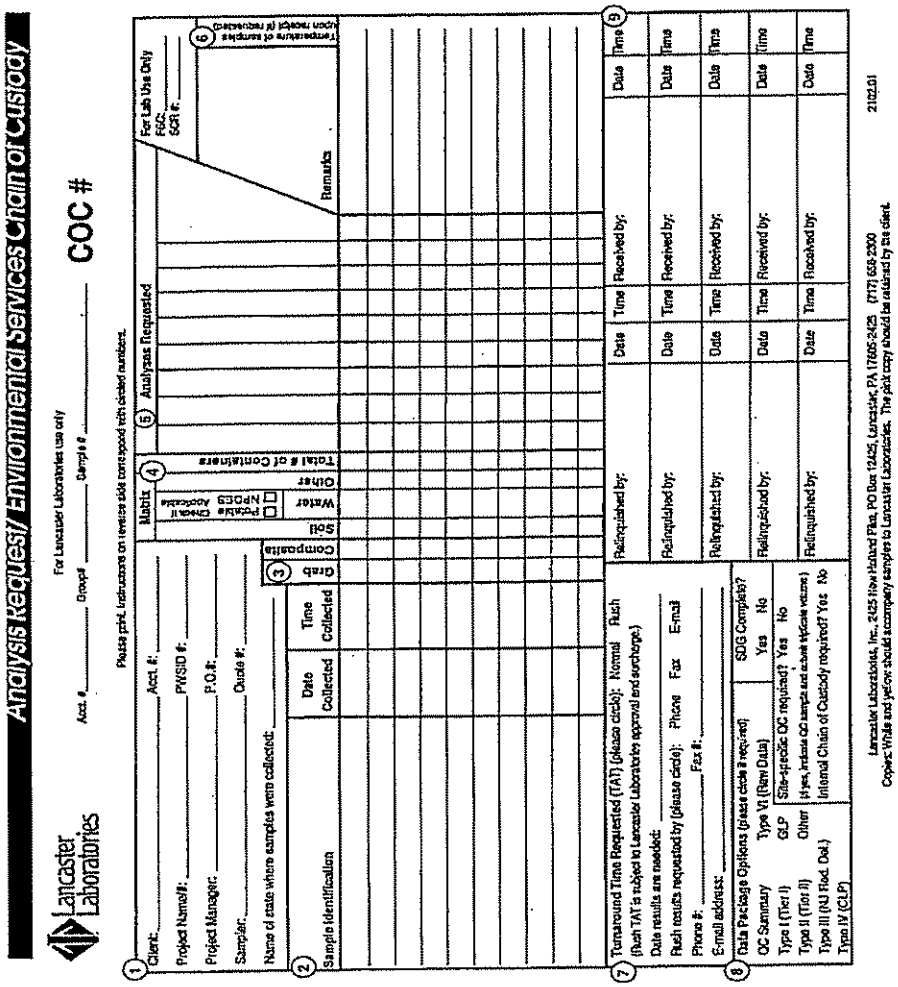

Figure 2

Lancaster Laboratories

Environmental Sample Administration
Receipt Documentation Log

Client/Project: _____ **Shipping Container Sealed:** Y / N

Date of Receipt: _____ **Custody Seal Present:** Y / N

Time of Receipt: _____ **Custody Seal Intact:** Y / N / NA

Source Code: _____ **Package:** Chilled / Not Chilled

Unpacker Emp. No.: _____

Temperature of Shipping Containers	
#1	#2
Thermometer ID: _____	Thermometer ID: _____
Temp.: _____	Temp.: _____
Temp. Bottle / Surface Temp.	Temp. Bottle / Surface Temp.
Wet Ice / Dry Ice / Ice Packs	Wet Ice / Dry Ice / Ice Packs
Ice Present? Y / N Loose / Bagged	Ice Present? Y / N Loose / Bagged
#3	#4
Thermometer ID: _____	Thermometer ID: _____
Temp.: _____	Temp.: _____
Temp. Bottle / Surface Temp.	Temp. Bottle / Surface Temp.
Wet Ice / Dry Ice / Ice Packs	Wet Ice / Dry Ice / Ice Packs
Ice Present? Y / N Loose / Bagged	Ice Present? Y / N Loose / Bagged

Paperwork Discrepancy/Unpacking Problems: _____

Sample Administration Internal Chain of Custody			
Name	Date	Time	Reason for Transfer
			Unpacking
			Place in Storage or Entry
			Remove from Storage
			Place in Storage or Entry
			Entry

2174.01

Figure 3

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Secure Storage Chain of Custody
Original Sample

Example

Client/Project: ABC Corporation

Sample # Range from Entry Group: 1234567 -70 SDG: ABC01

Preservative: None Matrix: water Bottle Type: OS

Sample Number(s) in Custody	Released By	Received By	Date of Transfer	Time of Transfer	Reason for Change of Custody	Dist., Extr., or Digest Chain Created (X)
1234567-70	S Green 108	SA HOLD	3/8/06	1205	Entry to Storage	
1234567-70	SA HOLD	A White 1002	3/8/06	1220	Sample transfer	
1234567-70	A White 1002	MAIN Storage	3/8/06	1235	Storage	
1234567,68,70	Main Storage	M Red 71AB	3/10/06	0845	Filter for silica	X
1234567,68,70	M Red 71AB	Main Storage	3/10/06	1115	Storage	
1234567-70	Main Storage	A Black 1043	3/10/06	1150	TDS	
1234567-70	A Black 1043	Main Storage	3/10/06	1710	Storage	

2016.02

Figure 4

Lancaster Laboratories

Department Storage Chain of Custody
Water Quality

Example

Circle One: Digest Distillate Extract (Filtrate) Subsample

Client/Project: ABC Corporation

Sample # Range from Entry Group: 1234567 -70

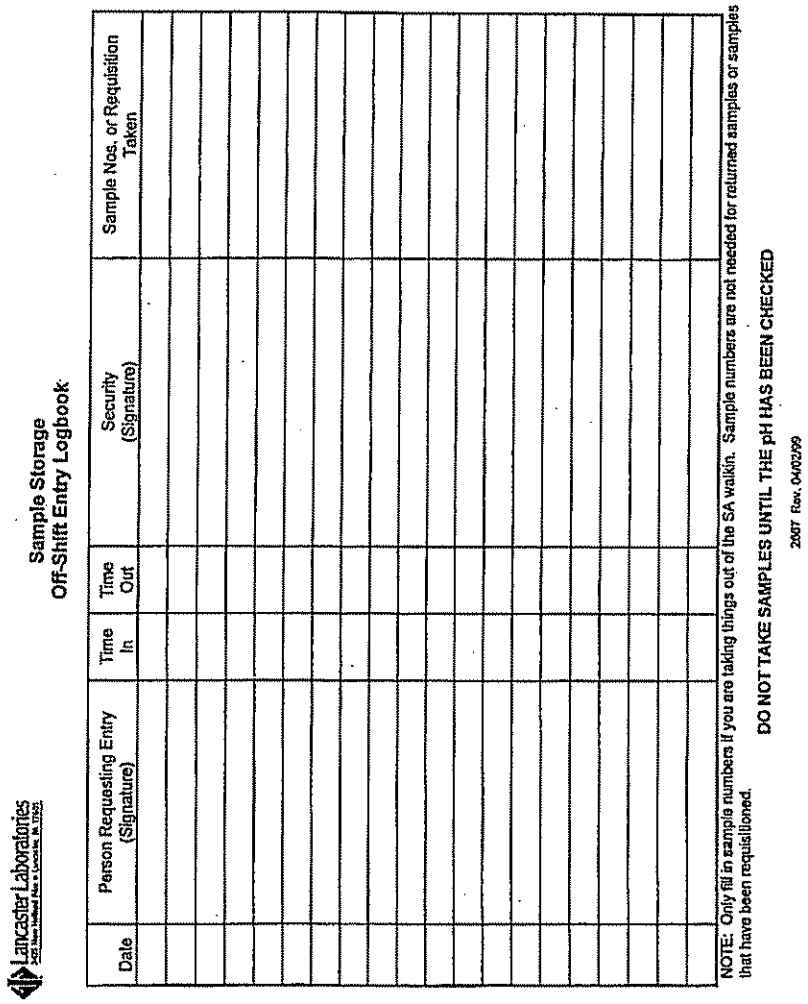
SDG: ABC01 Bottle Type: NA

Sample Number(s) in Custody	Released By	Received By	Date of Transfer	Time of Transfer	Reason for Change of Custody
1234567, 68, 70	M Reed 768	Dept 29 Storage	3/10/06	1030	storage
1234567, 68, 70	Dept 29 Storage	M Reed 768	3/12/06	0810	silica
1234567, 68, 70	M Reed 768	Dept 29 Storage	3/12/06	1105	Storage
1234567, 68, 70	Dept 29 Storage	S Purple 37	3/14/06	1635	Discard

3/12/06 mdh 768 (1)

2237.01

Figure 5



Lancaster Laboratories

Sample Storage
Off-Shift Entry Logbook

Date	Person Requesting Entry (Signature)	Time In	Time Out	Security (Signature)	Sample Nos. or Requisition Taken

NOTE: Only fill in sample numbers if you are taking things out of the SA walkin. Sample numbers are not needed for returned samples or samples that have been requisitioned.

DO NOT TAKE SAMPLES UNTIL THE pH HAS BEEN CHECKED

2007 Rev. 04/02/99

B4. Analytical Methods Requirements

The analytical procedures to be used for organics and inorganics are those described in the *USEPA SW-846 3rd Edition, Update III, 1996; Standard Methods for the Examination of Water and Wastewater, 20th edition;* and *Methods for the Chemical Analysis of Waters and Wastes, USEPA, 600/4-79-020* for the preparation and analysis of water, sediment, and soil for the client specified compounds. Copies of the analytical procedures are located in the laboratory and available for use by analysts. Copies of analytical methods are available upon request. Quantitation and detection limits for the following methods are noted in Tables B4-2 through B4-25. These are evaluated annually and are subject to change, as per the guidelines given in 40 CFR Part 136 Appendix B.

Inorganic Analysis

Metals by Inductively Coupled Plasma (ICP) – This is a technique for the simultaneous determination of elements in solution after acid digestion. The basis of the method is the measurement of atomic emission by an optical spectroscopic technique. Characteristic atomic line emission spectra are produced by excitation of the sample in a radio frequency inductively coupled plasma. Method 6010B, See Table B4-1 for list of elements and prep methods.

Mercury by Cold Vapor Atomic Absorption – Organic mercury compounds are oxidized and the mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of a spectrophotometer and absorbance (peak height) is measured. Method 7470A/7471A.

Metals by Inductively Coupled Plasma Mass Spectrometer (ICP/MS) – This is a technique for the simultaneous determination of elements in solution after acid digestion. The method involves the breakdown of molecules into elemental ions in a plasma followed by a mass spectrometric measurement. Characteristic mass spectra are produced by the element's natural isotopes. Method 6020.
See Table B4-1 for list of elements and prep methods.

Miscellaneous Wet Chemistry

Moisture – A known sample weight is placed in a drying oven maintained at 103° to 105°C for 8 to 24 hours. The sample is reweighed after drying and this value is divided by the original weight. The result is used to calculate analytical concentration on a dry-weight basis. Method 160.3 (modified).

Cyanide, total – Distillation of the sample releases the cyanide from cyanide complexes as HCN. The liberated HCN and simple cyanides are converted to cyanogen chloride by reaction with chloramine T. This reacts with pyridine and barbituric acid reagent to give a red colored complex. The absorbance is read at 570 nm and is compared to a standard curve using an automated spectrophotometer. Method 9012A.

Phenolics, total – This method is based on automated distillation of phenol and the subsequent reaction with 4-aminoantipyrine and ferriccyanide in basic buffer to produce a red colored complex. The absorbance is read at 505 nm and is compared to a standard curve using an automated spectrophotometer. Method 9066.

Sulfide, total – The sample is acidified and a known excess of iodine is added. The iodine reacts with sulfide in acid solution, oxidizing sulfide to sulfur. The excess iodine is back-titrated with sodium thiosulfate. SM20 4500 S_2F.

Total Petroleum Hydrocarbons – Samples are extracted with freon and the resulting solution is treated with silica gel to remove fatty acids and other polar compounds. The remaining nonpolar compounds are designated as petroleum hydrocarbons and are quantitatively measured using Fourier Transform Infrared Spectroscopy (FTIR), Method 418.1 (modified for soils).

Hexane Extractable Materials (HEM) – For HEM a one liter sample is acidified to a pH <2 and serially extracted with *n*-hexane in a separatory funnel. The solvent is evaporated from the extract, and the residual HEM is weighed. For SGT-HEM a one liter sample is serially extracted with *n*-hexane in a separatory funnel. The extract is mixed with silica gel, filtered through sodium sulfate, the solvent evaporated from the extract, and the residual SGT-HEM is weighed. Method 1664A.

Total Organic Carbon (TOC) – Following acidification, the sample is purged with nitrogen to remove inorganic carbon. Persulfate is injected to oxidize organic carbon to carbon dioxide which is detected by IR. Method 9060.

Total Nitrite/Nitrate – Using an autoanalyzer, the sample is passed through a column containing granulated copper-cadmium to reduce nitrate to nitrite. The nitrite ion reacts with sulfanilamide to yield a diazo compound which couples with *n*-1-naphylethylenediamine dihydrochloride to form a soluble, highly colored dye. The absorbance is read at 540 nm and compared to a standard curve. Method 353.2.

Organic Analysis

Volatiles by GC/MS – This method determines the concentration of volatile (purgeable) organics. The analysis is based on purging the volatiles onto a Tenax/silica gel trap, desorbing the volatiles onto a gas chromatographic column which separates them and identifying the separated components with a mass spectrometer. Method 8260B/5030B/5035.

Semivolatiles by GC/MS – This method determines the concentration of semivolatile organic compounds that are separated into an organic solvent and are amenable to gas chromatography. The method involves solvent extraction of the sample to isolate analytes and GC/MS analysis to determine semivolatile compounds present in the sample. Method 8270C/3550B/3510C.

Volatiles by GC – This method determines the concentration of volatile (purgeable) organic compounds. The analysis is based on purging the volatiles from the sample onto an appropriate sorbent trap and desorbing the volatiles onto a gas chromatographic column. Using an appropriate temperature program, the compounds are separated by the column and both qualitative and quantitative detection is achieved with a photoionization and/or electrolytic conductivity detector. Method 8021B/5030B/5035. Non-halogenated organics are analyzed by flame ionization detectors. Method 8015B/5030B/5035.

TPH-GRO – This method determines the concentration of gasoline range organics (2-methylpentane to 1,2,4-trimethylbenzene). The analysis is based on purging the volatiles from the sample onto an appropriate sorbent trap and desorbing the volatiles onto a gas chromatographic column. Using an appropriate temperature program, the compounds are separated by the column and both qualitative and quantitative detection is achieved with a flame ionization detector. BTEX may be determined simultaneously on systems equipped with a photoionization detector in tandem with the FID. Method 8015B/5030B/5035.

TPH-DRO – This method determines the concentration of diesel range organics (C-10 to C-28 hydrocarbons). The procedure includes solvent extraction of the sample and analysis of the extract on a gas chromatograph/flame ionization detector (GC/FID) using a megabore capillary column. Method 8015B.

Pesticides, PCBs, and Herbicides – These methods determine the concentration of organochloride pesticides, polychlorinated biphenyls, herbicides, and organophosphate pesticides. The procedures include solvent extraction of the sample, analysis of the extract on a gas chromatograph/electron capture detector (GC/EC) using a capillary column, and confirmation on a GC/EC using a second capillary column. A nitrogen-phosphorus detector is used for organophosphates. If the compound concentration is sufficient, confirmation may be performed on GC/MS upon request. Pesticides methods 8081A/3550B/3510C and 8141A/3550B/3510C. PCBs Method 8082/3550B/3510C. Herbicides Method 8151A/3550B.

PAHs by HPLC – The sample aliquot is extracted with methylene chloride. The extract is filtered (soils), dried, concentrated by evaporation and exchanged into acetonitrile. The extract is analyzed by reverse-phase HPLC with both UV and fluorescence detectors. Methods 8310/3550B/3510C.

Table B4-1
Inorganic Analytical Method Numbers

	ICP	ICP/MS
Aluminum	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Antimony	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Arsenic	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Barium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Beryllium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Cadmium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Calcium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Chromium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Cobalt	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Copper	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Iron	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Lead	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Magnesium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Manganese	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Molybdenum	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Nickel	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Potassium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Selenium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Silver	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Sodium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Thallium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Tin	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Vanadium	6010B/3005A/3010/3050B	6020/3010MOD/3050B
Zinc	6010B/3005A/3010/3050B	6020/3010MOD/3050B

The number of parameters analyzed and the method used will be determined by the site-specific requirements.

Mercury by Cold Vapor – 7470A/7471A.

Table B4-2
Metals Compound List (TAL)

Analyte	Waters		Soils**	
	LOQ* (mg/L)	MDL (mg/L)	LOQ* (mg/kg)	MDL (mg/kg)
Aluminum	0.2	0.08	20	3.4
Antimony	0.02	0.0097	2.	0.9
Arsenic	0.02	0.01	2.	0.91
Barium	0.005	0.00062	0.5	0.023
Beryllium	0.005	0.00094	0.5	0.068
Cadmium	0.005	0.00091	0.5	0.065
Calcium	0.2	0.1	20	13
Chromium	0.015	0.0023	1.5	0.58
Cobalt	0.005	0.0021	0.5	0.13
Copper	0.01	0.0022	1.	0.18
Iron	0.2	0.052	20	4.7
Lead	0.015	0.00685	1.5	0.441
Magnesium	0.1	0.014	10	1.9
Manganese	0.005	0.00036	0.5	0.056
Molybdenum	0.010	0.0056	1.0	0.0105
Mercury[1]	0.0002	0.000056	0.100	0.0105
Nickel	0.01	0.0056	1.	0.61
Potassium	0.5	0.05	50	3.3
Selenium	0.02	0.0094	2.	0.98
Silver	0.005	0.0016	0.5	0.17
Sodium	1.	0.43	100	35
Thallium	0.020	0.0135	2.00	1.33
Vanadium	0.005	0.0015	0.5	0.16
Zinc	0.02	0.0081	2.	0.66
Cyanide, total[2]	0.01	0.005	0.5	0.18

Analyzed by ICP

1Analyzed by Cold Vapor

[2]Analyzed by automated spectrophotometer

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis, will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQs and MDLs are evaluated annually and subject to change.

Table B4-3
Inorganic Priority Pollutants List

Analyte	Waters		Soils***	
	LOQ** (mg/L)	MDL (mg/L)	LOQ** (mg/kg)	MDL (mg/kg)
Antimony	0.02	0.0097	2.	0.9
Arsenic	0.02	0.01	2.	0.91
Beryllium	0.005	0.00094	0.5	0.068
Cadmium	0.005	0.00091	0.5	0.065
Chromium	0.015	0.0023	1.5	0.58
Copper	0.01	0.0022	1.	0.18
Lead	0.015	0.00685	1.5	0.441
Mercury*	0.0002	0.000056	0.100	0.0105
Nickel	0.01	0.0056	1.	0.61
Selenium	0.02	0.0094	2.	0.98
Silver	0.005	0.0016	0.5	0.17
Thallium	0.020	0.0135	2.00	1.33
Zinc	0.02	0.0081	2.	0.66
Cyanide, total†	0.01	0.005	0.5	0.18
Phenolics, total†	0.03	0.009	3.5	1.2

*Mercury is analyzed by Cold Vapor.

Except for Cyanide, Phenolics, and Mercury, all other elements analyzed by ICP.

†Cyanide and Phenolics analyzed by distillation followed by automated colorimetry.

**Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

***Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-4
Inorganic Appendix IX Analyte List

Analyte	Waters		Soils***	
	LOQ** (mg/L)	MDL (mg/L)	LOQ** (mg/kg)	MDL (mg/kg)
Antimony	0.02	0.0085	2.	0.66
Arsenic	0.01	0.0049	1.	0.5
Barium	0.005	0.00042	0.5	0.032
Beryllium	0.005	0.00034	0.5	0.059
Cadmium	0.005	0.00087	0.5	0.054
Chromium	0.005	0.0022	0.5	0.2
Cobalt	0.005	0.0016	0.5	0.14
Copper	0.01	0.0021	1.	0.19
Lead	0.02	0.0093	2.	0.79
Mercury*	0.0002	0.00016	0.1	0.0028
Nickel	0.01	0.0038	1.	0.2
Selenium	0.01	0.0047	1.	0.47
Silver	0.005	0.0018	0.5	0.15
Thallium	0.02	0.0089	2.	0.93
Tin	0.02	0.005	10.	0.41
Vanadium	0.005	0.0017	0.5	0.16
Zinc	0.005	0.0041	2.	0.18
Cyanide, total†	0.01	0.005	0.5	0.18
Sulfide, total††	2.	0.53	30	8.4

*Mercury is analyzed by Cold Vapor.

Except for Cyanide, Sulfide, and Mercury, all other elements are analyzed by ICP.

†Cyanide is analyzed by distillation followed by automated colorimetry.

††Sulfide is analyzed by 9034 (modified), titrimetric analysis.

**Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

***Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-5
Metals by ICP/MS List

Analyte	Waters		Soils***	
	LOQ** (mg/L)	MDL (mg/L)	LOQ** (mg/kg)	MDL (mg/kg)
Aluminum	0.1	0.013	10	0.74
Antimony	0.001	0.000038	0.1	0.005
Arsenic	0.002	0.00067	0.2	0.017
Barium	0.0005	0.000072	0.5	0.094
Beryllium	0.0002	0.000052	0.02	0.0028
Cadmium	0.00025	0.000099	0.025	0.0038
Calcium	0.075	0.023	75	18
Chromium	0.002	0.00026	0.2	0.031
Cobalt	0.0001	0.000012	0.01	0.00013
Copper	0.001	0.0002	0.1	0.035
Iron	0.075	0.025	20	2.1
Lead	0.001	0.000047	0.1	0.015
Magnesium	0.01	0.003	2.	0.43
Manganese	0.00075	0.00013	0.2	0.016
Molybdenum	0.001	0.000031	0.1	0.0044
Nickel	0.0002	0.00043	0.2	0.05
Potassium	0.05	0.011	5	0.6
Selenium	0.002	0.0005	0.2	0.037
Silver	0.0005	0.000023	0.05	0.0035
Sodium	0.2	0.067	20	5
Strontium	0.0005	0.000074	0.1	0.0098
Thallium	0.0005	0.000037	0.05	0.00094
Tin	0.0005	0.00013	1.	0.07
Titanium	0.001	0.00031	0.2	0.036
Vanadium	0.005	0.0011	0.05	0.0029
Zinc	0.015	0.0017	2.	0.25

**Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

***Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

Method 6020 (ICP/MS) – LOQ and MDLs are evaluated annually and subject to change.

Table B4-6
Miscellaneous Chemistry Analyte List

Parameter	Waters		Soils**	
	LOQ* (mg/L)	MDL (mg/L)	LOQ* (mg/kg)	MDL (mg/kg)
Cyanide, total	0.01	0.005	0.5	0.18
Hexane Extractable Materials (1664A)	5.	1.4	N/A	N/A
Moisture	N/A	N/A	0.5 wt.%	0.5 wt.%
Phenolics, total	0.04	0.012	3.5	1.2
Sulfide, total	2.	0.53	N/A	N/A
TOC	2.	0.5	170	60
Total Nitrite/Nitrate	0.1	0.04	N/A	N/A
TPH (418.1)	1.5	0.5	69	23

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-7
Volatile Full Compound List by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Dichlorodifluoromethane	5.	2.	5.	2.
Chloromethane	5.	1.	5.	2.
Vinyl Chloride	5.	1.	5.	1.
Bromomethane	5.	1.	5.	2.
Chloroethane	5.	1.	5.	2.
Trichlorofluoromethane	5.	2.	5.	2.
1,1-Dichloroethene	5.	0.8	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
Methylene Chloride	5.	2.	5.	2.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
2,2-Dichloropropane	5.	1.	5.	1.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
Chloroform	5.	0.8	5.	1.
Bromochloromethane	5.	1.	5.	1.
1,1,1-Trichloroethane	5.	0.8	5.	1.
Carbon Tetrachloride	5.	1.	5.	1.
1,1-Dichloropropene	5.	1.	5.	1.
Benzene	5.	0.5	5.	0.5
1,2-Dichloroethane	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
Dibromomethane	5.	1.	5.	1.
Bromodichloromethane	5.	1.	5.	1.
Toluene	5.	0.7	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
Tetrachloroethene	5.	0.8	5.	1.
1,3-Dichloropropane	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
1,2-Dibromoethane	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
1,1,1,2-Tetrachloroethane	5.	1.	5.	1.
Ethylbenzene	5.	0.8	5.	1.

Table B4-7 – Continued
Volatile Full Compound List by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
m+p-Xylene	5.	0.8	5.	1.
o-Xylene	5.	0.8	5.	1.
Styrene	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
Isopropylbenzene	5.	1.	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
Bromobenzene	5.	1.	5.	1.
1,2,3-Trichloropropane	5.	1.	5.	1.
n-Propylbenzene	5.	1.	5.	1.
2-Chlorotoluene	5.	1.	5.	1.
1,3,5-Trimethylbenzene	5.	1.	5.	1.
4-Chlorotoluene	5.	1.	5.	1.
tert-Butylbenzene	5.	1.	5.	1.
1,2,4-Trimethylbenzene	5.	1.	5.	1.
sec-Butylbenzene	5.	1.	5.	1.
p-Isopropyltoluene	5.	1.	5.	1.
1,3-Dichlorobenzene	5.	1.	5.	1.
1,4-Dichlorobenzene	5.	1.	5.	1.
n-Butylbenzene	5.	1.	5.	1.
1,2-Dichlorobenzene	5.	1.	5.	1.
1,2-Dibromo-3-chloropropane	5.	2.	5.	2.
1,2,4-Trichlorobenzene	5.	1.	5.	1.
Hexachlorobutadiene	5.	2.	5.	2.
Naphthalene	5.	1.	5.	1.
1,2,3-Trichlorobenzene	5.	1.	5.	1.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-8

Volatile Priority Pollutant Compound List by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,1,1-Trichloroethane	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
1,1-Dichloroethene	5.	0.8	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
2-Chloroethylvinyl ether	10	2.	10	2.
Acrolein	100	40	100	20
Acrylonitrile	20	4.	20	4.
Benzene	5.	0.5	5.	0.5
Bromodichloromethane	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
Bromomethane	5.	1.	5.	2.
Carbon tetrachloride	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Chloroethane	5.	1.	5.	2.
Chloroform	5.	0.8	5.	1.
Chloromethane	5.	1.	5.	2.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
cis-1,3-Dichloropropene	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
Ethylbenzene	5.	0.8	5.	1.
Methylene chloride	5.	2.	5.	2.
Tetrachloroethene	5.	0.8	5.	1.
Toluene	5.	0.7	5.	1.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
Trichlorofluoromethane	5.	2.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Xylene (total)	5.	0.8	5.	1.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-9
Appendix IX Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Chloromethane	5.	1.	5.	2.
Bromomethane	5.	1.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Dichlorodifluoromethane	5.	2.	5.	2.
Chloroethane	5.	1.	5.	2.
Methyl iodide	5.	1.	5.	3.
Acrolein	100	40	100	20
Acrylonitrile	20	4.	20	4.
Acetonitrile	100	25	100	25
Methylene chloride	5.	2.	5.	2.
Acetone	20	6.	20	7.
Trichlorofluoromethane	5.	2.	5.	2.
Carbon disulfide	5.	1.	5.	1.
Propionitrile	100	30	100	30
1,1-Dichloroethene	5.	0.8	5.	1.
Allyl chloride	5.	1.	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
Chloroform	5.	0.8	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
Methacrylonitrile	50	10	50	5.
2-Butanone	10	3.	10	4.
Dibromomethane	5.	1.	5.	1.
1,1,1-Trichloroethane	5.	0.8	5.	1.
1,4-Dioxane	250	70	250	70
Carbon tetrachloride	5.	1.	5.	1.
Isobutyl alcohol	250	100	250	100
Vinyl acetate	10	2.	10	2.
Bromodichloromethane	5.	1.	5.	1.
2-Chloro-1,3-butadiene	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.

Table B4-9 – Continued
Appendix IX Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Trichloroethene	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
1,2-Dibromoethane	5.	1.	5.	1.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
Benzene	5.	0.5	5.	0.5
cis-1,3-Dichloropropene	5.	1.	5.	1.
Methyl methacrylate	5.	1.	5.	1.
1,1,1,2-Tetrachloroethane	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
trans-1,4-Dichloro-2-butene	50	15	50	10
1,2,3-Trichloropropane	5.	1.	5.	1.
2-Hexanone	10	3.	10	3.
4-Methyl-2-pentanone	10	3.	10	3.
Tetrachloroethene	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
Toluene	5.	0.7	5.	1.
Ethyl methacrylate	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Pentachloroethane	5.	1.	5.	1.
Ethylbenzene	5.	0.8	5.	1.
1,2-Dibromo-3-chloropropane	5.	2.	5.	2.
Styrene	5.	1.	5.	1.
Xylenes (total)	5.	0.8	5.	1.

For samples preserved with 1:1 HCl to pH <2, low recovery of acid labile compounds is likely to occur.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDL are evaluated annually and subject to change.

Table B4-10
TCL3.2 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Chloromethane	5.	1.	5.	2.
Bromomethane	5.	1.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Chloroethane	5.	1.	5.	2.
Methylene chloride	5.	2.	5.	2.
Acetone	20	6.	20	7.
Carbon disulfide	5.	1.	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
1,1-Dichloroethene	5.	0.8	5.	1.
Chloroform	5.	0.8	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
2-Butanone	10	3.	10	4.
1,1,1-Trichloroethane	5.	0.8	5.	1.
Carbon tetrachloride	5.	1.	5.	1.
Bromodichloromethane	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
Dibromochloromethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
Benzene	5.	0.5	5.	0.5
cis-1,3-Dichloropropene	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
2-Hexanone	10	3.	10	3.
4-Methyl-2-pentanone	10	3.	10	3.
Tetrachloroethene	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.

Table B4-10 – Continued

TCL3.2 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Toluene	5.	0.7	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Ethylbenzene	5.	0.8	5.	1.
Styrene	5.	1.	5.	1.
Xylenes (total)	5.	0.8	5.	1.
cis-1,2-Dichloroethene	5.	0.8	5.	1.

For samples preserved with 1:1 HCl to pH <2, low recovery of acid labile compounds is likely to occur.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDL are evaluated annually and subject to change.

Table B4-11
TCL4.3 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,1,1-Trichloroethane	5.	0.8	5.	1.
1,1,2,2-Tetrachloroethane	5.	1.	5.	1.
1,1,2-Trichloroethane	5.	0.8	5.	1.
1,1-Dichloroethene	5.	0.8	5.	1.
1,1-Dichloroethane	5.	1.	5.	1.
1,2,4-Trichlorobenzene	5.	1.	5.	1.
1,2-Dibromo-3-chloropropane	5.	2.	5.	2.
1,2-Dibromoethane	5.	1.	5.	1.
1,2-Dichlorobenzene	5.	1.	5.	1.
1,2-Dichloroethane	5.	1.	5.	1.
1,2-Dichloropropane	5.	1.	5.	1.
1,3-Dichlorobenzene	5.	1.	5.	1.
1,4-Dichlorobenzene	5.	1.	5.	1.
2-Butanone	10	3.	10	4.
2-Hexanone	10	3.	10	3.
4-Methyl-2-pentanone	10	3.	10	3.
Acetone	20	6.	20	7.
Benzene	5.	0.5	5.	0.5
Bromodichloromethane	5.	1.	5.	1.
Bromoform	5.	1.	5.	1.
Bromomethane	5.	1.	5.	2.
Carbon disulfide	5.	1.	5.	1.
Carbon tetrachloride	5.	1.	5.	1.
Chlorobenzene	5.	0.8	5.	1.
Chloroethane	5.	1.	5.	2.
Chloroform	5.	0.8	5.	1.
Chloromethane	5.	1.	5.	2.
cis-1,2-Dichloroethene	5.	0.8	5.	1.
cis-1,3-Dichloropropene	5.	1.	5.	1.
Cyclohexane	5.	2.	5.	1.

Table B4-11 – Continued
TCL4.3 Volatile Compounds by GC/MS (8260B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Dibromochloromethane	5.	1.	5.	1.
Dichlorodifluoromethane	5.	2.	5.	2.
Ethylbenzene	5.	0.8	5.	1.
Freon 113	10	2.	10	2.
Isopropylbenzene	5.	1.	5.	1.
Methyl Acetate	5.	1.	5.	2.
Methyl *t*-butyl ether	5.	0.5	5.	0.5
Methylcyclohexane	5.	1.	5.	1.
Methylene chloride	5.	2.	5.	2.
Styrene	5.	1.	5.	1.
Tetrachloroethene	5.	0.8	5.	1.
Toluene	5.	0.7	5.	1.
trans-1,2-Dichloroethene	5.	0.8	5.	1.
trans-1,3-Dichloropropene	5.	1.	5.	1.
Trichloroethene	5.	1.	5.	1.
Trichlorofluoromethane	5.	2.	5.	2.
Vinyl chloride	5.	1.	5.	1.
Xylenes (total)	5.	0.8	5.	1.

For samples preserved with 1:1 HCl to pH <2, low recovery of acid labile compounds is likely to occur.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDL are evaluated annually and subject to change.

Table B4-12
Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Acenaphthene	5	1.	170	33
Acenaphthylene	5	1.	170	33
Acetophenone	5	2.	170	67
Aramite[2]	15	5.	1700	33
2-Acetylaminofluorene	5	2.	170	67
4-Aminobiphenyl	5	2.	500	170
Aniline	5	1.	500	170
Anthracene	5	1.	170	33
Benzidine	60	20	3300	1200
Benzo(a)anthracene	5	1.	170	33
Benzo(b)fluoranthene	5	1.	170	33
Benzo(k)fluoranthene	5	1.	170	33
Benzo(g,h,i)perylene	5	1.	170	33
Benzo(a)pyrene	5	1.	170	33
Benzyl alcohol	15	5.	500	170
bis (2-Chloroethoxy)methane	5	1.	170	33
bis(2-Chloroethyl)ether	5	1.	170	33
bis(2-Chloroisopropyl)ether	5	1.	170	33
bis(2-Ethylhexyl)phthalate	5	2.	330	67
4-Bromophenyl phenylether	5	1.	170	33
Butylbenzylphthalate	5	2.	170	67
4-Chloroaniline	5	1.	170	67
Carbazole	5	1.	170	33
Chlorobenzilate	10	3.	170	33
4-Chloro-3-methylphenol	5	1.	170	67
2-Chloronaphthalene	5	2.	170	33
2-Chlorophenol	5	1.	170	33
4-Chlorophenyl phenylether	5	2.	170	33
Chrysene	5	1.	170	33
2-Methylnaphthalene	5	1.	170	33
3 or 4-methyl phenol[3]	5	2.	170	67

Table B4-12 – Continued
Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Diallate (*cis/trans*)	5	1.	170	33
Dibenzofuran	5	1.	170	33
Di-*n*-butylphthalate	5	2.	170	67
Dibenz(a,h)anthracene	5	1.	170	33
1,2-Dichlorobenzene	5	1.	170	33
1,3-Dichlorobenzene	5	1.	170	33
1,4-Dichlorobenzene	5	1.	170	33
3,3'-Dichlorobenzidine	5	2.	330	100
2,4-Dichlorophenol	5	1.	170	33
2,6-Dichlorophenol	5	2.	170	67
Diethylphthalate	5	2.	170	67
Dimethoate	10	3.	500	170
p-(Dimethylamino)azobenzene	5	2.0	170	67
7,12-Dimethylbenz(a)anthracene	5	2.	170	33
3,3'-Dimethylbenzidine	25	10.	1000	330
a,a-Dimethylphenethylamine[2]	50	2.	1700	100
2,4-Dimethylphenol	10	3.	170	67
Dimethylphthalate	5	2.	170	67
1,3-Dinitrobenzene	5	2.	170	67
4,6-Dinitro-2-methylphenol	15	5.	500	170
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	5	1.	170	67
2,6-Dinitrotoluene	5	1.	170	33
Di-*n*-octylphthalate	5	2.	170	67
1,2-Diphenylhydrazine[4]	5	1.	170	33
Ethylmethanesulfonate	5	2.	170	67
Fluoranthene	5	1.	170	33
Fluorene	5	1.	170	33
Hexachlorobenzene	5	1.	170	33
Hexachlorobutadiene	5	1.	170	67
Hexachlorocyclopentadiene	15	5.	500	170
Hexachloroethane	5	1.	170	33

Table B4-12 – Continued
Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Hexachloropropene	5	2.	330	100
Indeno(1,2,3-cd)pyrene	5	1.	170	33
Isodrin	5	1.	170	33
Isophorone	5	1.	170	33
Isosafrole	5	2.	170	67
Methapyrilene	50	15	5000	1700
3-Methylcholanthrene	5	2.	170	67
Methylmethanesulfonate	5	1.	170	33
2-Methylphenol	5	1.	170	67
1-Methylnaphthalene	5	1.	170	33
2-Methylnaphthalene	5	1.	170	33
Naphthalene	5	1.	170	33
1,4-Naphthoquinone	30	10	3300	830
1-Naphthylamine	15	5.	500	170
2-Naphthylamine	15	5.	500	170
2-Nitroaniline	5	1.	170	33
3-Nitroaniline	5	1.	170	67
4-Nitroaniline	5	1.	170	67
Nitrobenzene	5	1.	170	33
2-Nitrophenol	5	1.	170	33
4-Nitrophenol	30	10	500	170
4-Nitroquinoline-1-oxide	60	20	1000	330
n-Nitrosodi-*n*-butylamine	5	2.	170	67
n-Nitrosodiethylamine	5	2.	170	67
n-Nitrosodimethylamine	5	2.	170	67
n-Nitrosodiphenylamine[1]	5	2.	170	33
n-Nitrosodi-*n*-propylamine	5	1.	170	33
n-Nitrosomethylethylamine	5	2.	170	67
n-Nitrosomorpholine	5	2.	170	67
n-Nitrosopiperidine	5	2.	170	67
n-Nitrosopyrrolidine	5	2.	170	67
5-Nitro-*o*-toluidine	5	3.	500	170

Table B4-12 – Continued
Semivolatile Full Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
2,2'-oxybis(1-Chloropropane)	5	1.	170	33
Pentachlorobenzene	5	2.	170	67
Pentachloronitrobenzene	5	2.	170	67
Pentachlorophenol	15	3.	500	170
Phenacetin	5	2.	170	67
Phenanthrene	5	1.	170	33
Phenol	5	1.	170	33
1,4-Phenylenediamine	250	75	33000	12000
2-Picoline	5	2.	330	100
Pronamide	5	1.	170	33
Pyrene	5	1.	170	33
Pyridine	5	2.	170	67
Safrole	5	2.	170	67
1,2,4,5-Tetrachlorobenzene	5	2.	170	67
2,3,4,6-Tetrachlorophenol	5	2.	170	67
Tetraethyldithiopyrophosphate	5	1.	170	67
Thionazin	5	2.	170	67
o-Toluidine	5	1.	670	200
1,2,4-Trichlorobenzene	5	1.	170	33
2,4,5-Trichlorophenol	5	1.	170	67
2,4,6-Trichlorophenol	5	1.	170	33
O,O,O-Triethylphosphorothioate	5	2.	170	67
1,3,5-Trinitrobenzene	15	5.	500	170

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1]*n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

[2]Aramite and a,a-dimethylphenethylamine can be determined upon request.

[3]3-methylphenol and 4-methylphenol cannot be resolved under this analysis. The combined total of both compounds is reported as 4-methylphenol.

[4]1,2-Diphenylhydrazine cannot be distinguished from azobenzene, therefore, the value reported represents the combined total of both.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-13

Semivolatile Priority Pollutant Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
2-Chlorophenol	5	1.	170	33
Phenol	5	1.	170	33
2-Nitrophenol	5	1.	170	33
2,4-Dimethylphenol	10	3	170	33
2,4-Dichlorophenol	5	1.	170	67
4-Chloro-3-methylphenol	5	1.	170	67
2,4,6-Trichlorophenol	5	1.	170	33
2,4-Dinitrophenol	60	20	2000	670
4-Nitrophenol	30	10	500	170
4,6-Dinitro-2-methylphenol	15	5.	500	170
Pentachlorophenol	15	3.	500	170
n-Nitrosodimethylamine	5	2.	330	67
bis(2-Chloroethyl)ether	5	1.	170	33
1,3-Dichlorobenzene	5	1.	170	33
1,4-Dichlorobenzene	5	1.	170	33
1,2-Dichlorobenzene	5	1.	170	33
bis(2-Chloroisopropyl)ether	5	1.	170	33
Hexachloroethane	5	1.	170	33
n-Nitrosodi-*n*-propylamine	5	1.	170	33
Nitrobenzene	5	1.	170	33
Isophorone	5	1.	170	33
bis (2-Chloroethoxy)methane	5	1.	170	33
1,2,4-Trichlorobenzene	5	1.	170	33
Naphthalene	5	1.	170	33
Hexachlorobutadiene	5	1.	170	67
Hexachlorocyclopentadiene	15	5.	500	170
2-Chloronaphthalene	5	2	170	33
Acenaphthylene	5	1.	170	33
Dimethylphthalate	5	2.	170	67
2,6-Dinitrotoluene	5	1.	170	33
Acenaphthene	5	1.	170	33
2,4-Dinitrotoluene	5	1.	170	67

Table B4-13 – Continued
Semivolatile Priority Pollutant Compound List by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Fluorene	5	1.	170	33
4-Chlorophenyl phenylether	5	2	170	33
Diethylphthalate	5	2.	170	67
1,2-Diphenylhydrazine	5	1.	170	33
n-Nitrosodiphenylamine[1]	5	2.	170	33
4-Bromophenyl phenylether	5	1.	170	33
Hexachlorobenzene	5	1.	170	33
Phenanthrene	5	1.	170	33
Anthracene	5	1.	170	33
Di-*n*-butylphthalate	5	2.	170	67
Fluoranthene	5	1.	170	33
Pyrene	5	1.	170	33
Benzidine	60	20	3300	1200
Butylbenzylphthalate	5	2.	170	67
Benzo(a)anthracene	5	1.	170	33
Chrysene	5	1.	170	33
3,3'-Dichlorobenzidine	5	2	330	100
bis(2-Ethylhexyl)phthalate	5	2.	330	67
Di-*n*-octylphthalate	5	2.	170	67
Benzo(b)fluoranthene	5	1.	170	33
Benzo(k)fluoranthene	5	1.	170	33
Benzo(a)pyrene	5	1.	170	33
Indeno(1,2,3-cd)pyrene	5	1.	170	33
Dibenz(a,h)anthracene	5	1.	170	33
Benzo(g,h,i)perylene	5	1.	170	33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1]*n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-14
Appendix IX Semivolatile Compounds by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Acenaphthene	5	1.	170	33
Acenaphthylene	5	1.	170	33
Acetophenone	5	2.	170	67
2-Acetylaminofluorene	5	2.	170	67
4-Aminobiphenyl	5	2.	500	170
Aniline	5	1.	500	170
Anthracene	5	1.	170	33
Aramite[2]	15	5	1700	33
Benzo(a)anthracene	5	1.	170	33
Benzo(b)fluoranthene	5	1.	170	33
Benzo(k)fluoranthene	5	1.	170	33
Benzo(g,h,i)perylene	5	1.	170	33
Benzo(a)pyrene	5	1.	170	33
Benzyl alcohol	15	5.	500	170
bis (2-Chloroethoxy)methane	5	1.	170	33
bis(2-Chloroethyl)ether	5	1.	170	33
bis(2-Chloroisopropyl)ether	5	1.	170	33
bis(2-Ethylhexyl)phthalate	5	2.	330	67
4-Bromophenyl phenylether	5	1.	170	33
Butylbenzylphthalate	5	2.	170	67
4-Chloroaniline	5	1.	170	67
Chlorobenzilate	10	3.	170	33
4-Chloro-3-methylphenol	5	1.	170	67
2-Chloronaphthalene	5	2	170	33
2-Chlorophenol	5	1.	170	33
4-Chlorophenyl phenylether	5	2	170	33
Chrysene	5	1.	170	33
2-Methylphenol	5	1.	170	67
3- or 4-Methylphenol[3]	5	2.	170	67
Diallate (*cis/trans*)	5	1.	170	33
Dibenzofuran	5	1.	170	33

Table B4-14 – Continued
Appendix IX Semivolatile Compounds by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Di-*n*-butylphthalate	5	2.	170	67
Dibenz(a,h)anthracene	5	1.	170	33
1,2-Dichlorobenzene	5	1.	170	33
1,3-Dichlorobenzene	5	1.	170	33
1,4-Dichlorobenzene	5	1.	170	33
3,3'-Dichlorobenzidine	5	2	330	100
2,4-Dichlorophenol	5	1.	170	33
2,6-Dichlorophenol	5	2.	170	67
Diethylphthalate	5	2.	170	67
Dimethoate	10	3.	500	170
p-(Dimethylamino)azobenzene	5	2.	170	67
7,12-Dimethylbenz(a)anthracene	5	2.	170	33
3,3'-Dimethylbenzidine	25	10	1000	330
a,a-Dimethylphenethylamine[2]	50	2	1700	100
2,4-Dimethylphenol	10	3	170	67
Dimethylphthalate	5	2.	170	67
1,3-Dinitrobenzene	5	2	170	67
4,6-Dinitro-2-methylphenol	15	5.	500	170
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	5	1.	170	67
2,6-Dinitrotoluene	5	1.	170	33
Di-*n*-octylphthalate	5	2.	170	67
Ethylmethanesulfonate	5	2.	170	67
Fluoranthene	5	1.	170	33
Fluorene	5	1.	170	33
Hexachlorobenzene	5	1.	170	33
Hexachlorobutadiene	5	1.	170	67
Hexachlorocyclopentadiene	15	5.	500	170
Hexachloroethane	5	1.	170	33
Hexachloropropene	5	2.	330	100
Indeno(1,2,3-cd)pyrene	5	1.	170	33
Isodrin	5	1.	170	33

Table B4-14 – Continued
Appendix IX Semivolatile Compounds by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Isophorone	5	1.	170	33
Isosafrole	5	2	170	67
Methapyrilene	50	15	5000	1700
3-Methylcholanthrene	5	2.	170	67
Methylmethanesulfonate	5	1.	170	33
1-Methylnaphthalene	5	1.	170	33
2-Methylnaphthalene	5	1.	170	33
Naphthalene	5	1.	170	33
1,4-Naphthoquinone	30	10	3300	830
1-Naphthylamine	15	5.	500	170
2-Naphthylamine	15	5.	500	170
2-Nitroaniline	5	1.	170	33
3-Nitroaniline	5	1.	170	67
4-Nitroaniline	5	1.	170	67
Nitrobenzene	5	1.	170	33
2-Nitrophenol	5	1.	170	33
4-Nitrophenol	30	10	500	170
4-Nitroquinoline-1-oxide	60	20	1000	330
n-Nitrosodiethylamine	5	2.	170	67
n-Nitrosodimethylamine	5	2.	170	67
n-Nitrosodi-*n*-butylamine	5	2.	170	67
n-Nitrosodi-*n*-propylamine	5	1.	170	33
n-Nitrosodiphenylamine[1]	5	2.	170	33
n-Nitrosomethylethylamine	5	2.	170	67
n-Nitrosomorpholine	5	2.	170	67
n-Nitrosopiperidine	5	2.	170	67
n-Nitrosopyrrolidine	5	2.	170	67
5-Nitro-*o*-toluidine	5	3.	500	170
Pentachlorobenzene	5	2.	170	67
Pentachloronitrobenzene	5	2.	170	67
Pentachlorophenol	15	3.	500	170
Phenacetin	5	2.	170	67

Table B4-14 – Continued
Appendix IX Semivolatile Compounds by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Phenanthrene	5	1.	170	33
Phenol	5	1.	170	33
1,4-Phenylenediamine	250	75	33000	12000
2-Picoline	5	2.	330	100
Pronamide	5	1.	170	33
Pyrene	5	1.	170	33
Pyridine	5	2.	170	67
Safrole	5	2.	170	67
1,2,4,5-Tetrachlorobenzene	5	2.	170	67
2,3,4,6-Tetrachlorophenol	5	2.	170	67
Tetraethyldithiopyrophosphate	5	1.	170	67
Thionazin	5	2.	170	67
o-Toluidine	5	1.	670	200
1,2,4-Trichlorobenzene	5	1.	170	33
2,4,5-Trichlorophenol	5	1.	170	67
2,4,6-Trichlorophenol	5	1.	170	33
O,O,O-Triethylphosphorothioate	5	2.	170	67
1,3,5-Trinitrobenzene	15	5.	500	170

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1] *n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

[2] Aramite and a,a-dimethylphenethylamine can be determined upon request.

[3] 3-methylphenol and 4-methylphenol cannot be resolved under this analsis. The combined total of both compounds is reported as 4-methylphenol.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-15
TCL3.2 Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,2,4-Trichlorobenzene	5	1.	170	33
1,2-Dichlorobenzene	5	1.	170	33
1,3-Dichlorobenzene	5	1.	170	33
1,4-Dichlorobenzene	5	1.	170	33
2,2'-Oxybis(1-Chloropropane)	5	1.	170	33
2,4,5-Trichlorophenol	5	1.	170	67
2,4,6-Trichlorophenol	5	1.	170	33
2,4-Dichlorophenol	5	1.	170	33
2,4-Dimethylphenol	10	3	170	67
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	5	1.	170	67
2,6-Dinitrotoluene	5	1.	170	33
2-Chloronaphthalene	5	2	170	33
2-Chlorophenol	5	1.	170	33
2-Methylnaphthalene	5	1.	170	33
2-Methylphenol	5	1.	170	67
2-Nitroaniline	5	1.	170	33
2-Nitrophenol	5	1.	170	33
3,3'-Dichlorobenzidine	5	2	330	100
3-Nitroaniline	5	1.	170	67
4,6-Dinitro-2-methylphenol	15	5.	500	170
4-Bromophenyl-phenylether	5	1.	170	33
4-Chloro-3-methylphenol	5	1.	170	67
4-Chloroaniline	5	1.	170	67
4-Chlorophenyl-phenylether	5	2	170	33
4-Methylphenol	5	2.	170	67
4-Nitroaniline	5	1.	170	67
4-Nitrophenol	30	10	500	170
Acenaphthene	5	1.	170	33
Acenaphthylene	5	1.	170	33
Anthracene	5	1.	170	33
Benzo(a)anthracene	5	1.	170	33
Benzo(a)pyrene	5	1.	170	33
Benzo(b)fluoranthene	5	1.	170	33
Benzo(g,h,i)perylene	5	1.	170	33
Benzo(k)fluoranthene	5	1.	170	33
bis(2-Chloroethoxy)methane	5	1.	170	33

Table B4-15 – Continued
TCL3.2 Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
bis(2-Chloroethyl)ether	5	1.	170	33
bis(2-Ethylhexyl)phthalate	5	2.	330	67
Butylbenzylphthalate	5	2.	170	67
Carbazole	5	1.	170	33
Chrysene	5	1.	170	33
Dibenz(a,h)anthracene	5	1.	170	33
Dibenzofuran	5	1.	170	33
Diethylphthalate	5	2.	170	67
Dimethylphthalate	5	2.	170	67
Di-*n*-butylphthalate	5	2.	170	67
Di-*n*-octylphthalate	5	2.	170	67
Fluoranthene	5	1.	170	33
Fluorene	5	1.	170	33
Hexachlorobenzene	5	1.	170	33
Hexachlorobutadiene	5	1.	170	67
Hexachlorocyclopentadiene	15	5.	500	170
Hexachloroethane	5	1.	170	33
Indeno(1,2,3-cd)pyrene	5	1.	170	33
Isophorone	5	1.	170	33
Naphthalene	5	1.	170	33
Nitrobenzene	5	1.	170	33
n-Nitroso-di-*n*-propylamine	5	1.	170	33
n-Nitrosodiphenylamine[1]	5	2.	170	33
Pentachlorophenol	15	3.	500	170
Phenanthrene	5	1.	170	33
Phenol	5	1.	170	33
Pyrene	5	1.	170	33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1] *n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-16
TCL4.3 Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1,1'-Biphenyl	5	1.	170	33
2,2'-Oxybis(1-Chloropropane)	5	1.	170	33
2,4,5-Trichlorophenol	5	1.	170	67
2,4,6-Trichlorophenol	5	1.	170	33
2,4-Dichlorophenol	5	1.	170	33
2,4-Dimethylphenol	10	3	170	67
2,4-Dinitrophenol	60	20	2000	670
2,4-Dinitrotoluene	5	1.	170	67
2,6-Dinitrotoluene	5	1.	170	33
2-Chloronaphthalene	5	2	170	33
2-Chlorophenol	5	1.	170	33
2-Methylnaphthalene	5	1.	170	33
2-Methylphenol	5	1.	170	67
2-Nitroaniline	5	1.	170	33
2-Nitrophenol	5	1.	170	33
3,3'-Dichlorobenzidine	5	2	330	100
3-Nitroaniline	5	1.	170	67
4,6-Dinitro-2-methylphenol	15	5.	500	170
4-Bromophenyl-phenylether	5	1.	170	33
4-Chloro-3-methylphenol	5	1.	170	67
4-Chloroaniline	5	1.	170	67
4-Chlorophenyl-phenylether	5	2	170	33
4-Methylphenol	5	2.	170	67
4-Nitroaniline	5	1.	170	67
4-Nitrophenol	30	10	500	170
Acenaphthene	5	1.	170	33
Acenaphthylene	5	1.	170	33
Acetophenone	5	2.	170	67
Anthracene	5	1.	170	33
Atrazine	5	2	170	33
Benzaldehyde	5	1.	170	67
Benzo(a)anthracene	5	1.	170	33
Benzo(a)pyrene	5	1.	170	33
Benzo(b)fluoranthene	5	1.	170	33
Benzo(g,h,i)perylene	5	1.	170	33
Benzo(k)fluoranthene	5	1.	170	33
bis(2-Chloroethoxy)methane	5	1.	170	33
bis(2-Chloroethyl)ether	5	1.	170	33

Table B4-16 – Continued
TCL4.3 Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
bis(2-Ethylhexyl)phthalate	5	2.	330	67
Butylbenzylphthalate	5	2.	170	67
Caprolactam	15	5.	170	33
Carbazole	5	1.	170	33
Chrysene	5	1.	170	33
Dibenz(a,h)anthracene	5	1.	170	33
Dibenzofuran	5	1.	170	33
Diethylphthalate	5	2.	170	67
Dimethylphthalate	5	2.	170	67
Di-*n*-butylphthalate	5	2.	170	67
Di-*n*-octylphthalate	5	2.	170	67
Fluoranthene	5	1.	170	33
Fluorene	5	1.	170	33
Hexachlorobenzene	5	1.	170	33
Hexachlorobutadiene	5	1.	170	67
Hexachlorocyclopentadiene	15	5.	500	170
Hexachloroethane	5	1.	170	33
Indeno(1,2,3-cd)pyrene	5	1.	170	33
Isophorone	5	1.	170	33
Naphthalene	5	1.	170	33
Nitrobenzene	5	1.	170	33
n-Nitroso-di-*n*-propylamine	5	1.	170	33
n-Nitrosodiphenylamine[1]	5	2.	170	33
Pentachlorophenol	15	3.	500	170
Phenanthrene	5	1.	170	33
Phenol	5	1.	170	33
Pyrene	5	1.	170	33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

[1] *n*-Nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for *n*-Nitrosodiphenylamine represents the combined total of both compounds.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-17

Volatiles Halocarbons and Aromatics by GC (8021B)

Compound Name	Waters	
	LOQ* (µg/L)	MDL (µg/L)
1,1,1-Trichloroethane	2.	0.5
1,1,2,2-Tetrachloroethane	2.	0.5
1,1,2-Trichloroethane	2.	0.5
1,1-Dichloroethane	2.	0.5
1,1-Dichloroethene	2.	0.5
1,2-Dichlorobenzene	2.	0.5
1,2-Dichloroethane	2.	0.5
1,2-Dichloropropane	2.	0.5
1,3-Dichlorobenzene	2.	0.5
1,4-Dichlorobenzene	2.	0.5
Benzene	2.	0.5
Bromodichloromethane	2.	0.5
Bromoform	2.	0.5
Bromomethane	5.	0.5
Carbon Tetrachloride	2.	0.5
Chlorobenzene	2.	0.5
Chloroethane	2.	0.5
Chloroform	2.	0.5
Chloromethane	5.	0.5
cis-1,2-Dichloroethene	2.	0.5
cis-1,3-Dichloropropene	2.	0.5
Dibromochloromethane	2.	0.5
Dichlorodifluoromethane	2.	0.5
Ethylbenzene	2.	0.5
Methylene Chloride	2.	0.5
Tetrachloroethene	2.	0.5
Toluene	2.	0.5
trans-1,2-Dichloroethene	2.	0.5
trans-1,3-Dichloropropene	2.	0.5
Trichloroethene	2.	0.5
Trichlorofluoromethane	2.	0.5
Vinyl Chloride	2.	0.5
Xylene (total)	3.	0.6

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-18
Petroleum Analysis by GC (8021B)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (mg/kg)	MDL (mg/kg)
Benzene	1.	0.2	0.005	0.002
Ethylbenzene	1.	0.2	0.005	0.002
Methyl *t*-butyl ether	1.	0.3	0.02	0.005
Naphthalene	5.	1.	0.02	0.01
Toluene	1.	0.2	0.005	0.002
Total Xylene	3.	0.6	0.015	0.005

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and my not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-19
TPH GRO/DRO by GC (8015B)

Compound Name	Waters		Soils**	
	LOQ* (mg/L)	MDL (mg/L)	LOQ* (mg/kg)	MDL (mg/kg)
TPH-DRO	0.1	0.029	12	4.
TPH-GRO	0.05	0.02	1.	0.2

NOTE: MDLs listed are higher than determined MDLs. This is because the method sums the total detectable area under the chromatographic plot in region of interest, instead of actual fuel peak area as the respective fuel.

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-20
Pesticide (8081A)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
4,4-DDD	0.02	0.004	1.7	0.33
4,4-DDE	0.02	0.005	1.7	0.33
4,4-DDT	0.02	0.006	1.7	0.33
Aldrin	0.02	0.004	0.83	0.19
alpha-BHC	0.01	0.0027	1.	0.33
beta-BHC	0.024	0.008	2.	0.61
Chlordane	0.5	0.07	17	4.
delta-BHC	0.024	0.008	0.83	0.17
Dieldrin	0.02	0.004	1.7	0.33
Endosulfan I	0.01	0.003	0.83	0.22
Endosulfan II	0.02	0.004	1.7	0.33
Endosulfan sulfate	0.04	0.012	1.7	0.33
Endrin	0.02	0.004	1.7	0.33
Endrin aldehyde	0.1	0.02	1.7	0.33
gamma-BHC (Lindane)	0.01	0.002	0.83	0.17
Heptachlor	0.01	0.003	0.83	0.17
Heptachlor epoxide	0.024	0.008	0.83	0.17
Methoxychlor	0.1	0.03	8.3	1.7
Toxaphene	1.	0.3	33	11

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-21
Appendix IX Organochlorine Pesticides (8081A)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
4,4-DDD	0.02	0.004	1.7	0.33
4,4-DDE	0.02	0.005	1.7	0.33
4,4-DDT	0.02	0.006	1.7	0.33
Aldrin	0.02	0.004	0.83	0.19
alpha-BHC	0.01	0.0027	1.	0.33
beta-BHC	0.024	0.008	2.	0.61
Chlordane	0.5	0.07	17	4.
delta-BHC	0.024	0.008	0.83	0.17
Dieldrin	0.02	0.004	1.7	0.33
Endosulfan I	0.01	0.003	0.83	0.22
Endosulfan II	0.02	0.004	1.7	0.33
Endosulfan sulfate	0.04	0.012	1.7	0.33
Endrin	0.02	0.004	1.7	0.33
Endrin aldehyde	0.1	0.02	1.7	0.33
gamma-BHC (Lindane)	0.01	0.002	0.83	0.17
Heptachlor	0.01	0.003	0.83	0.17
Heptachlor epoxide	0.024	0.008	0.83	0.17
Kepone	0.2	0.07	7.	2.3
Methoxychlor	0.1	0.03	8.3	1.7
Toxaphene	1.	0.3	33	11

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-22

TCL Pesticides (8081A)
(OLM03.2 and OLM04.3 lists)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
4,4'-DDD	0.02	0.004	1.7	0.33
4,4'-DDE	0.02	0.005	1.7	0.33
4,4'-DDT	0.02	0.006	1.7	0.33
Aldrin	0.02	0.004	0.83	0.19
alpha-BHC	0.01	0.0027	1.	0.33
alpha-Chlordane	0.01	0.003	0.83	0.17
beta-BHC	0.024	0.008	2.	0.61
delta-BHC	0.024	0.008	0.83	0.17
Dieldrin	0.02	0.004	1.7	0.33
Endosulfan I	0.01	0.003	0.83	0.22
Endosulfan II	0.02	0.004	1.7	0.33
Endosulfan sulfate	0.04	0.012	1.7	0.33
Endrin	0.02	0.004	1.7	0.33
Endrin aldehyde	0.1	0.02	1.7	0.33
Endrin ketone	0.04	0.013	1.7	0.33
gamma-BHC/Lindane	0.01	0.002	0.83	0.17
gamma-Chlordane	0.01	0.003	3	1
Heptachlor	0.01	0.003	0.83	0.17
Heptachlor epoxide	0.024	0.008	0.83	0.17
Methoxychlor	0.1	0.03	8.3	1.7
Toxaphene	1.	0.3	33	11

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client if a valid mass spectrum is obtained. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-23
PCB Compound List by GC (8082)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
PCB-1016	0.5	0.1	17	3.3
PCB-1221	0.5	0.1	17	5.2
PCB-1232	0.5	0.2	17	3.3
PCB-1242	0.5	0.1	17	3.3
PCB-1248	0.5	0.1	17	3.3
PCB-1254	0.5	0.1	17	3.3
PCB-1260	0.5	0.1	17	3.3

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-24
Appendix IX Organphosphate Pesticides (8141A)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
Bolstar	2.	0.4	67	22
Coumaphos	3.	0.68	67	22
Demeton-O	2.	0.4	67	22
Demeton-S	3.	0.85	67	22
Diazinon	4.	1.4	67	22
Dichlorvos	3.	1.	67	22
Disulfoton	2.	0.45	75	25
Dursban (Chlorpyrifos)	2.	0.4	67	22
EPN	4.	0.4	67	22
Ethion	2.	0.4	67	22
Ethoprop	3.	1.	67	22
Ethyl parathion	2.	0.4	67	22
Famphur	3.	0.8	67	22
Fensulfothion	15.	5.	67	22
Fenthion	2.	0.4	67	22
Guthion (Azinphos-methyl)	4.	0.6	67	22
Malathion	3.	0.8	67	22
Merphos	6.	2.	67	22
Methyl parathion	2.	0.4	67	22
Mevinphos	4.	1.1	67	22
Naled	3.	0.4	67	22
Phorate	2.	0.4	67	22
Ronnel	2.	0.4	67	22
Stirophos	2.	0.65	67	22
Tokuthion	2.	0.4	67	22
Trichloronate	2.	0.4	67	22
Trithion	2.	0.4	67	22

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-25
Herbicides by GC (8151A)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
2,4,5-T	0.05	0.013	1.7	0.75
2,4,5-TP	0.05	0.01	1.7	0.75
2,4-D	0.5	0.16	17	5.
2,4-DB	1.	0.3	17	5.3
2,4-DP (Dichlorprop)	0.5	0.16	17	5.
Dalapon	1.3	0.25	60	23
Dicamba	0.3	0.06	5.	1.6
Dinoseb	0.5	0.1	8.3	1.7
MCPA	1000	300	6000	2000
MCPP	200	50	2500	750
Pentachlorophenol	0.05	0.027	1.7	0.33

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

Table B4-26
PAHs by HPLC (8310)

Compound Name	Waters		Soils**	
	LOQ* (µg/L)	MDL (µg/L)	LOQ* (µg/kg)	MDL (µg/kg)
1-Methylnaphthalene	20	2.2	330	80
2-Methylnaphthalene	20	2.1	330	80
Acenaphthene	16	0.9	270	40
Acenapthylene	16	1.4	270	40
Anthracene	0.2	0.04	5.3	0.6
Benzo(a)anthracene	0.1	0.02	6.7	1.3
Benzo(a)pyrene	0.1	0.02	13	2.0
Benzo(b)fluoranthene	0.2	0.04	13	2.7
Benzo(g,h,i)perylene	0.6	0.1	13	2.7
Benzo(k)fluoranthene	0.1	0.02	6.7	1.3
Chrysene	0.4	0.08	13	2.0
Dibenzo(a,h)anthracene	0.2	0.04	5.3	2.0
Fluoranthene	0.2	0.04	5.3	1.3
Fluorene	0.8	0.5	27	4.0
Indeno(1,2,3-cd)pyrene	0.4	0.08	13	3.3
Naphthalene	12	1.3	330	47
Phenanthrene	0.4	0.08	13	2.0
Pyrene	0.8	0.18	27	4.7

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis will be higher.

The laboratory routinely reports at the limit of quantitation (LOQ) but can estimate down to the MDL when requested by the client. Values reported below the LOQ are reported with a J-flag and are defined as estimated values.

LOQ and MDLs are evaluated annually and subject to change.

B5. Quality Control

The particular types and frequencies of quality control checks analyzed with each sample are defined in *USEPA SW-846 3rd Edition, Update III, 1996*; *Standard Methods for the Examination of Water and Wastewater, 20th edition;* and *Methods for the Chemical Analysis of Waters and Wastes, USEPA, 600/4-79-020*. The quality control checks routinely performed during sample analysis include blanks, laboratory control samples, surrogates, duplicates, internal standards, and matrix spikes. In addition to these checks, some inorganic analyses employ serial dilutions and interference check samples.

Blanks (method, preparation) – Blanks are an analytical control consisting of a volume of deionized, distilled laboratory water for water samples, or a purified solid matrix for soil/sediment samples. (Metals use a digested reagent blank with soils.) They are treated with the same reagents, internal standards, and surrogate standards and carried through the entire analytical procedure. The blank is used to define the level of laboratory background contamination.

Laboratory Control Samples (LCS) or Reference materials – Aqueous and solid control samples of known composition are analyzed using the same sample preparation, reagents, and analytical methods employed for the sample. These materials may be purchased from NIST or commercial supply houses either as neat compounds or as solutions with certified concentrations, or prepared in the technical department. The accuracy and quality of the purchased standards are documented on certificates provided by the supply houses. Certificates are maintained on file in the laboratory. The accuracy information determined from reference materials and laboratory control samples is valuable because variables specific to sample matrix are eliminated. The acceptance criteria for this type of quality control is either dictated by the agency from whom the material is obtained or by statistical analysis of past information generated in the technical department. A LCS is analyzed with every sample preparation batch to demonstrate accuracy of the procedure and process control.

Surrogates (used for organic analysis only) – Each sample, matrix spike, matrix spike duplicate, and blank are spiked with surrogate compounds prior to purging and extraction in order to monitor preparation and analysis. Surrogates are used to evaluate analytical efficiency by measuring recovery. The recovery data is compared to method stipulated or statistically generated limits.

Duplicates (matrix or LCS spike duplicate – organics and inorganics; duplicate-inorganics) – A second aliquot of a matrix/sample is analyzed at the same time as the original sample in order to determine the precision of the method. The relative percent difference (RPD) between the two determinations is calculated and compared to values prescribed by the EPA or the laboratory's statistically generated limits.

Internal Standards (used for GC/MS and some GC analysis) – Internal standards are compounds added to every standard, blank, LCS, matrix spike, matrix spike duplicate, and sample at a known concentration, prior to analysis. The peak areas of the internal standards are used for internal standard quantitation as well as monitoring changes in the instrument response that may adversely affect quantification of target compounds.

Matrix Spikes – Matrix spikes are samples fortified with a target analyte and subjected to the entire analytical procedure. The recovery of the analyte(s) is calculated and indicates the appropriateness of the method for the matrix. The matrix spike and its duplicate is a pair of fortified samples from the same source. Analysis of the matrix spike duplicates yields precision and accuracy information. The acceptance criteria for percent recovery of spiked samples is prescribed by the EPA or determined by statistical analysis of historical data generated in the technical department.

Serial Dilutions (used for inorganics ICP, and ICP/MS only) – If the analyte concentration is sufficiently high, an analysis of a five-fold dilution must agree within 10% of the original determination. If the dilution analysis is not within 10%, a chemical or physical interference effect should be suspected.

Interference Check Sample (ICP and ICP/MS) – To verify interelement and background correction factors a solution containing both interfering and analyte elements of known concentration is analyzed at the beginning and end of each analysis run or a minimum of twice per 8 hours.

Second Source Check – A second source check is analyzed using either the LCS or an ICV (Initial Calibration Verification). The second source is a standard that is made from a solution or neat purchased from a different vendor than that used for the calibration standards. For some organic custom mixes, the same vendor but a different lot and preparation is used. This ensures that potential problems with a vendor supply would be evident in the analysis. Some areas of the lab may use the continuing calibration verification standards as a second source from the initial calibration.

The results of all quality control samples are entered into the LIMS in the same way as the results of client samples. The computer is programmed to compare the individual values with the acceptance limits (statistically determined or method specified) and inform the analyst if the results of the quality control tests are in or out of specification. If the results are not within the acceptance criteria, corrective action suitable to the situation must be taken. This may include, but is not limited to, checking calculations, examining other quality control analyzed with the same batch of samples, qualifying results with a comment stating the observed deviation, and reanalysis of the samples in the batch. In addition, computerized reports on the results for all quality control analyses (including mean and standard deviation) are generated monthly. These are used by the Quality Assurance Department to check for trends that may indicate method bias. Control charts are plotted via computer and may be accessed at any time by all analysts.

The following tables list the specific QC used for each method and the applicable QC windows. These windows are generated statistically and are subject to change. Statistical limits are determined for recovery and relative percent difference (RPD) data using historical data (minimum of 20 data points) and applying a 99% confidence interval around the mean. The limits are generated every 6 months for SW-846 methods and annually for other methods, and updated as needed. The tables list the full list of analytes for a method. Sublists (TCL, PPL, etc.) may be reported based on the clients requirements. See Element B4 for the particular analytes associated with a regulatory list.

Table B5-1

Quality Control
Inorganics

Type	Acceptance Limits (%)	Frequency	Corrective Action
Matrix Spikes:	See Table B5-2 See Table B5-2A for ICP/MS	Each group of samples of similar matrix/level (≤20) each method	Analyze post-digestion spike sample
Matrix Spike Duplicate (RPD):	±20% RPD	Each group of samples of similar matrix/level (≤20) each method	Analyze post-digestion spike sample if not already run for MS, flag the data
Duplicates (RPD):	±20% RPD for sample values ≥5× LOQ	Each group of samples of similar matrix/level (≤20) each method	Flag the data
Blanks: Initial Calibration (ICB) Continuing Calibration (CCB)	**ICP and ICP/MS:** <3× IDL or blank <1/10 conc. of action level and samples not ±10% of action level **GFAA and CVAA:** <LOQ	Each element immediately after calibration verification at 10% frequency or every 2 hours (beginning and end of run min.)	Correct problem, recalibrate, and rerun
Preparation Blank (PB)	≤LOQ	Each SDG or batch (≤20 samples)	Redigest and reanalyze blank and associated samples if sample result <20× blank result
Serial Dilutions (excluding Hg):	Within ±10% of the original determination	Each group (≤20) of similar matrix/level	Flag the data
Interference Check Sample (ICP and ICP/MS only):	±20% of the true value for the analytes	Each element after Initial Calibration Verification at beginning and end of the run or min. of 2× per 8 hour	Recalibrate the instrument
Laboratory Control Sample:	See Table B5-2 See Table B5-2A for ICP/MS	Each SDG or batch (≤20 samples), each method	Redigest and reanalyze LCS and associated samples. Elements in the LCS that fail high and are ND in the samples can be reported.

Table B5-1 – Continued
Quality Control
Metals

Type	Acceptance Limits (%)	Frequency	Corrective Action
Post Digestion Spike:	**ICP and ICP/MS:** 75% to 125% **GFAA and CVAA:** 85% to 115%	When matrix spikes are outside 75% to 125% range, or the stastical wiwndow (whichever is tighter)	Flag the data

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

This criteria is for TAL, PPL, and Appendix IX metals.

Table B5-2
Statistical Acceptance Limits for Metals

Analyte	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Aluminum	90-112	75-125	85-115	75-125
Antimony	80-120	75-125	0-211	75-125
Arsenic	80-120	75-125	80-119	75-125
Barium	90-110	75-125	83-117	75-125
Beryllium	90-111	87-114	83-117	83-111
Boron	90-110	88-111	64-136	80-110
Cadmium	90-112	83-116	82-118	75-125
Calcium	90-112	75-125	81-119	75-125
Chromium	90-110	81-120	79-121	75-125
Cobalt	90-110	87-112	82-118	81-110
Copper	90-112	86-122	83-117	75-125
Iron	90-112	75-125	35-165	75-125
Lead[1]	90-113	75-125	82-118	80-120
Magnesium	89-110	75-125	78-122	75-125
Manganese	90-110	75-125	82-118	75-125
Mercury[2]	80-120	80-120	66-133	80-120
Molybdenum	90-110	89-112	80-120	77-10
Nickel	90-111	86-115	82-118	75-125
Potassium	88-119	75-125	73-127	75-125
Selenium	80-120	75-125	78-122	81-112
Silver	90-117	75-125	66-134	75-125
Sodium	80-120	75-125	64-136	75-125
Strontium	90-110	90-110	80-120	80-111
Thallium	80-120	75-125	77-123	78-109
Tin	90-110	86-118	70-130	80-110
Titanium	90-113	90-110	85-115	75-125
Vanadium	90-110	90-111	68-132	75-125
Zinc	90-111	75-125	79-121	75-125

[1]Analyzed by GFAA

[2]Analyzed by Cold Vapor

All other elements analyzed by ICP.

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

The acceptance limits above pertain to the TAL, PPL and Appendix IX lists.

Table B5-2A
Acceptance Limits for ICP/MS

Analyte	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Antimony	80-120	75-125	0-264	75-125
Arsenic	80-120	75-125	79-121	75-125
Barium	80-120	75-125	81-119	75-125
Beryllium	80-120	75-125	80-120	75-125
Cadmium	80-120	75-125	81-119	75-125
Chromium	80-120	75-125	73-127	75-125
Copper	80-120	75-125	82-118	75-125
Lead	80-120	75-125	82-118	75-125
Nickel	80-120	75-125	82-118	75-125
Selenium	80-120	75-125	74-126	75-125
Silver	80-120	75-125	47-154	75-125
Thallium	80-120	75-125	78-122	75-125
Zinc	80-120	75-125	78-121	75-125

Acceptance limits are statistically derived or method-specified, whichever is more stringent.

Table B5-3
Quality Control
Miscellaneous Chemistry

Parameter	Acceptance Limits (%)	Frequency	Corrective Action
Moisture:			
LCS/LCSD:	See Table B5-4	Each group (≤20) of samples	Batch is repeated
Duplicate:	≤15%	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Cyanide, total:			
Initial Calibration Blank (ICB):	≤LOQ	After every calibration	Recalibrate
Continuing Calibration Blank (CCB):	≤LOQ	After each CCV, which is every 10 samples	Reanalyze bracketed sample
Prep Blank (PB):	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested, or if there is not sufficient volume for Matrix QC)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and cyanide is ND in the sample, can be reported.
MS:	See Table B5-4	Every 10 samples	Post digestion spike is performed, MSA is performed for CN by SW-846 9012A
Duplicates:	≤20%	Every 10 samples	Ensure that LCS meets acceptance criteria
Phenolics, total:			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and phenolics are ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Every 10 samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤20%	Every 10 samples	Ensure that LCS meets acceptance criteria
Sulfide, total:			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and sulfide is ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicate:	≤20% (statistically evaluated)	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria

Table B5-3 – Continued
Quality Control
Miscellaneous Chemistry

Parameter	Acceptance Limits (%)	Frequency	Corrective Action
TPH (418.1):			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and TPH is ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤34% wastewater ≤21% solid waste	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Hexane Extractable Materials (1664A):			
Blanks:	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and HEM is ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤18%	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
TOC:			
Initial Calibration Blank (ICB): Continuing Calibration Blank (CCB): Prep Blank (PB):	≤LOQ ≤LOQ ≤LOQ	After every calibration After every 10 injections Each group (≤20) of samples	Recalibrate Reanalyze bracketed sample Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and TOC is ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Every 10 samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤4%	Every 10 samples	Ensure that LCS meets acceptance criteria

Table B5-3 – Continued
Quality Control
Miscellaneous Chemistry

Parameter	Acceptance Limits (%)	Frequency	Corrective Action
Total Nitrite/Nitrate:			
Initial Calibration Blank (ICB):	≤LOQ	After initial calibration	Repeat calibration
Prep Blank (PBW):	≤LOQ	Each group (≤20) of samples	Batch is repeated
LCS: (LCSD when requested)	See Table B5-4 LCSD ≤20% RPD	Each group (≤20) of samples	Batch is repeated LCS that fails high, and total nitrite/nitrate is ND in the sample, can be reported.
MS/MSD:	See Table B5-4 MSD ≤20% RPD	Each group (≤20) of samples	Ensure that LCS meets acceptance criteria
Duplicates:	≤2%	Every 10 samples	Ensure that LCS meets acceptance criteria

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-4
Quality Control
Statistical Acceptance Limits for Miscellaneous Chemistry

Parameter	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Cyanide, total	90-110	83-111	90-110	59-124
HEM (1664A)	79-114	79-114	N/A	N/A
Moisture	N/A	N/A	99-101	N/A
Phenolics, total	80-109	73-115	82-113	38-175
Sulfide, total	80-120	86-113	N/A	N/A
TOC	80-120	62-148	40-148	51-115
Total Nitrite/Nitrate	90-110	90-110	N/A	N/A
TPH (418.1)	54-113	39-132	64-115	30-128

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-5
Quality Control
Volatiles by GC/MS (8260B)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates: Toluene-d_8 Bromofluorobenzene 1,2-Dichloroethane-d_4 Dibromofluoromethane	 85-112 83-113 82-112 81-120	 70-130 70-128 70-121 70-129	Each sample, MS, MSD, LCS, and blank	Reanalyze sample if outside limits; if reanalysis confirms original, document on report and/or case narrative
Matrix Spikes: Spike all compounds of interest	See Table B5-6		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Spike all compounds of interest	See Table B5-6		Each group (≤20) of samples per matrix/level	Reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Spike all compounds of interest	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds		Once for each 12-hour time period or ≤20 samples	Reanalyze blank and associated samples if blank outside limits
Internal Standards: Chlorobenzene-d_5 1,4-Dichlorobenzene-d_4	-50% to +100% of internal standard area of 12-hour STD RT Change ≤30 sec.		Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report or case narrative

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

This criteria is for PPL, Appendix IX, and TCL lists.

Table B5-6
Statistical Acceptance Limits for
Volatiles by GC/MS (8260B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
1,1,1,2-Tetrachloroethane	83-114	83-119	78-115	58-115
1,1,1-Trichloroethane	83-127	81-142	74-127	64-118
1,1,2,2-Tetrachloroethane	72-119	73-121	64-121	37-142
1,1,2-Trichloroethane	86-113	77-125	81-112	64-118
1,1-Dichloroethane	83-127	85-135	82-116	65-115
1,1-Dichloroethene	76-122	87-145	74-115	56-113
1,1-Dichloropropene	84-116	86-134	75-121	57-114
1,2,3-Trichlorobenzene	67-114	65-127	63-120	10-122
1,2,3-Trichloropropane	78-117	73-125	69-119	44-140
1,2,4-Trichlorobenzene	65-114	60-121	60-116	11-121
1,2,4-Trimethylbenzene	78-117	80-125	74-117	47-122
1,2-Dibromo-3-chloropropane	62-128	52-137	49-127	39-128
1,2-Dibromoethane	81-114	78-120	77-114	66-108
1,2-Dichlorobenzene	81-112	82-117	81-109	50-111
1,2-Dichloroethane	77-132	70-143	76-126	62-130
1,2-Dichloropropane	80-117	83-129	78-119	64-112
1,3,5-Trimethylbenzene	78-116	77-124	74-112	52-117
1,3-Dichlorobenzene	81-114	79-123	76-112	47-109
1,3-Dichloropropane	84-119	82-121	80-115	66-110
1,4-Dichlorobenzene	84-116	81-122	78-108	47-109
2,2-Dichloropropane	74-130	79-146	72-123	64-115
2-Butanone	52-163	57-137	45-154	37-148
2-Chloroethyl Vinyl Ether	66-125	1-156	26-148	22-133
2-Chlorotoluene	78-115	78-121	73-114	53-113
2-Hexanone	61-140	60-135	38-154	33-146
4-Chlorotoluene	80-112	81-123	75-110	52-113
4-Methyl-2-pentanone	70-130	68-133	51-141	37-138
Acetone	32-200	48-143	26-198	26-184
Acrolein	26-151	19-154	52-128	10-135
Acrylonitrile	67-128	63-132	58-122	43-117
Benzene	78-119	83-128	84-115	59-120
Bromobenzene	82-110	83-121	77-113	52-118
Bromochloromethane	83-121	82-129	75-121	65-116
Bromodichloromethane	83-121	80-129	77-116	57-117
Bromoform	69-118	64-119	63-120	54-114

Table B5-6 – Continued
Statistical Acceptance Limits for
Volatiles by GC/MS (8260B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Bromomethane	47-129	54-141	61-118	50-114
Carbon Disulfide	69-119	74-135	69-109	45-107
Carbon Tetrachloride	77-130	82-149	76-122	56-120
Chlorobenzene	85-115	83-120	81-112	58-109
Chloroethane	57-125	56-140	63-120	52-114
Chloroform	86-124	83-139	81-117	69-117
Chloromethane	47-132	46-149	58-123	38-115
cis-1,2-Dichloroethene	84-117	83-126	84-113	67-110
cis-1,3-Dichloropropene	78-114	80-126	80-113	58-113
Dibromochloromethane	78-119	82-119	79-118	69-113
Dibromomethane	87-117	82-128	79-118	69-113
Dichlorodifluoromethane	26-157	31-185	28-134	15-127
Ethylbenzene	82-119	82-129	82-115	54-116
Hexachlorobutadiene	62-119	51-135	57-122	11-123
Isopropylbenzene	80-120	81-130	82-110	41-120
m+p-Xylene	83-113	82-130	82-117	44-127
Methylene Chloride	85-120	79-133	75-120	42-131
Naphthalene	61-116	50-124	52-121	10-123
n-Butylbenzene	75-120	73-134	68-116	17-131
n-Propylbenzene	78-119	74-138	76-122	46-121
o-Xylene	83-113	82-130	82-117	44-127
p-Isopropyltoluene	72-118	72-128	72-113	43-117
sec-Butylbenzene	72-120	73-137	72-112	38-124
Styrene	82-111	69-131	79-108	48-111
tert-Butylbenzene	74-114	76-128	72-113	44-118
Tetrachloroethene	74-125	78-133	70-117	40-140
Toluene	85-115	83-127	81-116	38-131
trans-1,2-Dichloroethene	83-117	82-133	77-113	60-110
trans-1,3-Dichloropropene	79-114	77-123	79-112	60-110
Trichloroethene	87-117	83-136	81-114	48-124
Trichlorofluoromethane	57-141	64-165	58-125	49-127
Vinyl Chloride	54-143	54-143	60-118	48-113
Xylene (Total)	83-113	82-130	82-117	44-127
Allyl Chloride	73-129	65-145	75-126	59-121
2-Chloro-1,3-butadiene	62-139	61-161	61-134	35-133

Table B5-6 – Continued
Statistical Acceptance Limits for
Volatiles by GC/MS (8260B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
trans-1,4-Dichloro-2-butene	49-135	37-141	57-125	45-124
1,2-Dichloroethene (Total)	84-117	83-126	79-113	61-111
1,4-Dioxane	54-139	44-148	52-124	42-126
Ethyl Methacrylate	77-118	74-120	67-114	32-125
Isobutyl Alcohol	48-144	48-151	42-143	25-134
Methacrylonitrile	80-125	68-131	70-131	50-128
Methyl Iodide	70-116	72-128	67-119	53-115
Methyl Methacrylate	72-121	68-126	61-121	47-122
Propionitrile	68-137	62-142	61-137	52-131
Vinyl Acetate	68-134	62-137	41-148	10-181

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-7
Quality Control
Semivolatiles by GC/MS (8270C)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates:			Each sample, MS, MSD, LCS, and blank	Repeat extraction and analysis; if reanalysis confirms originals, document on report and/or case narrative
Nitrobenzene-d_5	54-124	47-128		
2-Fluorobiphenyl	64-112	55-123		
Terphenyl-d_{14}	43-116	49-133		
Phenol-d_6	10-80	45-120		
2-Fluorophenol	23-94	41-119		
2,4,6-Tribromophenol	40-136	46-136		
Matrix Spikes: Spike all compounds of interest	See Table B5-8 for acceptance limits		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Sample: Spike all compounds of interest	See Table B5-8 for acceptance limits		Each group (≤20) of samples per matrix/level	Re-extract and reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Same as for matrix spikes	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds		Once per extraction group (≤20) of samples, each matrix/level	Re-extract and reanalyze blank and associated samples
Internal Standards:	-50% to +100% of internal standard area of 12-hour STD		Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report and/or case narrative
1,4-Dichlorobenzene-d_4	RT change ≤30 sec.			
Naphthalene-d_8				
Acenaphthene-d_{10}				
Phenanthrene-d_{10}				
Chrysene-d_{12}				
Perylene-d_{12}				

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

This criteria is for PPL, Appendix IX, and TCL lists.

Table B5-8

Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
1,1'-Biphenyl	73-106	72-113	69-108	39-146
1,2,4,5-Tetrachlorobenzene	74-109	72-102	67-117	60-119
1,2,4-Trichlorobenzene	61-113	65-105	68-105	54-118
1,2-Dichlorobenzene	58-100	59-106	59-108	40-117
1,2-Diphenylhydrazine	62-106	60-113	62-115	56-125
1,3,5-Trinitrobenzene	21-154	45-124	5-111*	5-126*
1,3-Dichlorobenzene	52-106	55-105	56-103	41-117
1,3-Dinitrobenzene	78-113	75-112	73-113	59-119
1,4-Dichlorobenzene	54-103	50-112	58-104	42-118
1,4-Dinitrobenzene	70 -130	70-130	80-110	65-110
1,4-Dioxane	37-79	29-76	19-65	15-67
1,4-Naphthoquinone	70-130	70-130	70-130	70-130
1,4-Phenylenediamine	70-130	70-130	70-130	70-130
1-Methylnaphthalene	65-107	60-126@	69-104	39-142
1-Naphthylamine	40-105	5-124*	5-73*	5-125*
2,2'-oxybis(1-Chloropropane)	70-143	71-140	70-134	50-146
2,3,4,6-Tetrachlorophenol	61-131	44-125	72-125	18-153
2,4,5-Trichlorophenol	70-115	37-128	73-104	23-143
2,4,6-Trichlorophenol	69-111	35-138	73-112	27-149
2,4-Dichlorophenol	66-110	33-135	74-105	35-138
2,4-Dimethylphenol	60-107	9-139	68-103	43-135
2,4-Dinitrophenol	52-124	20-154*	33-122	20-152*
2,4-Dinitrotoluene	75-122	52-130	73-115	44-138
2,6-Dichlorophenol	70-112	74-100	70-113	60-116
2,6-Dinitrotoluene	70-108	71-111	75-109	50-132
2-Acetylaminofluorene	49-127	74-114	64-117	55-119
2-Chloronaphthalene	56-100	53-96	60-101	42-110
2-Chlorophenol	63-112	20-144	73-105	48-125
2-Methylnaphthalene	64-105	58-110	67-101	39-127
2-Methylphenol	56-105	9-122	64-112	39-129
2-Naphthylamine	8-88	5-118*	5-47*	5-107*
2-Nitroaniline	73-115	63-125	76-117	45-139
2-Nitrophenol	82-121	43-148	74-113	36-146
2-Picoline	52-96	51-95	47-102	40-109
3- or 4-methylphenol	52-97	30-114	65-113	40-132
3,3'-Dichlorobenzidine	52-113	27-128	12-107	3-142*
3,3'-Dimethylbenzidine	10-103*	10-88*	22-111	10-122*
3-Methylcholanthrene	46-128	64-112	71-111	49-114
3-Nitroaniline	63-112	42-134	46-108	27-140
4,6-Dinitro-2-methylphenol	74-122	21-150	56-120	5-156*

Table B5-8 – Continued
Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
4-Aminobiphenyl	4-66	2-90*	5-55*	5-102*
4-Bromophenyl phenylether	67-110	76-112	70-111	52-136
4-Chloro-3-methylphenol	72-114	22-157	61-134	48-135
4-Chloroaniline	42-115	20-123	2-116*	2-130*
4-Chlorophenyl phenylether	65-110	62-113	69-110	50-128
4-Methylphenol	51-98	2-129	64-116	36-136
4-Nitroaniline	55-107	38-118	45-101	22-129
4-Nitrophenol	9-78	10-100*	57-123	5-165*
4-Nitroquinoline-1-oxide	20-115*	20-126*	10-80*	10-50*
5-Nitro-*o*-toluidine	37-92	20-96	28-62	1-106
7,12-Dimethylbenz(a)anthracene	50-101	32-134	67-125	24-148
a,a-Dimethylphenethylamine	70-130	70-130	70-130	70-130
Acenaphthene	68-111	68-117	74-110	48-129
Acenaphthylene	76-117	71-118	79-115	45-144
Acetophenone	65-114	78-99	73-105	24-146
Aniline	56-105	40-110	32-107	5-162*
Anthracene	68-108	68-115	69-109	17-161
Aramite	20-60	14-67	70-130	70-130
Atrazine	63-124	45-125	65-137	16-156
Benzaldehyde	1-67	1-63	2-46*	2-124*
Benzenethiol	5-75*	70-130	1-53	70-130
Benzidine	20-163*	10-148*	35-115*	35-134*
Benzo(a)anthracene	71-113	65-116	72-112	22-158
Benzo(a)pyrene	68-121	66-120	71-119	25-154
Benzo(b)fluoranthene	65-122	61-125	66-123	12-165
Benzo(g,h,i)perylene	67-126	64-124	66-120	28-148
Benzo(k)fluoranthene	67-120	64-120	67-121	21-154
Benzoic Acid	6-59*	6-81*	20-159	5-173*
Benzyl alcohol	51-99	72-89	64-116	57-117
bis (2-Chloroethoxy)methane	69-119	64-128	75-114	50-137
bis(2-Chloroethyl)ether	57-110	69-103	60-112	41-122
bis(2-Chloroisopropyl)ether	68-133	66-142	68-132	52-152
bis(2-Ethylhexyl)phthalate	62-126	61-118	63-131	33-148
Butylbenzylphthalate	63-120	60-117	69-117	46-138
Caprolactam	16-37	16-36	69-112	1-181
Carbazole	66-109	32-154	69-109	36-143
Chlorobenzilate	67-115	55-119	68-123	59-125
Chrysene	70-111	67-115	71-112	19-158
Diallate (cis/trans)	69-122	80-98	79-120	56-127
Dibenz(a,h)anthracene	68-129	70-131	70-130	36-151

Table B5-8 – Continued
Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Dibenzofuran	70-109	65-110	72-107	37-135
Diethylphthalate	61-110	43-127	75-109	49-128
Dimethoate	3-109*	3-75*	5-66*	5-138*
Dimethylphthalate	56-113	12-141	76-108	46-131
Diphenyl ether	67-102	69-108	82-102	64-113
Di-*n*-butylphthalate	63-113	62-111	68-112	49-128
Di-*n*-octylphthalate	58-118	55-119	61-117	38-147
Ethylmethanesulfonate	67-108	70-103	68-105	57-114
Fluoranthene	66-108	61-112	66-109	23-142
Fluorene	75-112	65-110	66-115	30-146
Hexachlorobenzene	68-113	62-117	69-114	45-138
Hexachlorobutadiene	40-127	48-125	66-112	45-129
Hexachlorocyclopentadiene	31-135	10-156	33-152	5-154*
Hexachloroethane	40-117	42-122	56-112	31-125
Hexachloropropene	51-124	50-132	61-123	3-168
Indeno(1,2,3-cd)pyrene	64-125	62-122	66-123	28-149
Isodrin	72-117	27-135	71-126	1-157
Isophorone	63-105	65-94	65-93	31-122
Isosafrole	65-97	69-96	69-96	61-106
Methapyrilene	70-130	70-130	27-171	70-130
Methylmethanesulfonate	29-83	45-80	38-87	22-98
Naphthalene	68-108	53-123	70-107	33-137
Nitrobenzene	61-111	55-126	68-105	38-136
n-Nitrosodiethylamine	66-110	67-104	66-103	58-110
n-Nitrosodimethylamine	39-84	37-87	52-108	43-113
n-Nitrosodi-*n*-butylamine	55-119	58-106	65-125	52-136
n-Nitrosodi-*n*-propylamine	56-109	27-137	61-109	35-133
n-Nitrosodiphenylamine	75-112	64-127	67-105	46-150
n-Nitrosomethylethylamine	61-111	57-108	63-106	57-107
n-Nitrosomorpholine	53-107	60-102	65-113	53-129
n-Nitrosopiperidine	70-110	76-99	73-106	61-118
n-Nitrosopyrrolidine	62-109	62-105	76-103	60-118
O,O,O-Triethylphosphorothioate	74-106	74-108	70-113	56-120
o-Toluidine	31-109	28-109	23-107	16-117
Pentachloroacetophenone	70-130	70-130	70-130	70-130
p-(Dimethylamino)azobenzene	2-158*	63-102	39-106	2-157
Pentachlorobenzene	79-108	73-104	67-110	24-145
Pentachloronitrobenzene	66-135	71-110	69-129	56-123
Pentachlorophenol	48-108	7-136	47-110	5-140
Phenacetin	66-126	66-112	70-117	63-121

Table B5-8 – Continued
Statistical Acceptance Limits for
Semivolatiles by GC/MS (8270C)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Phenanthrene	68-111	68-116	70-107	4-176
Phenol	17-72	2-81	66-113	36-135
Pronamide	71-114	73-109	72-112	69-118
Pyrene	68-114	63-117	67-116	28-155
Pyridine	24-89	28-81	36-89	2-121*
Safrole	70-110	75-101	76-105	68-109
Tetraethyldithiopyrophosphate	59-120	68-117	63-114	58-123
Thionazin	67-115	70-104	64-125	42-143
a,a-Dimethylphenethylamine	1-77	4-65	70-130	70-130
N,N-dimethylformamide	70-130	70-130	70-130	70-130
N,N-diemthylacetamide	70-130	70-130	70-130	53-104
4,4'-Methylenebis(2-chloroaniline)	70-130	70-130	34-109	12-131
Indene	40-109	70-130	46-102	8-127
Quinoline	77-113	70-130	81-112	6-170
6-Methylchrysene	75-111	70-130	70-130	28-143
Dibenz(a,h)acridine	76-116	70-130	71-124	16-153
Phenothiazine	70-130	70-130	70-130	70-130
Dinoseb	70-130	70-130	70-130	70-130
Methyl Parathion	70-130	70-130	70-130	70-130
Octochlorostyrene	70-130	70-130	70-130	70-130
Parathion	70-130	70-130	70-130	70-130
Phorate	70-130	70-130	70-130	70-130
a-Methylstyrene	70-130	70-130	70-130	70-130
1,2,3,4-Tetrahydronaphthalene	70-130	70-130	70-130	70-130
1-Chloronaphthalene	70-130	70-130	70-130	70-130
Acylamide	70-130	70-130	70-130	70-130
Disulfoton	70-130	70-130	70-130	70-130
Famphur	70-130	70-130	70-130	70-130
(2-Bromoethyl)benzene	70-130	70-130	70-130	70-130
Dibenz(a,j)acridine	70-130	70-130	70-130	70-130

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

* = Lower limit adjusted for compound MDL.

@ = less than 20 data points.

All 70-130 windows are advisory due to insufficient data points except for 1,4-naphthoquinone, 1,4-phenylenediamine and methapyrilene. These windows are 70-130 are to the poor reproducibility of these compounds.

Table B5-9
Quality Control
Volatiles Halocarbons and Aromatics by GC (8021B)

Type	Waters Acceptance Limits (%)	Frequency	Corrective Action
Surrogates: Halocarbons; 1-Bromo-4-chlorobenzene (ELCD)	73-124	Each sample, MS, MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix related problems are evident
Aromatics; 1-Bromo-4-chlorobenzene (PID)	72-122		
Halocarbons/Aromatics; 1-Bromo-4-chlorobenzene (ELCD/PID)	See above		
Non-halogenated; 2-hexanone (FID)	81-121		
Matrix Spikes: Spike all compounds of interest	See Table B5-10 for acceptance limits	Each group of samples of similar matrix/level (≤20) each method	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples/Check Standards: Spike all compounds of interest	See Table B5-10 for acceptance limits	Each group (≤20); LCSD is analyzed if sufficient volume is not available for MS/MSD	Reanalyze LCS and associated samples for compounds outside of acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Internal Standards: Fluorobenzene (ELCD/PID)	80-120	Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report and/or case narrative; in cases where matrix is elevating the internal standard (ISTD) recovery, a dilution may be performed to bring the ISTD within specifications
Matrix Spike Duplicates (RPD): Same compounds as matrix spikes	≤30%	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds	At least one per 20 samples and at least one per 24 hours	Reanalyze blank and associated samples if blank is outside limits

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-10
Statistical Acceptance Limits for
Volatiles Halocarbons and Aromatics by GC (8021B)

Compound Name	Waters	
	LCS/LCSD (%)	MS/MSD (%)
1,1,1-Trichloroethane	73-121	80-121
1,1,2,2-Tetrachloroethane	73-115	66-135
1,1,2-Trichloroethane	79-119	65-121
1,1-Dichloroethane	70-135	85-125
1,1-Dichloroethene	61-124	66-144
1,2-Dichlorobenzene	74-121	66-129
1,2-Dichloroethane	78-120	81-117
1,2-Dichloropropane	83-118	77-118
1,3-Dichlorobenzene	78-123	65-140
1,4-Dichlorobenzene	78-114	81-129
Benzene	75-114	77-131
Bromodichloromethane	81-115	80-118
Bromoform	72-126	64-143
Bromomethane	72-128	51-150
Carbon tetrachloride	67-116	81-128
Chlorobenzene	84-115	67-134
Chloroethane	65-130	67-146
Chloroform	75-121	81-119
Chloromethane	68-130	21-157
cis-1,2-Dichloroethene	67-120	71-136
cis-1,3-Dichloropropene	74-116	57-131
Dibromochloromethane	76-115	82-122
Dichlorodifluoromethane	58-150	51-181
Ethylbenzene	77-116	79-122
Methylene chloride	55-135	62-131
Tetrachloroethene	74-122	71-122
Toluene	76-116	88-122
trans-1,2-Dichloroethene	58-122	45-153
trans-1,3-Dichloropropene	72-119	55-123
Trichloroethene	71-117	62-136
Trichlorofluoromethane	67-128	47-154
Vinyl chloride	55-121	57-152
Xylene (total)	84-115	78-131

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-11
Quality Control
Petroleum Analysis by GC (8021B)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates: α,α,α-Trifluorotoluene (PID)	66-136	72-122	Each sample, MS, MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix-related problems are evident
Matrix Spikes: Spike all compounds of interest	See Table B5-12		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Spike all compounds of interest	See Table B5-12		Each group (≤20) of samples per matrix/level LCSD – analyzed if sufficient volume is not available for MS/MSD.	Reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD):	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by an analyst in relationship to other QC results
Blanks:	≤LOQ for all compounds		At least one per 20 samples and at least one per 24 hours	Reanalyze blank and associated samples if blank is outside limits
Internal Standards: 1-Chloro-3-fluorobenzene (PID)	-50% to +150% if internal standard area		Each sample, MS, MSD, LCS, and blank analyzed on the PID	Reanalyze samples; if reanalysis confirms original, document on report or case narrative; in cases where matrix is elevating the ISTD recovery, a dilution may be performed to bring ISTD within specifications

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-12
Statistical Acceptance Limits for
Petroleum Analysis by GC (8021B)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Benzene	86-119	78-131	76-118	52-135
Ethylbenzene	81-119	75-133	77-115	56-132
MTBE	82-124	70-134	71-118	52-141
Naphthalene	52-136	50-146	61-117	53-122
Toluene	82-119	78-129	72-115	59-129
Total Xylenes	82-120	84-131	78-115	54-134

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-13
Quality Control
TPH-GRO by GC (8015B)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates: Trifluorotoluene (FID)	57-146	71-122	Each sample, MS, MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix-related problems are evident
Matrix Spikes: Gasoline standard 8015B	63-154	39-118	Each group of samples of similar matrix/level (≤20) each method	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Gasoline standard	70-130	67-119	Each group (≤20) of samples. LCSD analyzed if sufficient volume is not available for MS/MSD.	Reanalyze LCS and associated samples. LCS that fails high, and GRO is ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Same compounds as matrix spikes	≤30% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ		At least one per 20 samples and at least one per 24 hours	Reanalyze blank and associated samples if blank is outside limits

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-14
Quality Control
TPH-DRO by GC (8015B)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates: *o*-Terphenyl	54-127	60-131	Added to each sample, MS/MSD, blank, and LCS/LCSD during the extraction phase	Repeat extraction and analysis; if reanalysis confirms original result, report results and comment in case narrative
Matrix Spikes: #2 Fuel Oil 8015B API California	41-145	37-153	Each group (≤20) of samples per matrix/level	Reinject if surrogates appear low. If still out of spec, evaluate for matrix effect. If matrix effect, accept based on LCS data. If no matrix effect, repeat batch.
Laboratory Control Samples: No. 2 Fuel	53-126	74-118	Each group ≤20	Reinject if surrogates appear low. If still out of spec, repeat batch. LCS that fails high, and DRO is ND in the sample, can be reported.
Laboratory Control Duplicates (RPD): #2 Fuel	≤20% for waters and soils		Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	≤LOQ		Once per case or extraction group (≤20) of samples, each matrix, level, instrument	Inject a solvent blank first to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected, if they, too, contain the analyte that was contaminating the blank. If the reinjected blank is unacceptable, any affected samples must be re-extracted.

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-15
Quality Control
Organochlorine Pesticides/PCBs (8081A/8082)
Herbicides (8151A)
Organophosphate Pesticides (8141A)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates:			Added to each sample, MS/MSD, blank, LCS/LCSD during the extraction phase	Repeat extraction and analysis; if reanalysis confirms original result, report results and comment in case narrative
Organochlorine Pesticides:				
DCB	47-155	62-159		
TCX	45-125	58-149		
Herbicides:				
DCAA	31-137	31-137		
Organophosphate Pesticides:				
2NMX	46-117	69-118		
Matrix Spikes: Organochlorine Pesticides (for 8081A/8082) (spike all compounds of interest, except PCBs, chlordane, and toxaphene); Herbicides (spike all compounds of interest); Organophosphate Pesticides (spike all compounds of interest); PCBs (for 8082 only) Aroclor 1016 Aroclor 1260	See Table B5-16 through B5-18 for acceptance limits		Each extraction group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.

Table B5-15 – Continued
Quality Control
Organochlorine Pesticides/PCBs (8081A/8082)
Herbicides (8151A)
Organophosphate Pesticides (8141A)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Laboratory Control Samples: Organochlorine Pesticides (for 8081A/8082) (spike all compounds of interest, except PCBs, chlordane, and toxaphene); Herbicides (spike all compounds of interest); Organophosphate Pesticides (spike all compounds of interest); PCBs (for 8082 only) Aroclor 1016 Aroclor 1260	See Table B5-16 through B5-18 for acceptance limits		Each group (≤20) when MS/MSD falls outside established limits	Re-extract and reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Organochlorine Pesticides (for 8081A/8082) (spike all compounds of interest, except PCBs, chlordane, and toxaphene); Herbicides (spike all compounds of interest); Organophosphate Pesticides (spike all compounds of interest); PCBs (for 8082 only) Aroclor 1016 Aroclor 1260	≤30%	≤50%	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results. Acceptable LCS would be indicative of matrix effects on the MS/MSD.

Table B5-15 – Continued
Quality Control
Organochlorine Pesticides/PCBs (8081A/8082)
Herbicides (8151A)
Organophosphate Pesticides (8141A)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Blanks:	≤LOQ		Once per extraction group (≤20) of samples, each matrix, level, instrument	Inject a hexane or solvent blank first to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected if they too, contain the analyte that was contaminating the blank. If the reinjected blank is unacceptable, any affected samples must be re-extracted.
Internal Standards(ISTD): Herbicides: 4,4'-dibromooctafluorobiphenyl (DBOB) OP Pesticides: 1-bromo-2-nitrobenzene	-50% to +100% of internal standard area of 12-hour STD RT change ≤30 sec.		Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original, document on report and/or case narrative

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-16
Statistical Acceptance Limits for
Organochlorine Pesticides/PCBs (8081A/8082)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
4,4-DDD	65-125	81-119	60-153	52-181
4,4-DDE	65-123	48-138	52-159	48-175
4,4-DDT	59-133	40-128	57-124	62-166
Aldrin	47-122	41-131	58-138	21-141
alpha-BHC	71-123	46-131	60-127	25-146
alpha-Chlordane	77-127	45-140	66-127	3-157
beta-BHC	64-143	30-147	68-137	31-176
Chlordane	N/A	N/A	N/A	N/A
delta-BHC	64-128	50-129	66-118	68-158
Dieldrin	71-129	48-135	71-133	68-139
Endosulfan I	77-120	45-132	71-130	41-166
Endosulfan II	75-124	53-136	73-134	65-144
Endosulfan sulfate	69-130	58-141	58-133	65-154
Endrin	53-132	55-127	65-134	58-171
Endrin aldehyde	61-131	46-131	40-119	63-125
Endrin Ketone	61-139	61-142	70-143	33-173
gamma-BHC (Lindane)	71-124	48-143	74-133	43-154
gamma-Chlordane	52-153	28-170	63-145	30-157
Heptachlor	52-153	70-138	61-129	70-138
Heptachlor epoxide	73-141	50-131	72-132	69-133
Kepone	N/A	N/A	N/A	N/A
Methoxychlor	49-155	55-131	56-168	74-162
PCB-1016	52-123	66-115	45-125	72-120
PCB-1221	N/A	N/A	N/A	N/A
PCB-1232	N/A	N/A	N/A	N/A
PCB-1242	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A
PCB-1260	62-133	75-114	62-130	65-137
Toxaphene	N/A	N/A	N/A	N/A

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-17
Statistical Acceptance Limits for
Organophosphate Pesticides (8141A)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Bolstar	63-140	80-123	68-122	59-140
Coumaphos	54-140	71-125	44-167	18-210
Demeton-O	41-111	28-97	34-94	22-122
Demeton-S	20-151	85-191	63-170	41-214
Diazinon	52-130	82-160	68-146	60-148
Dichlorvos	66-162	83-165	25-154	48-181
Disulfoton	62-131	71-141	51-127	54-130
Dursban (Chlorpyrifos)	62-136	66-148	74-149	53-156
EPN	26-128	48-134	54-140	48-162
Ethion	61-140	74-121	57-153	57-157
Ethoprop	52-131	75-127	65-141	76-134
Ethyl parathion	64-129	58-157	58-145	34-181
Famphur	20-130	34-151	26-150	45-199
Fensulfothion	20-106	56-140	61-200	74-143
Fenthion	57-137	74-134	68-149	66-137
Guthion (Azinphos-methyl)	39-148	57-169	36-174	47-130
Malathion	62-120	46-150	75-116	39-176
Merphos	61-129	27-159	25-127	1-238
Methyl parathion	57-143	51-167	56-141	63-147
Mevinphos	20-111	63-140	42-130	25-231
Naled	52-145	24-183	19-175	19-170
Phorate	67-129	44-163	61-134	65-130
Ronnel	65-132	76-128	62-133	67-135
Stirophos	48-135	68-143	67-138	31-228
Tokuthion	69-138	86-124	66-142	51-168
Trichloronate	66-137	77-120	56-131	63-129
Trithion	58-135	69-138	71-120	55-173

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-18
Statistical Acceptance Limits for
Herbicides (8151A)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
2,4,5-T	39-143	12-177	48-119	13-189
2,4,5-TP	52-140	44-161	44-137	30-151
2,4-D	50-144	38-176	40-140	41-158
2,4-DB	41-163	30-186	57-127	72-168
2,4-DP (Dichlorprop)	76-127	46-187	76-120	59-136
Dalapon	31-113	32-98	18-82	12-86
Dicamba	59-134	28-161	40-115	52-126
Dinoseb	19-96	13-132	1-36	1-48
MCPA	16-139	48-157	34-113	48-145
MCPP	42-126	43-159	37-114	33-123
Pentachlorophenol	61-121	29-151	55-108	20-117

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-19
Quality Control
PAHs by HPLC (8310)

Type	Acceptance Limits (%) Waters	Soils	Frequency	Corrective Action
Surrogates: Nitrobenzene or Triphenylene	63-154 59-131	59-121 48-161	Added to each sample, MS/MSD, blank, LCS/LCSD during the extraction phase	Surrogate must be within the limits unless matrix related problems are evident. If matrix related problems are evident, comment on report and in case narrative.
Matrix Spikes: Spike all compounds of interest	See Table B5-20		Each group (≤20) of samples per matrix/level	Evaluation in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Spike all compounds of interest	See Table B5-20		Each group (≤20) of samples per matrix/level	Re-extract and reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS, and are ND in the sample, can be reported.
Matrix Spike Duplicates (RPD): Spike all compounds of interest	≤30%	≤50%	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relation to other QC results
Blanks:	≤LOQ		Once per extraction group (≤20) of samples, each matrix/level	Inject a hexane or solvent blank first, to be sure the analytical system is clean then reinject the blank itself. If the reinjected blank is acceptable, any samples extracted with this blank should be reinjected, if they contain the analyte, which was present in the blank. If the reinjected blank is unacceptable, any affected samples must be re-extracted.

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

Table B5-20
Statistical Acceptance Limits for
PAHs by HPLC (8310)

Compound Name	Waters		Soils	
	LCS/LCSD (%)	MS/MSD (%)	LCS/LCSD (%)	MS/MSD (%)
Acenaphthene	60-116	59-114	76-103	66-113
Acenaphthylene	59-96	54-117	66-110	60-118
Anthracene	67-109	68-104	68-117	1-168
Benzo(a)anthracene	73-114	63-111	72-115	14-71
Benzo(a)pyrene	68-112	65-133	75-111	61-127
Benzo(b)fluoranthene	72-113	71-121	71-119	69-112
Benzo(g,h,i)perylene	28-138	68-116	73-116	58-125
Benzo(k)fluoranthene	72-119	70-109	71-119	69-112
Chrysene	70-111	69-107	71-108	48-132
Dibenz(a,h)anthracene	44-130	75-115	73-116	50-146
Fluoranthene	70-112	67-119	73-107	1-190
Fluorene	66-106	65-121	71-106	70-112
Indeno(1,2,3-cd)pyrene	60-111	72-119	68-129	53-127
Naphthalene	55-94	54-112	61-120	2-155
Phenanthrene	67-115	66-115	73-112	68-125
Pyrene	69-113	66-106	67-117	1-172

Acceptance limits are based on statistical evaluation of laboratory data and are subject to change.

B6. Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Conditions of the laboratory equipment and instrumentation can have a marked effect on the accuracy and precision of analysis. In order to ensure timely production of data and prevent/address potential malfunctions, Lancaster Laboratories schedules routine preventive maintenance of instruments based on manufacturer's recommendations. Maintenance of the laboratory instruments is the responsibility of the technical group using the equipment in conjunction with our in-house Equipment Maintenance Group. A schedule of routinely performed instrument maintenance tasks is attached as Table B6-1. All preventive maintenance, as well as maintenance performed as corrective action, is recorded in instrument logs. Equipment/Instrumentation is assigned unique designations to allow tracking of the piece of equipment within laboratory documentation. This allows the laboratory to substantiate the instrument condition during the time it was used for testing.

Critical spare parts are kept in supply at the laboratory by the Equipment Maintenance Group. Most items not kept in stock at the laboratory are available through overnight delivery from the manufacturer. In addition, Lancaster Labs maintains multiple numbers of most of the critical instruments used in our laboratory operations. A recent equipment inventory may be found in the *Environmental Quality Policy Manual*. Because we are a large laboratory with redundant capacity, the problems of instrument downtime are minimized.

Table B6-1
Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
GC/MS	Change septum	AN*: Min. weekly
	Clean/replace injection port seal and liner	AN
	Check fans	Monthly
	Check cool flow	Monthly
	Clean source	Bimonthly or AN
	Change oil in diffusion pump	Annually
	Change oil in rough pump	Annually
GC Volatiles	Check propanol level in ELCD resevoir	AN: Min. semiweekly
	Check all liquid and gas flows	Prior to calib. or AN
	Clean ELCD cell, change reaction tube	AN
	Change ELCD, Teflon line, and resin tube	AN
	Replace absorbant trap in concentrators	AN
	Column maintenance	AN
	Change PID lamp	AN
	Precalibration instrument settings check	Prior to each calibration
GC	Septum change	Each run
	Column/injection port maintenance	AN
	Clean detector	AN
	Vacuum filters	Semiannually
	Leak check ECDs	Semiannually
Cold Vapor AA	Replace pump tubing	AN: Min. weekly
	Lubricate pump head and autosampler	AN
	Inspect optical cell and windows	Monthly

Table B6-1 – Continued
Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
ICP	Replace pump winding	AN
	Lubricate autosampler	AN
	Vacuum instrument airfilters and air intakes	AN
	Change vacuum pump oil	Semiannually
	Clean optics and lenses	AN
	Clean Torch and injector tip	AN
	Clean nebulizer and spray chamber	AN
Infrared Spectrometer (FTIR)	Check on-demand diagnostics	Weekly
	Change dessicant	AN
HPLC	Pump lubrication	Annually
	Check pump seals	Annually
	Check valves cleaned or rebuilt	AN
	Replace and/or adjust detector bulb	AN
	Clean detector flow cell	AN
	Replace Teflon lines	AN
	Autosampler septa replacement	AN
	In-line filter sonication/cleaning	AN
	System passivation	AN
	PCRS pump lubrication	AN
	Empty waste liquid resevoir	Daily
ICP/MS	Change interface rough pump oil	Quarterly
	Change MS rough pump oil	Semiannually
	Clean cones and ion lenses	AN
	Clean torch, injector tip, nebulizer, and spray chamber	AN
	Change peristalic tubing	Weekly
	Vacuum instrument airfilters and air intakes	AN
	Empty waste liquid resevoir	Daily

Table B6-1 – Continued
Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
Total Organic Carbon Analyzer	Check IR zero and IR cell	AN
	Check for leaks	AN
	Check acid pump calibration	Bimonthly
	Check persulfate pump calibration	Bimonthly
	Inspect 6-port rotary valve	AN
	Inspect sample pump head	AN
	Wash molecular sieve	AN
	Check sample loop calibration	Monthly
	Clean gas permeation tube	AN
	Inspect digestion vessel O-rings	AN
	Check activated carbon scrubber	AN
	Dust back and clean circuit boards	AN
Total Organic Halogen Analyzer	Polish counter electrode	Daily
	Polish sensor electrode	Daily
	Clean loaders and pistons	Weekly
Autoanalyzer spectrophotometer	Clean sample probe	AN
	Clean proportioning pump	AN
	Inspect pump tubing, replace if worn	AN
	Clean wash receptacles	Monthly

* AN means as needed. Any of these items may be performed more frequently if response during operation indicates this is necessary.

B7. Instrument Calibration and Frequency

All measuring and testing equipment having an effect on the accuracy or validity of calibrations and tests will be calibrated and/or verified on an on-going and routine basis. Procedures for initial calibration and continuing calibration verification are in place for all instruments within the laboratory. The calibrations generally involve checking instrument response to standards (standardization) for each target compound to be analyzed. The source and accuracy of standards used for this purpose are integral to obtaining the best quality data. Standards used at Lancaster Laboratories are purchased from commercial supply houses either as neat compounds or as solutions with certified concentrations. The accuracy and quality of these purchased standards is verified through documentation provided by these commercial sources. Most solutions and all neat materials require subsequent dilution to an appropriate working range. All dilutions performed are documented and the resulting solution is checked by obtaining the instrument response of the new solution and comparing with the response to the solution currently in use. Any discrepancies between the responses are investigated and resolved before the new solution is used. Each standard is assigned a code that allows traceability to the original components. The standard container is marked with the code, name of solution, concentration, date prepared, expiration date, and the initials of the preparer. Shelf life and storage conditions for standards are included in the standard operating procedures and old standards are replaced before their expiration date.

Each instrument is calibrated with a given frequency using one or more concentrations of the standard solution. As analysis proceeds, the calibration is checked for any unacceptable change in instrument response. If the calibration check verifies the initial response, the analysis proceeds. If the calibration check indicates that a significant change in instrument response has occurred, then a new calibration is initiated. If necessary, maintenance may be performed before the recalibration.

Some instrumentation calibration involves the comparison of an instrument reading to a physical standard with a known certified value such as balance/weights or comparison against other instrumentation/apparatus such as NIST thermometer.

Calibration records are usually kept in the form of raw data with the other instrument printouts. In cases where no data system is used, calibration data is manually recorded in notebooks. Any maintenance or repair is also recorded in a notebook. The information that is recorded either in the notebooks or on the instrument printout includes the date, instrument ID, employee name and/or identification number, and concentration or code number of standard.

The frequency of calibration and calibration verification, number of concentrations analyzed, and acceptance criteria for each of the instruments to be used are listed in Table B7-1. In addition to checking the instrument response to target compounds, the GC/MS units are checked to ensure that standard mass spectral abundance criteria are met. Before each calibration, instruments used for volatile compound analysis are tuned using bromofluorobenzene (BFB) and instruments used for semivolatile analysis are tuned using decafluorotriphenylphosphine (DFTPP). The key ions and their abundance criteria are listed in Table B7-2.

Table B7-1
Instrument Calibration and Frequency

	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc.	Acceptance Criteria	Frequency	# Std Conc.	Acceptance Criteria
GC/MS Volatiles*	After C-cal fails	6	RF for SPCCs >0.300 for chlorobenzene, and 1,1,2,2-tetrachloroethane, and >0.100 for 1,1-dichloroethene, bromoform, and chloromethane CCCs ≤30%	Every 12 hours	1	RF for SPCCs >0.300 for chlorobenzene, and 1,1,2,2-tetrachloroethane, and >0.100 for 1,1-dichloroethene, bromoform, and chloromethane %Drift for CCCs ≤20
GC/MS Semivolatiles*	After C-cal fails	6	RF for SPCCs ≥0.050 %RSD for CCCs ≤30%	Every 12 hours	1	RF for SPCCs ≥0.050 %Drift for CCCs ≤20
GC VOA Halocarbons and/or Aromatics	After C-cal fails	At least 5	%RSD of <20% for individual compounds or for average of all compounds	Every 12 hours, or every 10 samples	1	%Drift ±15% for individual compounds or average of all compounds
GC Pesticides and Herbicides (DDT/Endrin degradation applies to method 8081A only)	Each new run After C-cal fails	5	≤20% RSD of RFs of initial calibration to use avg. RF, otherwise use curve fit. Degradation for DDT, endrin 15%. Alternatively, if the average of the %RSDs of all compounds in the calibration standard is ≤20%, then the AVG RF can be used for all compounds.	Every 10 samples Every 20 samples or 12 hours for method 8081A, 8082	1	≤15% difference for individual analytes, from initial response for quantitation or A CCV is also compliant if the average RPD for all compounds in the CCV standard is ≤15%. DDT/Endrin degradation check every 12 hours or 20 injections
HPLC PAHs	Each new run or after C-cal fails	5	≤20% RSD of RFs of initial calibration to use average RF, otherwise use curve fit. Alternatively, if the average of the %RSDs of all compounds in the calibration standard is ≤20%, then the AVG RF can be used for all compounds.	Every 10 samples	1	≤15% difference for individual analytes, from initial response for quantitation or A CCV is also compliant if the average RPD for all compounds in the CCV standard is ≤15%.
GC TPH-GRO	After C-cal fails	At least 5	%RSD of <20% otherwise use calibration curve	Every 12 hours or every 10 samples	1	%Drift ±15%
GC TPH-DRO	After C-cal fails	5	% RSD of <20% for average RF otherwise use calibration curve	Every 10 samples	1	%Drift ±15%

Table B7-1 – Continued
Instrument Calibration and Frequency

	Initial Calibration			Continuing Calibration Verification		
ICP	Each new run	1	Independent calibration verification (ICV) within ±10%, standards <5%RSD	Every 10 samples	1	Same as initial
ICP-MS	Each new run	3	Independent calibration verification (ICV) within ±10% Corr. coeff. ≥0.995	Every 10 samples	1	±10% of true value
CVAA	Each new run	5	Independent calibration verification within ±10% Corr. coeff. >0.995	Every 10 samples	1	±20% of true value
TOC Analyzer (w) Inst #1 (w) Inst #2 (s) Inst #3	Weekly	 1 5 4	 ±10% @ STD Corr. coeff. >0.995 Corr. coeff. >0.995	Every 10 samples	1	±10% of true value
Autoanalyzer	Daily	6	Corr. coeff. >0.995	Every 10 samples	1	±10% of true value
Infrared Spectrophotometer (FTIR)	Monthly	7	Corr. coeff. >0.995	Every 10 samples	1	±10% of true value
Balance	Daily	4	Top-loading balance ±.5% Analytical balances ± .1% for weights >.1 g .05 g ± .5% .02 g ± 1.0% .01 g ± 2.0% .005 g ± 2.0%	N/A	N/A	N/A

*All compounds with %RSD >15 must use first or second order regression fit of the six calibration points. Alternatively, the AVG RF can be used for each compound.

Abbreviations

Std Conc. – The number of standard concentrations used

SPCCs – System performance check compounds

CCCs – Calibration check compounds

RF – Response factor

%RSD – Percent relative standard deviation

CCV – Continuing calibration verification

CVAA – Cold vapor atomic absorption spectrophotometer

HPLC – High Performance Liquid Chromatography

ICP – Inductively coupled plasma spectrophotometer; ICP run also includes interelement correction check standard (beginning and end of run)

Table B7-2
Mass and Ion Abundance Criteria

BFB Key Ions	Abundance Criteria
50	15% to 40% of mass 95
75	30% to 60% of mass 95
95	Base peak, 100% relative abundance
96	5% to 9% of mass 95
173	Less than 2% of mass 174
174	Greater than 50% of mass 95
175	5% to 9% of mass 174
176	Greater than 95% but less than 101% of mass 174
177	5% to 9% of mass 176
DFTPP Key Ions	Abundance Criteria
51	30% to 60% of mass 198
68	Less than 2% of mass 69
70	Less than 2% of mass 69
127	40% to 60% of mass 198
197	Less than 1% of mass 198
198	Base peak, 100% relative abundance
199	5% to 9% of mass 198
275	10% to 30% of mass 198
365	Greater than 1% of mass 198
441	Present but less than mass 443
442	Greater than 40% of mass 198
443	17% to 23% of mass 442

B8. Inspection/Acceptance Requirements for Supplies and Consumables

Analytical results can be affected by the type and quality of reagents, standards, and equipment. Time and effort could be lost if the reagents, standards, and equipment do not meet the specifications required for the method. Therefore, the specifications and/or requirements for reagents, standards, and equipment necessary to perform the testing methods are included in the analytical SOPs. Each technical department evaluates the reagents, standards and equipment they receive for acceptance and use in specific procedures. There are SOPs in place for procurement of supplies, and acceptance/evaluation of reagents and standards.

Sample bottles and vials provided to clients are purchased pre-cleaned to meet EPA specifications and guidelines for sample containers. Each lot of preservative purchased is analyzed for quality (signs of contamination) before being added to a sample container.

The deionized water system utilized by Lancaster Laboratories generates water for analytical purposes. Reagent water is defined as water that has been purified to remove contaminants and interferences to a level low enough to be acceptable for use in laboratory procedures. Analytes must not be present above LLI analytical detection levels or corrective action/data qualification may be needed. The routine test parameters for reagent water used by Lancaster Laboratories (LLI) are based on ASTM D1193, under Type II water and the USEPA Manual for the Certification of Laboratories Analyzing Drinking Water requirements. In addition, analytical methods employ the use of preparation and/or method blanks to demonstrate that the reagent water is appropriate for use.

B9. Data Acquisition Requirements (Non-Direct Measurements)

The data acquired from the analytical procedures will be assessed for precision, accuracy, representativeness, comparability, and completeness (PARCCs). These specifications will be met through precision and accuracy criteria as specified in Element B5 and MDLs as specified in Element B4.

Precision – Precision is determined by measuring the agreement among individual measurements of the same property, under similar conditions. The laboratory objective is to equal or exceed the precision demonstrated for the applied analytical method on comparable samples. The degree of agreement is expressed as the relative percent difference (RPD%). Evaluation of the RPD% is based on statistical evaluation of past lab data or guidelines within the methods for organic and inorganic analyses. External evaluation of precision is accomplished by analysis of standard reference material and interlaboratory performance data.

Accuracy – Accuracy is a measure of the closeness of an individual measurement to the true or expected value. Analyzing a reference material of known concentration or reanalyzing a sample which has been spiked with a known concentration/amount is a way to determine accuracy. Accuracy is expressed as a percent recovery (%R). Evaluation of the %R is based on statistical evaluation of past lab data or guidelines within the methods for organic and inorganic analyses.

Representativeness – Representativeness expresses the degree to which data accurately represents the media and conditions being measured. The representativeness of the data from the sampling site will depend on the sampling procedure. Sample collection is the responsibility of the client. Samples will be homogenized, if required, as part of the laboratory sample preparation. By comparing the quality control data for the samples against other data for similar samples analyzed at the same time, representativeness can be determined for this objective.

Comparability – Comparability conveys the confidence with which one set of data can be compared to another. The analytical results can be compared to other laboratories by using traceable standards, standard methodology, and consistent reporting units. The Laboratory Quality Assurance Program documents internal performance, and the interlaboratory studies document performance compared to other laboratories.

Completeness – Completeness is a measure of the quantity of valid data acquired from a measurement process compared to the amount that was expected to be acquired under the measurement conditions. The completeness of an analysis can be documented by including in the data deliverables sufficient information to allow the data user to assess the quality of the results. Additional information will be stored in the laboratory's archives, both hard copy and magnetic tape. SOPs are in place to provide traceability of all reported results.

Uncertainty – (ISO 17025) "All uncertainty components which are of importance in a given situation shall be taken into account using appropriate methods of analysis." (5.4.6.3) This means the laboratory must determine the uncertainty contribution of all steps in the testing process such as equipment, calibration, standards, reagents, preparation, cleanups, etc. Since, in most methods, the laboratory control sample (LCS) goes through the entire process of preparation to analysis; all factors that would contribute to uncertainty will be evident through the LCS results. LCS are performed with every batch of samples where appropriate for the method.

B10. Data Management

At a minimum, data management is initiated when Lancaster Laboratories receives the samples from the client. In many instances, client-communicated requirements for bottleware and analyses are documented on an Incoming Sample Activity Report (ISAR) prior to sample receipt. This communication helps ensure that analysis and reporting meet the client needs. Sample information and requested analyses are entered into the Laboratory Information Management System (LIMS) where it can be accessed by all laboratory personnel. The entry is based on the ISAR and the client's COC. After entry, labels are printed for each container and an Acknowledgement is printed for the client. This will show exactly what was entered for the client's samples.

The flow of data from the time the samples enter the laboratory until the data is reported is summarized in Table B10-1. Raw analytical data generated in the laboratories is collected on printouts from the instruments and associated data system or manually in bound notebooks. All data is tracked by a unique seven-digit sample number assignment. Analysts review data as it is generated to determine that the instruments and methods are performing within specifications. This review includes calibration checks, surrogate recoveries, blank checks, retention time reproducibility, and other QC checks described in Elements B4, B5, and B7. If any problems are noted during the analytical run and/or at completion, corrective action is taken and documented.

Any data recorded manually is collected in bound notebooks and recorded in indelible ink, as described in Element A9. Procedures are in place for handling erroneous entries and all changes are dated, initialed, and explained. All data is uploaded automatically or manually entered into the LIMS. The LIMS is programmed to accept and track the results of quality control samples including blanks, surrogates, recoveries, duplicates, controls, and reference materials. The LIMS is programmed with the acceptance criteria for each QC type and if results are outside specifications, then a message is displayed to the analyst.

Data obtained from instrument printouts are dated and contain the signature and/or identification of the analyst responsible for the generation. The LIMS also produces control charts and statistics, which are reviewed by QA staff for trends that may indicate problems with the analytical data.

Computer technology is an integral part of laboratory operations including analytical instrumentation and central corporate functions. The laboratory makes extensive use of computers for business applications, technical operations, and the QA program. The Information Technology (IT) group support hardware and software applications at all levels as their primary function. Although some commercial software has been adapted to the laboratory operation, a larger portion is custom programmed by the IT group. The System Development Life Cycle (SDLC) approach is utilized and hardware and software are evaluated for appropriate functionality, accuracy, and security. Changes to systems and testing are documented. As part of QA's routine traceability audits, the electronic records are reviewed.

The principal criteria used to validate data will be the acceptance criteria described in Elements B4, B5, and B7 and protocols specified in laboratory SOPs. Following review, interpretation, and data reduction by the analyst, data is transferred to the LIMS by direct data upload from the analytical data system or manually. This system stores client information, sample results, and QC results. Element D1 describes the data deliverables validation performed by the laboratory.

Project files are created per client/project and contain chain-of-custody records, analysis requirements, and laboratory acknowledgments that document samples received, laboratory sample number assignment, and analyses requested. Raw data is filed per batch number assignment and laboratory sample number that correlates to the sample receipt documents. When the project is complete, all documentation is archived for 10 years in a locked storage area.

Table B10-1
Sample and Data Flow

Action	Personnel Involved
Sample received at Lancaster Labs • Unpacked and reconciled against the client paper work or Chain of Custody • SA Documentation log completed	Sample Administration
Sample is entered into sample management system • Lab ID number assigned • Analyses entered • Chain of custody started • Storage location assigned • Electronic record of sample number • Labels generated • Acknowledgement printed (record of samples received and analysis entered)	Sample Administration
Sample stored in assigned location (refrigerator, freezer, etc.) • Electronic record of sample #, bottle code, and location	Sample Support
Acknowledgment sent to client	Sample Administration
Sample removed from storage for analysis • Electronic requisition of sample number by bottle code • Necessary aliquot taken • Sample returned to storage	Technical Personnel
Analysis is performed according to selected analytical method • Raw data recorded • Reviewed • Transferred to computer by chemist or technician* (this is tracked by the unique sample number and batch number.)	Technical Personnel
Computer performs calculations as programmed according to methods	Data Processing
Second chemist or supervisor verifies raw data vs. LIMS entry	Technical Personnel
Analytical reports are printed and reviewed prior to sending to the client	Billing and Reporting staff and Technical Personnel
Data package deliverables are assembled	Data Package Group
Data packages are reviewed prior to sending to client	QA, Data Package Personnel, and Laboratory Management
Data packages are scanned, creating Adobe Acrobat PDF files, which can be e-mailed or stored on a CD-ROM and sent to the client Hard copy of batch raw data is archived Electronic files are backed up and archived	Data Package Personnel, Office Services, Technical Personnel

* Analyses requiring the chemist's interpretation may involve manual data reduction before entry into the computer.

Each analytical run is reviewed by a chemist for completeness and accuracy before interpretation and data reduction. The following calculations are used to reduce raw data to reportable results.

Semivolatiles and Volatiles by GC/MS Calculations:

GC/MS calculation used by the data system to determine concentration in extract for semivolatiles or in the sample itself for volatiles:

$$Q = \frac{(A_x)\ (I_s)}{(A_{is})\ (RRF)\ (V_i)}$$

Where:

Q	=	Concentration determined by the data system (mg/L)
A_x	=	Peak area
A_{is}	=	Internal standard peak area
I_s	=	Amount of internal standard injected (ng)
RRF	=	Relative response factor
V_i	=	Volume of extract injected (L) or volume sample purged (mL)

The extract concentration is further reduced by considering the initial sample weight or volume and the final extract volume:

$$Sample\ Concentration = \frac{(Q)\ (D)\ (F)\ (1000)}{IV\ (or\ IW)}$$

Where:

Q	=	Concentration determined by the data system (mg/L)
D	=	Dilution factor if needed
F	=	Final extract volume (mL)
IW	=	Initial sample weight (g)
IV	=	Initial sample volume (mL)

Results are reported in µg/L for water samples and µg/kg for solid samples. Soil samples are reported on a dry-weight basis. The results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

Volatiles by GC and Petroleum Analysis Calculations:

For volatiles by GC and petroleum analysis, a calibration is performed with a minimum of five levels using either an internal standard calibration or external calibration.

A. Internal standard calibration

$$CF = \frac{(A_x)(C_{is})}{(A_{is})(C_x)} \text{ or } CF = \frac{(H_x)(C_{is})}{(H_{is})(C_x)}$$

Where:

A_x = Peak area of the compound to be measured in that level of the initial calibration

H_x = Height area of the compound to be measured in that level of the initial calibration

A_{is} = Peak area of the internal standard

H_{is} = Height are of the internal standard

C_{is} = Concentration of the internal standard

C_x = Concentration of the compound spiked into that level

$$\overline{CF} = \frac{\sum all\ CF\ in\ the\ initial\ calibration}{n}$$

Where:

n = Number of levels in the initial calibration

$$Concentration = \frac{(A_x)(C_{is})}{(A_{is})(\overline{CF})} \times DF \text{ or } \frac{(H_x)(C_{is})}{(H_{is})(\overline{CF})} \times DF$$

Where:

A_x = Peak area of the compound to be measured
H_x = Height area of the compound to be measured
A_{is} = Peak area of the internal standard
H_{is} = Height area of the internal standard
C_{is} = Concentration of the internal standard.
$\overline{CF}$ = Average calibration factor
DF = Dilution factor or preparation factor

B. External calibration

$$Concentration = \frac{A_x}{\overline{CF}} \times DF \text{ or } \frac{H_x}{\overline{CF}} \times DF$$

Where all parameters are defined in A above.

Results are reported in µg/L for water samples and mg/kg for solid samples. Soil samples are reported on a dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

Herbicides and Organophosphate Pesticides:

For herbicides and organophosphate pesticides, an internal standard calibration is used. The results are calculated from the average response factor when the individual analyte %RSD is ≤20% or when the average of all analyte %RSDs is ≤20%. Otherwise, the results are calculated using the curve.

A. Curve

$$Sample\ Concentration,\ \mu g/kg\ or\ \mu g/L = Extract\ Concentration \times \frac{DF \times FV \times AF}{IW\ (or\ IV)}$$

Where:

Extract Concentration	=	(peak ht. – y-intercept)/slope
FV	=	Final volume
IW	=	Initial weight (g)
IV	=	Initial volume (mL)
DF	=	Dilution Factor
AF	=	Additional preparation factors

B. Average response factor

$$Extract\ Conc.,\ mg/L = \frac{Pk\ Ht\ in\ sample}{ARF} \times \frac{Int\ std\ ht\ in\ L3\ std}{Int\ std\ ht\ in\ sample}$$

Where:

ARF	=	Average Response Factor [(RF Calib1 + ... + RF Calib 5)/5]
RF	=	Peak height/conc. in standard

Results are reported as µg/L for water samples and µg/kg for solid samples. Soil samples are reported on a dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

PAHs by HPLC and Pesticide/PCB Calculations:

The results for the PAHs by HPLC and pesticide/PCBs analyses are calculated using external standard. The pesticides/PCBs results are calculated from the average response factor when the individual analyte %RSD is ≤20% or when the average of all analyte %RSDs is ≤20%. Otherwise, the results are calculated using the curve.

$$\frac{Pk\ Ht \times FV \times DF \times AF}{ARF \times IV\ (or\ IW)} = Concentration\ (mg/L\ or\ \mu g/kg)$$

Where:

Pk Ht	=	Peak height found in sample
ARF	=	Average response factor [(RFCalib1 + …+ RFCalib5)/5]
FV	=	Final volume of sample extract (mL)
DF	=	Dilution factor (where applicable)
IV	=	Initial volume of sample extracted (mL)
IW	=	Initial weight of the sample extracted (g)
AF	=	Additional factor

If a curve is used, then $\frac{\text{Pk Ht}}{\text{ARF}}$ is replaced by the following in the preceding equation:

$$\frac{Pk\ Ht - y\ intercept}{slope}$$

Results are reported as µg/L for water samples and µg/kg for solid samples. Soil samples are reported on dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

TPH-GRO and TPH-DRO Calculations:

For TPH-GRO and TPH-DRO, an external calibration procedure of at least five levels of standards is used. The resulting point-to-point calibration curve is used by the data system to calculate analyte concentrations. The equations that the data system uses for calculating analyte concentrations are shown below:

$$Concentration = \left(\frac{Ax}{ARF}\right) \times (DF)$$

Where:

Ax = Total peak area in region defined as analyte
DF = Dilution factor
ARF = Average response factor from the calibration curve, calculated as shown below:

$$ARF = \frac{[(As1/Qs1) + (As2/Qs2) + (As3/Qs3) + (As4/Qs4) + (As5/Qs5) + \ldots (Asn/Qsn)]}{n}$$

Where:

As# = Analyte peak sum area for all components of calibration level #
Qs# = Analyte concentration sum for all components of calibration level #
n = Number of calibration levels

For DRO, the concentration determined is then multiplied by F/IV (or IW) to account for the sample preparation.

Where:

F = Final extract volume (mL)
IV = Initial sample volume (mL)
IW = Initial sample weight (g)

Results are reported in mg/L for water samples and in mg/kg for solid samples. Soil samples are reported on a dry-weight basis. Results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

Inorganic Calculations:

The results for inorganic analyses are calculated using the following equation:

$$Concentration = \frac{(A)\ (D)\ (E)}{IV\ (or\ IW)}$$

Where:

A = The concentration determined using calibration data programmed into the instrument (mg/L)
D = Dilution factor if needed
E = Final extract volume (mL)
IW = Initial sample weight (g)
IV = Initial sample volume (mL)

Results are usually reported in mg/L for water samples and in mg/kg for solid samples. Alternate units are available upon request. Soil samples are reported on a dry-weight basis. The results are reported on Lancaster Labs Analysis Report Forms shown in Appendix A.

GROUP C

ASSESSMENT AND OVERSIGHT

C1. Assessments and Response Actions

Whenever any of the data generated falls outside of the established acceptance criteria outlined for instrument tune and calibration (Element B7) and internal QC (Element B5), the cause of this irregularity must be investigated, corrected, and documented. The documentation will be used to prevent a recurrence of the problem and to inform management of the situation.

If the results are not within acceptance criteria, the appropriate corrective action will be initiated. This may include, but is not limited to, checking calculations and instrument performance, reanalysis of the associated samples, examining other QC analyzed with the same batch of samples, and qualifying results with a comment stating the observed deviation.

A standard operating procedure is in place, which outlines the procedures to be followed when quality control data for an analysis falls outside of previously established acceptance limits. All batch QC data is entered into the computerized QC system promptly after its generation and evaluated for compliance. When the QC (blanks, check standards, continuing calibration verification, LCS/LCSD, etc) is noncompliant then corrective action is needed.

The Quality Assurance Department reviews monthly summaries of the quality control data entered onto the computerized sample management system by analysts. Control charts and statistics are reviewed for trends that may indicate problems with the analytical data. In this way, small problems are identified before they have any significant impact on laboratory results.

System audits are conducted on each department at Lancaster Laboratories by members of the Quality Assurance Department to ensure compliance with laboratory procedures and assist in identifying and correcting deficiencies. The audits include checks on methodology, reagent preparation, equipment calibration and maintenance, quality control results, and training of personnel. These audits may entail observation of procedures in process or a review of records to demonstrate traceability and compliance with all documented record keeping procedures. The QA Department will then issue a written report to management and the department that summarizes the audit. The department must respond in

writing to the audit report within 30 days of report receipt. The response must address the corrective action that needs to be taken along with an expected completion date and identify the employee responsible for completing the action. Audit results and the corresponding response are communicated to laboratory personnel and management. Follow-up audits verify that proper corrective action has been implemented.

Audits by outside organizations including clients, regulatory personnel, and the USEPA are permitted by arrangement with the Quality Assurance Department.

Performance audits consist of both intralaboratory and interlaboratory check samples. QC samples from commercial suppliers are analyzed quarterly to assess laboratory accuracy including a double blind program. The Laboratory also participates in a number of interlaboratory performance evaluation studies, which involve analysis of samples with concentrations of analytes that are known to the sponsoring organization, but unknown to the laboratory. Inorganics, pesticide/herbicides, trihalomethanes, volatile organic compounds, semivolatile organic compounds, and traditional wet chemistry analyses are analyzed by Lancaster Labs for studies conducted by various state agencies and private vendors (WS, WP, solid and hazardous waste). Representative results from some of these studies are in Figure C1-2.

When performance evaluation studies are identified as out of specification or when a nonconformance is due to a repetitive laboratory error, system failures, or observable trend, an Investigation and Corrective Action Report (ICAR) is issued. An example of an ICAR form is in Figure C1-1. The QA Department will circulate all completed Investigation and Corrective Action forms to the appropriate management.

Annually the QA Department itself is audited for compliance with corporate and departmental procedures, and meeting regulatory requirements. In a separate event, the laboratory Executive Group reviews the previous year's activities and documentation to evaluate the effectiveness of the quality system and its implementation/adequacy for the operation.

Figure C1-1

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

No. _____

Investigation and Corrective Action Report (ICAR)

Part I – Description of the Problem (Attach additional pages, if needed, in addition to supporting documentation.)

1. Date of issue:
2. Department(s) involved:
3. LL sample number(s) involved:
4. Nature of the problem (describe in detail):

Initiated by: _____

Part II - The Investigation (Attach additional pages, if needed, in addition to supporting documentation.)

1. Steps taken to investigate the problem:

2. Explanation of probable cause(s) (Refer to LOM-SOP-ES-230 Procedure section for a list of the six areas of real/root cause):

3. Steps taken to prevent future occurrence (describe in detail and use corrective action check boxes below):

Corrective action(s): Check the appropriate box and attach supporting documentation

- ☐ Employee(s) retrained. (Attach proof of training)
- ☐ Employee(s) reread SOP, OMC, EQV, etc. (Attach copy of updated training record form)
- ☐ Other measures taken (Attach memo or equivalent proof)
- ☐ Further investigation needed from additional areas. (Include proof of the transfer of information)

4. Must investigation be complete before reporting further data to clients? Yes No

5. In addition to the samples listed above, would any additional data already reported to clients be affected by this problem? Yes No If yes, please explain:

Investigator(s): ..... Date: _____

Departmental Review*: ..... Date: _____
(*Manager or above, must be someone other than the investigator)

Quality Assurance: ..... Date: _____

Return to QA by: ..... Date: _____

Figure C1-2

Final Report Results For Laboratory
Lancaster Laboratories

Figure C1-2 – Continued

Study: **WP-144**

ERA Laboratory Code: **L272101**

Laboratory Name: **Lancaster Laboratories**

Inorganic Results

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Demand							
0037	TOC	mg/L	20.3	18.6	15.4 - 21.8	Acceptable	EPA 415.1
Simple Nutrients							
1820	Nitrate + Nitrite as N	mg/L	0.749	0.853	0.688 - 1.01	Acceptable	EPA 353.2
Total Cyanide							
0071	Cyanide, total	mg/L	0.293	0.329	0.171 - 0.493	Acceptable	EPA 335.4
Total Phenolics (4-AAP)							
0097	Phenolics, total	mg/L	0.105	0.140	0.0694 - 0.211	Acceptable	EPA 420.2
Oil & Grease							
0104	Oil & Grease (Gravimetric)	mg/L	61.1	67.5	45.6 - 80.3	Acceptable	EPA 1664A
Trace Metals							
0001	Aluminum	µg/L		618	485 - 749	Not Reported	
0016	Antimony	µg/L	322.	307	209 - 372	Acceptable	EPA 6020
0002	Arsenic	µg/L	438.	401	335 - 470	Acceptable	EPA 6020
1015	Barium	µg/L	2080.	2080	1810 - 2350	Acceptable	EPA 6020
0003	Beryllium	µg/L	79.9	80.8	67.5 - 91.4	Acceptable	EPA 6020
1025	Boron	µg/L		1890	1540 - 2200	Not Reported	
0004	Cadmium	µg/L	634.	673	574 - 764	Acceptable	EPA 6020
0006	Chromium	µg/L	579.	568	495 - 642	Acceptable	EPA 6020
0005	Cobalt	µg/L		585	514 - 656	Not Reported	
0007	Copper	µg/L	696.	660	594 - 726	Acceptable	EPA 6020
0008	Iron	µg/L		604	532 - 685	Not Reported	
0012	Lead	µg/L	655.	647	565 - 726	Acceptable	EPA 6020
0010	Manganese	µg/L		227	202 - 252	Not Reported	
0074	Molybdenum	µg/L		104	83.2 - 124	Not Reported	
0011	Nickel	µg/L	181.	175	152 - 199	Acceptable	EPA 6020
0013	Selenium	µg/L	1040.	991	788 - 1150	Acceptable	EPA 6020
0017	Silver	µg/L		181	155 - 208	Not Reported	
0075	Strontium	µg/L		91.1	76.9 - 105	Not Reported	
0018	Thallium	µg/L	572.	552	446 - 662	Acceptable	EPA 6020
0014	Vanadium	µg/L		1530	1340 - 1710	Not Reported	
0015	Zinc	µg/L		169	143 - 200	Not Reported	

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Trace Metals							
0001	Aluminum	µg/L	627.	618	485 - 749	Acceptable	EPA 6010B
0016	Antimony	µg/L	303.	307	209 - 372	Acceptable	EPA 6010B
0002	Arsenic	µg/L	388.	401	335 - 470	Acceptable	EPA 6010B
1015	Barium	µg/L	2070.	2080	1810 - 2350	Acceptable	EPA 6010B
0003	Beryllium	µg/L	81.4	80.8	67.5 - 91.4	Acceptable	EPA 6010B
1025	Boron	µg/L	1840.	1890	1540 - 2200	Acceptable	EPA 6010B
0004	Cadmium	µg/L	658.	673	574 - 764	Acceptable	EPA 6010B
0006	Chromium	µg/L	557.	568	495 - 642	Acceptable	EPA 6010B
0005	Cobalt	µg/L	606.	585	514 - 656	Acceptable	EPA 6010B
0007	Copper	µg/L	672.	660	594 - 726	Acceptable	EPA 6010B
0008	Iron	µg/L	593.	604	532 - 685	Acceptable	EPA 6010B
0012	Lead	µg/L	655.	647	565 - 726	Acceptable	EPA 6010B
0010	Manganese	µg/L	234.	227	202 - 252	Acceptable	EPA 6010B
0074	Molybdenum	µg/L	104.	104	83.2 - 124	Acceptable	EPA 6010B
0011	Nickel	µg/L	177.	175	152 - 199	Acceptable	EPA 6010B
0013	Selenium	µg/L	926.	991	788 - 1150	Acceptable	EPA 6010B
0017	Silver	µg/L	179.	181	155 - 208	Acceptable	EPA 6010B
0075	Strontium	µg/L	92.3	91.1	76.9 - 105	Acceptable	EPA 6010B
0018	Thallium	µg/L	534.	552	446 - 662	Acceptable	EPA 6010B
0014	Vanadium	µg/L	1510.	1530	1340 - 1710	Acceptable	EPA 6010B
0015	Zinc	µg/L	175.	169	143 - 200	Acceptable	EPA 6010B
Mercury							
0009	Mercury	µg/L	14.9	16.4	10.1 - 22.2	Acceptable	EPA 7470A
Tin & Titanium							
1175	Tin	µg/L	1620.	1700	1340 - 2060	Acceptable	EPA 6010
0076	Titanium	µg/L	183.	190	163 - 214	Acceptable	EPA 6010
Sulfide							
2005	Sulfide	mg/L	6.99	8.18	3.97 - 11.6	Acceptable	EPA 376.1

Figure C1-2 – Continued

Study: **WP-144**

ERA Laboratory Code: **L272101**

Laboratory Name: **Lancaster Laboratories**

Organic Results

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Volatiles							
4315	Acetone	µg/L		118	23.5 - 192	Not Reported	
4320	Acetonitrile	µg/L		0.00		Not Reported	
4325	Acrolein	µg/L		0.00		Not Reported	
4340	Acrylonitrile	µg/L		0.00		Not Reported	
0065	Benzene	µg/L	44.2	43.5	31.1 - 55.6	Acceptable	EPA 8021B
0060	Bromodichloromethane	µg/L	35.3	33.4	23.3 - 45.0	Acceptable	EPA 8021B
0062	Bromoform	µg/L	38.3	31.8	19.6 - 43.4	Acceptable	EPA 8021B
4950	Bromomethane	µg/L		0.00		Not Reported	
4410	2-Butanone (MEK)	µg/L		0.00		Not Reported	
5000	tert-Butyl methyl ether (MTBE)	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4450	Carbon disulfide	µg/L		46.8	25.9 - 76.6	Not Reported	
0058	Carbon tetrachloride	µg/L	20.9	20.5	11.7 - 28.4	Acceptable	EPA 8021B
0064	Chlorobenzene	µg/L	53.6	47.7	34.4 - 59.9	Acceptable	EPA 8021B
0061	Chlorodibromomethane	µg/L	45.9	42.6	29.0 - 56.5	Acceptable	EPA 8021B
4485	Chloroethane	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4500	2-Chloroethylvinylether	µg/L		0.00		Not Reported	
0055	Chloroform	µg/L	20.0	20.7	14.2 - 27.7	Acceptable	EPA 8021B
4960	Chloromethane	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4585	1,2-Dibromoethane (EDB)	µg/L		0.00		Not Reported	
4595	Dibromomethane	µg/L		0.00		Not Reported	
0094	1,2-Dichlorobenzene	µg/L	35.1	39.8	27.3 - 51.9	Acceptable	EPA 8021B
0096	1,3-Dichlorobenzene	µg/L	12.9	10.9	6.56 - 14.5	Acceptable	EPA 8021B
0095	1,4-Dichlorobenzene	µg/L	47.4	42.6	28.6 - 54.0	Acceptable	EPA 8021B
4625	Dichlorodifluoromethane	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4630	1,1-Dichloroethane	µg/L	28.6	28.5	19.2 - 38.9	Acceptable	EPA 8021B
0054	1,2-Dichloroethane	µg/L	23.9	24.2	16.7 - 32.7	Acceptable	EPA 8021B
4640	1,1-Dichloroethylene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4645	cis-1,2-Dichloroethylene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4700	trans-1,2-Dichloroethylene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
4655	1,2-Dichloropropane	µg/L	41.9	47.2	30.7 - 62.6	Acceptable	EPA 8021B
4680	cis-1,3-Dichloropropylene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B

All analytes are included in ERA's A2LA accreditation, Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Volatiles (Continued)							
4685	trans-1,3-Dichloropropylene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
0066	Ethylbenzene	µg/L	46.8	43.6	29.9 - 55.7	Acceptable	EPA 8021B
4835	Hexachlorobutadiene	µg/L	67.5	63.2	6.32 - 78.8	Acceptable	EPA 8021B
4860	2-Hexanone	µg/L		0.00		Not Reported	
0063	Methylene chloride	µg/L	65.8	63.0	38.6 - 87.7	Acceptable	EPA 8021B
4995	4-Methyl-2-pentanone (MIBK)	µg/L		82.0	38.2 - 123	Not Reported	
5005	Naphthalene	µg/L	43.6	42.5	13.4 - 53.7	Acceptable	EPA 8021B
5100	Styrene	µg/L	37.6	33.3	21.9 - 45.0	Acceptable	EPA 8021B
5105	1,1,1,2-Tetrachloroethane	µg/L		0.00		Not Reported	
5110	1,1,2,2-Tetrachloroethane	µg/L	30.7	32.3	17.5 - 49.3	Acceptable	EPA 8021B
0059	Tetrachloroethylene	µg/L	15.0	14.6	7.00 - 19.5	Acceptable	EPA 8021B
0067	Toluene	µg/L	46.7	44.8	31.1 - 56.4	Acceptable	EPA 8021B
5155	1,2,4-Trichlorobenzene	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
0056	1,1,1-Trichloroethane	µg/L	36.7	42.5	26.6 - 56.2	Acceptable	EPA 8021B
5165	1,1,2-Trichloroethane	µg/L	96.8	93.9	65.0 - 121	Acceptable	EPA 8021B
0057	Trichloroethylene	µg/L	38.6	37.8	23.9 - 49.8	Acceptable	EPA 8021B
5175	Trichlorofluoromethane	µg/L	< 0.5	0.00		Acceptable	EPA 8021B
5180	1,2,3-Trichloropropane (TCP)	µg/L		0.00		Not Reported	
5225	Vinyl acetate	µg/L		0.00		Not Reported	
5235	Vinyl chloride	µg/L	21.4	21.4	8.56 - 34.2	Acceptable	EPA 8021B
5260	Xylenes, total	µg/L	142.	132	75.6 - 178	Acceptable	EPA 8021B

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Volatiles							
4315	Acetone	µg/L	123.	118	23.5 - 192	Acceptable	EPA 8260
4320	Acetonitrile	µg/L	< 25.	0.00		Acceptable	EPA 8260
4325	Acrolein	µg/L	< 40.	0.00		Acceptable	EPA 8260
4340	Acrylonitrile	µg/L	< 4.	0.00		Acceptable	EPA 8260
0065	Benzene	µg/L	46.4	43.5	31.1 - 55.6	Acceptable	EPA 8260
0060	Bromodichloromethane	µg/L	35.1	33.4	23.3 - 45.0	Acceptable	EPA 8260
0062	Bromoform	µg/L	32.0	31.8	19.6 - 43.4	Acceptable	EPA 8260
4950	Bromomethane	µg/L	< 1.0	0.00		Acceptable	EPA 8260
4410	2-Butanone (MEK)	µg/L	< 3.0	0.00		Acceptable	EPA 8260
5000	tert-Butyl methyl ether (MTBE)	µg/L	< 0.5	0.00		Acceptable	EPA 8260
4450	Carbon disulfide	µg/L	58.1	48.8	25.9 - 76.6	Acceptable	EPA 8260
0058	Carbon tetrachloride	µg/L	22.8	20.5	11.7 - 28.4	Acceptable	EPA 8260
0064	Chlorobenzene	µg/L	50.2	47.7	34.4 - 59.9	Acceptable	EPA 8260
0061	Chlorodibromomethane	µg/L	43.8	42.6	29.0 - 56.5	Acceptable	EPA 8260
4485	Chloroethane	µg/L	< 1.0	0.00		Acceptable	EPA 8260
4500	2-Chloroethylvinylether	µg/L	< 2.0	0.00		Acceptable	EPA 8260
0055	Chloroform	µg/L	22.1	20.7	14.2 - 27.7	Acceptable	EPA 8260
4960	Chloromethane	µg/L	< 1.0	0.00		Acceptable	EPA 8260
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	< 2.0	0.00		Acceptable	EPA 8260
4585	1,2-Dibromoethane (EDB)	µg/L	< 1.0	0.00		Acceptable	EPA 8260
4595	Dibromomethane	µg/L	< 1.0	0.00		Acceptable	EPA 8260
0094	1,2-Dichlorobenzene	µg/L	41.2	39.8	27.3 - 51.9	Acceptable	EPA 8260
0096	1,3-Dichlorobenzene	µg/L	11.3	10.9	6.56 - 14.5	Acceptable	EPA 8260
0095	1,4-Dichlorobenzene	µg/L	44.6	42.6	28.6 - 54.0	Acceptable	EPA 8260
4625	Dichlorodifluoromethane	µg/L	< 2.0	0.00		Acceptable	EPA 8260
4630	1,1-Dichloroethane	µg/L	31.1	28.5	19.2 - 38.9	Acceptable	EPA 8260
0054	1,2-Dichloroethane	µg/L	26.8	24.2	16.7 - 32.7	Acceptable	EPA 8260
4640	1,1-Dichloroethylene	µg/L	< 0.8	0.00		Acceptable	EPA 8260
4645	cis-1,2-Dichloroethylene	µg/L	< 0.8	0.00		Acceptable	EPA 8260
4700	trans-1,2-Dichloroethylene	µg/L	< 0.8	0.00		Acceptable	EPA 8260
4655	1,2-Dichloropropane	µg/L	49.5	47.2	30.7 - 62.6	Acceptable	EPA 8260
4680	cis-1,3-Dichloropropylene	µg/L	< 1.0	0.00		Acceptable	EPA 8260

All analytes are included in ERA's A2LA accreditation, Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Volatiles (Continued)							
4685	trans-1,3-Dichloropropylene	µg/L	< 1.0	0.00		Acceptable	EPA 8260
0066	Ethylbenzene	µg/L	46.0	43.6	29.9 - 55.7	Acceptable	EPA 8260
4835	Hexachlorobutadiene	µg/L	68.3	63.2	6.32 - 78.8	Acceptable	EPA 8260
4860	2-Hexanone	µg/L	< 3.0	0.00		Acceptable	EPA 8260
0063	Methylene chloride	µg/L	70.7	63.0	38.6 - 87.7	Acceptable	EPA 8260
4995	4-Methyl-2-pentanone (MIBK)	µg/L	83.2	82.0	38.2 - 123	Acceptable	EPA 8260
5005	Naphthalene	µg/L	43.1	42.5	13.4 - 53.7	Acceptable	EPA 8260
5100	Styrene	µg/L	35.1	33.3	21.9 - 45.0	Acceptable	EPA 8260
5105	1,1,1,2-Tetrachloroethane	µg/L	< 1.0	0.00		Acceptable	EPA 8260
5110	1,1,2,2-Tetrachloroethane	µg/L	34.4	32.3	17.5 - 49.3	Acceptable	EPA 8260
0059	Tetrachloroethylene	µg/L	15.1	14.6	7.00 - 19.5	Acceptable	EPA 8260
0067	Toluene	µg/L	47.7	44.8	31.1 - 56.4	Acceptable	EPA 8260
5155	1,2,4-Trichlorobenzene	µg/L	< 1.0	0.00		Acceptable	EPA 8260
0056	1,1,1-Trichloroethane	µg/L	46.4	42.5	26.6 - 56.2	Acceptable	EPA 8260
5165	1,1,2-Trichloroethane	µg/L	103.	93.9	65.0 - 121	Acceptable	EPA 8260
0057	Trichloroethylene	µg/L	40.0	37.8	23.9 - 49.8	Acceptable	EPA 8260
5175	Trichlorofluoromethane	µg/L	< 2.0	0.00		Acceptable	EPA 8260
5180	1,2,3-Trichloropropane (TCP)	µg/L	< 1.0	0.00		Acceptable	EPA 8260
5225	Vinyl acetate	µg/L	< 2.0	0.00		Acceptable	EPA 8260
5235	Vinyl chloride	µg/L	23.3	21.4	8.56 - 34.2	Acceptable	EPA 8260
5260	Xylenes, total	µg/L	138.	132	75.6 - 178	Acceptable	EPA 8260
PCBs in Water							
0040	Aroclor 1016	µg/L	< 0.1	0.00		Acceptable	EPA 8082
8885	Aroclor 1221	µg/L	< 0.1	0.00		Acceptable	EPA 8082
0042	Aroclor 1232	µg/L	< 0.1	0.00		Acceptable	EPA 8082
0040	Aroclor 1242	µg/L	< 0.1	0.00		Acceptable	EPA 8082
0044	Aroclor 1248	µg/L	< 0.1	0.00		Acceptable	EPA 8082
0045	Aroclor 1254	µg/L	4.72	4.50	2.10 - 5.88	Acceptable	EPA 8082
0046	Aroclor 1260	µg/L	< 0.1	0.00		Acceptable	EPA 8082
PCBs in Oil							
0099	Aroclor 1016/1242	mg/kg	28.0	43.6	8.20 - 58.0	Acceptable	EPA 8082
0100	Aroclor 1254	mg/kg	< 0.60	0.00		Acceptable	EPA 8082
0101	Aroclor 1260	mg/kg	< 0.60	0.00		Acceptable	EPA 8082

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Organochlorine Pesticides							
0047	Aldrin	µg/L	2.78	3.26	0.934 - 4.51	Acceptable	EPA 8081A
7110	alpha-BHC	µg/L	8.87	8.85	3.92 - 12.0	Acceptable	EPA 8081A
7115	beta-BHC	µg/L	4.59	4.65	1.90 - 6.43	Acceptable	EPA 8081A
7105	delta-BHC	µg/L	2.85	2.74	0.874 - 3.85	Acceptable	EPA 8081A
7120	gamma-BHC(Lindane)	µg/L	2.14	2.19	0.828 - 3.15	Acceptable	EPA 8081A
7240	alpha-Chlordane	µg/L	3.53	3.42	1.53 - 4.71	Acceptable	EPA 8081A
7245	gamma-Chlordane	µg/L	2.04	2.14	0.932 - 3.02	Acceptable	EPA 8081A
0049	4,4'-DDD	µg/L	8.80	8.92	3.25 - 12.7	Acceptable	EPA 8081A
0050	4,4'-DDE	µg/L	8.68	9.42	4.21 - 12.1	Acceptable	EPA 8081A
0051	4,4'-DDT	µg/L	5.70	7.74	2.89 - 10.9	Acceptable	EPA 8081A
0048	Dieldrin	µg/L	11.8	11.5	5.66 - 15.6	Acceptable	EPA 8081A
7540	Endrin	µg/L	4.51	4.77	1.78 - 7.20	Acceptable	EPA 8081A
7530	Endrin aldehyde	µg/L	7.56	7.29	2.03 - 11.2	Acceptable	EPA 8081A
7535	Endrin ketone	µg/L	6.02	6.01	3.30 - 8.71	Acceptable	EPA 8081A
7510	Endosulfan I	µg/L	11.0	13.7	4.19 - 20.0	Acceptable	EPA 8081A
7515	Endosulfan II	µg/L	15.6	16.6	5.02 - 21.9	Acceptable	EPA 8081A
7520	Endosulfan sulfate	µg/L	9.66	9.12	3.43 - 13.3	Acceptable	EPA 8081A
0052	Heptachlor	µg/L	2.85	3.35	1.09 - 4.63	Acceptable	EPA 8081A
0076	Heptachlor epoxide (beta)	µg/L	2.92	2.85	1.37 - 4.05	Acceptable	EPA 8081A
7810	Methoxychlor	µg/L	10.8	13.7	3.72 - 21.5	Acceptable	EPA 8081A
Chlordane							
0053	Chlordane, technical	µg/L	14.3	14.0	5.25 - 20.2	Acceptable	EPA 8081A
Toxaphene							
8250	Toxaphene	µg/L	8.31	21.7	2.17 - 39.3	Acceptable	EPA 8081A

All analytes are included in ERA's A2LA accreditation, Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Chlorinated Acid Herbicides							
8505	Acifluorfen	µg/L		0.00		Not Reported	
8530	Bentazon	µg/L		9.69	0.969 - 18.9	Not Reported	
8540	Chloramben	µg/L		0.00		Not Reported	
8545	2,4-D	µg/L	4.55	6.96	0.696 - 11.2	Acceptable	EPA 8151
8560	2,4-DB	µg/L	5.82	8.18	0.818 - 15.7	Acceptable	EPA 8151
8550	Dacthal diacid (DCPA)	µg/L		2.82	0.419 - 4.89	Not Reported	
8555	Dalapon	µg/L	< 0.25	0.00		Acceptable	EPA 8151
8595	Dicamba	µg/L	21.7	2.65	0.265 - 4.05	Not Acceptable	EPA 8151
8600	3,5-Dichlorobenzoic acid	µg/L		9.48	2.82 - 14.0	Not Reported	
8605	Dichlorprop	µg/L	< 0.16	0.00		Acceptable	EPA 8151
8620	Dinoseb	µg/L	1.99	3.80	0.380 - 5.96	Acceptable	EPA 8151
7775	MCPA	µg/L	< 300.	0.00		Acceptable	EPA 8151
7780	MCPP	µg/L	< 50.0	12.8	0.00 - 34.7	Not Acceptable	EPA 8151
6500	4-Nitrophenol	µg/L		0.00		Not Reported	
6505	Pentachlorophenol	µg/L	< 0.027	0.00		Acceptable	EPA 8151
8645	Picloram	µg/L		0.00		Not Reported	
8655	2,4,5-T	µg/L	36.2	4.72	0.472 - 7.08	Not Acceptable	EPA 8151
8650	2,4,5-TP (Silvex)	µg/L	35.0	4.47	0.541 - 6.62	Not Acceptable	EPA 8151

All analytes are included in ERA's A2LA accreditation, Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

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EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Base/Neutrals							
5500	Acenaphthene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5505	Acenaphthylene	µg/L	17.9	20.1	7.09 - 26.4	Acceptable	EPA 8270C
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L	106.	128	25.3 - 172	Acceptable	EPA 8270C
5545	Aniline	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5555	Anthracene	µg/L	26.7	28.2	12.4 - 37.0	Acceptable	EPA 8270C
5595	Benzidine	µg/L	< 20.	0.00		Acceptable	EPA 8270C
5575	Benzo(a)anthracene	µg/L	15.6	15.9	6.67 - 21.0	Acceptable	EPA 8270C
5585	Benzo(b)fluoranthene	µg/L	20.4	23.9	7.43 - 34.0	Acceptable	EPA 8270C
5600	Benzo(k)fluoranthene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5590	Benzo(g,h,i)perylene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5580	Benzo(a)pyrene	µg/L	21.9	23.9	7.56 - 33.0	Acceptable	EPA 8270C
5630	Benzyl alcohol	µg/L	< 5.	0.00		Acceptable	EPA 8270C
5660	4-Bromophenyl-phenylether	µg/L	37.6	38.5	13.8 - 53.2	Acceptable	EPA 8270C
5670	Butylbenzylphthalate	µg/L	136.	149	30.5 - 210	Acceptable	EPA 8270C
5680	Carbazole	µg/L	58.4	55.5	32.0 - 80.2	Acceptable	EPA 8270C
5745	4-Chloroaniline	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5760	bis(2-Chloroethoxy)methane	µg/L	63.7	64.0	25.1 - 76.9	Acceptable	EPA 8270C
5765	bis(2-Chloroethyl)ether	µg/L	15.0	18.5	6.90 - 26.9	Acceptable	EPA 8270C
5780	bis(2-Chloroisopropyl)ether	µg/L	86.8	80.2	20.6 - 99.2	Acceptable	EPA 8270C
5790	1-Chloronaphthalene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5795	2-Chloronaphthalene	µg/L	< 2.	0.00		Acceptable	EPA 8270C
5825	4-Chlorophenyl-phenylether	µg/L	84.4	92.2	34.7 - 115	Acceptable	EPA 8270C
5855	Chrysene	µg/L	16.3	17.3	7.98 - 25.9	Acceptable	EPA 8270C
5895	Dibenz(a,h)anthracene	µg/L	29.1	28.5	7.42 - 42.3	Acceptable	EPA 8270C
5905	Dibenzofuran	µg/L	110.	121	42.0 - 149	Acceptable	EPA 8270C
5925	Di-n-butylphthalate	µg/L	95.	97.6	32.0 - 128	Acceptable	EPA 8270C
4610	1,2-Dichlorobenzene	µg/L	50.3	64.1	6.87 - 79.0	Acceptable	EPA 8270C
4615	1,3-Dichlorobenzene	µg/L	37.2	48.6	6.58 - 58.6	Acceptable	EPA 8270C
4620	1,4-Dichlorobenzene	µg/L	103.	128	12.8 - 151	Acceptable	EPA 8270C
5945	3,3'-Dichlorobenzidine	µg/L	< 2.	0.00		Acceptable	EPA 8270C
6070	Diethylphthalate	µg/L	< 2.	0.00		Acceptable	EPA 8270C
6135	Dimethylphthalate	µg/L	< 2.	0.00		Acceptable	EPA 8270C

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

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717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Base/Neutrals (Continued)							
6185	2,4-Dinitrotoluene	µg/L	44.8	49.4	17.0 - 64.1	Acceptable	EPA 8270C
6190	2,6-Dinitrotoluene	µg/L	80.5	90.6	37.3 - 114	Acceptable	EPA 8270C
6200	Di-n-octylphthalate	µg/L	96.3	103	22.5 - 152	Acceptable	EPA 8270C
6255	bis(2-Ethylhexyl)phthalate	µg/L	62.6	68.6	20.6 - 96.5	Acceptable	EPA 8270C
6265	Fluoranthene	µg/L	39.3	40.3	18.9 - 52.4	Acceptable	EPA 8270C
6270	Fluorene	µg/L	120.	131	57.8 - 154	Acceptable	EPA 8270C
6275	Hexachlorobenzene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
4835	Hexachlorobutadiene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
6285	Hexachlorocyclopentadiene	µg/L	< 5.	0.00		Acceptable	EPA 8270C
4840	Hexachloroethane	µg/L	< 1.	0.00		Acceptable	EPA 8270C
6315	Indeno(1,2,3-cd)pyrene	µg/L	30.9	30.5	4.47 - 44.4	Acceptable	EPA 8270C
6320	Isophorone	µg/L	45.6	53.1	21.5 - 69.4	Acceptable	EPA 8270C
6385	2-Methylnaphthalene	µg/L	35.7	40.2	5.86 - 54.1	Acceptable	EPA 8270C
5005	Naphthalene	µg/L	37.7	43.6	13.6 - 54.9	Acceptable	EPA 8270C
6460	2-Nitroaniline	µg/L	< 1.	0.00		Acceptable	EPA 8270C
6465	3-Nitroaniline	µg/L	< 1.	0.00		Acceptable	EPA 8270C
6470	4-Nitroaniline	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5015	Nitrobenzene	µg/L	56.5	63.5	20.3 - 78.7	Acceptable	EPA 8270C
6525	N-Nitrosodiethylamine	µg/L	85.1	97.3	19.8 - 107	Acceptable	EPA 8270C
6530	N-Nitrosodimethylamine	µg/L	60.2	109	10.9 - 129	Acceptable	EPA 8270C
6535	N-Nitrosodiphenylamine	µg/L	< 2.	0.00		Acceptable	EPA 8270C
6545	N-Nitroso-di-n-propylamine	µg/L	< 1.	0.00		Acceptable	EPA 8270C
6590	Pentachlorobenzene	µg/L	49.7	58.8	11.6 - 78.8	Acceptable	EPA 8270C
6615	Phenanthrene	µg/L	113.	116	53.2 - 139	Acceptable	EPA 8270C
6665	Pyrene	µg/L	< 1.	0.00		Acceptable	EPA 8270C
5095	Pyridine	µg/L	< 2.	0.00		Acceptable	EPA 8270C
6715	1,2,4,5-Tetrachlorobenzene	µg/L	< 2.	0.00		Acceptable	EPA 8270C
5155	1,2,4-Trichlorobenzene	µg/L	< 1.	0.00		Acceptable	EPA 8270C

Figure C1-2 – Continued

WP-144 Final Complete Report

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EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Base/Neutrals							
5500	Acenaphthene	µg/L	< 0.05	0.00		Acceptable	EPA 8270-SIM
5505	Acenaphthylene	µg/L	19.0	20.1	7.09 - 26.4	Acceptable	EPA 8270-SIM
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L		128	25.3 - 172	Not Reported	
5545	Aniline	µg/L		0.00		Not Reported	
5555	Anthracene	µg/L	28.5	28.2	12.4 - 37.0	Acceptable	EPA 8270-SIM
5595	Benzidine	µg/L		0.00		Not Reported	
5575	Benzo(a)anthracene	µg/L	16.9	15.9	6.67 - 21.0	Acceptable	EPA 8270-SIM
5585	Benzo(b)fluoranthene	µg/L	22.4	23.9	7.43 - 34.0	Acceptable	EPA 8270-SIM
5600	Benzo(k)fluoranthene	µg/L	< 0.01	0.00		Acceptable	EPA 8270-SIM
5590	Benzo(g,h,i)perylene	µg/L	< 0.02	0.00		Acceptable	EPA 8270-SIM
5580	Benzo(a)pyrene	µg/L	21.4	23.9	7.56 - 33.0	Acceptable	EPA 8270-SIM
5630	Benzyl alcohol	µg/L		0.00		Not Reported	
5660	4-Bromophenyl-phenylether	µg/L		38.5	13.8 - 53.2	Not Reported	
5670	Butylbenzylphthalate	µg/L		149	30.5 - 210	Not Reported	
5680	Carbazole	µg/L		55.5	32.0 - 80.2	Not Reported	
5745	4-Chloroaniline	µg/L		0.00		Not Reported	
5760	bis(2-Chloroethoxy)methane	µg/L		64.0	25.1 - 76.9	Not Reported	
5765	bis(2-Chloroethyl)ether	µg/L		18.5	6.90 - 26.9	Not Reported	
5780	bis(2-Chloroisopropyl)ether	µg/L		80.2	20.6 - 99.2	Not Reported	
5790	1-Chloronaphthalene	µg/L		0.00		Not Reported	
5795	2-Chloronaphthalene	µg/L		0.00		Not Reported	
5825	4-Chlorophenyl-phenylether	µg/L		92.2	34.7 - 115	Not Reported	
5855	Chrysene	µg/L	17.7	17.3	7.98 - 25.9	Acceptable	EPA 8270-SIM
5895	Dibenz(a,h)anthracene	µg/L	28.8	28.5	7.42 - 42.3	Acceptable	EPA 8270-SIM
5905	Dibenzofuran	µg/L		121	42.0 - 149	Not Reported	
5925	Di-n-butylphthalate	µg/L		97.6	32.0 - 128	Not Reported	
4610	1,2-Dichlorobenzene	µg/L		64.1	6.87 - 79.0	Not Reported	
4615	1,3-Dichlorobenzene	µg/L		48.6	6.58 - 58.6	Not Reported	
4620	1,4-Dichlorobenzene	µg/L		128	12.8 - 151	Not Reported	
5945	3,3'-Dichlorobenzidine	µg/L		0.00		Not Reported	
6070	Diethylphthalate	µg/L		0.00		Not Reported	
6135	Dimethylphthalate	µg/L		0.00		Not Reported	

All analytes are included in ERA's A2LA accreditation, Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

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EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Base/Neutrals (Continued)							
6185	2,4-Dinitrotoluene	µg/L		49.4	17.0 - 64.1	Not Reported	
6190	2,6-Dinitrotoluene	µg/L		90.6	37.3 - 114	Not Reported	
6200	Di-n-octylphthalate	µg/L		103	22.5 - 152	Not Reported	
6255	bis(2-Ethylhexyl)phthalate	µg/L		68.6	20.6 - 96.5	Not Reported	
6265	Fluoranthene	µg/L	44.6	40.3	18.9 - 52.4	Acceptable	EPA 8270-SIM
6270	Fluorene	µg/L	138.	131	57.8 - 154	Acceptable	EPA 8270-SIM
6275	Hexachlorobenzene	µg/L		0.00		Not Reported	
4835	Hexachlorobutadiene	µg/L		0.00		Not Reported	
6285	Hexachlorocyclopentadiene	µg/L		0.00		Not Reported	
4840	Hexachloroethane	µg/L		0.00		Not Reported	
6315	Indeno(1,2,3-cd)pyrene	µg/L	32.2	30.5	4.47 - 44.4	Acceptable	EPA 8270-SIM
6320	Isophorone	µg/L		53.1	21.5 - 69.4	Not Reported	
6385	2-Methylnaphthalene	µg/L	42.2	40.2	5.86 - 54.1	Acceptable	EPA 8270-SIM
5005	Naphthalene	µg/L	44.2	43.6	13.6 - 54.9	Acceptable	EPA 8270-SIM
6460	2-Nitroaniline	µg/L		0.00		Not Reported	
6465	3-Nitroaniline	µg/L		0.00		Not Reported	
6470	4-Nitroaniline	µg/L		0.00		Not Reported	
5015	Nitrobenzene	µg/L		63.5	20.3 - 78.7	Not Reported	
6525	N-Nitrosodiethylamine	µg/L		97.3	19.8 - 107	Not Reported	
6530	N-Nitrosodimethylamine	µg/L		109	10.9 - 129	Not Reported	
6535	N-Nitrosodiphenylamine	µg/L		0.00		Not Reported	
6545	N-Nitroso-di-n-propylamine	µg/L		0.00		Not Reported	
6590	Pentachlorobenzene	µg/L		58.8	11.6 - 78.8	Not Reported	
6615	Phenanthrene	µg/L	118.	116	53.2 - 139	Acceptable	EPA 8270-SIM
6665	Pyrene	µg/L	< 0.2	0.00		Acceptable	EPA 8270-SIM
5095	Pyridine	µg/L		0.00		Not Reported	
6715	1,2,4,5-Tetrachlorobenzene	µg/L		0.00		Not Reported	
5155	1,2,4-Trichlorobenzene	µg/L		0.00		Not Reported	

Figure C1-2 – Continued

WP-144 Final Complete Report

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717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Base/Neutrals							
5500	Acenaphthene	µg/L	< 0.9	0.00		Acceptable	EPA 8310
5505	Acenaphthylene	µg/L	18.0	20.1	7.09 - 26.4	Acceptable	EPA 8310
5145	2-Amino-1-methylbenzene (o-toluidine)	µg/L		128	25.3 - 172	Not Reported	
5545	Aniline	µg/L		0.00		Not Reported	
5555	Anthracene	µg/L	23.1	26.2	12.4 - 37.0	Acceptable	EPA 8310
5595	Benzidine	µg/L		0.00		Not Reported	
5575	Benzo(a)anthracene	µg/L	14.5	15.9	6.67 - 21.0	Acceptable	EPA 8310
5585	Benzo(b)fluoranthene	µg/L	20.1	23.9	7.43 - 34.0	Acceptable	EPA 8310
5600	Benzo(k)fluoranthene	µg/L	< 0.05	0.00		Acceptable	EPA 8310
5590	Benzo(g,h,i)perylene	µg/L	< 0.1	0.00		Acceptable	EPA 8310
5580	Benzo(a)pyrene	µg/L	20.4	23.9	7.56 - 33.0	Acceptable	EPA 8310
5630	Benzyl alcohol	µg/L		0.00		Not Reported	
5660	4-Bromophenyl-phenylether	µg/L		38.5	13.6 - 53.2	Not Reported	
5670	Butylbenzylphthalate	µg/L		149	30.5 - 210	Not Reported	
5680	Carbazole	µg/L		55.5	32.0 - 80.2	Not Reported	
5745	4-Chloroaniline	µg/L		0.00		Not Reported	
5760	bis(2-Chloroethoxy)methane	µg/L		64.0	25.1 - 76.9	Not Reported	
5765	bis(2-Chloroethyl)ether	µg/L		18.5	6.90 - 26.9	Not Reported	
5780	bis(2-Chloroisopropyl)ether	µg/L		80.2	20.6 - 99.2	Not Reported	
5790	1-Chloronaphthalene	µg/L		0.00		Not Reported	
5795	2-Chloronaphthalene	µg/L		0.00		Not Reported	
5825	4-Chlorophenyl-phenylether	µg/L		92.2	34.7 - 115	Not Reported	
5855	Chrysene	µg/L	16.6	17.3	7.98 - 25.9	Acceptable	EPA 8310
5895	Dibenz(a,h)anthracene	µg/L	24.3	28.5	7.42 - 42.3	Acceptable	EPA 8310
5905	Dibenzofuran	µg/L		121	42.0 - 149	Not Reported	
5925	Di-n-butylphthalate	µg/L		97.6	32.0 - 128	Not Reported	
4610	1,2-Dichlorobenzene	µg/L		64.1	6.87 - 79.0	Not Reported	
4615	1,3-Dichlorobenzene	µg/L		48.6	6.58 - 58.6	Not Reported	
4620	1,4-Dichlorobenzene	µg/L		128	12.8 - 151	Not Reported	
5945	3,3'-Dichlorobenzidine	µg/L		0.00		Not Reported	
6070	Diethylphthalate	µg/L		0.00		Not Reported	
6135	Dimethylphthalate	µg/L		0.00		Not Reported	

All analytes are included in ERA's A2LA accreditation, Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
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717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Base/Neutrals (Continued)							
6185	2,4-Dinitrotoluene	µg/L		49.4	17.0 - 64.1	Not Reported	
6190	2,6-Dinitrotoluene	µg/L		90.6	37.3 - 114	Not Reported	
6200	Di-n-octylphthalate	µg/L		103	22.5 - 152	Not Reported	
6255	bis(2-Ethylhexyl)phthalate	µg/L		68.6	20.6 - 96.5	Not Reported	
6265	Fluoranthene	µg/L	34.0	40.3	18.9 - 52.4	Acceptable	EPA 8310
6270	Fluorene	µg/L	111.	131	57.8 - 154	Acceptable	EPA 8310
6275	Hexachlorobenzene	µg/L		0.00		Not Reported	
4835	Hexachlorobutadiene	µg/L		0.00		Not Reported	
6285	Hexachlorocyclopentadiene	µg/L		0.00		Not Reported	
4840	Hexachloroethane	µg/L		0.00		Not Reported	
6315	Indeno(1,2,3-cd)pyrene	µg/L	26.2	30.5	4.47 - 44.4	Acceptable	EPA 8310
6320	Isophorone	µg/L		53.1	21.5 - 69.4	Not Reported	
6385	2-Methylnaphthalene	µg/L	324.	40.2	5.86 - 54.1	Not Acceptable	EPA 8310
5005	Naphthalene	µg/L	38.7	43.6	13.6 - 54.9	Acceptable	EPA 8310
6460	2-Nitroaniline	µg/L		0.00		Not Reported	
6465	3-Nitroaniline	µg/L		0.00		Not Reported	
6470	4-Nitroaniline	µg/L		0.00		Not Reported	
5015	Nitrobenzene	µg/L		63.5	20.3 - 78.7	Not Reported	
6525	N-Nitrosodiethylamine	µg/L		97.3	19.8 - 107	Not Reported	
6530	N-Nitrosodimethylamine	µg/L		109	10.9 - 129	Not Reported	
6535	N-Nitrosodiphenylamine	µg/L		0.00		Not Reported	
6545	N-Nitroso-di-n-propylamine	µg/L		0.00		Not Reported	
6590	Pentachlorobenzene	µg/L		58.8	11.6 - 78.8	Not Reported	
6615	Phenanthrene	µg/L	100.	116	53.2 - 139	Acceptable	EPA 8310
6665	Pyrene	µg/L	< 0.2	0.00		Acceptable	EPA 8310
5095	Pyridine	µg/L		0.00		Not Reported	
5715	1,2,4,5-Tetrachlorobenzene	µg/L		0.00		Not Reported	
5155	1,2,4-Trichlorobenzene	µg/L		0.00		Not Reported	

Figure C1-2 – Continued

WP-144 Final Complete Report

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EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Acids							
5610	Benzoic acid	µg/L	< 6.0	0.00		Acceptable	EPA 8270C
5700	4-Chloro-3-methylphenol	µg/L	127.	128	50.0 - 164	Acceptable	EPA 8270C
5800	2-Chlorophenol	µg/L	145.	158	44.6 - 198	Acceptable	EPA 8270C
6000	2,4-Dichlorophenol	µg/L	132.	131	42.6 - 161	Acceptable	EPA 8270C
6005	2,6-Dichlorophenol	µg/L	184	175	61.3 - 216	Acceptable	EPA 8270C
6130	2,4-Dimethylphenol	µg/L	65.0	68.4	13.0 - 90.7	Acceptable	EPA 8270C
6360	4,6-Dinitro-2-methylphenol	µg/L	93.2	130	44.4 - 184	Acceptable	EPA 8270C
6175	2,4-Dinitrophenol	µg/L	60.4	120	12.0 - 169	Acceptable	EPA 8270C
6400	2-Methylphenol	µg/L	61.5	74.1	14.0 - 92.7	Acceptable	EPA 8270C
6410	4-Methylphenol	µg/L	86.7	109	10.9 - 141	Acceptable	EPA 8270C
6490	2-Nitrophenol	µg/L	167	154	35.0 - 202	Acceptable	EPA 8270C
6500	4-Nitrophenol	µg/L	52.6	116	11.6 - 157	Acceptable	EPA 8270C
6605	Pentachlorophenol	µg/L	69.0	74.5	17.3 - 103	Acceptable	EPA 8270C
6625	Phenol	µg/L	64.0	151	15.1 - 202	Acceptable	EPA 8270C
6735	2,3,4,6-Tetrachlorophenol	µg/L	48.5	46.7	4.67 - 63.8	Acceptable	EPA 8270C
6835	2,4,5-Trichlorophenol	µg/L	74.2	79.1	29.1 - 103	Acceptable	EPA 8270C
6840	2,4,6-Trichlorophenol	µg/L	129.	130	41.6 - 162	Acceptable	EPA 8270C

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Nitrogen Pesticides							
7005	Alachlor	µg/L	7.59	7.32	4.83 - 9.66	Acceptable	EPA 8141
7035	Ametryn	µg/L		0.00		Not Reported	
7045	Anilazine	µg/L		0.00		Not Reported	
7060	Atraton	µg/L		0.00		Not Reported	
7065	Atrazine	µg/L	18.0	15.9	9.64 - 21.4	Acceptable	EPA 8141
7130	Bromacil	µg/L		0.00		Not Reported	
7160	Butachlor	µg/L		0.00		Not Reported	
7175	Butylate	µg/L		0.00		Not Reported	
7340	Cyanazine	µg/L	10.1	9.44	1.26 - 15.9	Acceptable	EPA 8141
7066	Deethyl atrazine	µg/L		0.00		Not Reported	
7067	Deisopropyl atrazine	µg/L		0.00		Not Reported	
7068	Diaminoatrazine	µg/L		0.00		Not Reported	
7555	EPTC (Eptam)	µg/L		19.1	6.38 - 24.5	Not Reported	
7705	Hexazinone	µg/L		0.00		Not Reported	
7835	Metolachlor	µg/L	18.4	17.2	6.78 - 26.3	Acceptable	EPA 8141
7845	Metribuzin	µg/L		11.3	1.93 - 16.9	Not Reported	
6440	Napropamide	µg/L		10.5	3.68 - 15.5	Not Reported	
8035	Prometon	µg/L		6.74	1.68 - 10.6	Not Reported	
8040	Prometryn	µg/L		0.00		Not Reported	
6650	Pronamide	µg/L		0.00		Not Reported	
8045	Propachlor	µg/L		12.7	8.31 - 15.8	Not Reported	
8060	Propazine	µg/L		0.00		Not Reported	
8125	Simazine	µg/L	13.5	11.5	4.35 - 16.4	Acceptable	EPA 8141
8180	Terbacil	µg/L		0.00		Not Reported	
8295	Trifluralin	µg/L		4.04	0.456 - 6.54	Not Reported	

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

Figure C1-2 – Continued

WP-144 Final Complete Report

Amy Doupe
QA Senior Specialist
Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17601-5994
717-656-2308

EPA ID: PA00009
ERA Laboratory Code: L272101
Report Issued: 03/22/07
Study Dates: 01/15/07 - 03/01/07
Agency ID:

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
Organophosphorous Pesticides (OPP)							
7075	Azinphos-methyl (Guthion)	µg/L	8.20	11.4	1.48 - 19.5	Acceptable	EPA 8141
7220	Carbophenothion	µg/L	13.0	14.8	2.46 - 25.1	Acceptable	EPA 8141
7300	Chlorpyrifos	µg/L	< 0.4	11.6	5.66 - 15.8	Not Acceptable	EPA 8141
7395	Demeton-O	µg/L	< 0.4	0.00		Acceptable	EPA 8141
7385	Demeton-S	µg/L	< 0.85	0.00		Acceptable	EPA 8141
7410	Diazinon	µg/L	7.18	9.45	3.51 - 14.0	Acceptable	EPA 8141
8610	Dichlorvos (DDVP)	µg/L	< 1.0	0.00		Acceptable	EPA 8141
7475	Dimethoate	µg/L		0.00		Not Reported	
7495	Dioxathion	µg/L		0.00		Not Reported	
8625	Disulfoton	µg/L	5.35	5.76	0.952 - 9.40	Acceptable	EPA 8141
7565	Ethion	µg/L	7.07	7.44	1.24 - 12.6	Acceptable	EPA 8141
7570	Ethoprop	µg/L	< 1.0	0.00		Acceptable	EPA 8141
7955	Ethyl Parathion	µg/L	4.63	5.02	2.76 - 7.28	Acceptable	EPA 8141
7580	Famphur	µg/L	< 0.8	0.00		Acceptable	EPA 8141
7640	Fonofos	µg/L		0.00		Not Reported	
7770	Malathion	µg/L	10.6	12.3	2.75 - 19.4	Acceptable	EPA 8141
7825	Methyl Parathion	µg/L	5.97	6.65	0.950 - 10.5	Acceptable	EPA 8141
7985	Phorate	µg/L	< 0.4	0.00		Acceptable	EPA 8141
8000	Phosmet	µg/L		0.00		Not Reported	
8110	Ronnel	µg/L	13.9	16.0	2.66 - 27.2	Acceptable	EPA 8141
8200	Stirophos	µg/L	< 0.65	0.00		Acceptable	EPA 8141
8185	Terbufos	µg/L		3.83	0.932 - 5.78	Not Reported	
Gasoline Range Organics (GRO) in Water							
9408	Gasoline Range Organics (GRO)	µg/L	3090.	2480	963 - 4360	Acceptable	EPA 8015B
4375	Benzene in GRO	µg/L		15.6	6.73 - 26.2	Not Reported	
4765	Ethylbenzene in GRO	µg/L		68.7	39.2 - 96.0	Not Reported	
5140	Toluene in GRO	µg/L		194	103 - 259	Not Reported	
5260	Xylenes, total in GRO	µg/L		276	157 - 373	Not Reported	
Diesel Range Organics (DRO) in Water							
9369	Diesel Range Organics (DRO)	µg/L	2910	3200	781 - 4130	Acceptable	EPA 8015B
Total Petroleum Hydrocarbons (TPH) in Water							
1935	TPH (Gravimetric)	mg/L		60.0	27.3 - 86.6	Not Reported	
1935	TPH (IR)	mg/L	74.4	73.8	34.1 - 106	Acceptable	EPA 418.1

C2. Reports To Management

Reports of quality status from the Quality Assurance Department to management are made frequently and in various forms. All results from internal or external performance evaluation samples are circulated to management along with corrective action responses. A report of each audit performed is prepared and copied to management. Monthly summaries of data obtained from analysis of quality control check samples are generated via the computerized sample management system. These summaries include mean and standard deviation to aid in assessment of data accuracy and precision. These are reviewed by QA personnel to evaluate trends. Any issues are communicated to the technical department management. Documentation summarizing problems that require investigation and corrective action are completed by group leaders and circulated to management. Through these channels, laboratory management is kept apprised of QA/QC activities.

Any problems or unusual observations that occur during the analysis of samples for a specific project will be listed on the laboratory report and/or in the case narrative delivered with the data package. The items often discussed in this manner include samples with surrogate recovery outside of the acceptance criteria and samples with matrix problems requiring dilution and causing increased detection limits. Where applicable, any corrective action attempted or performed to address the problem will also be presented.

Monthly and quarterly reports are sent to management, which provide them with the quality status on each technical department. The reports detail areas of improvement, observable trends, ICAR summaries, MDL/statistical window status, and a summary of client/agency issues. Reports are also generated for support groups closely tied to technical operations (i.e., Sample Administration, Bottles, and Sample Support).

The laboratory will contact the client for direction regarding major problems. Such as, but not limited to samples listed on the chain of custody but missing from the shipping container, samples which arrive broken or are accidentally broken in the laboratory, and samples with severe matrix problems. The client will be contacted if it is necessary to change any item in the original approved project plan.

GROUP D

DATA VALIDATION AND USABILITY

D1. Data Review, Verification, and Validation

As stated in Element B10, following review, interpretation, and data reduction by the analyst, the data is transferred into the Laboratory Information Management System (LIMS) by manual entry or direct upload from the analytical data system. This system stores the client information, sample results, and QC results. A security system is in place to control access of laboratory personnel and to provide an audit trail for information changes.

The data is again reviewed by the group leader or another analyst whose function is to provide an independent review before data is verified on the LIMS. The person performing the verification step reviews all data including quality control information before verifying the data. Any errors identified and corrected during the review process are documented and addressed with appropriate personnel to ensure generation of quality data.

If data package deliverables have been requested, the data deliverables department will complete the appropriate forms (see Appendix A) summarizing the quality control information, and include copies of all raw data (instrument printouts, spectra, chromatograms, laboratory notebooks, etc.). This group will combine the information from the various analytical tests and the analytical reports from the LIMS into one package in the client requested format. This package is reviewed for quality, compliance, and conformance to SOPs and QC requirements. Any analytical problems are discussed in the case narrative, which is also included with the data package deliverables.

The validation of the data for quality and compliance includes spot checking raw data versus the final report, checking that all pertinent raw data is included and does refer to the samples analyzed, review of all QC results for conformance with the method, and review of the case narrative for description of any unusual occurrences during analysis. This validation is performed using techniques similar to those used by the Sample Management Office for the USEPA's Contract Laboratory Program.

The validation performed by the laboratory does not address usability of the data, which usually requires some knowledge of the site. The laboratory will make every attempt to meet requirements of the project, thus reducing the need to assess usability of the data.

D2. Verification and Validation Methods

Lancaster Laboratories has procedures in place to verify that instrumental computers and the LIMS perform at the required accuracy, traceability, and security for reporting verified data. Element B10 describes this process in more detail.

Knowledge of the site and sampling methods are necessary to assess data usability. Therefore, overall data validation and assessment of data usability is the responsibility of the client. Lancaster Laboratories will evaluate the analytical data to verify that method and/or project requirements have been met.

D3. Reconciliation with User Requirements

Data quality requirements are based on the measurement process and the intended use of the data. Lancaster Laboratories evaluates the QC data generated by the following data quality objectives.

Precision – Precision refers to the reproducibility of a method when it is repeated on a second aliquot of the same sample. The degree of agreement is expressed as the relative percent difference (RPD). The RPD will be calculated according to the following equation:

$$RPD = \frac{|D_2 - D_1|}{\frac{(D_1 D_2)}{2}} \times 100$$

Where:

D_1 = First sample value
D_2 = Second sample value (Duplicate)

Duplicates will be run on at least 5% of the samples for inorganics analyses and matrix spike duplicates are used for organics analyses. Acceptance criteria are detailed in Element B5. All quality control sample results are entered into the LIMS and compared with acceptance limits. In addition, there is a monthly review of values on the computer QC system. Data obtained from quality control samples is entered onto our LIMS that charts the data and calculates a mean and standard deviation on a monthly basis. The Quality Assurance Department then reviews this data for trends, which may indicate analytical problems. The control charts are graphical methods for monitoring precision and bias over time.

Accuracy – Accuracy refers to the agreement between the amount of a compound measured by the test method and the amount present. Accuracy is usually expressed as a percent recovery (R). Recoveries will be calculated according to the following equations:

$$Surrogate\ \%\ Recovery = \frac{Qd}{Qa} \times 100$$

Where:

Qd = Quantity determined by analysis
Qa = Quantity added to sample

$$Matrix\ Spike\ \%\ Recovery = \frac{(SSR - SR)}{SA} \times 100$$

Where:

SSR = Spiked sample results
SR = Sample results
SA = Spike added

$$Laboratory\ Control\ Sample\ \%\ Recovery = \frac{LCS\ found}{LCS\ true} \times 100$$

As directed by the methods, surrogate standards are added to each sample analyzed for organics. Spikes and laboratory control samples will be run on at least 5% of the samples (each batch or Sample Delivery Group [SDG], ≤20 samples). Refer to Element B5 for acceptance criteria for accuracy. The LIMS is programmed to compare the individual values with the acceptance limits and inform the analyst if the results meet specifications. If the results are not within the acceptance criteria, corrective action suitable to the situation will be taken. This may include, but is not limited to, checking calculations and instrument performance, reanalysis of the associated samples, examining other QC analyzed with the same batch of samples, and qualifying results with documentation of any QC problems in the case narrative.

Commercial quality control materials are run at least quarterly to ensure accuracy of the analytical procedure. Repetitive analysis of a reference material will also yield precision data. Accuracy information determined from reference materials is valuable because variables specific to sample matrix are eliminated.
The QC program is capable of charting data for surrogates, spikes, control materials, and reference materials. The Quality Assurance Department reviews these charts in association with the monthly trend report for any indication of possible problems (i.e., shift in the mean and standard deviation).

Completeness – Completeness is the percentage of valid data acquired from a measurement system compared to the amount of valid measurements that were planned to be collected. The objective is analysis of all samples submitted intact, and to ensure that sufficient sample weight/volume is available should the initial analysis not meet acceptance criteria. The laboratory's LIMS will assign a unique identification number to the sample which tracks and controls movement of samples from the time of receipt until disposal. All data generated will be recorded referencing the corresponding sample identification number. The completeness of an analysis can be documented by including in the data deliverables sufficient information to allow the data user to assess the quality of the results. This information will include, but is not limited to, summaries of QC data and sample results, chromatograms, spectra, and instrument tune and calibration data. Additional information will be stored in the laboratory's archives, both hard copy and electronic.

$$Completeness = \frac{Number\ of\ valid\ measurements}{Total\ measurements\ needed} \times 100$$

Method Detection Limit – It is important to ascertain the limit of quantitation that can be achieved by a given method, particularly when the method is commonly used to determine trace levels of analyte. The Environmental Protection Agency has set forth one method for determining method detection limits (MDLs) from which limits of quantitation (LOQs) can be extrapolated. MDLs are evaluated on an annual basis. MDL is defined as follows for all measurements:

$$MDL = t_{(n-1,1-a=0.99)} \times S$$

Where:

MDL	=	Method detection limit
s	=	Standard deviation of the replicate analyses
$t_{(n-1,1-a=0.99)}$	=	Students' t-value for a one-sided 99% confidence level and a standard deviation estimate with n-1 degrees of freedom

Definitions:

Calculated Method Detection Limit – The calculated method detection limit is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. It is determined from analysis, on a given instrument, of a sample in a given matrix containing the analyte.

Reported Method Detection Limit (MDL) – The reported MDL is defined as the highest of all calculated MDLs obtained from all instruments used for a particular method/matrix. This can be the actual value or a default value set above the calculated values.

Limit of Quantitation (LOQ) – The limit of quantitation is defined as the level above which quantitative results may be obtained with a specified degree of confidence. The Lancaster Laboratories' policy is to set quantitation limits at a value at least 3× the MDL. Regulatory limits may require setting a lower LOQ. The judgement of the technical department management may be used to assess the feasibility of a lower LOQ.

APPENDIX A

EXAMPLE REPORTING FORMS

Lancaster Laboratories

ANALYTICAL RESULTS

Prepared for:

Example Client
2425 New Holland Pike
Lancaster, PA 17601

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 1029138. Samples arrived at the laboratory on Tuesday, March 13, 2007. The PO# for this group is 4000010170 and the release number is 6-066.

Client Description	Lancaster Labs Number
Sludge-Mix_No._3 Waste Sludge Sample	5003785
Sludge-Mix_No._4 Waste Sludge Sample	5003788

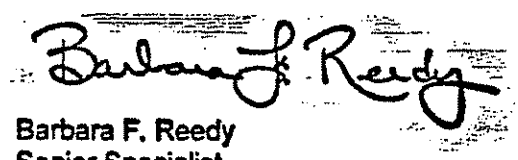
METHODOLOGY

The specific methodologies used in obtaining the enclosed analytical results are indicated on the laboratory chronicles.

1 COPY TO	Example Client	Attn: Ms. Joanne Smith
1 COPY TO	Data Package Group	

Questions? Contact your Client Services Representative
Katherine A Klinefelter at (717) 656-2300

Respectfully Submitted,



Barbara F. Reedy
Senior Specialist

Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681

Lancaster Laboratories
2425 New Holland Pike • Lancaster, PA 17601

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	BMQL	Below Minimum Quantitation Level
N.D.	none detected	MPN	Most Probable Number
TNTC	Too Numerous To Count	CP Units	cobalt-chloroplatinate units
IU	International Units	NTU	nephelometric turbidity units
umhos/cm	micromhos/cm		
C	degrees Celsius	F	degrees Fahrenheit
meq	milliequivalents	lb.	pound(s)
g	gram(s)	kg	kilogram(s)
ug	microgram(s)	mg	milligram(s)
ml	milliliter(s)	l	liter(s)
m3	cubic meter(s)	ul	microliter(s)

<	less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.
>	greater than
J	estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a possible aldol-condensation product	B	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	E	Estimated due to interference
C	Pesticide result confirmed by GC/MS	M	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	N	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	S	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	U	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	W	Post digestion spike out of control limits
U	Compound was not detected	*	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	+	Correlation coefficient for MSA <0.995

Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 5003785

Sludge-Mix_No._3 Waste Sludge Sample
SITE ID: 6-066 SAMPLE ID: Sludge-Mix_No._3
6-066
Collected:03/12/2007 08:00 by DG

Account Number: 06195

Submitted: 03/13/2007 09:20
Reported: 04/02/2007 at 14:03
Discard: 06/02/2007

Example Client
2425 New Holland Pike
Lancaster, PA 17601

AMIX3 SDG#: PDR73-01

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Units	Dilution Factor
00159	9.38 Mercury	7439-97-6	0.0258 J	0.0115	mg/kg	1
01643	Aluminum	7429-90-5	9,170.	3.78	mg/kg	1
01650	Calcium	7440-70-2	217,000.	143.	mg/kg	10
01654	Iron	7439-89-6	5,110.	5.32	mg/kg	1
01657	Magnesium	7439-95-4	2,000.	2.87	mg/kg	1
01662	Potassium	7440-09-7	2,000.	3.74	mg/kg	1
01667	Sodium	7440-23-5	3,970.	39.3	mg/kg	1
06925	Thallium	7440-28-0	N.D.	1.50	mg/kg	1
06935	Arsenic	7440-38-2	3.58	1.03	mg/kg	1
06936	Selenium	7782-49-2	N.D.	1.10	mg/kg	1
06944	Antimony	7440-36-0	N.D.	1.02	mg/kg	1
06946	Barium	7440-39-3	307.	0.0260	mg/kg	1
06947	Beryllium	7440-41-7	0.673	0.0767	mg/kg	1
06949	Cadmium	7440-43-9	0.470 J	0.0734	mg/kg	1
06951	Chromium	7440-47-3	16.4	0.658	mg/kg	1
06952	Cobalt	7440-48-4	4.88	0.147	mg/kg	1
06953	Copper	7440-50-8	21.4	0.203	mg/kg	1
06955	Lead	7439-92-1	62.2	0.498	mg/kg	1
06958	Manganese	7439-96-5	190.	0.0632	mg/kg	1
06961	Nickel	7440-02-0	33.6	0.684	mg/kg	1
06966	Silver	7440-22-4	N.D.	0.192	mg/kg	1
06971	Vanadium	7440-62-2	142.	0.181	mg/kg	1
06972	Zinc	7440-66-6	40.5	0.739	mg/kg	1
04173	20.90 Formaldehyde in Soil	50-00-0	N.D.	1,100.	ug/kg	1
00111	18.60 Moisture	n.a.	11.4	0.50	%	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.					
07400	18.50 Total Residue	n.a.	88.6	0.50	%	1
	The total residue is calculated by subtracting the moisture value from 100%.					
04688	8.44 TCL Semivolatiles/Soil					
00176	1,4-Dioxane	123-91-1	N.D.	1,100.	ug/kg	1
01185	Phenol	108-95-2	15,000.	380.	ug/kg	1
01186	2-Chlorophenol	95-57-8	N.D.	380.	ug/kg	1
01187	1,4-Dichlorobenzene	106-46-7	N.D.	380.	ug/kg	1
01188	N-Nitroso-di-n-propylamine	621-64-7	N.D.	380.	ug/kg	1
01189	1,2,4-Trichlorobenzene	120-82-1	N.D.	380.	ug/kg	1
01190	4-Chloro-3-methylphenol	59-50-7	N.D.	750.	ug/kg	1
01191	Acenaphthene	83-32-9	N.D.	380.	ug/kg	1

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 5003785

Sludge-Mix_No._3 Waste Sludge Sample
SITE ID: 6-066 SAMPLE ID: Sludge-Mix_No._3
6-066
Collected:03/12/2007 08:00 by DG

Account Number: 06195

Submitted: 03/13/2007 09:20
Reported: 04/02/2007 at 14:03
Discard: 06/02/2007

Example Client
2425 New Holland Pike
Lancaster, PA 17601

AMIX3 SDG#: PDR73-01

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
01192	4-Nitrophenol	100-02-7	N.D.		1,900.	ug/kg	1
01193	2,4-Dinitrotoluene	121-14-2	N.D.		750.	ug/kg	1
01194	Pentachlorophenol	87-86-5	N.D.		1,900.	ug/kg	1
01195	Pyrene	129-00-0	N.D.		380.	ug/kg	1
03746	2-Nitrophenol	88-75-5	N.D.		380.	ug/kg	1
03747	2,4-Dimethylphenol	105-67-9	N.D.		750.	ug/kg	1
03748	2,4-Dichlorophenol	120-83-2	560.	J	380.	ug/kg	1
03749	2,4,6-Trichlorophenol	88-06-2	N.D.		380.	ug/kg	1
03750	2,4-Dinitrophenol	51-28-5	N.D.		7,500.	ug/kg	1
03751	4,6-Dinitro-2-methylphenol	534-52-1	N.D.		1,900.	ug/kg	1
03753	bis(2-Chloroethyl)ether	111-44-4	N.D.		380.	ug/kg	1
03754	1,3-Dichlorobenzene	541-73-1	N.D.		380.	ug/kg	1
03755	1,2-Dichlorobenzene	95-50-1	N.D.		380.	ug/kg	1
03757	Hexachloroethane	67-72-1	N.D.		380.	ug/kg	1
03758	Nitrobenzene	98-95-3	N.D.		380.	ug/kg	1
03759	Isophorone	78-59-1	N.D.		380.	ug/kg	1
03760	bis(2-Chloroethoxy)methane	111-91-1	N.D.		380.	ug/kg	1
03761	Naphthalene	91-20-3	3,600.		380.	ug/kg	1
03762	Hexachlorobutadiene	87-68-3	N.D.		750.	ug/kg	1
03763	Hexachlorocyclopentadiene	77-47-4	N.D.		1,900.	ug/kg	1
03764	2-Chloronaphthalene	91-58-7	N.D.		380.	ug/kg	1
03765	Acenaphthylene	208-96-8	N.D.		380.	ug/kg	1
03766	Dimethylphthalate	131-11-3	N.D.		750.	ug/kg	1
03767	2,6-Dinitrotoluene	606-20-2	N.D.		380.	ug/kg	1
03768	Fluorene	86-73-7	480.	J	380.	ug/kg	1
03769	4-Chlorophenyl-phenylether	7005-72-3	N.D.		380.	ug/kg	1
03770	Diethylphthalate	84-66-2	N.D.		750.	ug/kg	1
03772	N-Nitrosodiphenylamine	86-30-6	N.D.		380.	ug/kg	1
	N-nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine. The result reported for N-nitrosodiphenylamine represents the combined total of both compounds.						
03773	4-Bromophenyl-phenylether	101-55-3	N.D.		380.	ug/kg	1
03774	Hexachlorobenzene	118-74-1	N.D.		380.	ug/kg	1
03775	Phenanthrene	85-01-8	4,200.		380.	ug/kg	1
03776	Anthracene	120-12-7	N.D.		380.	ug/kg	1
03777	Di-n-butylphthalate	84-74-2	N.D.		750.	ug/kg	1
03778	Fluoranthene	206-44-0	N.D.		380.	ug/kg	1
03780	Butylbenzylphthalate	85-68-7	N.D.		750.	ug/kg	1
03781	Benzo(a)anthracene	56-55-3	N.D.		380.	ug/kg	1
03782	Chrysene	218-01-9	1,500.	J	380.	ug/kg	1
03783	3,3'-Dichlorobenzidine	91-94-1	N.D.		1,100.	ug/kg	1
03784	bis(2-Ethylhexyl)phthalate	117-81-7	N.D.		750.	ug/kg	1

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 5003785

Sludge-Mix_No._3 Waste Sludge Sample
SITE ID: 6-066 SAMPLE ID: Sludge-Mix_No._3
6-066
Collected:03/12/2007 08:00 by DG

Account Number: 06195

Submitted: 03/13/2007 09:20
Reported: 04/02/2007 at 14:03
Discard: 06/02/2007

Example Client
2425 New Holland Pike
Lancaster, PA 17601

AMIX3 SDG#: PDR73-01

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
03785	Di-n-octylphthalate	117-84-0	N.D.		750.	ug/kg	1
03786	Benzo(b)fluoranthene	205-99-2	N.D.		380.	ug/kg	1
03787	Benzo(k)fluoranthene	207-08-9	N.D.		380.	ug/kg	1
03788	Benzo(a)pyrene	50-32-8	N.D.		380.	ug/kg	1
03789	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.		380.	ug/kg	1
03790	Dibenz(a,h)anthracene	53-70-3	N.D.		380.	ug/kg	1
03791	Benzo(g,h,i)perylene	191-24-2	N.D.		380.	ug/kg	1
04690	2-Methylphenol	95-48-7	N.D.		750.	ug/kg	1
04691	2,2'-oxybis(1-Chloropropane)	108-60-1	N.D.		380.	ug/kg	1
04692	4-Methylphenol	106-44-5	1,300.	J	750.	ug/kg	1
	3-Methylphenol and 4-methylphenol cannot be resolved under the chromatographic conditions used for sample analysis. The result reported for 4-methylphenol represents the combined total of both compounds.						
04693	4-Chloroaniline	106-47-8	N.D.		750.	ug/kg	1
04694	2-Methylnaphthalene	91-57-6	4,000.		380.	ug/kg	1
04695	2,4,5-Trichlorophenol	95-95-4	N.D.		750.	ug/kg	1
04696	2-Nitroaniline	88-74-4	N.D.		380.	ug/kg	1
04697	3-Nitroaniline	99-09-2	N.D.		750.	ug/kg	1
04698	Dibenzofuran	132-64-9	N.D.		380.	ug/kg	1
04700	4-Nitroaniline	100-01-6	N.D.		750.	ug/kg	1
04702	Carbazole	86-74-8	N.D.		380.	ug/kg	1
	Due to sample matrix interferences observed during the extraction, the normal reporting limits were not attained.						
	Surrogate recoveries were outside of QC limits for the GC/MS semivolatile compounds due to the increased final volume from the sample extraction.						
06292	8.32 TCL VOAs by 8260 (soil)						
02016	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.6	ug/kg	1
05444	Chloromethane	74-87-3	N.D.		2.	ug/kg	1
05445	Vinyl Chloride	75-01-4	N.D.		1.	ug/kg	1
05446	Bromomethane	74-83-9	N.D.		2.	ug/kg	1
05447	Chloroethane	75-00-3	N.D.		2.	ug/kg	1
05449	1,1-Dichloroethene	75-35-4	N.D.		1.	ug/kg	1
05450	Methylene Chloride	75-09-2	4.	J	2.	ug/kg	1
05451	trans-1,2-Dichloroethene	156-60-5	N.D.		1.	ug/kg	1
05452	1,1-Dichloroethane	75-34-3	N.D.		1.	ug/kg	1
05454	cis-1,2-Dichloroethene	156-59-2	N.D.		1.	ug/kg	1
05455	Chloroform	67-66-3	N.D.		1.	ug/kg	1
05457	1,1,1-Trichloroethane	71-55-6	N.D.		1.	ug/kg	1
05458	Carbon Tetrachloride	56-23-5	N.D.		1.	ug/kg	1

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 5003785

Sludge-Mix_No._3 Waste Sludge Sample
SITE ID: 6-066 SAMPLE ID: Sludge-Mix_No._3
6-066
Collected:03/12/2007 08:00 by DG

Account Number: 06195

Submitted: 03/13/2007 09:20
Reported: 04/02/2007 at 14:03
Discard: 06/02/2007

Example Client
2425 New Holland Pike
Lancaster, PA 17601

AMIX3 SDG#: PDR73-01

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit	Units	Dilution Factor
05460	Benzene	71-43-2	2.	J	0.6	ug/kg	1
05461	1,2-Dichloroethane	107-06-2	N.D.		1.	ug/kg	1
05462	Trichloroethene	79-01-6	N.D.		1.	ug/kg	1
05463	1,2-Dichloropropane	78-87-5	N.D.		1.	ug/kg	1
05465	Bromodichloromethane	75-27-4	N.D.		1.	ug/kg	1
05466	Toluene	108-88-3	2.	J	1.	ug/kg	1
05467	1,1,2-Trichloroethane	79-00-5	N.D.		1.	ug/kg	1
05468	Tetrachloroethene	127-18-4	N.D.		1.	ug/kg	1
05470	Dibromochloromethane	124-48-1	N.D.		1.	ug/kg	1
05472	Chlorobenzene	108-90-7	N.D.		1.	ug/kg	1
05474	Ethylbenzene	100-41-4	N.D.		1.	ug/kg	1
05477	Styrene	100-42-5	N.D.		1.	ug/kg	1
05478	Bromoform	75-25-2	N.D.		1.	ug/kg	1
05480	1,1,2,2-Tetrachloroethane	79-34-5	N.D.		1.	ug/kg	1
06293	Acetone	67-64-1	120.		8.	ug/kg	1
06294	Carbon Disulfide	75-15-0	2.	J	1.	ug/kg	1
06296	2-Butanone	78-93-3	12.		5.	ug/kg	1
06297	trans-1,3-Dichloropropene	10061-02-6	N.D.		1.	ug/kg	1
06298	cis-1,3-Dichloropropene	10061-01-5	N.D.		1.	ug/kg	1
06299	4-Methyl-2-pentanone	108-10-1	N.D.		3.	ug/kg	1
06300	2-Hexanone	591-78-6	N.D.		3.	ug/kg	1
06301	Xylene (Total)	1330-20-7	11.		1.	ug/kg	1

Surrogate recoveries were outside of QC limits for the GC/MS volatile fraction. The analysis was repeated and out of specification surrogate recoveries were again observed indicating a matrix effect. A GC/MS volatile internal standard peak area was also outside the QC limits for the re-analysis.

Commonwealth of Pennsylvania Lab Certification No. 36-037

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
00159	9.38 Mercury	SW-846 7471A	1	03/16/2007 09:54	Damary Valentin	1
01643	Aluminum	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 5003785

Sludge-Mix_No._3 Waste Sludge Sample
SITE ID: 6-066 SAMPLE ID: Sludge-Mix_No._3
6-066
Collected:03/12/2007 08:00 by DG

Account Number: 06195

Submitted: 03/13/2007 09:20
Reported: 04/02/2007 at 14:03
Discard: 06/02/2007

Example Client
2425 New Holland Pike
Lancaster, PA 17601

AMIX3 SDG#: PDR73-01

01650	Calcium	SW-846 6010B	1	03/19/2007 22:23	Choon Y Tian	10
01654	Iron	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
01657	Magnesium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
01662	Potassium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
01667	Sodium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06925	Thallium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06935	Arsenic	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06936	Selenium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06944	Antimony	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06946	Barium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06947	Beryllium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06949	Cadmium	SW-846 6010B	1	03/20/2007 19:48	Choon Y Tian	1
06951	Chromium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06952	Cobalt	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06953	Copper	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06955	Lead	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06958	Manganese	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06961	Nickel	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06966	Silver	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06971	Vanadium	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
06972	Zinc	SW-846 6010B	1	03/19/2007 22:18	Choon Y Tian	1
04173	20.90 Formaldehyde in Soil	SW-846 8315A	1	03/21/2007 21:05	James H Place	1
00111	18.60 Moisture	EPA 160.3 modified	1	03/15/2007 17:23	Scott W Freisher	1
07400	18.50 Total Residue	EPA 160.3 modified	1	03/15/2007 17:23	Scott W Freisher	1
04688	8.44 TCL Semivolatiles/Soil	SW-846 8270C	1	03/17/2007 08:25	William T Parker	1
06292	8.32 TCL VOAs by 8260 (soil)	SW-846 8260B	1	03/20/2007 17:26	Emiley A King	1
00374	GC/MS - Bulk Sample Prep	SW-846 5030A	1	03/20/2007 14:34	Emiley A King	n.a.
00381	BNA Soil Extraction	SW-846 3550B	1	03/15/2007 18:30	Sally L Appleyard	1
05708	SW SW846 ICP Digest	SW-846 3050B	1	03/15/2007 20:10	Annamaria Stipkovits	1
05711	SW SW846 Hg Digest	SW-846 7471A modified	1	03/15/2007 23:20	Annamaria Stipkovits	1
05876	Formaldehyde Solid Extraction	SW-846 8315A	1	03/21/2007 08:15	Deborah M Zimmerman	1

APPENDIX A

GC/MS VOLATILES
DATA DELIVERABLES FORMS

2A

WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: Lancaster Laboratories Contract: _____

Lab Code: LANCAS Case No.: _____ SAS No.: _____ SDG No.: LS433

	EPA SAMPLE NO.	SMC1 (DCA) #	SMC2 (TOL) #	SMC3 (BFB) #	TOT OUT
01	VBLKR32	106	102	98	0
02	TB322	107	102	100	0
03	IN322DL	109	103	101	0
04	IN322	109	102	106	0
05	VIBLKR00	107	103	98	0
06	IN322MS	110	101	103	0
07	VIBLKR01	110	102	98	0
08	IN322MSD	105	104	106	0

	QC LIMITS
SMC1 (DCA) = 1,2-Dichloroethane-d4	(76-114)
SMC2 (TOL) = Toluene-d8	(88-110)
SMC3 (BFB) = 4-Bromofluorobenzene	(86-115)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogate diluted out

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKR32

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix: (soil/water) WATER Lab Sample ID: VBLKR32

Sample wt/vol: 5.00 (g/mL) mL Lab File ID: HP07566.i/07apr02a.b/ra02b01.d

Level: (low/med) LOW Date Received:

Moisture: not dec. _____ Date Analyzed: 04/02/07

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	10	U
75-01-4	Vinyl Chloride	10	U
74-83-9	Bromomethane	10	U
75-00-3	Chloroethane	10	U
75-35-4	1,1-Dichloroethene	10	U
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	10	U
75-09-2	Methylene Chloride	10	U
75-34-3	1,1-Dichloroethane	10	U
78-93-3	2-Butanone	10	U
67-66-3	Chloroform	10	U
71-55-6	1,1,1-Trichloroethane	10	U
56-23-5	Carbon Tetrachloride	10	U
71-43-2	Benzene	10	U
107-06-2	1,2-Dichloroethane	10	U
79-01-6	Trichloroethene	10	U
78-87-5	1,2-Dichloropropane	10	U
75-27-4	Bromodichloromethane	10	U
10061-01-5	cis-1,3-Dichloropropene	10	U
108-10-1	4-Methyl-2-Pentanone	10	U
108-88-3	Toluene	10	U
10061-02-6	trans-1,3-Dichloropropene	10	U
79-00-5	1,1,2-Trichloroethane	10	U
127-18-4	Tetrachloroethene	10	U
591-78-6	2-Hexanone	10	U
124-48-1	Dibromochloromethane	10	U
108-90-7	Chlorobenzene	10	U
100-41-4	Ethylbenzene	10	U
1330-20-7	Xylene (Total)	10	U
100-42-5	Styrene	10	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKR32

ab Name: Lancaster Laboratories Contract:_____

ab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

atrix: (soil/water) WATER Lab Sample ID: VBLKR32

ample wt/vol: 5.00 (g/mL) mL Lab File ID: HP07566.i/07apr02a.b/ra02b01.d

evel: (low/med) LOW Date Received:

oisture: not dec. _____ Date Analyzed: 04/02/07

Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	10	U
79-34-5	1,1,2,2-Tetrachloroethane	10	U
540-59-0	1,2-Dichloroethene (Total)	10	U

4A

VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

VBLKR32

Lab Name: Lancaster Laboratories Contract: _____

Lab Code: LANCAS Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: ra02b01.d Lab Sample ID: VBLKR32

Date Analyzed: 04/02/07 Time Analyzed: 19:23

GC Column: DB-624 ID: 0.25 (mm) Heated Purge: (Y/N) N

Instrument ID: HP07566

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	246TB	5012043	ra02s01.d	20:09
02	TB322	5013066	ra02s02.d	20:34
03	IN322DL	5013065	ra02s03.d	20:59
04	IN322	5013065	ra02s04.d	21:24
05	VIBLKR00	VIBLKR00	ra02s05.d	21:49
06	IN322MS	5013065	ra02s06.d	22:13
07	VIBLKR01	VIBLKR01	ra02s07.d	22:38
08	IN322MSD	5013065	ra02s08.d	23:03

COMMENTS: R070921AA

5A

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID: ra02t02.d BFB Injection Date: 04/02/07

Instrument ID: HP07566 BFB Injection Time: 18:03

GC Column: DB-624 ID: .25 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	8.0 - 40.0% of mass 95	22.5
75	30.0 - 66.0% of mass 95	50.7
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.6
173	Less than 2.0% of mass 174	0.2 (0.3)1
174	50.0 - 120.0% of mass 95	73.7
175	4.0 - 9.0% of mass 174	6.2 (8.4)1
176	93.0 - 101.0% of mass 174	71.7 (97.3)1
177	5.0 - 9.0% of mass 176	5.6 (7.8)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE ~~FOLLOWING~~ SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD050	VSTD050	ra02c01.d	04/02/07	18:27
02	VBLKR32	VBLKR32	ra02b01.d	04/02/07	19:23
03	246TB	5012043	ra02s01.d	04/02/07	20:09
04	TB322	5013066	ra02s02.d	04/02/07	20:34
05	IN322DL	5013065	ra02s03.d	04/02/07	20:59
06	IN322	5013065	ra02s04.d	04/02/07	21:24
07	VIBLKR00	VIBLKR00	ra02s05.d	04/02/07	21:49
08	IN322MS	5013065	ra02s06.d	04/02/07	22:13
09	VIBLKR01	VIBLKR01	ra02s07.d	04/02/07	22:38
10	IN322MSD	5013065	ra02s08.d	04/02/07	23:03

8A

VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID (Standard): ra02c01.d Date Analyzed: 04/02/07

Instrument ID: HP07566 Time Analyzed: 18:27

GC Column: DB-624 ID: 0.25 (mm) Heated Purge: (Y/N) N

		IS1(BCM)		IS2(DFB)		IS3(CBZ)	
		AREA #	RT #	AREA #	RT #	AREA #	RT #
	12 HOUR STD	120834	6.378	754713	7.777	709348	11.111
	UPPER LIMIT	241668	6.878	1509426	8.277	1418696	11.611
	LOWER LIMIT	60417	5.878	377356	7.277	354674	10.611
	EPA SAMPLE NO.						
01	VBLKR32	109279	6.385	672355	7.780	608086	11.114
02	246TB	105039	6.381	643582	7.783	578415	11.114
03	TB322	104435	6.384	623680	7.783	576801	11.114
04	IN322DL	101733	6.380	627469	7.779	569573	11.113
05	IN322	101651	6.380	624145	7.780	574489	11.113
06	VIBLKR00	100325	6.381	622238	7.777	563361	11.111
07	IN322MS	100923	6.374	630675	7.777	578000	11.111
08	VIBLKR01	98881	6.381	616494	7.777	565944	11.111
09	IN322MSD	103311	6.380	627595	7.776	560061	11.113

IS1 (BCM)=Bromochloromethane
IS2 (DFB)=1,4-Difluorobenzene
IS3 (CBZ)=Chlorobenzene-d5

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk
* Values outside of QC limits.

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP07566 Calibration Date(s): 12/15/06 12/15/06

Heated Purge: (Y/N) N Calibration Time(s): 05:20 06:58

GC Column: DB-624 ID: .25 (mm)

LAB FILE ID: RRF 10= rd15i01.d RRF 20= rd15i02.d
RRF 50= rd15i03.d RRF100= rd15i04.d RRF200= rd15i05.d

COMPOUND	RRF 10	RRF 20	RRF 50	RRF100	RRF200	$\overline{RRF}$	% RSD	
Chloromethane	3.9749	3.9407	4.0779	4.0905	3.9305	4.0029	1.9	
Vinyl Chloride	*3.6054	3.5574	3.7034	3.6741	3.5777	3.6236	1.7	*
Bromomethane	*2.1743	2.1242	2.1992	2.2350	2.1571	2.1780	1.9	*
Chloroethane	2.0194	1.9854	2.0762	2.0850	2.0054	2.0343	2.2	
1,1-Dichloroethene	*2.2039	1.9780	2.2831	2.2121	2.2574	2.1869	5.5	*
Acetone	1.0936	0.9849	1.0068	0.9447	1.0051	1.0070	5.4	
Carbon Disulfide	8.1512	7.4062	8.7166	8.6572	8.9575	8.3778	7.4	
Methylene Chloride	2.6892	2.4867	2.7683	2.6998	2.7219	2.6732	4.1	
trans-1,2-Dichloroethene	2.4392	2.1940	2.5645	2.5167	2.5470	2.4523	6.2	
1,1-Dichloroethane	*4.8474	4.4664	5.1890	5.1001	5.1059	4.9418	6.0	*
cis-1,2-Dichloroethene	2.6066	2.3984	2.7578	2.7156	2.7374	2.6432	5.6	
2-Butanone	1.6435	1.5925	1.7687	1.6506	1.7735	1.6858	4.8	
Chloroform	*3.9900	3.7728	4.3056	4.2425	4.2710	4.1164	5.6	*
1,1,1-Trichloroethane	*0.5157	0.4569	0.5450	0.5297	0.5344	0.5164	6.7	*
Carbon Tetrachloride	*0.4072	0.3568	0.4311	0.4216	0.4292	0.4092	7.5	*
1,2-Dichloroethene (Total)	2.5229	2.2962	2.6612	2.6161	2.6422	2.5477	5.9	
Benzene	*1.6955	1.5335	1.7797	1.7409	1.7284	1.6956	5.6	*
1,2-Dichloroethane	*3.3042	3.2259	3.6694	3.5919	3.6164	3.4816	5.8	*
Trichloroethene	*0.3606	0.3145	0.3701	0.3696	0.3723	0.3574	6.8	*
1,2-Dichloropropane	0.4657	0.4344	0.5045	0.4875	0.4882	0.4761	5.7	
Bromodichloromethane	*0.4580	0.4424	0.5109	0.5096	0.5120	0.4866	6.9	*
cis-1,3-Dichloropropene	*0.6652	0.6230	0.7356	0.7209	0.7253	0.6940	7.0	*
4-Methyl-2-Pentanone	0.5815	0.5791	0.6463	0.6011	0.6420	0.6100	5.3	
Toluene	*1.9551	1.7110	1.9720	1.9392	1.9273	1.9009	5.6	*
trans-1,3-Dichloropropene	*0.6019	0.5840	0.6753	0.6659	0.6719	0.6398	6.8	*
1,1,2-Trichloroethane	*0.3445	0.3277	0.3696	0.3599	0.3593	0.3522	4.6	*
Tetrachloroethene	*0.2921	0.2566	0.2968	0.2936	0.3028	0.2884	6.3	*
2-Hexanone	0.3949	0.3980	0.4498	0.4227	0.4536	0.4238	6.5	
Dibromochloromethane	*0.2991	0.2912	0.3449	0.3438	0.3543	0.3266	8.9	*
1,2-Dibromoethane	0.3891	0.3731	0.4207	0.4122	0.4153	0.4021	5.0	
Chlorobenzene	*1.1491	1.0231	1.1676	1.1534	1.1655	1.1317	5.4	*
Ethylbenzene	*0.6484	0.5608	0.6552	0.6501	0.6583	0.6346	6.5	*
m+p-Xylene	0.7936	0.7014	0.8125	0.8059	0.8144	0.7856	6.1	
Xylene (Total)	*0.7703	0.6854	0.7937	0.7847	0.7966	0.7662	6.0	*
o-Xylene	0.7703	0.6854	0.7937	0.7847	0.7966	0.7662	6.0	
Styrene	*1.2449	1.1336	1.3134	1.3094	1.3251	1.2653	6.3	*
Bromoform	*0.1929	0.1947	0.2329	0.2357	0.2484	0.2209	11.5	*
1,1,2,2-Tetrachloroethane	*0.5682	0.5511	0.6053	0.5796	0.5856	0.5780	3.5	*
1,2-Dibromo-3-Chloropropane	0.1098	0.1010	0.1133	0.1096	0.1167	0.1101	5.3	
1,2-Dichloroethane-d4(mz102)	0.5482	0.5415	0.5493	0.5752	0.5754	0.5580	2.9	
1,2-Dichloroethane-d4	2.5831	2.7168	2.7019	2.8216	2.8199	2.7287	3.6	
Toluene-d8(mz100)	0.9620	0.9759	0.9548	1.0084	0.9949	0.9792	2.3	
4-Bromofluorobenzene(mz174)	0.3782	0.3884	0.3768	0.4010	0.4097	0.3908	3.7	
Toluene-d8	1.4696	1.4990	1.4451	1.5310	1.5165	1.4922	2.3	
4-Bromofluorobenzene	*0.5519	0.5658	0.5465	0.5781	0.5780	0.5641	2.6	*

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP07566 Calibration Date: 12/15/06 Time: 09:39

Lab File ID: rd15cv2.d Init. Calib. Date(s): 12/15/06 12/15/06

Heated Purge: (Y/N) N Init. Calib. Time(s): 05:20 09:39

GC Column: DB-624 ID: .25 (mm)

			MIN		MAX
COMPOUND	RRF	RRF50	RRF	%D	%D
Chloromethane	4.0029	4.2255		5.6	
* Vinyl Chloride	3.6236	3.7482	0.10	3.4	25.0*
* Bromomethane	2.1780	2.2935	0.10	5.3	25.0*
Chloroethane	2.0343	2.1530		5.8	
* 1,1-Dichloroethene	2.1869	1.7370	0.10	-20.6	25.0*
Acetone	1.0070	0.9905		-1.6	
Carbon Disulfide	8.3778	6.4144		-23.4	
Methylene Chloride	2.6732	2.3588		-11.8	
trans-1,2-Dichloroethene	2.4523	2.1474		-12.4	
* 1,1-Dichloroethane	4.9418	4.5086	0.20	-8.8	25.0*
cis-1,2-Dichloroethene	2.6432	2.4221		-8.4	
2-Butanone	1.6858	1.7776		5.4	
* Chloroform	4.1164	3.9069	0.20	-5.1	25.0*
* 1,1,1-Trichloroethane	0.5164	0.4754	0.10	-7.9	25.0*
* Carbon Tetrachloride	0.4092	0.3708	0.10	-9.4	25.0*
1,2-Dichloroethene (Total)	2.5477	2.2848		-10.3	
* Benzene	1.6956	1.5612	0.50	-7.9	25.0*
* 1,2-Dichloroethane	3.4816	3.3732	0.10	-3.1	25.0*
* Trichloroethene	0.3574	0.3311	0.30	-7.4	25.0*
1,2-Dichloropropane	0.4761	0.4579		-3.8	
* Bromodichloromethane	0.4866	0.4892	0.20	0.5	25.0*
* cis-1,3-Dichloropropene	0.6940	0.6834	0.20	-1.5	25.0*
4-Methyl-2-Pentanone	0.6100	0.6758		10.8	
* Toluene	1.9009	1.8018	0.40	-5.2	25.0*
* trans-1,3-Dichloropropene	0.6398	0.6336	0.10	-1.0	25.0*
* 1,1,2-Trichloroethane	0.3522	0.3448	0.10	-2.1	25.0*
* Tetrachloroethene	0.2884	0.2659	0.20	-7.8	25.0*
2-Hexanone	0.4238	0.4612		8.8	
* Dibromochloromethane	0.3266	0.3392	0.10	3.8	25.0*
1,2-Dibromoethane	0.4021	0.3976		-1.1	
* Chlorobenzene	1.1317	1.1027	0.50	-2.6	25.0*
* Ethylbenzene	0.6346	0.6031	0.10	-5.0	25.0*
m+p-Xylene	0.7856	0.7533		-4.1	
* Xylene (Total)	0.7662	0.7353	0.30	-4.0	25.0*
o-Xylene	0.7662	0.7353		-4.0	
* Styrene	1.2653	1.2993	0.30	2.7	25.0*

All other compounds must meet a minimum RRF of 0.010.

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP07566 Calibration Date: 12/15/06 Time: 09:39

Lab File ID: rd15cv2.d Init. Calib. Date(s): 12/15/06 12/15/06

Heated Purge: (Y/N) N Init. Calib. Time(s): 05:20 09:39

GC Column: DB-624 ID: .25 (mm)

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
* Bromoform	0.2209	0.2260	0.10	2.3	25.0*
* 1,1,2,2-Tetrachloroethane	0.5780	0.5912	0.30	2.3	25.0*
1,2-Dibromo-3-Chloropropane	0.1101	0.1112		1.0	
1,2-Dichloroethane-d4	2.7287	2.7448		0.6	
Toluene-d8	1.4922	1.4694		-1.5	
* 4-Bromofluorobenzene	0.5641	0.5616	0.20	-0.4	25.0*

All other compounds must meet a minimum RRF of 0.010.

APPENDIX A

GC/MS SEMIVOLATILES
DATA DELIVERABLES FORMS

2C
WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: Lancaster Laboratories Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: LS433

	LL #'s	EPA SAMPLE NO.	S1 (TBP) #	S2 (PHL) #	S3 (DCB) #	S4 (2FP) #	S5 (2CP) #	S6 (TPH) #	S7 (NBZ) #	S8 (FBP) #	TOT OUT
01	5013065	IN322	121	91	70	73	84	86	97	85	0
02	5013065DL	IN322DL	105	102	74	83	94	78	100	90	0
03	SBLKWB085	SBLKWB0858	110	89	69	76	83	101	93	81	0
04	085WBLCS	085WBLCS8	118	90	72	76	82	96	91	81	0
05	085WBLCSD	085WBLCSD8	116	91	72	75	82	95	91	82	0

		QC LIMITS	
S1 (TBP)	= 2,4,6-Tribromophenol	(10-123)	
S2 (PHL)	= Phenol-d5	(10-110)	
S3 (DCB)	= 1,2-Dichlorobenzene-d4	(16-110)	(advisory)
S4 (2FP)	= 2-Fluorophenol	(21-110)	
S5 (2CP)	= 2-Chlorophenol-d4	(33-110)	(advisory)
S6 (TPH)	= Terphenyl-d14	(33-141)	
S7 (NBZ)	= Nitrobenzene-d5	(35-114)	
S8 (FBP)	= 2-Fluorobiphenyl	(43-116)	

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogate diluted out

Lancaster Laboratories, Inc.
GC/MS Volatiles Matrix Spike/Spike Duplicate Recoveries

Unspiked: cy23s24.d
LECS3 4773655
Method: SOW OLM 10/92
Instrument: HP10193

Matrix Spike: cy23s25.d
LECS3MS 4773656
Matrix/Level: WL
Dilution Factor: 1.00

Spike Duplicate: cy23s27.d
LECS3MSD 4773657
Batch: C061431AB

COMPOUND NAME	MS SPIKE	MSD SPIKE	US CONC ng	MS CONC ng	MSD CONC ng	MS REC %	MSD REC %	Range LOWER-UPPER	INSPEC	RPD %	RPD MAX
Vinyl Chloride	125.0	125.0	ND	152	153	122	123	60-140	YES	0.6	30
Carbon Tetrachloride	125.0	125.0	ND	140	140	112	112	60-140	YES	0	30
Benzene	125.0	125.0	ND	133	131	107	105	60-140	YES	1.8	30
1,2-Dichloroethane	125.0	125.0	ND	146	144	116	115	60-140	YES	1.1	30
Trichloroethene	125.0	125.0	2.50	138	137	108	108	60-140	YES	0	30
1,2-Dichloropropane	125.0	125.0	ND	129	127	103	102	60-140	YES	1.2	30
cis-1,3-Dichloropropene	125.0	125.0	ND	123	117	98	94	60-140	YES	4.7	30
1,1,2-Trichloroethane	125.0	125.0	ND	130	130	104	104	60-140	YES	0	30
Tetrachloroethene	125.0	125.0	ND	130	127	104	102	60-140	YES	2.4	30
1,2-Dibromoethane	125.0	125.0	ND	124	120	99	96	60-140	YES	3.3	30
Bromoform	125.0	125.0	ND	138	136	110	109	60-140	YES	1.4	30
1,4-Dichlorobenzene	125.0	125.0	ND	148	143	119	114	60-140	YES	3.6	30

N/C = Could not calculate

Ent. by ____

Lab Chronicle: _____

Ver. by ____

3B

SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Lancaster Laboratories Contract: _____

Lab Code: LANCAS Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - EPA Sample No.: 00115 Level: (low/med) LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
1,1-Dichloroethene	60.47	0.00	63.29	105	59-172
Benzene	60.47	2.09	62.21	99	66-142
Trichloroethene	60.47	0.00	53.96	89	62-137
Toluene	60.47	2.16	71.54	115	59-139
Chlorobenzene	60.47	0.00	58.56	97	60-133

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene	57.11	46.90	82	24*	22	59-172
Benzene	57.11	46.26	77	25*	21	66-142
Trichloroethene	57.11	42.41	74	18	24	62-137
Toluene	57.11	48.76	82	34*	21	59-139
Chlorobenzene	57.11	42.09	74	27*	21	60-133

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 4 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

COMMENTS: _____

Lancaster Laboratories, Inc.
Volatiles Laboratory Control Sample Recoveries

LCS: cu18l01.d
Client ID: LCSC07
Method: SW-846 8260B (25ML)
Instrument: HP10193

LCS Duplicate: cu18l02.d
Client ID: LCDC07
Matrix/Level: WL
Dilution Factor: 1.0

Batch: C071691AA

COMPOUND NAME	SPIKE LEVEL	LCS CONC UG/L	LCSD CONC UG/L	LCS REC %	LCSD REC %	Range LOWER-UPPER	RPD %	RPD MAX	INSPEC
Dichlorodifluoromethane	5.00	4.58	4.32	92	86	44-146	6	30	YES
Chloromethane	5.00	5.03	4.82	101	96	51-135	4	30	YES
Vinyl Chloride	5.00	5.11	4.90	102	98	65-120	4	30	YES
Bromomethane	5.00	5.11	4.89	102	98	74-113	4	30	YES
Chloroethane	5.00	5.29	5.00	106	100	64-121	6	30	YES
Acrolein	37.50	35.43	34.87	94	93	10-138	2	30	YES
1,1-Dichloroethene	5.00	4.94	4.75	99	95	84-117	4	30	YES
Freon 113	5.00	4.84	4.62	97	92	78-114	5	30	YES
Acetone	37.50	40.68	39.68	108	106	64-129	2	30	YES
Carbon Disulfide	5.00	4.44	4.15	89	83	77-123	7	30	YES
Allyl Chloride	5.00	5.19	4.97	104	99	67-128	4	30	YES
Methyl Acetate	5.00	5.39	5.00	108	100	34-178	7	30	YES
Methylene Chloride	5.00	4.95	4.81	99	96	83-111	3	30	YES
t-Butyl Alcohol	50.00	48.49	44.69	97	89	68-132	8	30	YES
Acrylonitrile	25.00	30.20	27.98	121	112	71-128	8	30	YES
trans-1,2-Dichloroethene	5.00	4.95	4.73	99	95	86-111	5	30	YES
Methyl Tertiary Butyl Ether	5.00	4.80	4.78	96	96	83-110	1	30	YES
n-Hexane	5.00	5.29	5.07	106	101	73-121	4	30	YES
1,1-Dichloroethane	5.00	5.51	5.33	110	107	84-116	3	30	YES
2-Chloro-1,3-Butadiene	5.00	5.50	5.18	110	104	62-158	6	30	YES
Ethyl t-Butyl Ether	5.00	4.89	4.83	98	97	83-115	1	30	YES
2,2-Dichloropropane	5.00	5.00	4.76	100	95	78-121	5	30	YES
cis-1,2-Dichloroethene	5.00	4.82	4.66	96	93	86-113	3	30	YES
2-Butanone	37.50	46.37	44.52	124	119	71-132	4	30	YES
Propionitrile	37.50	44.37	41.69	118	111	69-135	6	30	YES
Methacrylonitrile	37.50	43.60	41.68	116	111	87-115	5	30	NO
Bromochloromethane	5.00	4.44	4.38	89	88	83-115	1	30	YES
Tetrahydrofuran	25.00	27.33	26.26	109	105	81-115	4	30	YES
Chloroform	5.00	5.49	5.33	110	107	83-121	3	30	YES
1,1,1-Trichloroethane	5.00	5.53	5.28	111	106	83-123	5	30	YES
Cyclohexane	5.00	5.22	4.95	104	99	78-121	5	30	YES
1,1-Dichloropropene	5.00	5.36	5.04	107	101	87-114	6	30	YES
Carbon Tetrachloride	5.00	5.42	5.17	108	103	76-134	5	30	YES
Isobutyl Alcohol	125.00	136.40	129.43	109	104	56-138	5	30	YES
Benzene	5.00	5.11	4.90	102	98	87-111	4	30	YES
1,2-Dichloroethane	5.00	5.93	5.81	119	116	83-130	2	30	YES
t-Amyl Methyl Ether	5.00	4.56	4.52	91	90	84-112	1	30	YES
n-Heptane	5.00	5.89	5.53	118	111	79-115	6	30	NO
n-Butanol	250.00	225.14	216.68	90	87	53-127	4	30	YES
Trichloroethene	5.00	5.09	4.88	102	98	87-116	4	30	YES
Methylcyclohexane	5.00	4.91	4.62	98	92	86-116	6	30	YES
1,2-Dichloropropane	5.00	5.40	5.24	108	105	85-115	3	30	YES
Dibromomethane	5.00	5.14	5.08	103	102	90-116	1	30	YES
Methyl Methacrylate	5.00	5.37	5.09	107	102	76-116	5	30	YES
Bromodichloromethane	5.00	5.56	5.48	111	110	85-123	1	30	YES
cis-1,3-Dichloropropene	5.00	4.83	4.72	97	94	79-114	2	30	YES
4-Methyl-2-Pentanone	25.00	26.99	27.01	108	108	71-130	0	30	YES
Toluene	5.00	5.12	4.90	102	98	89-113	4	30	YES
trans-1,3-Dichloropropene	5.00	5.26	5.18	105	104	77-122	2	30	YES
Ethyl Methacrylate	5.00	4.95	4.99	99	100	71-121	1	30	YES
1,1,2-Trichloroethane	5.00	5.11	5.05	102	101	87-115	1	30	YES
Tetrachloroethene	5.00	4.52	4.27	90	85	81-116	5	30	YES
1,3-Dichloropropane	5.00	5.53	5.42	111	108	88-114	2	30	YES
2-Hexanone	25.00	28.77	28.94	115	116	69-135	1	30	YES
Dibromochloromethane	5.00	5.36	5.18	107	104	85-117	3	30	YES
1,2-Dibromoethane	5.00	5.08	5.01	102	100	86-116	2	30	YES
Chlorobenzene	5.00	5.03	4.86	101	97	88-112	3	30	YES
1,1,1,2-Tetrachloroethane	5.00	5.17	4.98	103	100	86-119	4	30	YES

N/C = Could not calculate

Lab Chronicle: _____ Ent. by [redacted].

_____ Ver. by _____

Lancaster Laboratories, Inc.
Volatiles Laboratory Control Sample Recoveries

LCS: cu18l01.d
Client ID: LCSC07
Method: SW-846 8260B (25ML)
Instrument: HP10193

LCS Duplicate: cu18l02.d
Client ID: LCDC07
Matrix/Level: WL
Dilution Factor: 1.0

Batch: C071691AA

COMPOUND NAME	SPIKE LEVEL	LCS CONC UG/L	LCSD CONC UG/L	LCS REC %	LCSD REC %	Range LOWER-UPPER	RPD %	RPD MAX	INSPEC
Ethylbenzene	5.00	5.40	5.17	108	103	88-114	4	30	YES
m+p-Xylene	10.00	10.12	9.70	101	97	88-115	4	30	YES
o-Xylene	5.00	5.06	4.89	101	98	88-115	3	30	YES
Styrene	5.00	4.77	4.63	95	93	85-118	3	30	YES
Bromoform	5.00	4.40	4.30	88	86	79-126	2	30	YES
Isopropylbenzene	5.00	5.11	4.89	102	98	87-115	4	30	YES
1,1,2,2-Tetrachloroethane	5.00	5.59	5.61	112	112	83-119	0	30	YES
Bromobenzene	5.00	4.96	4.80	99	96	84-112	3	30	YES
trans-1,4-Dichloro-2-Butene	25.00	27.73	26.23	111	105	15-165	6	30	YES
n-Propylbenzene	5.00	6.10	5.86	122	117	88-116	4	30	NO
2-Chlorotoluene	5.00	5.35	5.16	107	103	90-112	4	30	YES
4-Chlorotoluene	5.00	5.46	5.26	109	105	90-113	4	30	YES
1,3,5-Trimethylbenzene	5.00	5.65	5.45	113	109	86-113	4	30	YES
Pentachloroethane	5.00	4.98	4.94	100	99	86-122	1	30	YES
tert-Butylbenzene	5.00	5.15	4.96	103	99	90-114	4	30	YES
1,2,4-Trimethylbenzene	5.00	5.66	5.51	113	110	86-114	3	30	YES
sec-Butylbenzene	5.00	5.57	5.40	111	108	83-115	3	30	YES
1,3-Dichlorobenzene	5.00	5.07	5.00	101	100	85-109	1	30	YES
p-Isopropyltoluene	5.00	5.39	5.18	108	104	85-115	4	30	YES
1,4-Dichlorobenzene	5.00	5.08	4.98	102	100	85-112	2	30	YES
Benzyl Chloride	5.00	4.47	4.42	89	88	70-130	1	30	YES
n-Butylbenzene	5.00	5.80	5.64	116	113	82-115	3	30	NO
1,2-Dichlorobenzene	5.00	5.00	4.95	100	99	89-114	1	30	YES
1,2-Dibromo-3-Chloropropane	5.00	4.56	4.39	91	88	76-120	4	30	YES
1,2,4-Trichlorobenzene	5.00	4.39	4.48	88	90	78-117	2	30	YES
Hexachlorobutadiene	5.00	4.37	4.38	87	88	75-120	0	30	YES
Naphthalene	5.00	4.81	4.77	96	95	75-123	1	30	YES
1,2,3-Trichlorobenzene	5.00	4.35	4.39	87	88	84-116	1	30	YES

N/C = Could not calculate

Lab Chronicle: _____ Ent. by _____

_____ Ver. by 8260

SOIL GC/MS SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: LANCASTER LABS Lab Code: LANCAS

UNSPIKED:ed1383.d
S2030 5034293
AMT USED:30.0 g
FINAL VOL:1 ml

MATRIX SPIKE:ed1384.d
S2030MS 5034293
AMT USED: 30.0 g
FINAL VOL: 1 ml

SPIKE DUPLICATE:ed1385.d
S2030MSD 5034293
AMT USED: 30.0 g
FINAL VOL: 1 ml

INSTRUMENT: HP09572 DILUTION FACTOR: 1 BATCH: 07114SLA026

%MOISTURE: 24 EXTRACT SPIKE LEVEL: 2192.98

COMPOUND NAME	MS SPIKE	MSD SPIKE	US CONC UG/KG	MS CONC UG/KG	MSD CONC UG/KG	MS REC %	MSD REC %	Range LOWER-UPPER	INSPEC	RPD %	RPD MAX	INSPEC
Benzaldehyde	2192.98	2192.98	ND	829.89	638.12	38	29	2-124	YES	27	30	YES
Phenol	2192.98	2192.98	ND	1904.56	1877.08	87	86	36-135	YES	1	30	YES
bis(2-Chloroethyl)ether	2192.98	2192.98	ND	2026.15	1969.25	92	90	41-122	YES	2	30	YES
2-Chlorophenol	2192.98	2192.98	ND	2133.83	2040.64	97	93	48-125	YES	4	30	YES
2-Methylphenol	2192.98	2192.98	ND	1917.05	1953.95	87	89	39-129	YES	2	30	YES
2,2'-oxybis(1-Chloropropane	2192.98	2192.98	ND	1621.93	1560.80	74	71	45-146	YES	4	30	YES
Acetophenone	2192.98	2192.98	ND	2020.57	1981.13	92	90	24-146	YES	2	30	YES
N-Nitroso-di-n-propylamine	2192.98	2192.98	ND	2001.40	1991.62	91	91	35-133	YES	0	30	YES
4-Methylphenol	2192.98	2192.98	ND	2207.80	2201.07	101	100	36-136	YES	1	30	YES
Hexachloroethane	2192.98	2192.98	ND	1931.00	1778.20	88	81	31-125	YES	8	30	YES
Nitrobenzene	2192.98	2192.98	ND	1941.99	1956.81	89	89	38-136	YES	0	30	YES
Isophorone	2192.98	2192.98	ND	1818.09	1790.53	83	82	31-122	YES	1	30	YES
2-Nitrophenol	2192.98	2192.98	ND	2172.62	2206.92	99	101	36-146	YES	2	30	YES
2,4-Dimethylphenol	2192.98	2192.98	ND	2000.93	1986.08	91	91	43-135	YES	0	30	YES
bis(2-Chloroethoxy)methane	2192.98	2192.98	ND	2057.26	2026.71	94	92	50-137	YES	2	30	YES
2,4-Dichlorophenol	2192.98	2192.98	ND	2076.84	2066.72	95	94	35-138	YES	1	30	YES
Naphthalene	2192.98	2192.98	ND	1978.62	1975.19	90	90	33-137	YES	0	30	YES
4-Chloroaniline	2192.98	2192.98	ND	1891.15	1951.82	86	89	2-130	YES	3	30	YES
Hexachlorobutadiene	2192.98	2192.98	ND	1989.23	1985.40	91	91	45-129	YES	0	30	YES
Caprolactam	2192.98	2192.98	ND	1969.53	2041.10	90	93	1-181	YES	3	30	YES
4-Chloro-3-methylphenol	2192.98	2192.98	ND	2089.96	2047.56	95	93	48-135	YES	2	30	YES
2-Methylnaphthalene	2192.98	2192.98	ND	1981.88	2018.92	90	92	39-127	YES	2	30	YES
Hexachlorocyclopentadiene	4385.96	4385.96	ND	3673.96	3401.11	84	78	5-154	YES	7	30	YES
2,4,6-Trichlorophenol	2192.98	2192.98	ND	2143.48	2134.19	98	97	27-149	YES	1	30	YES
2,4,5-Trichlorophenol	2192.98	2192.98	ND	2046.25	2146.04	93	98	23-142	YES	5	30	YES
1,1'-Biphenyl	2192.98	2192.98	ND	2053.74	2089.80	94	95	39-146	YES	1	30	YES
2-Chloronaphthalene	2192.98	2192.98	ND	1576.06	1568.05	72	72	42-110	YES	0	30	YES
2-Nitroaniline	2192.98	2192.98	ND	2168.03	2111.42	99	96	45-139	YES	3	30	YES
Dimethylphthalate	2192.98	2192.98	ND	2094.08	2123.90	95	97	46-131	YES	2	30	YES
2,6-Dinitrotoluene	2192.98	2192.98	ND	2171.08	2151.40	99	98	50-132	YES	1	30	YES
Acenaphthylene	2192.98	2192.98	ND	2072.03	2066.77	94	94	45-144	YES	0	30	YES
3-Nitroaniline	2192.98	2192.98	ND	2060.23	2063.99	94	94	27-140	YES	0	30	YES
Acenaphthene	2192.98	2192.98	ND	2089.08	2095.64	95	96	48-129	YES	1	30	YES
2,4-Dinitrophenol	2192.98	2192.98	ND	1779.49	1731.91	81	79	20-152	YES	2	30	YES
4-Nitrophenol	2192.98	2192.98	ND	1736.80	1674.65	79	76	5-165	YES	4	30	YES
Dibenzofuran	2192.98	2192.98	ND	2080.22	2082.51	95	95	37-135	YES	0	30	YES
2,4-Dinitrotoluene	2192.98	2192.98	ND	2173.47	2181.11	99	99	44-138	YES	0	30	YES
Diethylphthalate	2192.98	2192.98	ND	2126.90	2179.48	97	99	49-128	YES	2	30	YES
Fluorene	2192.98	2192.98	ND	2123.67	2132.45	97	97	30-146	YES	0	30	YES
4-Chlorophenyl-phenylether	2192.98	2192.98	ND	2183.52	2168.94	100	99	50-128	YES	1	30	YES
4-Nitroaniline	2192.98	2192.98	ND	1739.80	1744.68	79	80	22-129	YES	1	30	YES
4,6-Dinitro-2-methylphenol	2192.98	2192.98	ND	2150.70	2135.98	98	97	5-156	YES	1	30	YES
N-Nitrosodiphenylamine	2192.98	2192.98	ND	2178.48	2175.84	99	99	46-150	YES	0	30	YES
4-Bromophenyl-phenylether	2192.98	2192.98	ND	2176.33	2141.90	99	98	52-136	YES	1	30	YES
Hexachlorobenzene	2192.98	2192.98	ND	2146.52	2184.17	98	100	45-138	YES	2	30	YES
Atrazine	2192.98	2192.98	ND	2160.38	2178.42	99	99	16-156	YES	0	30	YES
Pentachlorophenol	2192.98	2192.98	ND	1623.25	1570.63	74	72	5-140	YES	3	30	YES
Phenanthrene	2192.98	2192.98	ND	2141.00	2127.61	98	97	4-176	YES	1	30	YES
Anthracene	2192.98	2192.98	ND	2128.97	2110.42	97	96	17-161	YES	1	30	YES
Carbazole	2192.98	2192.98	ND	2045.09	2062.06	93	94	36-143	YES	1	30	YES
Di-n-butylphthalate	2192.98	2192.98	ND	2283.44	2270.24	104	104	49-128	YES	0	30	YES
Fluoranthene	2192.98	2192.98	ND	1993.34	1967.96	91	90	23-142	YES	1	30	YES
Pyrene	2192.98	2192.98	ND	2249.32	2165.82	103	99	28-155	YES	4	30	YES
Butylbenzylphthalate	2192.98	2192.98	ND	2228.04	2187.78	102	100	46-138	YES	2	30	YES
3,3'-Dichlorobenzidine	2192.98	2192.98	ND	2006.06	1964.31	91	90	3-142	YES	1	30	YES
Benzo(a)anthracene	2192.98	2192.98	ND	2301.19	2224.96	105	101	22-158	YES	4	30	YES

COMMENTS: _____

Lancaster Laboratories, Inc.
Semi Volatiles Laboratory Control Sample Recoveries

LCS: hc154.d
085WBLCS8 085WBLCS
Method: SOW OLM03.2
Instrument: HP04629

LCS Duplicate: hc155.d
085WBLCSD8 085WBLCSD
Matrix/Level: W/L
Dilution Factor: 1.0

Batch: 06085WAB026

COMPOUND NAME	SPIKE LEVEL	LCS CONC UG/L	LCSD CONC UG/L	LCS REC %	LCSD REC %	Range LOWER-UPPER	REC INSPEC	RPD %	RPD MAX	RPD INSPEC
Phenol	75.00	59.47	59.46	79	79	12-110	YES	0	42	YES
2-Chlorophenol	75.00	57.13	58.04	76	77	27-123	YES	2	40	YES
1,4-Dichlorobenzene	50.00	35.57	35.94	71	72	36-103	YES	1	28	YES
1,2,4-Trichlorobenzene	50.00	40.46	40.72	81	81	39-103	YES	1	28	YES

N/C = Could not calculate

Lab Chronicle: _____ Ent. by _____

_____ Ver. by _____

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

IN322

Client Sample ID:W-TSI-INF-032207
Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_LS433__

Matrix: (soil/water) WATER Lab Sample ID: 5013065

Sample wt/vol: 1046 (g/mL)ML Lab File ID: hc156.d

Level: (low/med) LOW Date Received: 03/23/07

% Moisture: not dec: dec: Date Extracted: 03/26/07

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 03/28/07

Injection Volume: 2 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: Extraction: Cont

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)	LOQ UG/L	Q
108-95-2	Phenol		52	
95-57-8	2-Chlorophenol		77	E
541-73-1	1,3-Dichlorobenzene		10	U
106-46-7	1,4-Dichlorobenzene		29	
95-50-1	1,2-Dichlorobenzene		9	
120-83-2	2,4-Dichlorophenol		9	
120-82-1	1,2,4-Trichlorobenzene		6	
91-20-3	Naphthalene		10	U
88-06-2	2,4,6-Trichlorophenol		10	U
118-74-1	Hexachlorobenzene		22	U
85-01-8	Phenanthrene		10	U
206-44-0	Fluoranthene		10	U

4B

SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

SBLKWB0858

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID: hc153.d Lab Sample ID: SBLKWB085

Date Extracted: 01/01/00 Extraction: Cont

Date Analyzed: 03/28/07 Time Analyzed: 01:30

Matrix (soil/water): WATER Level: (low/med) LOW

Instrument ID: HP04629

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	085WBLCS8	085WBLCS	hc154.d	03/28/07
02	085WBLCSD8	085WBLCSD	hc155.d	03/28/07
03	IN322	5013065	hc156.d	03/28/07
04	IN322DL	5013065DL	hc157.d	03/28/07

COMMENTS:

5B

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID: hb160.d DFTPP Injection Date: 02/08/07

Instrument ID: HP04629 DFTPP Injection Time: 21:19

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 80.0% of mass 198	42.9
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	62.4
70	Less than 2.0% of mass 69	0.31 (0.5)1
127	25.0 - 75.0% of mass 198	36.7
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	6.96
275	10.0 - 30.0% of mass 198	22.3
365	Greater than 0.75% of mass 198	2.62
441	Present, and less than mass 443	7.06
442	40.0 - 110% of mass 198	51.8
443	15.0 - 24.0% of mass 442	11.1 (21.5)2

1-Value is % mass 69 2-Value is % mass of 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD05023	CLP0197	hb161.d	02/08/07	21:43
02	SSTD16023	CLP0197	hb162.d	02/08/07	22:49
03	SSTD12023	CLP0197	hb163.d	02/08/07	23:56
04	SSTD08023	CLP0197	hb164.d	02/09/07	01:02
05	SSTD01023	CLP0197	hb165.d	02/09/07	02:08
06	~~ICV2196~~ SSTD0523	ICV2196	hb166.d	02/09/07	03:15
07	70560DL	4964245DL	hb167.d	02/09/07	04:21

G. LS 1957 2/21/07

5B

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID: hc150.d DFTPP Injection Date: 03/27/07

Instrument ID: HP04629 DFTPP Injection Time: 22:45

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 80.0% of mass 198	48.5
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 relative abundance	64.2
70	Less than 2.0% of mass 69	0.22 (0.35)1
127	25.0 - 75.0% of mass 198	37.5
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	6.71
275	10.0 - 30.0% of mass 198	19.5
365	Greater than 0.75% of mass 198	2.56
441	Present, and less than mass 443	7.49
442	40.0 - 110% of mass 198	49.6
443	15.0 - 24.0% of mass 442	9.6 (19.4)2

1-Value is % mass 69 2-Value is % mass of 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD05079	CLP0197	hc151.d	03/27/07	23:09
02	SBLKWB0858	SBLKWB085	hc153.d	03/28/07	01:30
03	085WBLCS8	085WBLCS	hc154.d	03/28/07	02:36
04	085WBLCSD8	085WBLCSD	hc155.d	03/28/07	03:43
05	IN322	5013065	hc156.d	03/28/07	04:49
06	IN322DL	5013065DL	hc157.d	03/28/07	05:56

8B

SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: LANCASTER LABS Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID (Standard): hc151.d Date Analyzed: 03/27/07

Instrument ID: HP04629 Time Analyzed: 23:09

		IS1(DCB)		IS2(NPT)		IS3(ANT)	
		AREA #	RT #	AREA #	RT #	AREA #	RT #
	12 HOUR STD	247005	14.158	811547	17.995	532981	23.487
	UPPER LIMIT	494010	14.658	1623094	18.495	1065962	23.987
	LOWER LIMIT	123502	13.658	405774	17.495	266490	22.987
	EPA SAMPLE NO.						
01	SBLKWB0858	266693	14.163	868249	17.991	586103	23.486
02	085WBLCS8	257367	14.164	813479	17.994	584944	23.480
03	085WBLCSD8	265895	14.164	842958	17.994	596324	23.491
04	IN322	230134	14.158	702063	17.998	476596	23.485
05	IN322DL	307647	14.158	908313	17.988	621326	23.483

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

AREA UPPER LIMIT (advisory) = +100% of internal standard area
AREA LOWER LIMIT (advisory) = -50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard are and RT values with an asterisk
* Values outside of QC limits.

8C

SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: LANCASTER LABS Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Lab File ID (Standard): hc151.d Date Analyzed: 03/27/07

Instrument ID: HP04629 Time Analyzed: 23:09

		IS4 (PHN)		IS5 (CRY)		IS6 (PRY)	
		AREA #	RT #	AREA #	RT #	AREA #	RT #
	12 HOUR STD	1006237	27.984	725087	35.490	486895	43.683
	UPPER LIMIT	2012474	28.484	1450174	35.990	973790	44.183
	LOWER LIMIT	503118	27.484	362544	34.990	243448	43.183
	EPA SAMPLE NO.						
01	SBLKWB0858	984214	27.984	637468	35.475	358546	43.678
02	085WBLCS8	992751	27.984	680707	35.476	376794	43.689
03	085WBLCSD8	1030635	27.985	706658	35.478	388947	43.690
04	IN322	800792	27.991	541905	35.485	397167	43.708
05	IN322DL	1043421	27.987	749080	35.479	478401	43.680

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

AREA UPPER LIMIT (advisory) = +100% of internal standard area
AREA LOWER LIMIT (advisory) = -50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard are and RT values with an asterisk
* Values outside of QC limits.

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP04629 Calibration Date(s): 02/08/07 02/09/07

Calibration Times: 21:43 02:08

LAB FILE ID: RRF1023 = hb165.d RRF5023 = hb161.d
RRF8023 = hb164.d RRF12023 = hb163.d RRF16023 = hb162.d

COMPOUND		RRF1023	RRF5023	RRF8023	RRF12023	RRF16023	$\overline{RRF}$	% RSD
N-Nitrosodimethylamine		1.251	1.141	1.216	1.124	1.171	1.181	4
Pyridine		1.790	1.688	1.709	1.562	1.575	1.665	6
N,N-dimethyl formamide		1.114	1.250	1.332	1.309	0.868	1.175	16
2-methylcyclohexanone		0.409	0.416	0.428	0.409	0.402	0.413	2
3-methylcyclohexanone		0.415	0.386	0.380	0.364	0.336	0.376	8
4-methylcyclohexanone		0.382	0.370	0.346	0.330	0.304	0.347	9
Benzaldehyde		1.126	0.887	0.833	0.699	0.559	0.821	26
1,3,5-Trimethylbenzene		2.745	2.726	2.789	2.700	2.569	2.706	3
Aniline		2.106	1.904	1.769	1.680	1.544	1.801	12
Phenol	*	1.928	1.668	1.810	1.641	1.594	1.728	8*
bis(2-Chloroethyl)ether	*	1.592	1.450	1.540	1.408	1.397	1.477	6*
2-Chlorophenol	*	1.340	1.205	1.280	1.157	1.168	1.230	6*
1,2,4-Trimethylbenzene		2.884	2.883	2.919	2.891	2.698	2.855	3
1,3-Dichlorobenzene	*	1.639	1.521	1.597	1.468	1.483	1.542	5*
1,4-Dichlorobenzene	*	1.641	1.517	1.601	1.480	1.499	1.548	4*
1,2,3-Trimethylbenzene		2.827	2.903	2.912	2.849	2.691	2.836	3
1,2-Dichlorobenzene	*	1.557	1.429	1.476	1.347	1.367	1.435	6*
2-Methylphenol	*	1.338	1.153	1.248	1.141	1.148	1.206	7*
2,2'-oxybis(1-Chloropropane)		3.110	2.690	2.804	2.572	2.558	2.747	8
bis(2-Chloroisopropyl)ether		3.110	2.690	2.804	2.572	2.558	2.747	8
Acetophenone		1.976	2.013	2.096	2.057	2.004	2.029	2
N-Nitroso-di-n-propylamine	*	1.639	1.488	1.594	1.443	1.435	1.520	6*
o-Toluidine		2.201	1.928	1.787	1.697	1.536	1.830	14
4-Methylphenol	*	1.396	1.231	1.361	1.235	1.229	1.290	6*
Hexachloroethane	*	0.785	0.769	0.797	0.737	0.755	0.769	3*
Nitrobenzene	*	0.633	0.594	0.616	0.569	0.594	0.601	4*
Isophorone	*	1.176	1.051	1.115	1.014	1.058	1.083	6*
2-Nitrophenol	*	0.265	0.236	0.260	0.240	0.249	0.250	5*
2,4-Dimethylphenol	*	0.541	0.493	0.529	0.483	0.513	0.512	5*
1-chloro-2-nitro-4(trifluorome		0.180	0.193	0.197	0.202	0.202	0.195	4
bis(2-Chloroethoxy)methane	*	0.582	0.516	0.574	0.522	0.537	0.546	6*
2,4-Dichlorophenol	*	0.406	0.385	0.429	0.393	0.415	0.406	4*
1,2,4-Trichlorobenzene	*	0.478	0.442	0.474	0.436	0.467	0.460	4*
2-Tertbutylphenol		0.470	0.478	0.521	0.505	0.495	0.494	4
Naphthalene	*	1.029	0.935	0.984	0.914	0.933	0.959	5*
4-Chloroaniline		0.442	0.377	0.361	0.262	0.220	0.333	27
Hexachlorobutadiene		0.303	0.295	0.308	0.297	0.319	0.304	3
Caprolactam		0.135	0.127	0.141	0.144	0.113	0.132	9
4-Chloro-3-methylphenol	*	0.325	0.286	0.313	0.284	0.296	0.301	6*
2-Methylnaphthalene	*	0.745	0.675	0.731	0.662	0.694	0.701	5*
Phthalic anhydride		0.432	0.298	0.296	0.270	0.143	0.288	36
Hexachlorocyclopentadiene		0.413	0.498	0.517	0.493	0.551	0.495	10
2,4,6-Trichlorophenol	*	0.468	0.459	0.513	0.472	0.508	0.484	5*
2,4,5-Trichlorophenol	*		0.496	0.562	0.499	0.550	0.527	6*
1,1'-Biphenyl		1.196	1.347	1.391	1.356	1.396	1.337	6
Diphenyl		1.196	1.358	1.398	1.364	1.392	1.341	6
2-Chloronaphthalene	*	1.228	1.180	1.258	1.145	1.208	1.204	4*
4-Tertbutylphenol		0.688	0.638	0.684	0.685	0.668	0.673	3
2-Nitroaniline			0.608	0.648	0.596	0.621	0.618	4
Dimethylphthalate		1.604	1.464	1.586	1.454	1.514	1.525	4
2,6-Dinitrotoluene	*	0.387	0.376	0.419	0.382	0.413	0.396	5*
Acenaphthylene	*	1.896	1.770	1.873	1.691	1.759	1.798	5*

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

B1528
2-12-07

6C
SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP04629 Calibration Date(s): 02/08/07 02/09/07

Calibration Times: 21:43 02:08

LAB FILE ID: RRF1023 = hb165.d RRF5023 = hb161.d
RRF8023 = hb164.d RRF12023 = hb163.d RRF16023 = hb162.d

COMPOUND		RRF1023	RRF5023	RRF8023	RRF12023	RRF16023	RRF	%RSD
3-Nitroaniline			0.308	0.312	0.261	0.250	0.283	11
Acenaphthene	*	1.096	1.033	1.106	1.025	1.102	1.073	4*
2,4-Dinitrophenol			0.289	0.346	0.322	0.366	0.331	10
4-Nitrophenol			0.362	0.400	0.370	0.379	0.378	4
Dibenzofuran	*	1.780	1.657	1.814	1.634	1.751	1.727	4*
2,4-Dinitrotoluene	*	0.517	0.505	0.572	0.527	0.553	0.535	5*
2,6-Dinitrophenol			0.121	0.144	0.146	0.151	0.140	10
2,6-Ditertbutylphenol		0.650	0.881	0.720	0.741	0.711	0.741	12
Diethylphthalate		1.700	1.534	1.684	1.522	1.604	1.609	5
Fluorene	*	1.354	1.231	1.351	1.231	1.346	1.303	5*
4-Chlorophenyl-phenylether	*	0.727	0.679	0.743	0.683	0.755	0.717	5*
4(tert-Octyl)phenol		1.002	1.021	1.035	0.984	0.969	1.002	3
4-Nitroaniline			0.324	0.351	0.323	0.333	0.333	4
4,6-Dinitro-2-methylphenol			0.183	0.212	0.206	0.215	0.204	7
N-Nitrosodiphenylamine (1)		0.591	0.548	0.616	0.567	0.602	0.585	5
2,4-Ditertbutylphenol		1.413	1.455	1.579	1.613	1.612	1.534	6
1,2-Diphenylhydrazine		1.017	0.926	0.964	0.874	0.896	0.935	6
3,5-Ditertbutylphenol		1.092	1.119	1.216	1.221	1.221	1.174	5
4-Bromophenyl-phenylether	*	0.232	0.228	0.254	0.235	0.262	0.242	6*
Hexachlorobenzene	*	0.282	0.262	0.290	0.275	0.301	0.282	5*
Atrazine		0.208	0.227	0.228	0.221	0.224	0.222	4
Pentachlorophenol	*		0.190	0.221	0.208	0.224	0.211	7*
Phenanthrene	*	1.095	0.997	1.091	1.016	1.047	1.049	4*
Anthracene	*	1.150	1.014	1.090	1.013	1.041	1.062	6*
Carbazole		1.056	0.922	1.013	0.935	0.947	0.975	6
Di-n-butylphthalate		1.464	1.289	1.327	1.212	1.203	1.299	8
Fluoranthene	*	1.176	0.997	1.094	1.010	1.010	1.058	7*
Pyrene	*	1.515	1.497	1.636	1.466	1.618	1.546	5*
Butylbenzylphthalate		0.790	0.799	0.857	0.777	0.840	0.813	4
3,3'-Dichlorobenzidine		0.431	0.253	0.285	0.232	0.235	0.287	29
Benzo(a)anthracene	*	1.223	1.152	1.283	1.180	1.261	1.220	4*
Chrysene	*	1.059	1.037	1.172	1.079	1.160	1.102	6*
bis(2-Ethylhexyl)phthalate		1.027	1.030	1.135	1.039	1.111	1.068	5
Di-n-octylphthalate		2.499	2.584	2.942	2.742	2.816	2.717	6
Benzo(b)fluoranthene	*	1.628	1.518	1.736	1.626	1.682	1.638	5*
Benzo(k)fluoranthene	*	1.576	1.486	1.668	1.538	1.631	1.580	4*
Benzo(a)pyrene	*	1.432	1.362	1.542	1.453	1.521	1.462	5*
Indeno(1,2,3-cd)pyrene	*	1.084	1.088	1.162	1.107	1.244	1.137	6*
Dibenz(a,h)anthracene	*	1.020	1.016	1.114	1.068	1.204	1.085	7*
Benzo(g,h,i)perylene	*	1.047	1.108	1.209	1.148	1.319	1.166	9*
2-Fluorophenol	*	1.479	1.368	1.463	1.324	1.326	1.392	5*
Phenol-d5	*	1.944	1.674	1.770	1.585	1.579	1.710	9*
2-Chlorophenol-d4	*	1.394	1.261	1.359	1.242	1.245	1.300	5*
1,2-Dichlorobenzene-d4	*	1.103	1.005	1.070	0.995	1.005	1.035	5*
Nitrobenzene-d5	*	0.622	0.596	0.630	0.579	0.609	0.607	3*
2-Fluorobiphenyl	*	1.445	1.392	1.523	1.366	1.462	1.438	4*
2,4,6-Tribromophenol		0.146	0.136	0.157	0.146	0.166	0.150	8
Terphenyl-d14	*	1.018	1.010	1.112	1.022	1.161	1.065	6*

(1) Cannot be separated from Diphenylamine
All other compounds must meet a minimum RRF of 0.010.

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP04629 Calibration Date: 03/27/07 Time: 23:09

Lab File ID: hc151.d Init. Calib. Date(s): 02/08/07 02/09/07

Init. Calib. Times(s): 21:43 02:08

			MIN		MAX	
COMPOUND	RRF	RRF50	RRF	%D	%D	
N-Nitrosodimethylamine	1.181	1.228		4		
Pyridine	1.665	1.688		1		
N,N-dimethyl formamide	1.175	1.261		7		
2-methylcyclohexanone	0.413	0.442		7		
3-methylcyclohexanone	0.376	0.389		3		
4-methylcyclohexanone	0.346	0.367		6		
Benzaldehyde	0.821	0.902		10		
1,3,5-Trimethylbenzene	2.706	2.656		-2		
Aniline	1.801	1.794		0		
* Phenol	1.728	1.711	0.800	-1	25	*
* bis(2-Chloroethyl)ether	1.477	1.443	0.700	-2	25	*
* 2-Chlorophenol	1.230	1.217	0.800	-1	25	*
1,2,4-Trimethylbenzene	2.855	2.807		-2		
* 1,3-Dichlorobenzene	1.542	1.532	0.600	-1	25	*
* 1,4-Dichlorobenzene	1.548	1.522	0.500	-2	25	*
1,2,3-Trimethylbenzene	2.836	2.807		-1		
* 1,2-Dichlorobenzene	1.435	1.425	0.400	-1	25	*
* 2-Methylphenol	1.206	1.167	0.700	-3	25	*
2,2'-oxybis(1-Chloropropane)	2.747	2.621		-4		
bis(2-Chloroisopropyl)ether	2.747	2.621		-4		
Acetophenone	2.029	1.984		-2		
* N-Nitroso-di-n-propylamine	1.520	1.397	0.500	-8	25	*
o-Toluidine	1.830	1.748		-4		
* 4-Methylphenol	1.290	1.287	0.600	0	25	*
* Hexachloroethane	0.769	0.716	0.300	-7	25	*
* Nitrobenzene	0.601	0.539	0.200	-10	25	*
* Isophorone	1.083	0.997	0.400	-8	25	*
* 2-Nitrophenol	0.250	0.227	0.100	-9	25	*
* 2,4-Dimethylphenol	0.512	0.484	0.200	-6	25	*
1-chloro-2-nitro-4(trifluorome	0.195	0.174		-11		
* bis(2-Chloroethoxy)methane	0.546	0.510	0.300	-7	25	*
* 2,4-Dichlorophenol	0.406	0.386	0.200	-5	25	*
* 1,2,4-Trichlorobenzene	0.460	0.435	0.200	-5	25	*
2-Tertbutylphenol	0.494	0.458		-7		
* Naphthalene	0.959	0.934	0.700	-2	25	*
4-Chloroaniline	0.332	0.364		9		

All other compounds must meet a minimum RRF of 0.010.

FORM VII SV-1 OLM03.0

MM195 03/28/07

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP04629 Calibration Date: 03/27/07 Time: 23:09

Lab File ID: hc151.d Init. Calib. Date(s): 02/08/07 02/09/07

Init. Calib. Times(s): 21:43 02:08

	COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D	
	Hexachlorobutadiene	0.304	0.287		-6		
	Caprolactam	0.132	0.133		1		
*	4-Chloro-3-methylphenol	0.301	0.289	0.200	-4	25	*
*	2-Methylnaphthalene	0.701	0.678	0.400	-3	25	*
	Phthalic anhydride	0.288	0.225		-22		
	Hexachlorocyclopentadiene	0.494	0.424		-14		
*	2,4,6-Trichlorophenol	0.484	0.449	0.200	-7	25	*
*	2,4,5-Trichlorophenol	0.527	0.496	0.200	-6	25	*
	1,1'-Biphenyl	1.337	1.355		1		
	Diphenyl	1.341	1.355		1		
*	2-Chloronaphthalene	1.204	1.142	0.800	-5	25	*
	4-Tertbutylphenol	0.672	0.627		-7		
	2-Nitroaniline	0.618	0.582		-6		
	Dimethylphthalate	1.525	1.483		-3		
*	2,6-Dinitrotoluene	0.396	0.384	0.200	-3	25	*
*	Acenaphthylene	1.798	1.773	0.900	-1	25	*
	3-Nitroaniline	0.283	0.300		6		
*	Acenaphthene	1.073	1.021	0.900	-5	25	*
	2,4-Dinitrophenol	0.331	0.204		-38		
	4-Nitrophenol	0.378	0.276		-27		
*	Dibenzofuran	1.727	1.631	0.500	-6	25	*
*	2,4-Dinitrotoluene	0.535	0.504	0.200	-6	25	*
	2,6-Dinitrophenol	0.140	0.084		-40		
	2,6-Ditertbutylphenol	0.740	0.623		-16		
	Diethylphthalate	1.609	1.524		-5		
*	Fluorene	1.303	1.156	0.900	-11	25	*
*	4-Chlorophenyl-phenylether	0.717	0.625	0.400	-13	25	*
	4(tert-Octyl)phenol	1.002	0.984		-2		
	4-Nitroaniline	0.333	0.281		-16		
	4,6-Dinitro-2-methylphenol	0.204	0.160		-21		
	N-Nitrosodiphenylamine (1)	0.585	0.520		-11		
	2,4-Ditertbutylphenol	1.534	1.350		-12		
	1,2-Diphenylhydrazine	0.935	0.824		-12		
	3,5-Ditertbutylphenol	1.174	1.057		-10		
*	4-Bromophenyl-phenylether	0.242	0.224	0.100	-8	25	*
*	Hexachlorobenzene	0.282	0.253	0.100	-10	25	*

(1) Cannot be Separated from Diphenylamine

All other compounds must meet a minimum RRF of 0.010.

7C cont

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: Lancaster Laboratories Contract:_____

Lab Code: LANCAS Case No.:_____ SAS No.:_____ SDG No.:_____

Instrument ID: HP04629 Calibration Date: 03/27/07 Time: 23:09

Lab File ID: hc151.d Init. Calib. Date(s): 02/08/07 02/09/07

Init. Calib. Times(s): 21:43 02:08

			MIN		MAX	
COMPOUND	RRF	RRF50	RRF	%D	%D	
Atrazine	0.222	0.226		2		
* Pentachlorophenol	0.211	0.163	0.050	-23	25	*
* Phenanthrene	1.049	0.994	0.700	-5	25	*
* Anthracene	1.062	0.998	0.700	-6	25	*
Carbazole	0.975	0.912		-6		
Di-n-butylphthalate	1.299	1.312		1		
* Fluoranthene	1.058	1.080	0.600	2	25	*
* Pyrene	1.546	1.512	0.600	-2	25	*
Butylbenzylphthalate	0.813	0.822		1		
3,3'-Dichlorobenzidine	0.287	0.288		0		
* Benzo(a)anthracene	1.220	1.161	0.800	-5	25	*
* Chrysene	1.102	1.042	0.700	-5	25	*
bis(2-Ethylhexyl)phthalate	1.068	1.151		8		
Di-n-octylphthalate	2.717	2.743		1		
* Benzo(b)fluoranthene	1.638	1.564	0.700	-4	25	*
* Benzo(k)fluoranthene	1.580	1.495	0.700	-5	25	*
* Benzo(a)pyrene	1.462	1.359	0.700	-7	25	*
* Indeno(1,2,3-cd)pyrene	1.137	0.857	0.500	-25	25	*
* Dibenz(a,h)anthracene	1.085	0.739	0.400	-32	25	*
* Benzo(g,h,i)perylene	1.166	0.908	0.500	-22	25	*
* 2-Fluorophenol	1.392	1.469	0.600	6	25	*
* Phenol-d5	1.710	1.708	0.800	0	25	*
* 2-Chlorophenol-d4	1.300	1.250	0.800	-4	25	*
* 1,2-Dichlorobenzene-d4	1.035	1.037	0.400	0	25	*
* Nitrobenzene-d5	0.607	0.553	0.200	-9	25	*
* 2-Fluorobiphenyl	1.438	1.322	0.700	-8	25	*
2,4,6-Tribromophenol	0.150	0.120		-20		
* Terphenyl-d14	1.065	1.003	0.500	-6	25	*

All other compounds must meet a minimum RRF of 0.010.

APPENDIX A

GC VOLATILES
DATA DELIVERABLES FORMS

Quality Control Summary
SDG# WRF18

Surrogate Recovery
Volatiles by GC - Soil

LL Sample#	Sample Code	Dilution Factor	TFT-F Soil--FID % Recovery	TOT OUT
4997216 %	13-60	25.0	77	
4997216MS	13-60	25.0	80	
4997216MSD	13-60	25.0	75	
5015033	HA-18	2561.48	2D	1
5015034 %	76SMP	585937.5	3 D	1
BLK3438	METHOD BLANK	25.0	79	
LCS3438	LAB CONTROL	1.0	102	

* = Values outside quality control limits.
D = Surrogates diluted - not counted towards total out.
TOT OUT = Total # of surrogates with recovery outside control limits.

		Control Limits Lower	Upper
TFT-F	= Trifluorotoluene (Soil - FID)	61	122

Matrix Spike
Petroleum Analysis - Water

Unspiked Sample Number....: 4912610
Spiked Sample Number.....: 4912610MS
Method Reference.....: GRO

Batch Number.....: 06318A53
Date.....: 11/14/06
Instrument.....: 7530

Compound	Spike Added (UG/L)	Sample Conc (UG/L)	MS Conc (UG/L)	MS % Recov	QC Limits Recov
GRO	1100	0.00	1500	136	63-154

MS=Matrix Spike; ND=None Detected; * = Value outside quality control limits.

Lab Control/Lab Control Duplicate
Petroleum Analysis - Water

Lab Control Sample Number....: LCS5458
Lab Control Sample Number....: LDS5458
Method Reference.....: GRO

Batch Number.....: 06278A54
Date.....: 10/05/06
Instrument.....: 7550

Compound	Spike Added (UG/L)	LCS Conc (UG/L)	LDS Conc (UG/L)	LCS % Recov	LDS % Recov	LCS Limits Recov	RPD	LCS Limits RPD
GRO	1100	1170	1220	107	111	70-130	4	30

LCS=Lab Control Sample; LDS=Lab Control Sample Duplicate; RPD=Relative Percent Difference

* = Value outside quality control limits.

Quality Control Summary
SDG# WRF18

Method Blank
Volatiles by GC - Water

Blank ID.....: BLK3438
Date.....: 03/27/07
Instrument.....: 5398

Batch Number.....: 07086A34A
Time.....: 22:35
Matrix.....: Water

Sample Information

LL Sample#	Sample Code	Analysis Date	Analysis Time
LCS3438	LAB CONTROL	03/27/07	23:47
4997216 %	13-60	03/28/07	00:24
4997216MS	13-60	03/28/07	01:00
4997216MSD	13-60	03/28/07	01:36
5015033	HA-18	03/28/07	02:26
5015034 %	76SMP	03/28/07	09:20

Method Blank Results

CAS Number	Compound	Blank Conc. (UG/L)	LOQ (UG/L)	MDL (UG/L)
0000-00-0	GRO	ND	1000	200

LOQ = Limit of Quantitation; MDL = Method Detection Limit
ND = None Detected; * = Above Limit of Quantitation

Initial Calibration Summary

Instrument ID: 5398
Calibration Batch: 07052A34A
Method Reference: GRO
Initial Calibration Date(s): 02/21/07(FID)

F015B 34052

STANDARD		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5		
DATE INJECTED		02/21/07	02/21/07	02/21/07	02/21/07	02/21/07		
TIME INJECTED		14:04	14:40	15:16	15:52	16:28		
		Retention Time		Relative Response Factor (RRF)						
COMPOUND (DETECTOR)		LEVEL 3	Window	LEVEL1	LEVEL2	LEVEL3	LEVEL4	LEVEL5	MEAN	% RSD
GRO	(FID)	2.000	0.03	70634.4	66016.3	62956.7	62844.4	60486.2	64587.6	6
SURR-TFT-F	(FID)	6.990	0.03	80601.9	71244.0	76701.1	79460.0	75906.4	76782.7	5

SS/IN
2/23/07

Calibration Verification Summary

Instrument ID: 5398
Method Reference: GRO
Data File: C:\DEPT25\34052B.0014.RAW
Date Injected: 02/21/07 Time Injected: 18:52

COMPOUND (DETECTOR)	RETENTION TIME ACTUAL	RETENTION TIME WINDOW START	RETENTION TIME WINDOW END	THEORETICAL CONCENTRATION (UG/L)	ACTUAL CONCENTRATION (UG/L)	% DRIFT	%DRIFT LIMITS
GRO (FID)				220.0	195.8	-11	-15 to +15
SURR-TFT-F (FID)	6.980	6.900	7.060	30.0	26.2	-13	-43 to +46

* = %DRIFT outside control limits.

APPENDIX A

PESTICIDES/PCBs
DATA DELIVERABLES FORMS

2E
WATER SURROGATE RECOVERY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.: LS433

GC Column (1): RTXCLP ID: .32 GC Column (2): RTXCLPII ID: .32

Batchnumber: 070830012A

SAMPLE	SAMPLE CODE NO.	TCX 1 % REC #	TCX 2 % REC #	DCB 1 % REC #	DCB 2 % REC #	TOT OUT
5013065	IN322	163 *	79	95	101	1
BLANKA	PBLKOB	89	87	102	105	0
LCSA	LCSX0	93	92	95	99	0
LCSDA	LCSDX0	89	89	100	104	0

	ADVISORY QC LIMITS	NOMINAL CONCENTRATION
TCX = Tetrachloro-m-xylene	(30 - 150)	0.200 ug/l
DCB = Decachlorobiphenyl	(30 - 150)	0.204 ug/l

Column to be used to flag recovery values

* Values outside of QC Limits

D Surrogate diluted out

3E

Water Matrix Spike/Matrix Spike Duplicate Recovery

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Matrix Spike - Sample Code No.: WO-10

Compound	Spike Added (ug/l)	Sample Concen (ug/l)	MS Concen (ug/l)	MSD Concen (ug/l)	MS % Rec #	MSD % Rec #	MS-MSD % REC Limits	% RPD #	% RPD Lim
Formaldehyde	500	70	520	510	90	88	(70 - 124)	2	30

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 1 outside limits

Spike Recovery: 0 out of 2 outside limits

Comments: Results calculated on as-received basis.

Sample No.: 5000751 Batch: 070680018A

3E

Water Lab Control Spike/Lab Control Spike Duplicate Recovery

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Laboratory Control Spike - EPA Sample No.: LCSX0

Compound	Spike Added (ug/l)	LCS Concen (ug/l)	LCS % Rec #	LCS-LCSD % REC Limits
gamma-BHC (Lindane)	0.50	0.51	102	56 - 123
Heptachlor	0.50	0.45	90	40 - 131
Aldrin	0.50	0.38	76	40 - 120
Dieldrin	1.0	1.0	100	52 - 126
Endrin	1.0	1.1	110	56 - 121
4,4'-DDT	1.0	1.0	100	38 - 127

Compound	Spike Added (ug/l)	LCSD Concen (ug/l)	LCSD % Rec #	% RPD #	% RPD Lim	LCS-LCSD % REC Limits
gamma-BHC (Lindane)	0.50	0.50	100	2	15	56 - 123
Heptachlor	0.50	0.44	88	2	20	40 - 131
Aldrin	0.50	0.35	70	8	22	40 - 120
Dieldrin	1.0	1.0	100	0	18	52 - 126
Endrin	1.0	0.99	99	10	21	56 - 121
4,4'-DDT	1.0	0.96	96	4	27	38 - 127

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 6 outside limits

Spike Recovery: 0 out of 12 outside limits

Comments: Results calculated on as-received basis.

Sample No.: LCSA Batch: 070830012A

1D

ORGANICS ANALYSIS DATA SHEET

SAMPLE CODE NO. IN322

Client Sample ID: W-TSI-INF-032207

Lab Name: Lancaster Laboratories Contract: Batchnumber: 070830012A

Lab Code: Case No.: SAS No.: SDG No.: LS433

Matrix: (soil/water) WATER

Sample wt/vol: 1015 (g/ml) ml

% Moisture: Decanted: (Y/N)

Extraction: (SepF/Cont/Sonc) SEPF

Concentrated Extract Volume: 10000 (uL)

Injection Volume: 1 (uL)

GPC Cleanup: (Y/N) N pH:

Lab Sample ID: 5013065

Lab File ID: 5D1053.29R

Date Received: 3/23/2007

Date Extracted: 3/25/2007

Date Analyzed: 3/29/2007

Dilution Factor: 1

Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS (UG/L or UG/KG) ug/l	Q
72-55-9	4,4'-DDE	0.35	U
959-98-8	Endosulfan I	0.050	U
50-29-3	4,4'-DDT	0.34	U

4C

METHOD BLANK SUMMARY

SAMPLE CODE NO.

PBLKOB

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Lab Sample ID BLANKA Batch 070830012A

Lab File ID: 5D1053.26R 5D1053B.26R

Matrix: (soil/water) WATER

Extraction: (SepF/Cont/Sonc) SEPF

Sulfur Cleanup: (Y/N) N

Date Extracted: 3/25/2007

Date Analyzed (1): 3/29/2007

Date Analyzed (2): 3/29/2007

Time Analyzed (1): 13:46:38

Time Analyzed (2): 13:46:38

Instrument ID (1): V5807A

Instrument ID (2): V5807B

GC Column: RTXCLP ID: 0.32 (mm)

GC Column: RTXCLPII ID: 0.32 (mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS, AND MSD

	SAMPLE CODE NO.	LAB SAMPLEID	DATE ANALYZED 1	DATE ANALYZED 2
01	IN322	5013065	3/29/2007	3/29/2007
02	PBLKOB	BLANKA	3/29/2007	3/29/2007
03	LCSX0	LCSA	3/29/2007	3/29/2007
04	LCSDX0	LCSDA	3/29/2007	3/29/2007

COMMENTS: _____

6D
INITIAL CALIBRATION - RETENTION TIME SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument ID: V5807A Level (x Low): low 1.0 mid 4.0 high 20.0

GC Column (1) : RTXCLP ID: 0.32 (mm) Date(s) Analyzed: 02/22/07 02/23/07

COMPOUND	RT OF STANDARDS LOW	MID	HIGH	MEAN RT	RT WINDOW FROM	TO
alpha-BHC	7.45	7.44	7.44	7.44	7.39	7.49
gamma-BHC (Lindane)	8.20	8.19	8.20	8.19	8.14	8.24
beta-BHC	8.43	8.42	8.43	8.42	8.37	8.47
delta-BHC	8.83	8.82	8.83	8.82	8.77	8.87
Heptachlor	9.31	9.30	9.30	9.30	9.25	9.35
Aldrin	9.99	9.98	9.99	9.98	9.93	10.03
Heptachlor epoxide	11.34	11.34	11.35	11.34	11.29	11.39
gamma-Chlordane	11.62	11.61	11.62	11.61	11.56	11.66
alpha-Chlordane	11.91	11.90	11.91	11.90	11.85	11.95
4,4'-DDE	12.10	12.10	12.11	12.10	12.03	12.17
Endosulfan I	12.19	12.18	12.18	12.18	12.13	12.23
Dieldrin	12.70	12.69	12.70	12.69	12.62	12.76
Endrin	13.19	13.18	13.18	13.18	13.11	13.25
4,4'-DDD	13.37	13.35	13.36	13.35	13.28	13.42
Endosulfan II	13.67	13.66	13.67	13.66	13.59	13.73
4,4'-DDT	13.95	13.94	13.94	13.94	13.87	14.01
Endrin aldehyde	14.55	14.54	14.56	14.54	14.48	14.62
Methoxychlor	14.97	14.96	14.96	14.96	14.89	15.03
Endosulfan sulfate	15.46	15.45	15.46	15.45	15.38	15.52
Endrin ketone	16.04	16.03	16.04	16.03	15.96	16.10
Tetrachloro-m-xylene	6.09	6.08	6.08	6.08	6.03	6.13
Decachlorobiphenyl	18.36	18.35	18.35	18.35	18.25	18.45

*Surrogate retention times are measured from Standard Mix A analyses.

Retentiontime Windows are +/- 0.05 minutes for all compounds that elute before Heptachlor epoxide, +/- 0.07 minutes for all other compounds, except +/- 0.100 minutes for Decachlorobiphenyl

6D
INITIAL CALIBRATION - RETENTION TIME SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument ID: V5807B Level (x Low): low 1.0 mid 4.0 high 20.0

GC Column (2) : RTXCLPII ID: 0.32 (mm) Date(s) Analyzed: 02/22/07 02/23/07

COMPOUND	RT OF STANDARDS			MEAN RT	RT WINDOW	
	LOW	MID	HIGH		FROM	TO
alpha-BHC	7.57	7.56	7.56	7.56	7.51	7.61
gamma-BHC (Lindane)	8.42	8.41	8.42	8.41	8.36	8.46
beta-BHC	8.65	8.64	8.65	8.65	8.60	8.70
delta-BHC	9.32	9.31	9.32	9.31	9.26	9.36
Heptachlor	9.41	9.40	9.40	9.40	9.35	9.45
Aldrin	10.13	10.12	10.13	10.12	10.07	10.17
Heptachlor epoxide	11.43	11.42	11.43	11.42	11.37	11.47
gamma-Chlordane	11.83	11.82	11.83	11.82	11.77	11.87
alpha-Chlordane	12.15	12.14	12.15	12.14	12.09	12.19
Endosulfan I	12.26	12.25	12.25	12.25	12.20	12.30
4,4'-DDE	12.55	12.54	12.56	12.54	12.48	12.62
Dieldrin	12.85	12.84	12.84	12.84	12.77	12.91
Endrin	13.49	13.48	13.48	13.48	13.41	13.55
4,4'-DDD	13.78	13.77	13.77	13.77	13.70	13.84
Endosulfan II	13.95	13.94	13.95	13.95	13.88	14.02
4,4'-DDT	14.43	14.41	14.42	14.42	14.34	14.48
Endrin aldehyde	14.68	14.67	14.68	14.67	14.60	14.74
Endosulfan sulfate	15.26	15.25	15.26	15.25	15.18	15.32
Methoxychlor	15.89	15.88	15.88	15.88	15.81	15.95
Endrin ketone	16.37	16.36	16.37	16.36	16.29	16.43
Tetrachloro-m-xylene	6.04	6.03	6.03	6.03	5.98	6.08
Decachlorobiphenyl	19.51	19.50	19.50	19.50	19.40	19.60

*Surrogate retention times are measured from Standard Mix A analyses.

Retentiontime Windows are +/- 0.05 minutes for all compounds that elute before Heptachlor epoxide, +/- 0.07 minutes for all other compounds, except +/- 0.100 minutes for Decachlorobiphenyl

6E

INITIAL CALIBRATION - CALIBRATION FACTOR SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument: V5807A Level (x Low): low 1.0 mid 4.0 high 20.0

GC Column (1) : RTXCLP ID: 0.32 (mm) Date(s) Analyzed: 2/22/2007 2/23/2007

COMPOUND	CALIBRATION FACTORS LOW	MID	HIGH	MEAN	%RSD
alpha-BHC	5.06E+02	4.94E+02	5.17E+02	5.06E+02	2.3
gamma-BHC (Lindane)	4.55E+02	4.37E+02	4.51E+02	4.48E+02	2.1
beta-BHC	1.76E+02	1.81E+02	1.53E+02	1.70E+02	8.7
delta-BHC	4.05E+02	4.25E+02	4.20E+02	4.16E+02	2.5
Heptachlor	4.50E+02	4.34E+02	4.42E+02	4.42E+02	1.8
Aldrin	3.95E+02	4.25E+02	4.03E+02	4.08E+02	3.8
Heptachlor epoxide	3.61E+02	3.78E+02	3.50E+02	3.63E+02	4.0
gamma-Chlordane	3.47E+02	3.65E+02	3.46E+02	3.53E+02	3.0
alpha-Chlordane	3.43E+02	3.42E+02	3.24E+02	3.37E+02	3.2
4,4'-DDE	3.24E+02	3.41E+02	3.43E+02	3.36E+02	3.1
Endosulfan I	3.58E+02	3.44E+02	3.37E+02	3.46E+02	3.1
Dieldrin	3.61E+02	3.53E+02	3.66E+02	3.60E+02	1.8
Endrin	2.83E+02	2.64E+02	2.69E+02	2.72E+02	3.5
4,4'-DDD	2.59E+02	2.53E+02	2.80E+02	2.64E+02	5.4
Endosulfan II	2.85E+02	2.84E+02	2.87E+02	2.85E+02	.4
4,4'-DDT	2.84E+02	2.70E+02	2.95E+02	2.83E+02	4.4
Endrin aldehyde	2.02E+02	2.12E+02	1.98E+02	2.04E+02	3.5
Methoxychlor	1.27E+02	1.29E+02	1.22E+02	1.26E+02	2.8
Endosulfan sulfate	2.16E+02	2.22E+02	2.22E+02	2.20E+02	1.5
Endrin ketone	2.63E+02	2.75E+02	2.79E+02	2.73E+02	3.1
Tetrachloro-m-xylene	2.83E+02	2.68E+02	2.51E+02	2.68E+02	5.9
Decachlorobiphenyl	1.93E+02	1.85E+02	1.75E+02	1.84E+02	4.7

*Surrogate calibration factors are measured from standard Mix A analyses.

6E

INITIAL CALIBRATION - CALIBRATION FACTOR SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument: V5807B Level (x Low): low 1.0 mid 4.0 high 20.0

GC Column (2) : RTXCLPII ID: 0.32 (mm) Date(s) Analyzed: 2/22/2007 2/23/2007

COMPOUND	CALIBRATION FACTORS				%RSD
	LOW	MID	HIGH	MEAN	
alpha-BHC	7.08E+02	6.75E+02	6.37E+02	6.73E+02	5.2
gamma-BHC (Lindane)	6.22E+02	5.89E+02	5.65E+02	5.92E+02	4.8
beta-BHC	2.34E+02	2.39E+02	2.01E+02	2.25E+02	9.1
delta-BHC	5.48E+02	5.56E+02	5.15E+02	5.40E+02	4.0
Heptachlor	6.29E+02	5.87E+02	5.50E+02	5.89E+02	6.7
Aldrin	5.46E+02	5.69E+02	4.15E+02	5.10E+02	16.3
Heptachlor epoxide	5.00E+02	5.13E+02	4.47E+02	4.87E+02	7.2
gamma-Chlordane	4.74E+02	4.98E+02	4.50E+02	4.74E+02	5.0
alpha-Chlordane	4.55E+02	4.69E+02	4.31E+02	4.52E+02	4.2
Endosulfan I	4.85E+02	4.49E+02	4.20E+02	4.52E+02	7.2
4,4'-DDE	3.68E+02	3.93E+02	3.62E+02	3.74E+02	4.4
Dieldrin	5.10E+02	4.81E+02	4.13E+02	4.68E+02	10.6
Endrin	3.81E+02	3.55E+02	3.25E+02	3.54E+02	8.0
4,4'-DDD	2.93E+02	3.28E+02	3.00E+02	3.07E+02	6.1
Endosulfan II	3.65E+02	3.83E+02	3.39E+02	3.62E+02	6.2
4,4'-DDT	3.37E+02	3.28E+02	3.31E+02	3.32E+02	1.4
Endrin aldehyde	2.66E+02	2.85E+02	2.53E+02	2.68E+02	6.0
Endosulfan sulfate	2.90E+02	2.87E+02	2.67E+02	2.82E+02	4.4
Methoxychlor	1.42E+02	1.44E+02	1.09E+02	1.31E+02	14.6
Endrin ketone	3.41E+02	3.50E+02	3.25E+02	3.39E+02	3.8
Tetrachloro-m-xylene	3.71E+02	3.56E+02	3.26E+02	3.51E+02	6.6
Decachlorobiphenyl	2.23E+02	2.01E+02	1.85E+02	2.03E+02	9.2

*Surrogate calibration factors are measured from standard Mix A analyses.

6F

INITIAL CALIBRATION OF MULTICOMPONENT ANALYTES

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument: V5807A Date(s) Analyzed: 02/22/07 02/23/07

GC Column (1) : RTXCLP ID: 0.32 (mm)

COMPOUND	AMOUNT (ng)	PEAK[1]	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR
Aroclor-1016	100.000	1	6.98	6.92	7.06	5.255
	100.000	2	7.82	7.75	7.89	6.495
	100.000	3	9.19	9.12	9.26	7.362
Aroclor-1221	200.000	1	6.54	6.47	6.61	2.834
	200.000	2	6.89	6.82	6.96	1.953
	200.000	3	6.99	6.92	7.06	7.039
Aroclor-1232	100.000	1	6.99	6.92	7.06	6.607
	100.000	2	7.82	7.75	7.89	3.013
	100.000	3	9.19	9.12	9.26	3.562
Aroclor-1242	100.000	1	6.98	6.91	7.05	4.524
	100.000	2	7.82	7.75	7.89	5.321
	100.000	3	9.19	9.12	9.26	6.025
Aroclor-1248	100.000	1	10.29	10.22	10.36	5.856
	100.000	2	11.02	10.95	11.09	8.605
	100.000	3	11.08	11.01	11.15	7.418
Aroclor-1254	100.000	1	11.48	11.41	11.55	10.544
	100.000	2	12.33	12.26	12.40	16.462
	100.000	3	12.91	12.84	12.98	15.280
Aroclor-1260	100.000	1	15.27	15.20	15.34	35.549
	100.000	2	15.86	15.79	15.93	15.273
	100.000	3	17.18	17.11	17.25	8.034
Toxaphene	500.000	1	14.75	14.68	14.82	3.868
	500.000	2	15.59	15.52	15.66	3.919
	500.000	3	16.30	16.23	16.37	3.514

[1] At least 3 peaks for each column are required for identification of multicomponent analytes.

6F

INITIAL CALIBRATION OF MULTICOMPONENT ANALYTES

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: LS433

Instrument: V5807B Date(s) Analyzed: 02/22/07 02/23/07

GC Column (2) : RTXCLPII ID: 0.32 (mm)

COMPOUND	AMOUNT (ng)	PEAK[1]	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR
Aroclor-1016	100.000	1	7.25	7.18	7.32	6.263
	100.000	2	9.52	9.44	9.58	9.020
	100.000	3	9.74	9.67	9.81	6.989
Aroclor-1221	200.000	1	6.77	6.70	6.84	3.822
	200.000	2	7.11	7.04	7.18	2.626
	200.000	3	7.25	7.18	7.32	7.759
Aroclor-1232	100.000	1	7.25	7.18	7.32	7.140
	100.000	2	9.52	9.45	9.59	3.918
	100.000	3	9.74	9.67	9.81	3.722
Aroclor-1242	100.000	1	7.25	7.18	7.32	5.216
	100.000	2	9.51	9.44	9.58	7.377
	100.000	3	9.74	9.67	9.81	6.113
Aroclor-1248	100.000	1	10.55	10.48	10.62	10.083
	100.000	2	10.81	10.74	10.88	8.861
	100.000	3	11.36	11.29	11.43	10.650
Aroclor-1254	100.000	1	12.45	12.38	12.52	4.379
	100.000	2	13.30	13.23	13.37	12.352
	100.000	3	13.66	13.59	13.73	10.155
Aroclor-1260	100.000	1	15.73	15.66	15.80	39.034
	100.000	2	16.50	16.44	16.58	13.662
	100.000	3	17.81	17.74	17.88	8.267
Toxaphene	500.000	1	14.12	14.05	14.19	13.687
	500.000	2	16.55	16.48	16.62	4.388
	500.000	3	16.96	16.89	17.03	2.660

[1] At least 3 peaks for each column are required for identification of multicomponent analytes.

7D

PESTICIDE CALIBRATION VERIFICATION SUMMARY

Lab Name: Lancaster Laboratories
Contract:

Lab Code: Case No.: SAS No.: SDG No.:

GC Column (1) : RTXCLP ID: .32 (mm) Init. Calib Date(s): 02/22/07 02/23/07

EPA Sample No. (PIBLK): PIBLKAA Date Analyzed: 02/22/07

Lab Sample ID (PIBLK): IBLKX0624B Time Analyzed: 19:10

EPA Sample No. (PEM): PEMAA Date Analyzed: 02/22/07

Lab Sample ID (PEM): PEMXX0724D Time Analyzed: 19:41

PEM COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	%D
Tetrachloro-m-xylene	6.08	6.04	6.14	0.018	0.020	-8.8
alpha-BHC	7.44	7.39	7.49	0.009	0.010	-7.2
gamma-BHC (Lindane)	8.19	8.15	8.25	0.010	0.010	-3.8
beta-BHC	8.42	8.38	8.48	0.010	0.010	-0.4
4,4'-DDE	12.09	12.03	12.17	0.003		
Endrin	13.18	13.11	13.25	0.050	0.050	0.2
4,4'-DDD	13.36	13.29	13.43	0.000		
4,4'-DDT	13.94	13.87	14.01	0.093	0.100	-7.6
Endrin aldehyde	14.54	14.48	14.62	0.001		
Methoxychlor	14.96	14.90	15.04	0.232	0.251	-7.5
Endrin ketone	16.02	15.96	16.10	0.001		
Decachlorobiphenyl	18.35	18.25	18.45	0.018	0.020	-9.8

4'4-DDT % Breakdown (1) : 3.4

Endrin % Breakdown (1) : 4.6

Combined % Breakdown (1) : 8

7E

PESTICIDE CALIBRATION VERIFICATION SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

GC Column (1) : RTXCLP ID: .32 (mm) Init. Calib Date(s):02/22/07 02/23/07

EPA Sample No. (PIBLK): PIBLKDM Date Analyzed: 03/29/07

Lab Sample ID (PIBLK): IBLKX0724A Time Analyzed: 12:16

EPA Sample No. (INDAM): INDAMUG Date Analyzed: 03/29/07

Lab Sample ID (INDA): INDAM0724A Time Analyzed: 12:46

INDIVIDUAL MIX A COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	%D
Tetrachloro-m-xylene	6.08	6.04	6.14	0.020	0.020	-2.2
alpha-BHC	7.44	7.39	7.49	0.020	0.020	-0.7
gamma-BHC (Lindane)	8.20	8.15	8.25	0.020	0.020	0.7
Heptachlor	9.30	9.26	9.36	0.020	0.020	-2.4
Endosulfan I	12.18	12.13	12.23	0.019	0.020	-4.6
Dieldrin	12.69	12.63	12.77	0.040	0.040	-0.7
Endrin	13.18	13.11	13.25	0.032	0.040	-18.8
4,4'-DDD	13.36	13.29	13.43	0.040	0.040	1.2
4,4'-DDT	13.94	13.87	14.01	0.038	0.040	-4.8
Methoxychlor	14.96	14.90	15.04	0.171	0.200	-14.6
Decachlorobiphenyl	18.34	18.25	18.45	0.039	0.040	-2.7

EPA Sample No. (INDBM): INDBMUE Date Analyzed: 03/29/07

Lab Sample ID (INDB): INDBM0724A Time Analyzed: 13:16

INDIVIDUAL MIX B COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	%D
Tetrachloro-m-xylene	6.08	6.04	6.14	0.020	0.020	-0.9
beta-BHC	8.42	8.38	8.48	0.019	0.020	-3.2
delta-BHC	8.82	8.78	8.88	0.020	0.020	1.5
Aldrin	9.98	9.92	10.02	0.019	0.020	-3.0
Heptachlor epoxide	11.33	11.29	11.39	0.020	0.020	-1.1
gamma-Chlordane	11.60	11.57	11.67	0.020	0.020	-0.2
alpha-Chlordane	11.89	11.85	11.95	0.020	0.020	0.2
4,4'-DDE	12.09	12.03	12.17	0.037	0.040	-6.8
Endosulfan II	13.65	13.60	13.74	0.039	0.040	-2.2
Endrin aldehyde	14.54	14.48	14.62	0.039	0.040	-2.1
Endosulfan sulfate	15.44	15.39	15.53	0.039	0.040	-2.2
Endrin ketone	16.02	15.96	16.10	0.039	0.040	-2.5
Decachlorobiphenyl	18.34	18.25	18.45	0.039	0.040	-1.5

8D
ANALYTICAL SEQUENCE

Sequence: 1D1053 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: RTXCLP ID: 0.32

Instrument: V5807A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	TCX	DCB
001		CONDITIONER	02/22/2007	17:09:43	2D1053	6.08	18.35
002		CONDITIONER	02/22/2007	17:40:00	2D1053	6.09	18.36
003		CONDITIONER	02/22/2007	18:10:13	2D1053	6.09	18.36
004	AA	RCMXX0724A	02/22/2007	18:40:29	2D1053	6.09	18.36
005	PIBLKAA	IBLKX0624B	02/22/2007	19:10:46	2D1053	6.09	18.36
006	PEMAA	PEMXX0724D	02/22/2007	19:41:09	2D1053	6.08	18.35
007	AR1660AA	PR16X0624B	02/22/2007	20:11:26	2D1053	6.09	18.36
008	AR1221AA	PR21X0624B	02/22/2007	20:41:44	2D1053	6.09	18.36
009	AR1232AA	PR32X0624B	02/22/2007	21:12:02	2D1053	6.09	18.36
010	AR1242AA	PR42X0624B	02/22/2007	21:42:19	2D1053	6.09	18.36
011	AR1248AA	PR48X0624B	02/22/2007	22:12:35	2D1053	6.10	18.36
012	AR1254AA	PR54X0624B	02/22/2007	22:42:50	2D1053	6.09	18.36
013	TOXAPHAA	PTOXX0624B	02/22/2007	23:13:02	2D1053	6.09	18.35
014	INDALAA	INDAL0624C	02/22/2007	23:43:16	1D1053	6.09	18.36
015	INDBLAA	INDBL0624C	02/23/2007	00:13:29	1D1053	6.09	18.36
016	INDAMAA	INDAM0624C	02/23/2007	00:43:46	1D1053	6.08	18.35
017	INDBMAA	INDBM0624C	02/23/2007	01:14:00	1D1053	6.09	18.35
018	INDAHAA	INDAH0624C	02/23/2007	01:44:14	1D1053	6.08	18.35
019	INDBHAA	INDBH0624C	02/23/2007	02:14:26	1D1053	6.09	18.36
020	PIBLKAA	IBLKX0624B	02/23/2007	02:44:40	2D1053	6.09	18.36
021	PEMAB	PEMXX0724D	02/23/2007	03:14:52	2D1053	6.09	18.35
022	PBLKNL	BLANKA	02/23/2007	03:45:07	2D1053	6.09	18.35
023	LCSX7	LCSA	02/23/2007	04:15:17	2D1053	6.08	18.35
024	LCSDBV	LCSDA	02/23/2007	04:45:28	2D1053	6.09	18.36
025	KQA-1	4975036	02/23/2007	05:15:41	2D1053	6.08	18.35
026	KQA-2	4975037	02/23/2007	05:45:55	2D1053	6.09	18.35
027	AA	GPC38BL051	02/23/2007	06:16:06	2D1053		
028	AA	GPC38MS051	02/23/2007	06:46:17	2D1053		
029	AA	CONTROL	02/23/2007	07:16:26	2D1053		
030	AA	GPC38AR051	02/23/2007	07:46:38	2D1053		18.36
031	PIBLKYN	IBLKX0624B	02/23/2007	08:16:50	2D1053	6.09	18.36

	ICAL Dates		ICAL RT	QC Limits
1D1053	02/22/2007 - 02/23/2007	TCX = Tetrachloro-m-xylene	6.08	(6.03 - 6.13 Minutes)
		DCB = Decachlorobiphenyl	18.35	(18.25 - 18.45 Minutes)
2D1053	02/22/2007 - 02/23/2007	TCX = Tetrachloro-m-xylene	6.09	(6.04 - 6.14 Minutes)
		DCB = Decachlorobiphenyl	18.35	(18.25 - 18.45 Minutes)

8D
ANALYTICAL SEQUENCE

Sequence: 1D1053 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: RTXCLP ID: 0.32

Instrument: V5807A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	TCX	DCB
032	INDAMTP	INDAM0624C	02/23/2007	08:47:03	2D1053	6.08	18.35
033	INDBMTN	INDBM0624C	02/23/2007	09:17:13	2D1053	6.08	18.35
034	PIBLKZL	IBLKX0724A	03/05/2007	15:41:41	2D1053	6.09	18.35
035	PEMAA	PEMXX0724E	03/05/2007	16:11:57	2D1053	6.09	18.35
036	PBLK5F	BLANKA	03/05/2007	16:42:12	2D1053	6.09	18.35
037	LCSEU	LCSA	03/05/2007	17:12:22	2D1053	6.09	18.36
038	LCSDM9	LCSDA	03/05/2007	17:42:33	2D1053	6.09	18.36
039	228IN	4994055	03/05/2007	18:12:48	2D1053	6.09	18.35
040	AA	GPC38BL059	03/05/2007	18:42:59	2D1053		
041	AA	GPC38MS059	03/05/2007	19:13:15	2D1053		
042	AA	CONTROL	03/05/2007	19:43:28	2D1053		
043	AA	GPC38AR059	03/05/2007	20:13:40	2D1053		18.35
044	PIBLKZM	IBLKX0724A	03/05/2007	20:43:51	2D1053	6.09	18.35
045	INDAMTR	INDAM0624C	03/05/2007	21:14:05	2D1053	6.08	18.34
046	INDBMTP	INDBM0624C	03/05/2007	21:44:19	2D1053	6.08	18.34

	ICAL Dates		ICAL RT	QC Limits
1D1053	02/22/2007 - 02/23/2007	TCX = Tetrachloro-m-xylene	6.08	(6.03 - 6.13 Minutes)
		DCB = Decachlorobiphenyl	18.35	(18.25 - 18.45 Minutes)
2D1053	02/22/2007 - 02/23/2007	TCX = Tetrachloro-m-xylene	6.09	(6.04 - 6.14 Minutes)
		DCB = Decachlorobiphenyl	18.35	(18.25 - 18.45 Minutes)

APPENDIX A

METALS
DATA DELIVERABLES FORMS

QUALITY ASSURANCE SUMMARY

FORM 2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Initial Calibration Source: LLI

Continuing Calibration Source: LLI

Concentration Units: UG/L

Analyte	Initial Calibration			Continuing Calibration						M
	True	Found	%R(1)	True	Found	%R(2)	True	Found	%R(2)	
Arsenic 75	50.0	51.21	102.4	25.0	25.33	101.3	25.0	25.06	100.2	MS
Barium	600.0	578.03	96.3	500.0	491.13	98.2	500.0	475.35	95.1	P
Chromium	600.0	586.88	97.8	500.0	502.75	100.6	500.0	489.44	97.9	P
Nickel	600.0	584.35	97.4	500.0	495.62	99.1	500.0	489.82	98.0	P
Selenium 77	50.0	52.27	104.5	25.0	25.72	102.9	25.0	25.36	101.4	MS
Vanadium	600.0	584.96	97.5	500.0	501.66	100.3	500.0	488.71	97.7	P
Zinc	600.0	588.77	98.1	500.0	503.05	100.6	500.0	492.14	98.4	P

(1) Control Limits: All Metals: 90-110
(2) Control Limits: All Metals: 90-110

QUALITY ASSURANCE SUMMARY

FORM 2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Initial Calibration Source: LLI

Continuing Calibration Source: LLI

Concentration Units: UG/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(2)	True	Found	%R(2)	M
Arsenic 75				25.0	25.25	101.0	25.0	24.47	97.9	MS
Barium				500.0	478.29	95.7	500.0	489.38	97.9	P
Chromium				500.0	494.53	98.9	500.0	505.76	101.2	P
Nickel				500.0	490.61	98.1	500.0	506.80	101.4	P
Selenium 77				25.0	25.55	102.2	25.0	24.65	98.6	MS
Vanadium				500.0	491.82	98.4	500.0	503.92	100.8	P
Zinc				500.0	495.91	99.2	500.0	508.08	101.6	P

(1) Control Limits: All Metals: 90-110
(2) Control Limits: All Metals: 90-110

QUALITY ASSURANCE SUMMARY

FORM 2B

LOW LEVEL CHECK STANDARD FOR AA AND ICP

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

AA CRDL Standard Source: LLI

ICP CRDL Standard Source: LLI

Concentration Units: UG/L

Analyte	AA			ICP				
	True	Found	%R	Initial True	Initial Found	Initial %R	Final Found	Final %R
Arsenic 75				2.0	1.99	99.5	2.13	106.5
Barium				5.0	4.90	98.0	4.94	98.8
Chromium				15.0	14.63	97.5	15.00	100.0
Nickel				10.0	10.10	101.0	13.42	134.2
Selenium 77				2.0	2.18	109.0	2.16	108.0
Vanadium				5.0	4.99	99.8	4.87	97.4
Zinc				20.0	20.34	101.7	20.44	102.2

Control limits apply to values up to 10 times the true value of the low level check standard. Mercury, GFAA and ICP-MS: 50 - 150%. ICP: See statistical windows form.

QUALITY ASSURANCE SUMMARY

FORM 2B

LOW LEVEL CHECK STANDARD FOR AA AND ICP

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

AA CRDL Standard Source: LLI

ICP CRDL Standard Source: LLI

Concentration Units: UG/L

Analyte	AA			ICP				
				Initial			Final	
	True	Found	%R	True	Found	%R	Found	%R
Arsenic								
Barium								
Chromium								
Nickel								
Selenium 82				2.0	2.15	107.5	2.23	111.5
Vanadium								
Zinc								

Control limits apply to values up to 10 times the true value of the low level check standard. Mercury, GFAA and ICP-MS: 50 - 150%. ICP: See statistical windows form.

Statistical Windows for Low Level Check

Element	True Value ug/L	Statistical Window (%)
Aluminum	200	0 - 200
Antimony	20	25 - 175
Arsenic	20	50 - 150
Barium	5	75 - 125
Beryllium	5	50 - 150
Boron	50	50 - 150
Cadmium	5	75 - 125
Calcium	200	0 - 200
Chromium	15	50 - 150
Cobalt	5	25 - 175
Copper	10	25 - 175
Iron	200	25 - 175
Lead	15	50 - 150
Magnesium	100	0 - 200
Manganese	5	50 - 150
Molybdenum	10	25 - 175
Nickel	10	50 - 150
Potassium	200	75 - 125
Selenium	20	50 - 150
Silver	5	50 - 150
Sodium	1000	25 - 175
Strontium	5	75 - 125
Thallium	20	0 – 200
Tin	20	25 - 175
Titanium	10	50 - 150
Vanadium	5	50 - 150
Zinc	20	75 - 125

Effective: 12/29/2005

QUALITY ASSURANCE SUMMARY

FORM 3

BLANKS

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank				
	Mass		C	1	C	2	C	3	C	Mass		C	Sample ID	M
Arsenic	75	0.15	U	0.15	U	0.15	U	0.15	U	75	0.670	U	P06850AB	MS
Barium		0.26	B	0.32	B	-0.13	B	-0.21	B		0.620	U	P06805AB	P
Chromium		1.1	U	1.1	B	1.1	U	1.1	U		2.300	U	P06805AB	P
Nickel		2.3	U	2.3	U	2.3	U	2.3	U		5.600	U	P06805AB	P
Selenium	77	0.47	U	0.47	U	0.47	U	0.47	U	77	0.500	U	P06850AB	MS
Vanadium		0.91	U	0.91	U	0.91	U	0.91	U		1.500	U	P06805AB	P
Zinc		0.41	U	0.42	B	0.41	U	0.41	U		8.200	U	P06805AB	P

QUALITY ASSURANCE SUMMARY

FORM 3

BLANKS

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte		Initial Calibration Blank (ug/L)		Continuing Calibration Blank (ug/L)						Preparation Blank				
	Mass		C	1	C	2	C	3	C	Mass		C	Sample ID	M
rsenic	75			0.15	U									MS
arium				0.13	U									P
hromium				1.1	U									P
ickel				2.3	U									P
elenium	77			0.47	U					82	0.500	U	P06850AB	MS
anadium				0.91	U									P
inc				0.41	U									P

QUALITY ASSURANCE SUMMARY

FORM 4A

ICP-AES INTERFERENCE CHECK SAMPLE

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP-AES Instrument ID: 05478 ICS Source: LLI

Concentration Units: UG/L

	True		Initial Found				Final Found			
Analyte	Sol. A	Sol. AB	Sol. A	%R	Sol. AB	%R	Sol. A	%R	Sol. AB	%R
luminum	500000	500000	507410	101.5	507449.7	101.5	511273	102.3	517378.3	103.5
arium	0	500	0		516.2	103.2	0		524.3	104.9
alcium	500000	500000	533296	106.7	532441.7	106.5	541195	108.2	545142.3	109.0
hromium	0	500	-3		504.3	100.9	-2		514.4	102.9
ron	200000	200000	209770	104.9	209485.3	104.7	212076	106.0	213971.8	107.0
agnesium	500000	500000	511293	102.3	511328.1	102.3	516461	103.3	522030.4	104.4
ickel	0	1000	1		992.2	99.2	-1		1013.0	101.3
anadium	0	500	-2		502.2	100.4	-3		514.0	102.8
inc	0	1000	6		1029.4	102.9	7		1055.6	105.6

Control Limits: All Metals 80%-120%

QUALITY ASSURANCE SUMMARY

4B-IN

ICP-MS INTERFERENCE CHECK SAMPLE

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP-MS Instrument ID: 10007 ICS Source: LLI

Concentration Units: UG/L

Analyte		True Sol. A	True Sol. AB	Found Sol. A	%R	Found Sol. AB	%R
Aluminum	27	10000	10000	10480	104.8	10517.9	105.2
Arsenic	75	0	20	0		19.9	99.5
Calcium	43	10000	10000	10466	104.7	10836.9	108.4
Carbon	13	20000	20000	NA		NA	
Chloride	37	100000	100000	NA		NA	
Iron	54	10000	10000	10384	103.8	10559.7	105.6
Magnesium	24	10000	10000	10427	104.3	10553.0	105.5
Molybdenum	98	200	200	209	104.5	216.4	108.2
Phosphorus	31	10000	10000	NA		NA	
Potassium	39	10000	10000	10328	103.3	10785.3	107.9
Selenium	77	0	0	2		2.1	
Sodium	23	10000	10000	10354	103.5	10653.0	106.5
Sulfur	34	10000	10000	NA		NA	
Titanium	47	200	200	241	120.5	243.3	121.7

Control Limits: All Metals 80%-120%

QUALITY ASSURANCE SUMMARY

16

ICP-MS INTERNAL Standards Relative Intensity Summary

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP-MS Instrument ID: 10007

Start Date: 03/12/2007 End Date: 03/13/2007

EPA Sample No.	Time	Internal Standards %RI For:											
		Element GE-72	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
S0	2234	100											
S	2237	103											
LRS	2240	97											
CCS	2243	98											
ICV	2246	102											
ICB	2248	100											
LLC	2251	100											
ICSA	2254	105											
ICSAB	2257	103											
CCV	2300	101											
CCB	2303	98											
P06850AB	2305	99											
P06850AQ	2308	97											
WO-10	2311	95											
WO-10A	2314	96											
WO-10D	2317	96											
WO-10S	2319	98											
WO-10M	2322	97											
WO-10L	2325	105											
DWM16	2328	103											
DWM39	2331	101											
CCV	2334	100											
CCB	2336	97											
DWM46	2339	97											
BINAB	2342	96											
BINEB	2345	94											
BIN36	2348	97											
BIN35	2351	96											
BI35D	2354	96											
BIN45	2356	95											
BINM6	2359	100											
BIN40	0002	97											

QUALITY ASSURANCE SUMMARY

16

ICP-MS INTERNAL Standards Relative Intensity Summary

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP-MS Instrument ID: 10007

Start Date: 03/12/2007 End Date: 03/13/2007

EPA Sample No.	Time	Internal Standards %RI For:											
		Element GE-72	Q	Element	Q	Element	Q	Element	Q	Element	Q	Element	Q
BIN22	0005	97											
CCV	0008	98											
CCB	0011	94											
BIN44	0013	95											
BINM7	0016	98											
BIN43	0019	94											
BIN19	0022	95											
BI19D	0025	95											
WO-47	0028	94											
WO-48	0031	95											
LLC	0033	93											
ICSA	0036	99											
ICSAB	0039	97											
CCV	0042	97											
CCB	0045	94											

QUALITY ASSURANCE SUMMARY

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Lab Name: LANCASTER_LABORATORIES

CLIENT SAMPLE NO.

WO-10S

SDG No.: DWD02

Matrix (Soil/Water): WATER

% Solids for sample: 0.0

Concentration Units (ug/l or mg/kg dry weight): UG/L

Level (low/med): LOW

Batch Id(s): P06850A, P06805A

Analyte	M	Sample Result	C	MS Sample Result	C	MSD Sample Result	C	MS Spike Added	MSD Spike Added	MS %R	Q	MSD %R	Q	Control Limit %R	RPD	Q	Ctl Lim RPD
Arsenic 75	MS	7.2762		17.6185		17.5774		10.0000	10.0000	103		103		75 - 125	0		20
Barium	P	69.8800		2079.7500		2071.7500		2000.0000	2000.0000	100		100		75 - 125	0		20
Chromium	P	4.6300	B	203.1000		203.6000		200.0000	200.0000	99		99		81 - 120	0		20
Nickel	P	5.6000	U	504.2600		500.1100		500.0000	500.0000	101		100		86 - 115	1		20
Selenium 77	MS	4.3854		8.1721		8.0053		10.0000	10.0000	38	N	36	N	75 - 125	2		20
Vanadium	P	5.5500		508.3900		505.7900		500.0000	500.0000	101		100		90 - 111	1		20
Zinc	P	8.2000	U	514.3700		508.3500		500.0000	500.0000	103		102		75 - 125	1		20

QUALITY ASSURANCE SUMMARY

FORM 5B

POST DIGEST SPIKE SAMPLE RECOVERY

CLIENT SAMPLE No.

WO-10A

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Matrix (soil/water): WATER

Level (low/med): LOW

Concentration Units: UG/L

Batch ID(s): P06850A

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Arsenic									NR
Barium									NR
Chromium									NR
Nickel									NR
Selenium 77		8.7440		4.3854		4.0000	109		MS
Vanadium									NR
Zinc									NR

Comments:

QUALITY ASSURANCE SUMMARY

Form 6

DUPLICATES

CLIENT SAMPLE No.

WO-10D

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Matrix (soil/water): WATER

Level (low/med): LOW

% Solids for Sample: 0.0

% Solids of Duplicate: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

Batch ID(s): P06850A, P06805A

Analyte	Control Limit	Samples (S)	C	Duplicate (D)	C	RPD	Q	M
Arsenic 75	2.0	7.2762		7.2397		1		MS
Barium		69.8800		72.5500		4		P
Chromium		4.6300	B	4.2700	B	8		P
Nickel		5.6000	U	5.6000	U			P
Selenium 77	2.0	4.3854		4.1497		6		MS
Vanadium	5.0	5.5500		5.4700		1		P
Zinc		8.2000	U	8.2000	U			P

NOTE: An asterisk (*) in column "Q" indicates poor duplicate precision (RPD > 20% OR $|(S) - (D)|$ > LOQ for values < 5x LOQ).
The data are considered to be valid because the laboratory control sample is within the control limits. See the Laboratory Control Sample page of the Quality Assurance Summary.

QUALITY ASSURANCE SUMMARY

FORM 7

LABORATORY CONTROL SAMPLE

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Solid LCS Source: _____

Aqueous LCS Source: LLI

Analyte	Sample ID	Aqueous (ug/L) True	Found	%R(1)	Solid (mg/kg) True	Found	C	Limit		%R
Arsenic 75	P06850AQ	10.0	10.32	103						
Barium	P06805AQ	2000.0	1997.55	100						
Chromium	P06805AQ	200.0	200.56	100						
Nickel	P06805AQ	500.0	509.26	102						
Selenium 82	P06850AQ	10.0	10.06	101						
Vanadium	P06805AQ	500.0	507.01	101						
Zinc	P06805AQ	500.0	512.14	102						

(1) Control Limits: Statistically determined

Statistical Windows: Waters LCS/LCSD

EPA600 ICP

Element	True value ug/L	Statistical Window
AL	2000	85-115
SB	500	85-115
AS	140	85-115
BA	2000	85-115
BE	50	85-115
B	2000	85-115
CD	50	85-115
CA	4000	85-115
CR	200	85-115
CO	500	85-115
CU	250	85-115
FE	1000	85-115
PB	120	85-115
MG	2000	85-115
MN	500	85-115
MO	2000	85-115
NI	500	85-115
K	4000	85-115
SE	110	85-115
AG	50	85-115
NA	4000	85-115
SR	1000	85-115
TL	150	85-115
SN	4000	85-115
TI	1000	85-115
V	500	85-115
ZN	500	85-115

EPA600 GFAA

Element	True value ug/L	Statistical Window
SB	50	85-115
AS	40	85-115
BE	2.5	85-115
CD	2.5	86-110
CR	10	85-115
CU	20	87-110
PB	20	85-115
NI	20	85-115
SE	10	85-115
AG	2.5	85-115
TL	50	90-110

EPA600 Mercury

Element	True value ug/L	Statistical Window
HG	1	85-115

Effective Date: 03/26/2007

Statistical Windows: Waters LCS/LCSD

SW846 ICP

Element	True value ug/L	Statistical Window
AL	2000	90-112
SB	500	88-111
AS	140	90-119
BA	2000	90-110
BE	50	90-111
B	2000	90-110
CD	50	90-112
CA	4000	90-112
CR	200	90-110
CO	500	90-110
CU	250	90-112
FE	1000	90-112
PB	120	90-113
LI	4000	80-120
MG	2000	89-110
MN	500	90-110
MO	2000	90-110
NI	500	90-111
K	4000	88-119
SE	110	80-120
AG	50	90-117
NA	4000	80-120
SR	1000	90-110
TL	150	80-120
SN	4000	90-110
TI	1000	90-113
V	500	90-110
ZN	500	90-111

SW846 GFAA

Element	True value ug/L	Statistical Window
SB	50	80-120
AS	40	80-120
BE	2.5	86.6-112.2
CD	2.5	80-120
CR	10	80-111
CU	20	87-110
PB	20	80-120
NI	20	80-120
SE	10	80-120
AG	2.5	85-116
TL	50	80-120

SW846 Mercury

Element	True value ug/L	Statistical Window
HG	1	80-120

Effective Date: 03/26/2007

Statistical Windows: Waters LCS/LCSD

SW846 ICP-MS

	True value	Statistical
Element	ug/L	Window
Antimony	6	80 - 120
Arsenic	10	80 - 120
Barium	50	80 - 120
Beryllium	4	89 - 113
Cadmium	5	90 - 114
Chromium	50	90 - 118
Copper	50	80 - 120
Lead	15	90 - 115
Nickel	50	80 - 120
Selenium	10	80 - 120
Silver	50	80 - 120
Thallium	2	89 - 116
Zinc	50	80 - 120

Effective 03/26/2007

QUALITY ASSURANCE SUMMARY

FORM 9

SERIAL DILUTIONS

CLIENT SAMPLE No.

WO-10 L

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Matrix (soil/water): WATER

Level (low/med): LOW

Concentration Units: UG/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Arsenic 75	7.2762		7.1069	B	2		MS
Barium	69.8800		64.9500		7		P
Chromium	4.6300	B	11.5000	U	100		P
Nickel	5.6000	U	28.0000	U			P
Selenium 77	4.3854		4.9209	B	12		MS
Vanadium	5.5500		7.5000	U	100		P
Zinc	8.2000	U	41.0000	U			P

NOTE: An E in column Q indicates the presence of a chemical or physical interference in the matrix when the % difference is greater than 10%. This applies only when (I) is greater than or equal to 50x MDL for ICP, 100x MDL for ICP-MS (6020), 50x MDL for ICP-MS (200.8), or 25x MDL for GFAA.

QUALITY ASSURANCE SUMMARY

FORM 10

INSTRUMENT DETECTION LIMITS (BIANNUALLY)

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP Instrument ID: 05478 Date: 01/2007

Flame Instrument ID: _____

Furnace Instrument ID: _____

Method: P

Analyte	Wavelength (nm)	Back-ground	IDL (ug/L)
Arsenic			
Barium	493.40		0.13
Chromium	267.71		1.1
Nickel	231.60		2.3
Selenium			
Vanadium	292.40		0.91
Zinc	213.85		0.41

Comments:

QUALITY ASSURANCE SUMMARY

FORM 10 MDL

METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Method: P

Date: 05/2006

Matrix (soil/water): WATER

Analyte	Wavelength (nm)	Background	LOQ (ug/L)	MDL (ug/L)
Arsenic				
Barium	493.40		5.0	0.62
Chromium	267.71		15.0	2.3
Nickel	231.60		10.0	5.6
Selenium				
Vanadium	292.40		5.0	1.5
Zinc	213.85		20.0	8.2

** The LOQ must be adjusted for % Solids and Sample Weight for samples reporting in mg/kg and ug.

Comments:

QUALITY ASSURANCE SUMMARY

FORM 11

ICP INTERELEMENT CORRECTION FACTORS (ANNUALLY)

Lab Name: LANCASTER_LABORATORIES

SDG No. : DWD02

ICP Instrument ID: 05478 Date: 11/2006

Analyte	Wave-length (nm)	Interelement Correction Factor for: AL	CA	FE	MG	CO
Arsenic						
Barium	493.40	0.0000000	0.0000020	0.0000020	0.0000000	0.0000000
Chromium	267.71	0.0000000	0.0000000	-0.0000200	0.0000060	0.0000000
Nickel	231.60	0.0000000	0.0000000	0.0000000	0.0000060	-0.0005702
Selenium						
Vanadium	292.40	0.0000008	0.0000000	-0.0002904	0.0000000	0.0000000
Zinc	213.85	0.0000050	0.0000020	0.0000910	0.0000028	0.0000000

Comments:

QUALITY ASSURANCE SUMMARY

FORM 12

LINEAR RANGES

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

ICP Instrument ID: 05478 Date: 01/2007

Method: P

Analyte	Wavelength (nm)	Integration Time (Sec.)	Concentration (ug/L)
Arsenic			
Barium	493.4	10.00	10000.0
Chromium	267.71	10.00	10000.0
Nickel	231.6	10.00	10000.0
Selenium			
Vanadium	292.4	10.00	10000.0
Zinc	213.85	10.00	10000.0

Comments:

QUALITY ASSURANCE SUMMARY

Form 15

ICP-MS TUNE

Lab Name: LANCASTER_LABORATORIES___

SDG No.: DWD02____

Matrix: WATER

ICP-MS Instrument ID: 10007 Date: 03/12/2007

Element - Mass	Avg. Measured Mass (amu)	Avg.Peak Width at 5% Peak Height (amu)	%RSD
LI - 6.015	6.03	0.65	1.9
MG - 23.985	23.98	0.65	1.8
RH - 102.905	102.98	0.65	1.0
IN - 114.904	114.93	0.66	0.6
CE - 139.905	139.93	0.65	0.8
PB - 207.977	207.98	0.65	1.5
U - 238.050	238.03	0.65	0.9

Comments:

QUALITY ASSURANCE SUMMARY

FORM 13

PREPARATION LOG

Lab Name: LANCASTER_LABORATORIES___

SDG No.: DWD02_

Method: P_

Batch ID: P06805A

EPA Sample No.	Preparation Date	Weight (gram)	Volume (ml)
BI19D	03/11/2007		50
BI35D	03/11/2007		50
BIN19	03/11/2007		50
BIN22	03/11/2007		50
BIN35	03/11/2007		50
BIN36	03/11/2007		50
BIN40	03/11/2007		50
BIN43	03/11/2007		50
BIN44	03/11/2007		50
BIN45	03/11/2007		50
BINAB	03/11/2007		50
BINEB	03/11/2007		50
BINM6	03/11/2007		50
BINM7	03/11/2007		50
DWM16	03/11/2007		50
DWM39	03/11/2007		50
DWM46	03/11/2007		50
WO-47	03/11/2007		50
WO-48	03/11/2007		50
WO-10	03/11/2007		50
WO-10D	03/11/2007		50
WO-10M	03/11/2007		50
WO-10S	03/11/2007		50
P06805AB	03/11/2007		50
P06805AQ	03/11/2007		50

QUALITY ASSURANCE SUMMARY

FORM 14

ANALYSIS RUN LOG

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Instrument ID Number: 05478 Method: P

Start Date: 03/12/2007 End Date: 03/12/2007

EPA Sample No.	D/F	Time	% R	Analytes						
				AS	BA	CR	NI	SE	V	ZN
)	1.00	2053			X	X	X		X	X
	1.00	2057								
	1.00	2101			X		X			X
	1.00	2104				X			X	
:V	1.00	2109			X	X	X		X	X
:B	1.00	2113			X	X	X		X	X
:C	1.00	2116			X	X	X		X	X
:SA	1.00	2120			X	X	X		X	X
:SAB	1.00	2124			X	X	X		X	X
:V	1.00	2127			X	X	X		X	X
:B	1.00	2131			X	X	X		X	X
)6805AB	1.00	2135			X	X	X		X	X
)6805AQ	1.00	2138			X	X	X		X	X
)-10	1.00	2142			X	X	X		X	X
)-10A	1.00	2146								
)-10D	1.00	2149			X	X	X		X	X
)-10S	1.00	2153			X	X	X		X	X
)-10M	1.00	2157			X	X	X		X	X
)-10L	5.00	2200			X	X	X		X	X
VM16	1.00	2204			X	X			X	X
VM39	1.00	2208			X	X			X	X
:V	1.00	2211			X	X	X		X	X
:B	1.00	2215			X	X	X		X	X
VM46	1.00	2219			X	X			X	X
:NAB	1.00	2222			X	X	X		X	X
:NEB	1.00	2226			X	X	X		X	X
:N36	1.00	2230			X	X			X	X
:N35	1.00	2234			X	X			X	X
:35D	1.00	2237			X	X			X	X
:N45	1.00	2241			X	X			X	X
:NM6	1.00	2245			X	X			X	X
:N40	1.00	2248			X	X			X	X

QUALITY ASSURANCE SUMMARY

FORM 14

ANALYSIS RUN LOG

Lab Name: LANCASTER_LABORATORIES

SDG No.: DWD02

Instrument ID Number: 05478 Method: P

Start Date: 03/12/2007 End Date: 03/12/2007

EPA Sample No.	D/F	Time	% R	Analytes						
				AS	BA	CR	NI	SE	V	ZN
BIN22	1.00	2252			X	X			X	X
CCV	1.00	2256			X	X	X		X	X
CCB	1.00	2259			X	X	X		X	X
BIN44	1.00	2303			X	X			X	X
BINM7	1.00	2307			X	X	X		X	X
BIN43	1.00	2311			X	X			X	X
BIN19	1.00	2314			X	X			X	X
BI19D	1.00	2318			X	X			X	X
WO-47	1.00	2322			X	X			X	X
WO-48	1.00	2325			X	X			X	X
LLC	1.00	2329			X	X	X		X	X
ICSA	1.00	2333			X	X	X		X	X
ICSAB	1.00	2336			X	X	X		X	X
CCV	1.00	2340			X	X	X		X	X
CCB	1.00	2344			X	X	X		X	X

APPENDIX A

WET CHEMISTRY
DATA DELIVERABLES FORMS

Lancaster Laboratories

Quality Control Summary
Method Blank
Miscellaneous Wet Chemistry
SDG: DWD02
Matrix: LIQUID

Analyte	Analysis Date	Method	Batch Number	Blank Results	Units	MDL	LOQ
Fluoride (distilled)	03/13/07	MTR	07071144801	N.D.	mg/l	0.03	0.1
	03/15/07	MTR	07073144801	N.D.	mg/l	0.03	0.1
Sulfide	03/12/07	CO	07071023002	N.D.	mg/l	0.054	0.16
	03/14/07	CO	07073023001	N.D.	mg/l	0.054	0.16

Comments: The blank is acceptable when the result is less than the limit of quantitation.

Lancaster Laboratories

Quality Control Summary
Matrix Spike Analysis/ Matrix Spike Duplicate (MS/MSD)
Miscellaneous Wet Chemistry
SDG: BLH25
Matrix: LIQUID

Sample Number	Sample Code	Analyte	Spike Analysis Date	ME	Batch #	Sample Result	MS Spike Added	MSD Spike Added	MS Result	MSD Result	Units	MS Rec (%)	MSD Rec (%)	Acceptance Window (%)	RPD (%)	% RPD Limits </=
P016170	6170R	Sulfate	03/31/07	MTR	07090112502A	20.3	40	40	58.0	58.7	mg/l	94	96	66 - 134	1	6
P016170	6170M	(turbidimetr.)Code 418														
P010917	0917R	Total Diss. Solids Code 072	03/26/07	G	07085021201A	604.	800	800	1430.	1400.	mg/l	103	100	60 - 140	2	5
P010917	0917M															

Comments: If the background and/or matrix spike/matrix spike duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

If the background result was more than four times the spike added amount the percent recovery is program deleted.

Lancaster Laboratories

Quality Control Summary
Duplicate Analysis
Miscellaneous Wet Chemistry
SDG: DWD02
Matrix: LIQUID

Sample Number	Sample Code	Analyte	Analysis Date	ME	Batch #	Sample Result	Duplicate Result	Units	RPD (%)	Control Limits %
P999045	9045D	Fluoride (distilled)	03/13/07	MTR	07071144801A	62.3	62.5	mg/l	NA	NA
4998486	DWM46	Sulfide	03/12/07	CO	07071023002A	0.71	0.70	mg/l	NA	NA

Comments: If the background and/or the duplicate result was less than the limit of quantitation, the RPD is not required.

If the background and/or duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

Lancaster Laboratories

Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate (LCSD)
Miscellaneous Wet Chemistry
SDG: DWD02
Matrix: LIQUID

Batch #	Analyte	Analysis Date	ME	True LCS/LCSD Value	LCS Results	LCSD Results	Units	Acceptance Range	% RPD Results	% RPD Acceptance </=
07071144801	Fluoride (distilled)	03/13/07	MTR	1	0.929	NA	mg/l	0.89 - 1.04	NA	NA
07073144801	Fluoride (distilled)	03/15/07	MTR	1	0.912	NA	mg/l	0.89 - 1.04	NA	NA
07071023002	Sulfide	03/12/07	CO	1	1.1	NA	mg/l	0.9 - 1.1	NA	NA
07073023001	Sulfide	03/14/07	CO	1	0.96	NA	mg/l	0.9 - 1.1	NA	NA

Lancaster Laboratories

Quality Control Summary
Initial Calibration
Miscellaneous Wet Chemistry
Total Petroleum Hydrocarbons
Instrument Identification: 10097
Calibration Date: 04/03/06
SDG: KIA22

Batch Number	Units Conc. mg/L	Blank 0.0000	STD 1 1.0000	STD 2 5.0000	STD 3 10.0000	STD 4 20.0000	STD 5 30.0000	STD 6 40.0000	Correlation Coefficient
06100112601A	ABS	0.001	0.019	0.099	0.212	0.418	0.620	0.762	0.996

Analysis Date: 04/11/06

Units mg/L

Parameter	Reference Concentration	Result	% Recovery	Acceptance Range
ICV	5.0	5.142	103	4.475 - 5.52495
CCV	20.0	19.378	97	17.9 - 22.0998
CCV	30.0	29.024	97	26.85 - 33.1497
CCV	20.0	19.411	97	17.9 - 22.0998

ABBREVIATION KEY
ICV = Initial Calibration Verification
CCV = Conti. Calibration Verification

APPENDIX A

INSTRUMENTAL WATER QUALITY DATA DELIVERABLES FORMS

Lancaster Laboratories

Quality Control Summary
Method Blank
Instrumental Water Quality
SDG: DWD02
Matrix: LIQUID

Analyte	Analysis Date	Method	Batch Number	Blank Results	Units	MDL	LOQ
Total Cyanide (water)	03/12/07	AK	07068117102	N.D.	mg/l	0.0050	0.010
	03/12/07	AK	07068117101	N.D.	mg/l	0.0050	0.010
	03/14/07	AK	07073117101	N.D.	mg/l	0.0050	0.010

Comments: The blank is acceptable when the result is less than the limit of quantitation.

Lancaster Laboratories

Quality Control Summary
Matrix Spike Analysis/ Matrix Spike Duplicate (MS/MSD)
Instrumental Water Quality
SDG: BLH25
Matrix: LIQUID

Sample Number	Sample Code	Analyte	Spike Analysis Date	ME	Batch #	Sample Result	MS Spike Added	MSD Spike Added	MS Result	MSD Result	Units	MS Rec (%)	MSD Rec (%)	Acceptance Window (%)	RPD (%)	% RPD Limits </=
5012388	-171-	Chloride Code 404	04/03/07	IC	07092196101B	34.0	40	NA	72.9	NA	mg/l	97	NA	90 - 110	NA	NA
5012394	MFG-3	Total Nitrite/Nitrate Nitrogen	03/26/07	AK	07085118101A	N.D.	1	NA	0.96	NA	mg/l	96	NA	90 - 110	NA	NA

Comments: If the background and/or matrix spike/matrix spike duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

If the background result was more than four times the spike added amount the percent recovery is program deleted.

Lancaster Laboratories

Quality Control Summary
Duplicate Analysis
Instrumental Water Quality
SDG: DWD02
Matrix: LIQUID

Sample Number	Sample Code	Analyte	Analysis Date	ME	Batch #	Sample Result	Duplicate Result	Units	RPD (%)	Control Limits %
5000754	WO-10	Total Cyanide (water)	03/14/07	AK	07073117101A	N.D.	N.D.	mg/l	NA	NA

Comments: If the background and/or the duplicate result was less than the limit of quantitation, the RPD is not required.

If the background and/or duplicate result is less than five times the limit of quantitation, the RPD is not considered applicable and is program deleted.

Lancaster Laboratories

Quality Control Summary
Laboratory Control Standard (LCS)
Laboratory Control Standard Duplicate (LCSD)
Instrumental Water Quality
SDG: DWD02
Matrix: LIQUID

Batch #	Analyte	Analysis Date	ME	True LCS/LCSD Value	LCS Results	LCSD Results	Units	Acceptance Range	% RPD Results	% RPD Acceptance </=
07068117101	Total Cyanide (water)	03/12/07	AK	0.2	0.20	NA	mg/l	0.179 - 0.2208	NA	NA
07068117102	Total Cyanide (water)	03/12/07	AK	0.2	0.20	NA	mg/l	0.179 - 0.2208	NA	NA
07073117101	Total Cyanide (water)	03/14/07	AK	0.2	0.20	NA	mg/l	0.179 - 0.2208	NA	NA

Lancaster Laboratories

Quality Control Summary
Initial And Continuing Calibration
Instrumental Analysis
Total Cyanide
SDG: DWD02
Instrument Identification: 09037

*=Out of Specifications

Initial Calibration Date: 03/12/07, 03/14/07, 03/16/07
Continuing Calibration Dates:03/12/07, 03/14/07, 03/16/07

	True Value (mg/L)	Acceptance Range
ICV/CCV	Varies	+/- 10%
ICB/CCB	0	< LOQ

Initial Calibration Verification/Blank	True Value	Result (mg/L)	% Recovery
ICV	0.15	0.14800	99
ICB	0	ND	NA
ICV	0.15	0.14780	99
ICB	0	ND	NA
ICV	0.15	0.14800	99
ICB	0	ND	NA

Continuing Calibration Verification/Blank	True Value	Result (mg/L)	% Recovery
CCV2	0.15	0.14910	99
CCB 1	0	ND	NA
CCV2	0.15	0.14850	99
CCB 2	0	ND	NA
CCV2	0.15	0.14880	99
CCB 3	0	ND	NA
CCV2	0.15	0.14870	99
CCB 4	0	ND	NA
CCV2	0.15	0.14670	98
CCB 1	0	ND	NA
CCV2	0.15	0.14950	100
CCB 2	0	ND	NA
CCV2	0.15	0.14690	99
CCB 3	0	ND	NA
CCV2	0.15	0.14940	100
CCB 4	0	ND	NA
CCV2	0.15	0.14680	98
CCB 5	0	ND	NA
CCV2	0.15	0.15400	103
CCB 1	0	ND	NA

Lancaster Laboratories

Quality Control Summary
Initial And Continuing Calibration
Instrumental Analysis
Nitrite-N
SDG: ALT03
Instrument Identification: 09106

*=Out of Specifications

Initial Calibration Date: 06/14/07, 06/15/07, 06/16/07, 06/19/07
Continuing Calibration Dates:06/14/07, 06/15/07, 06/16/07, 06/19/07

	True Value (mg/L)	Acceptance Range
ICV/CCV	Varies	+/- 10%
ICB/CCB	0	< LOQ

Initial Calibration Verification/Blank	True Value	Result (mg/L)	% Recovery
ICV	0.6	0.60600	101
ICB	0	ND	NA
ICV	0.6	0.59903	100
ICB	0	ND	NA
ICV	0.6	0.59204	99
ICB	0	ND	NA
ICV	0.6	0.61535	103
ICB	0	ND	NA

Continuing Calibration Verification/Blank	True Value	Result (mg/L)	% Recovery
CCV2	0.6	0.54778	91
CCB 1	0	ND	NA
CCV2	0.6	0.61808	103
CCB 2	0	ND	NA
CCV2	0.6	0.57776	96
CCB 2	0	ND	NA
CCV2	0.6	0.55228	92
CCB 3	0	ND	NA
CCV2	0.6	0.57059	95
CCB 4	0	ND	NA
CCV2	0.6	0.61444	102
CCB 5	0	ND	NA
CCV2	0.6	0.60041	100
CCB 1	0	ND	NA
CCV2	0.6	0.59272	99
CCB 2	0	ND	NA
CCV2	0.6	0.57452	96
CCB 3	0	ND	NA
CCV2	0.6	0.60555	101
CCB 5	0	ND	NA
CCV2	0.6	0.60408	101
CCB 6	0	ND	NA
CCV2	0.6	0.61322	102
CCB 1	0	ND	NA
CCV2	0.6	0.61275	102
CCB 2	0	ND	NA

Lancaster Laboratories

Quality Control Summary
Initial and Continuing Calibration
Instrumental Analysis/Anion Scan

Instrument Identification: 08022
Calibration Date: 04/01/07
SDG: BLH25

Batch Number	Analysis/ Parameter	AUTO CAL1	AUTO CAL2	AUTO CAL3	AUTO CAL4	AUTO CAL5	R^2	CC
07092196101A 07092196101B	Fluoride Chloride Nitrite-N Bromide Nitrate-N Sulfate	0.143	0.274	0.666	1.427	2.293	0.997053	0.998525

ICV/CCV Control Limits: 90% - 110% ICB/CCB < LOQ of the Analyte Concentration units: mg/L

Analysis Dates: 04/01/07, 04/02/07, 04/03/07

Analyte	Initial Calibration Verification/Blank True	ICV	%Rec	ICB	Continuing Calibration Verification/Blank True	CCV1	%Rec	CCB1
Fl Cl NO2 Br NO3 SO4	3	2.9202	97	0.0000	3	2.8851	96	0.0000

Analyte	Continuing Calibration Verification/Blank True	CCV2	%Rec	CCB2	Continuing Calibration Verification/Blank True	CCV3	%Rec	CCB3
Fl Cl NO2 Br NO3 SO4	3	2.8854	96	0.0000	3	2.8879	96	0.0000

Analyte	Continuing Calibration Verification/Blank True	CCV4	%Rec	CCB4	Continuing Calibration Verification/Blank True	CCV5	%Rec	CCB5
Fl Cl NO2 Br NO3 SO4	3	2.8953	97	0.0000				

Lancaster Laboratories

Quality Control Summary

Initial Calibration & Linearity Check
Instrumental Analysis
Total Organic Carbon
Instrument Identification: 5214
Calibration Date: 1/09/
SDG: CVL38
Matrix: WATER

Correlation Coefficient: 0.99992

Blank:	8.17679 mv	Standard:	372.312 mv
Blank:	6.09124 mv	Standard:	374.753 mv
Blank:	6.61163 mv	Standard:	372.312 mv
Blank:	mv	Standard:	mv
Blank:	mv	Standard:	mv
Blank Average:	6.96 mv	Average:	373.13 mv

Batch Number	Method Blank	ICV/ 2.0 mg/L	ICV/ 7.5 mg/L	ICV/ 10 mg/L	ICV/ 25 mg/L	ICV/ 50 mg/L	ICV/ 75 mg/L
07022049513A/B	0.35847	2.89716	7.54704	10.27330	24.74500	48.45170	NA

Continuing Calibration Verification	TRUE Value	Result (mg/L)	% Recovery
CCV	25.0	24.47370	98
CCV	25.0	24.27840	97
CCV	25.0	24.47370	98
CCV	25.0	24.50630	98

Continuing Calibration

	True Value (mg/L)	Acceptance Range
ICV/CCV	Varies	+/- 10%

* Out of Specification

APPENDIX A

EPA MISC GC METHOD
DATA DELIVERABLES FORMS

2E
WATER SURROGATE RECOVERY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.: ETX15

GC Column (1): GS-ALUMINA ID: .53 GC Column (2): ID:

Batchnumber: 062780007A

SAMPLE	SAMPLE CODE NO.	PROP 1 % REC #	PROP 2 % REC #	TOT OUT
4879969	TUTC3	93		0
4879970	TUT10	65		0
4880903	FRE02	79		0
4880903 MS	FRE02MS	77		0
4880903 MSD	FRE02MSD	80		0
BLANKA	PBLKRK	109		0
LCSA	LCSZP	107		0

	ADVISORY QC LIMITS	NOMINAL CONCENTRATION
PROP = PROPENE	(38 - 129)	20.7 ug/l

Column to be used to flag recovery values
* Values outside of QC Limits
D Surrogate diluted out

3E

Water Lab Control Spike/Lab Control Spike Duplicate Recovery

ɔ Name: Lancaster Laboratories Contract:

ɔ Code: Case No.: SAS No.: SDG No.:

ɔoratory Control Spike - Sample Code No.: LCSZP

Compound	Spike Added (ug/l)	LCS Concen (ug/l)	LCSD Concen (ug/l)	LCS % Rec #	LCSD % Rec #	LCS-LCSD % REC Limits	% RPD #	% RPD Lim
METHANE	59	62		105		(80 - 120)		20
ETHANE	61	63		103		(80 - 120)		20
ETHENE	61	64		105		(80 - 120)		20
PROPANE	61	64		105		(73 - 125)		20

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 4 outside limits

Spike Recovery: 0 out of 4 outside limits

ɔmments: Results calculated on as-received basis.

Sample No.: LCSA Batch: 062780007A

3E
Water Matrix Spike/Matrix Spike Duplicate Recovery

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Matrix Spike - Sample Code No.: FRE02

Compound	Spike Added (ug/l)	Sample Concen (ug/l)	MS Concen (ug/l)	MSD Concen (ug/l)	MS % Rec #	MSD % Rec #	MS-MSD % REC Limits	% RPD #	% RPD Lim
METHANE	59	2.7	61	66	99	107	(63 - 124)	8	20
ETHANE	61	0	64	69	105	113	(63 - 127)	8	20
ETHENE	61	0	81	87	133*	143*	(69 - 126)	7	20
PROPANE	61	0	57	59	93	97	(56 - 136)	3	20

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits.

RPD: 0 out of 4 outside limits

Spike Recovery: 2 out of 8 outside limits

Comments: Results calculated on as-received basis.

Sample No.: 4880903 Batch: 062780007A

1D

ORGANICS ANALYSIS DATA SHEET

SAMPLE CODE NO. PBLKRK

Lab Name: Lancaster Laboratories Contract: Batchnumber: 062780007A

Lab Code: Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: BLANKA

Sample wt/vol: 5 (g/ml) ml Lab File ID: 7S19254.44R

% Moisture: Decanted: (Y/N) Date Received:

Extraction: (SepF/Cont/Sonc) Headspace Date Extracted: 10/5/2006

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 10/6/2006

Injection Volume: 1000 (uL) Dilution Factor: 1

GPC Cleanup: (Y/N) N pH: Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS (UG/L or UG/KG) ug/l	Q
74-82-8	METHANE	2.0	U
74-84-0	ETHANE	1.0	U
74-85-1	ETHENE	1.0	U
74-98-6	PROPANE	1.0	U

4C

METHOD BLANK SUMMARY

SAMPLE CODE NO.

PBLKRK

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.: ETX15

Lab Sample ID BLANKA Batch 062780007A Lab File ID: 7S19254.44R

Matrix: (soil/water) WATER Extraction: (SepF/Cont/Sonc) Headspace

Sulfur Cleanup: (Y/N) N Date Extracted: 10/5/2006

Date Analyzed (1): 10/6/2006 Date Analyzed (2):

Time Analyzed (1): 10:50:03 Time Analyzed (2):

Instrument ID (1): H4132A Instrument ID (2):

GC Column: GS-ALUMINA ID: 0.53 (mm) GC Column: ID: (mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS, AND MSD

	SAMPLE CODE NO.	LAB SAMPLEID	DATE ANALYZED 1	DATE ANALYZED 2
01	TUTC3	4879969	10/6/2006	
02	TUT10	4879970	10/6/2006	
03	FRE02	4880903	10/6/2006	
04	FRE02MS	4880903	10/6/2006	
05	FRE02MSD	4880903	10/6/2006	
06	PBLKRK	BLANKA	10/6/2006	
07	LCSZP	LCSA	10/6/2006	

COMMENTS: _____

6D

INITIAL CALIBRATION - RETENTION TIME SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H4132A Calibration File: 1S19254

GC Column (1) : GS-ALUMINA ID: 0.53 (mm) Update File:

Date(s) Analyzed: 9/11/2006 9/12/2006

COMPOUND	RT OF STANDARDS					MIDPOINT RT	RT WINDOW	
	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5		FROM	TO
METHANE	1.24	1.24	1.23	1.23	1.24	1.24	1.21	1.27
ETHANE	1.47	1.47	1.46	1.47	1.47	1.47	1.44	1.50
ETHENE	1.78	1.77	1.78	1.78	1.78	1.78	1.73	1.83
PROPANE	2.22	2.21	2.21	2.22	2.22	2.22	2.16	2.28
PROPENE	2.89	2.86	2.88	2.88	2.88	2.89	2.76	3.02

6D
INITIAL CALIBRATION - RETENTION TIME SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H4132A Calibration File: 2S19254

GC Column (1) : GS-ALUMINA ID: 0.53 (mm) Update File: 6S19254.19R

Date(s) Analyzed: 10/3/2006 10/3/2006

COMPOUND	RT OF STANDARDS					MIDPOINT RT	RT WINDOW	
	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5		FROM	TO
METHANE				1.17		1.17	1.14	1.20
ETHANE				1.39		1.39	1.36	1.42
ETHENE				1.69		1.69	1.64	1.74
PROPANE				2.13		2.13	2.07	2.19
PROPENE				2.80		2.79	2.66	2.92

6E

INITIAL CALIBRATION - CALIBRATION FACTOR SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H2739A Calibration File: 1M27137

GC Column (1) : RTX-200 ID: 0.53 (mm) Date(s) Analyzed: 5/17/2007 5/18/2007

COMPOUND	CALIBRATION FACTORS							
	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	MEAN	%RSD
Methanol	1.15E+00	1.11E+00	1.00E+00	1.02E+00	9.88E-01		1.06E+00	6.9
ethanol	1.75E+00	1.62E+00	1.39E+00	1.39E+00	1.60E+00		1.55E+00	10.1
ISOPROPANOL	1.81E+00	1.77E+00	1.64E+00	1.67E+00	2.03E+00		1.78E+00	8.6
Acetone	1.76E+00	1.70E+00	1.70E+00	1.69E+00	1.65E+00		1.70E+00	2.4

Average % RSD: 7

6E

INITIAL CALIBRATION - CALIBRATION FACTOR SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H4132A Calibration File: 2S19254

GC Column (1) : GS-ALUMINA ID: 0.53 (mm) Date(s) Analyzed: 10/3/2006 10/3/2006

COMPOUND	CALIBRATION FACTORS						%RSD
	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	MEAN	
METHANE	2.51E+03	1.83E+03	1.52E+03	1.45E+03	1.53E+03	1.77E+03	25.0
ETHANE	1.30E+03	1.41E+03	1.40E+03	1.34E+03	1.47E+03	1.39E+03	4.8
ETHENE	1.64E+03	1.81E+03	1.77E+03	1.73E+03	1.84E+03	1.76E+03	4.4
PROPANE	2.50E+03	2.69E+03	2.87E+03	2.70E+03	2.64E+03	2.68E+03	5.0
PROPENE	5.91E+03	5.90E+03	5.58E+03	5.79E+03	5.93E+03	5.82E+03	2.5
						Average % RSD:	8.3

7E

CALIBRATION VERIFICATION SUMMARY

Lab Name: Lancaster Laboratories Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Instrument: H4132A Init. Calib Date(s): 09/12/06 09/12/06

GC Column (1) : GS-ALUMINA ID: .53 (mm) Date Analyzed: 09/12/06

Lab File ID: 1S19254.16R Time Analyzed: 10:48

Lab Standard ID: 71053AI Initial Calibration: 1S19254

COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT	NOM AMOUNT	%D
METHANE	1.23	1.21	1.27	57.67	59.84	-3.6
ETHANE	1.46	1.44	1.50	58.62	59.08	-0.8
ETHENE	1.77	1.73	1.83	59.77	60.56	-1.3
PROPANE	2.21	2.16	2.28	57.72	60.60	-4.8
PROPENE	2.89	2.76	3.02	19.53	21.27	-8.2
					Average of %D:	3.7

8D
ANALYTICAL SEQUENCE

Sequence: 1S19254 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: GS-ALUMINA ID: 0.53

Instrument: H4132A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	PROP
001		CONDITIONER	09/11/2006	13:24:07	1S19254	
002		CONDITIONER	09/11/2006	13:36:59	1S19254	
003	71051AA	710510632E	09/11/2006	13:50:31	1S19254	2.90
004	71052AA	710520632BE	09/11/2006	14:03:32	1S19254	2.90
005	71053AA	710530632CV	09/11/2006	14:16:45	1S19254	2.88
006	71054AA	710540632CG	09/11/2006	14:30:02	1S19254	2.88
007	71055AA	710550632E	09/11/2006	14:43:22	1S19254	2.88
008	HSMDXAA	HSMDX0632E	09/11/2006	14:56:32	1S19254	2.88
009	71053AI	710530632CW	09/11/2006	15:09:42	1S19254	2.88
010	71051AA	710510632E	09/11/2006	15:26:05	1S19254	2.86
011	71052AA	710520632BE	09/11/2006	15:42:08	1S19254	2.86
012		CONDITIONER	09/12/2006	08:05:17	1S19254	
013		CONDITIONER	09/12/2006	08:18:01	1S19254	
014	71051AA	710510632E	09/12/2006	08:31:13	1S19254	2.90
015	71051AA	710510632E	09/12/2006	09:07:30	1S19254	2.89
016	71053AI	710530632CW	09/12/2006	10:48:55	1S19254	2.89
017	AA	CONDITIONER	09/12/2006	13:49:44	1S19254	2.93
018		CONDITIONER	09/12/2006	14:02:36	1S19254	
019	71053AJ	710530632CX	09/12/2006	14:15:57	1S19254	2.88
020	PBLK30	BLANKA	09/12/2006	14:29:23	1S19254	2.87
021	LCS9D	LCSA	09/12/2006	14:42:25	1S19254	2.87
022	UR11D	4856709	09/12/2006	14:55:40	1S19254	2.87
023	UR11DMS	4856710	09/12/2006	15:08:54	1S19254	2.85
024	UR11DMSD	4856711	09/12/2006	15:22:14	1S19254	2.84
025	GW20A	4855970	09/12/2006	15:35:25	1S19254	2.84
026	ADL04	4856192	09/12/2006	15:48:46	1S19254	2.84
027	ADL06	4856194	09/12/2006	16:02:14	1S19254	2.84
028	ADL4D	4856202	09/12/2006	16:15:20	1S19254	2.84
029	URS03	4856706	09/12/2006	16:28:47	1S19254	2.84
030	71053AK	710530632CX	09/12/2006	16:41:52	1S19254	2.84
031	URS09	4856707	09/12/2006	16:55:20	1S19254	2.84
032	URS11	4856708	09/12/2006	17:08:35	1S19254	2.84
033	URS23	4856712	09/12/2006	17:21:41	1S19254	2.83

	ICAL Dates		ICAL RT	QC Limits
1S19254	09/11/2006 - 09/12/2006	PROP = PROPENE	2.89	(2.76 - 3.02 Minutes)

8D
ANALYTICAL SEQUENCE

Sequence: 1S19254 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: GS-ALUMINA ID: 0.53

Instrument: H4132A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	PROP
034	URS26	4856713	09/12/2006	17:34:58	1S19254	2.83
035	URSFD	4856714	09/12/2006	17:48:10	1S19254	2.83
036	GW-8A	4855968	09/12/2006	18:01:26	1S19254	2.81
037	GW20A	4855970	09/12/2006	18:14:43	1S19254	2.81
038	ETV11	4856164	09/12/2006	18:28:13	1S19254	2.81
039	ADL05	4856193	09/12/2006	18:41:15	1S19254	2.81
040	ADL08	4856196	09/12/2006	18:54:40	1S19254	2.82
041	71053AL	710530632CX	09/12/2006	19:07:46	1S19254	2.82
042	ADL13	4856199	09/12/2006	19:21:04	1S19254	2.82
043	URS03	4856706	09/12/2006	19:34:29	1S19254	2.79
044	URS09	4856707	09/12/2006	19:47:38	1S19254	2.95
045	URS11	4856708	09/12/2006	20:00:51	1S19254	2.79
046	URS23	4856712	09/12/2006	20:14:07	1S19254	2.80
047	URS26	4856713	09/12/2006	20:27:24	1S19254	2.79
048	URSFD	4856714	09/12/2006	20:40:44	1S19254	2.79
049	71053AM	710530632CX	09/12/2006	20:58:38	1S19254	2.81
050	PBLK4B	BLANKA	09/12/2006	21:11:35	1S19254	2.82
051	LCSAV	LCSA	09/12/2006	21:25:00	1S19254	2.81
052	GW7BT	4857525	09/12/2006	21:38:38	1S19254	2.81
053	GW7B-	4857526	09/12/2006	21:51:47	1S19254	2.82
054	GW7B-MS	4857527	09/12/2006	22:05:23	1S19254	2.80
055	GW7B-MSD	4857528	09/12/2006	22:18:31	1S19254	2.81
056	GW7BD	4857530	09/12/2006	22:32:01	1S19254	2.81
057	GW7BB	4857531	09/12/2006	22:45:15	1S19254	2.82
058	GAR1R	4859180	09/12/2006	22:58:41	1S19254	2.81
059	GAR2R	4859181	09/12/2006	23:11:58	1S19254	2.81
060	71053AN	710530632CX	09/12/2006	23:25:30	1S19254	2.81
061	GARM3	4859182	09/12/2006	23:38:50	1S19254	2.79
062	GARM4	4859183	09/12/2006	23:52:12	1S19254	2.80
063	GARM5	4859184	09/13/2006	00:05:42	1S19254	2.79
064	GAR6R	4859185	09/13/2006	00:18:55	1S19254	2.79
065	GAR7R	4859186	09/13/2006	00:32:16	1S19254	2.80
066	GAR8R	4859187	09/13/2006	00:45:50	1S19254	2.79

	ICAL Dates		ICAL RT	QC Limits
1S19254	09/11/2006 - 09/12/2006	PROP = PROPENE	2.89	(2.76 - 3.02 Minutes)

8D
ANALYTICAL SEQUENCE

Sequence: 1S19254 Lab Name: Lancaster laboratories Contract:

Lab Code: Case No.: SAS No: SDG No.:

GC Column: GS-ALUMINA ID: 0.53

Instrument: H4132A

THIS ANALYTICAL SEQUENCE OF BLANKS, SAMPLES AND STANDARDS IS GIVEN BELOW:

	Sample Code No.	Lab Sample ID	Date Analyzed	Time Analyzed	Calibration File	PROP
067	GARM9	4859188	09/13/2006	00:59:04	1S19254	2.80
068	GAR10	4859189	09/13/2006	01:12:27	1S19254	2.80
069	GAR11	4859190	09/13/2006	01:25:45	1S19254	2.79
070	GAR12	4859191	09/13/2006	01:39:14	1S19254	2.79
071	71053AO	710530632CX	09/13/2006	01:52:45	1S19254	2.81
072	GAR13	4859192	09/13/2006	02:05:57	1S19254	2.79
073	GAR14	4859193	09/13/2006	02:19:13	1S19254	2.80
074	MNA20	4859283	09/13/2006	02:32:40	1S19254	2.78
075	MN114	4859284	09/13/2006	02:46:02	1S19254	2.79
076	71053AP	710530632CX	09/13/2006	02:59:23	1S19254	2.81

	ICAL Dates		ICAL RT	QC Limits
1S19254	09/11/2006 - 09/12/2006	PROP = PROPENE	2.89	(2.76 - 3.02 Minutes)

Lancaster Laboratories

Quality Control Summary

Surrogate Recovery
TPH with Ranges
EPH/Misc Organics

Matrix.................Water
Batch Number.... 062770002A

LL Sample No.	Client Designation	S1	S2
BLANKA	PBLKQ6	72	85
LCSA	LCSXV	63	62
LCSDA	LCSDOU	86	92
4879968	TUTG8	85	98
4879969	TUTC3	116	63
4879970	TUT10	75	85

	QC LIMITS
S1 = Chlorobenzene	28-152
S2 = o-Terphenyl	52-131

ABBREVIATION KEY
* = VALUES OUTSIDE QC LIMITS
NC = NOT CALCULATED DUE TO MATRIX INTERFERENCE
D = DILUTED OUT

Lancaster Laboratories

Quality Control Summary

Method Blank
TPH with Ranges
EPH/Misc Organics

*** BLANK INFORMATION ***
Matrix..... Water
Extraction Date..... 10/4/2006
Concentration Units..... mg/l
Batch Number..... 062770002A

Sample Information		Blank Contamination Information			
LL Sample No.	Client Designation	CAS Number	Compound	Blank Result	MDL
BLANKA	PBLKQ6				
LCSA	LCSXV				
LCSDA	LCSDOU		C10-C28	ND	0.2
4879968	TUTG8		>C28-C40	ND	0.2
4879969	TUTC3		Total TPH	ND	0.2
4879970	TUT10				

ABBREVIATION KEY
MDL = MINIMUM DETECTION LIMIT
LOQ = LIMIT OF QUANTITATION
ND = NONE DETECTED
J = ESTIMATED VALUE BELOW THE LOQ

Lancaster Laboratories

Quality Control Summary

Laboratory Control Sample
TPH with Ranges
EPH/Misc Organics

Matrix..... Water
Units..... mg/l
Batch Number..... 062770002A

Compound	Amount Spiked	LCS Result	LCS % Rec	LCSD Result	LCSD % Rec	QC Rec Limits	% RPD	RPD Limits
Total TPH	0.801	0.522	65	0.743	93	53-120	35 *	20

ABBREVIATION KEY
* = VALUES OUTSIDE QC LIMITS
N/A = NOT APPLICABLE
ND = NONE DETECTED

Quality Control Summary

Continuing Calibration
TPH with Ranges
EPH/Misc Organics

% Difference..... +/-15
Units..... ppm

File Number	Compound	Reference Conc.	Continuing Cal. Conc.	% Difference
R272.08R	TPH	272	276.9	1.8
R272.02R	TPH	144	141.8	-1.5
R272.17R	TPH	576	545.6	-5.3
R272.02R	Chlorobenzene	8	7.76	-3.1
R272.17R	Chlorobenzene	32	30.6	-4.4
R272.02R	o-Terphenyl	8	7.92	-1.0
R272.17R	o-Terphenyl	32	29.12	-9.0

APPENDIX C

LANCASTER NYSDOH ELAP CERTIFICATION

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER
RICHARD F. DAINES, M.D.

Expires 12:01 AM April 01, 2010
Issued April 21, 2009

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

DR. TIMOTHY S. OOSTDYK
LANCASTER LABORATORIES INC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670
EPA Lab Code: PA00009

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

D. W. Methylcarbamate Pesticides

3-Hydroxy Carbofuran	EPA 531.1
Aldicarb	EPA 531.1
Aldicarb Sulfone	EPA 531.1
Aldicarb Sulfoxide	EPA 531.1
Carbaryl	EPA 531.1
Carbofuran	EPA 531.1
Methomyl	EPA 531.1
Oxamyl	EPA 531.1

Drinking Water Chlorinated Acids

2,4,5-TP (Silvex)	EPA 515.1
2,4-D	EPA 515.1
Dalapon	EPA 515.1
Dicamba	EPA 515.1
Dinoseb	EPA 515.1
Pentachlorophenol	EPA 515.1
Picloram	EPA 515.1

Drinking Water Metals I

Arsenic, Total	EPA 200.8 Rev. 5.4
Barium, Total	EPA 200.7 Rev. 4.4
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Chromium, Total	EPA 200.7 Rev. 4.4
Copper, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.8 Rev. 5.4
Manganese, Total	EPA 200.7 Rev. 4.4

Drinking Water Metals I

Mercury, Total	EPA 245.1 Rev. 3.0
Selenium, Total	EPA 200.8 Rev. 5.4
Silver, Total	EPA 200.7 Rev. 4.4
Zinc, Total	EPA 200.7 Rev. 4.4

Drinking Water Metals II

Aluminum, Total	EPA 200.7 Rev. 4.4
Antimony, Total	EPA 200.8 Rev. 5.4
Beryllium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Nickel, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Drinking Water Metals III

Calcium, Total	EPA 200.7 Rev. 4.4
Sodium, Total	EPA 200.7 Rev. 4.4

Drinking Water Miscellaneous

Benzo(a)pyrene	EPA 525.2
Bis(2-ethylhexyl) phthalate	EPA 525.2
Butachlor	EPA 525.2
Hexachlorobenzene	EPA 508
	EPA 525.2
Hexachlorocyclopentadiene	EPA 508
	EPA 525.2
Methyl tert-butyl ether	EPA 524.2
Propachlor	EPA 525.2
Temperature	SM 18-21 2550B (00)

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER
RICHARD F. DAINES, M.D.

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Issued in accordance with and pursuant to section 502 Public Health Law of New York State

DR. TIMOTHY S. OOSTDYK
LANCASTER LABORATORIES INC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670
EPA Lab Code: PA00009

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

Drinking Water Non-Metals

Alkalinity	SM 18-21 2320B (97)
Color	SM 18-21 2120B (01)
Cyanide, Total	EPA 335.4 Rev. 1.0
Fluoride, Total	EPA 300.0 Rev. 2.1
	SM 18-21 4500-F C (97)
Hydrogen Ion (pH)	SM 18-21 4500-H B (00)
Nitrate (as N)	EPA 300.0 Rev. 2.1
	EPA 353.2 Rev. 2.0
Nitrite (as N)	EPA 300.0 Rev. 2.1
	EPA 353.2 Rev. 2.0
Silica, Dissolved	SM 20-21 4500 SiO2-C (97)
Solids, Total Dissolved	SM 18-21 2540C (97)
Specific Conductance	SM 18-21 2510B (97)

Drinking Water Organohalide Pesticides

Alachlor	EPA 507
	EPA 525.2
Aldrin	EPA 508
Atrazine	EPA 507
	EPA 525.2
Chlordane Total	EPA 508
Dieldrin	EPA 508
	EPA 525.2
Endrin	EPA 508
	EPA 525.2
Heptachlor	EPA 508
	EPA 525.2
Heptachlor epoxide	EPA 508
	EPA 525.2

Drinking Water Organohalide Pesticides

Lindane	EPA 508
	EPA 525.2
Methoxychlor	EPA 508
	EPA 525.2
Metolachlor	EPA 525.2
Metribuzin	EPA 525.2
Simazine	EPA 507
	EPA 525.2
Toxaphene	EPA 508

Drinking Water Trihalomethanes

Bromodichloromethane	EPA 524.2
Bromoform	EPA 524.2
Chloroform	EPA 524.2
Dibromochloromethane	EPA 524.2
Total Trihalomethanes	EPA 524.2

Microextractibles

1,2-Dibromo-3-chloropropane	EPA 504.1
1,2-Dibromoethane	EPA 504.1

Volatile Aromatics

1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2

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Volatile Aromatics

2-Chlorotoluene	EPA 524.2
4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2
Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2
Total Xylenes	EPA 524.2

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2

Volatile Halocarbons

2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2
Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2
Vinyl chloride	EPA 524.2

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 603
	EPA 624
	EPA 8260B
Acrylonitrile	EPA 603
	EPA 624
	EPA 8260B
Amines	
1,4-Phenylenediamine	EPA 8270C
3-Nitroaniline	EPA 8270C
4-Chloroaniline	EPA 8270C
Aniline	EPA 8270C
Carbazole	EPA 8270C
Diphenylamine	EPA 8270C
Methapyrilene	EPA 8270C
Pronamide	EPA 8270C
Propionitrile	EPA 8260B
Pyridine	EPA 8270C
Benzidines	
3,3'-Dichlorobenzidine	EPA 625
	EPA 8270C
3,3'-Dimethylbenzidine	EPA 8270C
Benzidine	EPA 625
	EPA 8270C
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 608
	EPA 8081A

Chlorinated Hydrocarbon Pesticides	
4,4'-DDE	EPA 608
	EPA 8081A
4,4'-DDT	EPA 608
	EPA 8081A
Aldrin	EPA 608
	EPA 8081A
alpha-BHC	EPA 608
	EPA 8081A
beta-BHC	EPA 608
	EPA 8081A
Chlordane Total	EPA 608
	EPA 8081A
delta-BHC	EPA 608
	EPA 8081A
Dieldrin	EPA 608
	EPA 8081A
Endosulfan I	EPA 608
	EPA 8081A
Endosulfan II	EPA 608
	EPA 8081A
Endosulfan sulfate	EPA 608
	EPA 8081A
Endrin	EPA 608
	EPA 8081A
Endrin aldehyde	EPA 608
	EPA 8081A
Endrin Ketone	EPA 8081A
Heptachlor	EPA 608

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Chlorinated Hydrocarbon Pesticides	
Heptachlor	EPA 8081A
Heptachlor epoxide	EPA 608
	EPA 8081A
Lindane	EPA 608
	EPA 8081A
Methoxychlor	EPA 8081A
Toxaphene	EPA 608
	EPA 8081A
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260B
1,2,4,5-Tetrachlorobenzene	EPA 8270C
1,2,4-Trichlorobenzene	EPA 625
	EPA 8260B
	EPA 8270C
2-Chloronaphthalene	EPA 625
	EPA 8270C
Hexachlorobenzene	EPA 625
	EPA 8270C
Hexachlorobutadiene	EPA 625
	EPA 8260B
	EPA 8270C
Hexachlorocyclopentadiene	EPA 625
	EPA 8270C
Hexachloroethane	EPA 625
	EPA 8270C
Hexachloropropene	EPA 8270C
Pentachlorobenzene	EPA 8270C

Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
Demand	
Biochemical Oxygen Demand	SM 18-20 5210B (01)
Carbonaceous BOD	SM 18-20 5210B (01)
Chemical Oxygen Demand	EPA 410.4 Rev. 2.0
Fuel Oxygenates	
Ethanol	EPA 8015 B
Methyl tert-butyl ether	EPA 8260B
tert-Butyl alcohol	EPA 8015 B
	EPA 8260B
Haloethers	
4-Bromophenylphenyl ether	EPA 625
	EPA 8270C
4-Chlorophenylphenyl ether	EPA 625
	EPA 8270C
Bis (2-chloroisopropyl) ether	EPA 625
	EPA 8270C
Bis(2-chloroethoxy)methane	EPA 625
	EPA 8270C

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Haloethers	
Bis(2-chloroethyl)ether	EPA 625
	EPA 8270C
Low Level Polynuclear Aromatics	
Acenaphthene	EPA 8310
Acenaphthylene	EPA 8310
Anthracene	EPA 8310
Benzo(a)anthracene	EPA 8310
Benzo(a)pyrene	EPA 8310
Benzo(b)fluoranthene	EPA 8310
Benzo(g,h,i)perylene	EPA 8310
Benzo(k)fluoroanthene	EPA 8310
Chrysene	EPA 8310
Dibenzo(a,h)anthracene	EPA 8310
Fluoranthene	EPA 8310
Fluorene	EPA 8310
Indeno(1,2,3-cd)pyrene	EPA 8310
Naphthalene	EPA 8310
Phenanthrene	EPA 8310
Pyrene	EPA 8310
Microextractables	
1,2-Dibromo-3-chloropropane	EPA 8011
	EPA 8260B
1,2-Dibromoethane	EPA 8011
	EPA 8260B
Mineral	
Acidity	SM 18-20 2310B.4a (97)
Mineral	
Alkalinity	SM 18-21 2320B (97)
Chloride	EPA 300.0 Rev. 2.1
Fluoride, Total	EPA 300.0 Rev. 2.1
	SM 18-21 4500-F C (97)
Hardness, Total	SM 18-20 2340C (97)
Sulfate (as SO4)	EPA 300.0 Rev. 2.1
Nitroaromatics and Isophorone	
1,3,5-Trinitrobenzene	EPA 8270C
	EPA 8330
1,3-Dinitrobenzene	EPA 8270C
	EPA 8330
1,4-Naphthoquinone	EPA 8270C
2,4,6-Trinitrotoluene	EPA 8330
2,4-Dinitrotoluene	EPA 625
	EPA 8270C
	EPA 8330
2,6-Dinitrotoluene	EPA 625
	EPA 8270C
	EPA 8330
2-Amino-4,6-dinitrotoluene	EPA 8330
2-Nitrotoluene	EPA 8330
3-Nitrotoluene	EPA 8330
4-Amino-2,6-dinitrotoluene	EPA 8330
4-Nitrotoluene	EPA 8330
Hexahydro-1,3,5-trinitro-1,3,5-triazine	EPA 8330
Isophorone	EPA 625
	EPA 8270C
Nitrobenzene	EPA 625

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Nitroaromatics and Isophorone	
Nitrobenzene	EPA 8270C
	EPA 8330
Octahydro-tetranitro-tetrazocine	EPA 8330
Nitrosoamines	
N-Nitrosodiethylamine	EPA 8270C
N-Nitrosodimethylamine	EPA 625
	EPA 8270C
N-Nitrosodi-n-butylamine	EPA 8270C
N-Nitrosodi-n-propylamine	EPA 625
	EPA 8270C
N-Nitrosodiphenylamine	EPA 625
	EPA 8270C
N-nitrosopiperidine	EPA 8270C
N-Nitrosopyrrolidine	EPA 8270C
Nutrient	
Kjeldahl Nitrogen, Total	EPA 351.2 Rev. 2.0
Nitrate (as N)	EPA 300.0 Rev. 2.1
	EPA 353.2 Rev. 2.0
Nitrite (as N)	EPA 300.0 Rev. 2.1
	EPA 353.2 Rev. 2.0
Orthophosphate (as P)	EPA 365.3 Rev. 1978
	SM 18-21 4500-P E
Phosphorus, Total	EPA 365.1 Rev. 2.0
Organophosphate Pesticides	
Atrazine	EPA 8141A
Azinphos methyl	EPA 8141A
Organophosphate Pesticides	
Demeton-O	EPA 8141A
Demeton-S	EPA 8141A
Diazinon	EPA 8141A
Disulfoton	EPA 8141A
Famphur	EPA 8141A
Malathion	EPA 8141A
Parathion ethyl	EPA 8141A
Parathion methyl	EPA 8141A
Phorate	EPA 8141A
Simazine	EPA 8141A
Phthalate Esters	
Benzyl butyl phthalate	EPA 625
	EPA 8270C
Bis(2-ethylhexyl) phthalate	EPA 625
	EPA 8270C
Diethyl phthalate	EPA 625
	EPA 8270C
Dimethyl phthalate	EPA 625
	EPA 8270C
Di-n-butyl phthalate	EPA 625
	EPA 8270C
Di-n-octyl phthalate	EPA 625
	EPA 8270C
Polychlorinated Biphenyls	
PCB-1016	EPA 608
	EPA 8082
PCB-1221	EPA 608

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Polychlorinated Biphenyls	
PCB-1221	EPA 8082
PCB-1232	EPA 608
	EPA 8082
PCB-1242	EPA 608
	EPA 8082
PCB-1248	EPA 608
	EPA 8082
PCB-1254	EPA 608
	EPA 8082
PCB-1260	EPA 608
	EPA 8082
PCB-1262	EPA 8082
PCB-1268	EPA 8082
Polynuclear Aromatics	
3-Methylcholanthrene	EPA 8270C
7,12-Dimethylbenzyl (a) anthracene	EPA 8270C
Acenaphthene	EPA 625
	EPA 8270C
Acenaphthylene	EPA 625
	EPA 8270C
Anthracene	EPA 625
	EPA 8270C
Benzo(a)anthracene	EPA 625
	EPA 8270C
Benzo(a)pyrene	EPA 625
	EPA 8270C
Benzo(b)fluoranthene	EPA 625
	EPA 8270C
Polynuclear Aromatics	
Benzo(ghi)perylene	EPA 625
	EPA 8270C
Benzo(k)fluoranthene	EPA 625
	EPA 8270C
Chrysene	EPA 625
	EPA 8270C
Dibenzo(a,h)anthracene	EPA 625
	EPA 8270C
Fluoranthene	EPA 625
	EPA 8270C
Fluorene	EPA 625
	EPA 8270C
Indeno(1,2,3-cd)pyrene	EPA 625
	EPA 8270C
Naphthalene	EPA 625
	EPA 8260B
	EPA 8270C
Phenanthrene	EPA 625
	EPA 8270C
Pyrene	EPA 625
	EPA 8270C
Priority Pollutant Phenols	
2,4,5-Trichlorophenol	EPA 8270C
2,4,6-Trichlorophenol	EPA 625
	EPA 8270C
2,4-Dichlorophenol	EPA 625
	EPA 8270C
2,4-Dimethylphenol	EPA 625

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Priority Pollutant Phenols	
2,4-Dimethylphenol	EPA 8270C
2,4-Dinitrophenol	EPA 625
	EPA 8270C
2,6-Dichlorophenol	EPA 8270C
2-Chlorophenol	EPA 625
	EPA 8270C
2-Methyl-4,6-dinitrophenol	EPA 625
2-Methylphenol	EPA 8270C
2-Nitrophenol	EPA 625
	EPA 8270C
4-Chloro-3-methylphenol	EPA 625
	EPA 8270C
4-Methylphenol	EPA 8270C
4-Nitrophenol	EPA 625
	EPA 8270C
Pentachlorophenol	EPA 625
	EPA 8151A
	EPA 8270C
Phenol	EPA 625
	EPA 8270C

Purgeable Aromatics	
1,2,4-Trimethylbenzene	EPA 8260B
1,2-Dichlorobenzene	EPA 601
	EPA 602
	EPA 624
	EPA 625
	EPA 8021B
	EPA 8260B

Purgeable Aromatics	
1,2-Dichlorobenzene	EPA 8270C
1,3,5-Trimethylbenzene	EPA 8260B
1,3-Dichlorobenzene	EPA 601
	EPA 602
	EPA 624
	EPA 625
	EPA 8021B
	EPA 8260B
	EPA 8270C
1,4-Dichlorobenzene	EPA 601
	EPA 602
	EPA 624
	EPA 625
	EPA 8021B
	EPA 8260B
	EPA 8270C
Benzene	EPA 602
	EPA 624
	EPA 8021B
	EPA 8260B
Chlorobenzene	EPA 601
	EPA 602
	EPA 624
	EPA 8021B
	EPA 8260B
Ethyl benzene	EPA 602
	EPA 624
	EPA 8021B

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Purgeable Aromatics	
Ethyl benzene	EPA 8260B
Isopropylbenzene	EPA 8260B
n-Butylbenzene	EPA 8260B
n-Propylbenzene	EPA 8260B
p-Isopropyltoluene (P-Cymene)	EPA 8260B
sec-Butylbenzene	EPA 8260B
Styrene	EPA 8021B
	EPA 8260B
Toluene	EPA 602
	EPA 624
	EPA 8021B
	EPA 8260B
Total Xylenes	EPA 602
	EPA 624
	EPA 8021B
	EPA 8260B

Purgeable Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260B
1,1,1-Trichloroethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,1,2,2-Tetrachloroethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,1,2-Trichloroethane	EPA 601
	EPA 624

Purgeable Halocarbons	
1,1,2-Trichloroethane	EPA 8021B
	EPA 8260B
1,1,2-Trifluoro-1,2,2-Trichloroethane	EPA 8260B
1,1-Dichloroethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,1-Dichloroethene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,1-Dichloropropene	EPA 8260B
1,2,3-Trichloropropane	EPA 8260B
1,2-Dichloroethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,2-Dichloropropane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,3-Dichloropropane	EPA 8260B
2,2-Dichloropropane	EPA 8260B
2-Chloroethylvinyl ether	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
3-Chloropropene (Allyl chloride)	EPA 8260B

Serial No.: 40040

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER
RICHARD F. DAINES, M.D.

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CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

DR. TIMOTHY S. OOSTDYK
LANCASTER LABORATORIES INC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670
EPA Lab Code: PA00009

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Purgeable Halocarbons	
Bromochloromethane	EPA 8021B
	EPA 8260B
Bromodichloromethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Bromoform	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Bromomethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Carbon tetrachloride	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Chloroethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Chloroform	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Chloromethane	EPA 601
	EPA 624

Purgeable Halocarbons	
Chloromethane	EPA 8021B
	EPA 8260B
cis-1,2-Dichloroethene	EPA 8260B
cis-1,3-Dichloropropene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Dibromochloromethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Dibromomethane	EPA 8260B
Dichlorodifluoromethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Methylene chloride	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Tetrachloroethene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
trans-1,2-Dichloroethene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B

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Purgeable Halocarbons	
trans-1,3-Dichloropropene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
trans-1,4-Dichloro-2-butene	EPA 8260B
Trichloroethene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Trichlorofluoromethane	EPA 601
	EPA 624
	EPA 8260B
Vinyl chloride	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Purgeable Organics	
1,4-Dioxane	EPA 8260B
2-Butanone (Methylethyl ketone)	EPA 8260B
2-Hexanone	EPA 8260B
4-Methyl-2-Pentanone	EPA 8260B
Acetone	EPA 8260B
Acetonitrile	EPA 8260B
Carbon Disulfide	EPA 8260B
Cyclohexane	EPA 8260B
Ethyl Acetate	EPA 8260B
Isobutyl alcohol	EPA 8260B
Methyl iodide	EPA 8260B
Purgeable Organics	
o-Toluidine	EPA 8270C
Vinyl acetate	EPA 8260B
Residue	
Solids, Total	SM 18-20 2540B (97)
Solids, Total Dissolved	SM 18-21 2540C (97)
Solids, Total Suspended	SM 18-20 2540D (97)
Semi-Volatile Organics	
2-Methylnaphthalene	EPA 8270C
4-Amino biphenyl	EPA 8270C
Acetophenone	EPA 8270C
Benzaldehyde	EPA 8315
Benzoic Acid	EPA 8270C
Benzyl alcohol	EPA 8270C
Dibenzofuran	EPA 8270C
Ethyl methanesulfonate	EPA 8270C
Isosafrole	EPA 8270C
Methyl methanesulfonate	EPA 8270C
O,O,O-Triethyl phosphorothioate	EPA 8270C
Phenacetin	EPA 8270C
Safrole	EPA 8270C
Wastewater Metals I	
Barium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6020
Cadmium, Total	EPA 200.7 Rev. 4.4

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Wastewater Metals I	
Cadmium, Total	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6020
	EPA 7131A
Calcium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Chromium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6020
Copper, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
Iron, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Lead, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6020
	EPA 7421
Magnesium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Manganese, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Nickel, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
Potassium, Total	EPA 200.7 Rev. 4.4

Wastewater Metals I	
Potassium, Total	EPA 6010B
Silver, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Sodium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Strontium, Total	EPA 6010B
Wastewater Metals II	
Aluminum, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Antimony, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 204.2
	EPA 6010B
	EPA 6020
	EPA 7041
Arsenic, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6020
	EPA 7060A
Beryllium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	EPA 6020
Chromium VI	EPA 218.6 Rev. 3.3
	EPA 7196A
	EPA 7199
	SM 20 3500-Cr B (01)

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Wastewater Metals II

Mercury, Total	EPA 1631E
	EPA 245.1 Rev. 3.0
	EPA 7470A
Selenium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	EPA 7740
Vanadium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Zinc, Total	EPA 200.7 Rev. 4.4
	EPA 6010B

Wastewater Metals III

Cobalt, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Molybdenum, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Thallium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 279.2 Rev. 1978
	EPA 6010B
	EPA 6020
Tin, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Titanium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B

Wastewater Miscellaneous

Boron, Total	EPA 200.7 Rev. 4.4
	EPA 6010B

Wastewater Miscellaneous

Bromide	EPA 300.0 Rev. 2.1
Color	SM 18-21 2120B (01)
Cyanide, Total	EPA 335.4 Rev. 1.0
	EPA 9012A
Hydrogen Ion (pH)	EPA 9040B
	SM 18-21 4500-H B (00)
Oil & Grease Total Recoverable (HEM)	EPA 1664A
Organic Carbon, Total	SM 18-21 5310B (00)
	SM 18-21 5310C (00)
Phenols	EPA 420.4 Rev. 1.0
Silica, Dissolved	SM 20-21 4500 SiO2-C (97)
Specific Conductance	EPA 120.1 Rev. 1982
	SM 18-21 2510B (97)
Sulfide (as S)	EPA 376.1
	EPA 376.2
	SM 18-20 4500-S D (00)
	SM 19-20 4500-S F (00)
Surfactant (MBAS)	SM 18-21 5540C (00)
Total Recoverable Petroleum Hydrocarb	EPA 418.1

Sample Preparation Methods

EPA 3005A
EPA 3010A
EPA 3020A
EPA 3510C
EPA 3520C
EPA 5030B

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NY Lab Id No: 10670
EPA Lab Code: PA00009

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved subcategories and/or analytes are listed below:

Nitroaromatics and Isophorone

Methyl-2,4,6-trinitrophenylnitramine	EPA 8330

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EPA Lab Code: PA00009

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260B
Acrylonitrile	EPA 8260B
Ethyl methacrylate	EPA 8260B
Methyl methacrylate	EPA 8260B
Amines	
1,2-Diphenylhydrazine	EPA 8270C
1,4-Phenylenediamine	EPA 8270C
1-Naphthylamine	EPA 8270C
2-Naphthylamine	EPA 8270C
2-Nitroaniline	EPA 8270C
3-Nitroaniline	EPA 8270C
4-Chloroaniline	EPA 8270C
4-Nitroaniline	EPA 8270C
5-Nitro-o-toluidine	EPA 8270C
Aniline	EPA 8270C
Carbazole	EPA 8270C
Methapyrilene	EPA 8270C
Pronamide	EPA 8270C
Benzidines	
3,3'-Dichlorobenzidine	EPA 8270C
3,3'-Dimethylbenzidine	EPA 8270C
Carbamate Pesticides	
Aldicarb	EPA 8318
Aldicarb Sulfone	EPA 8318
Carbofuran	EPA 8318

Characteristic Testing	
Corrosivity	EPA 9040B
	EPA 9045C
Ignitability	EPA 1010
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081A
4,4'-DDE	EPA 8081A
4,4'-DDT	EPA 8081A
Aldrin	EPA 8081A
alpha-BHC	EPA 8081A
alpha-Chlordane	EPA 8081A
beta-BHC	EPA 8081A
Chlordane Total	EPA 8081A
delta-BHC	EPA 8081A
Dieldrin	EPA 8081A
Endosulfan I	EPA 8081A
Endosulfan II	EPA 8081A
Endosulfan sulfate	EPA 8081A
Endrin	EPA 8081A
Endrin aldehyde	EPA 8081A
Endrin Ketone	EPA 8081A
gamma-Chlordane	EPA 8081A
Heptachlor	EPA 8081A
Heptachlor epoxide	EPA 8081A
Lindane	EPA 8081A
Methoxychlor	EPA 8081A
Pentachloronitrobenzene	EPA 8270C
Toxaphene	EPA 8081A

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Chlorinated Hydrocarbons	
1,2,4,5-Tetrachlorobenzene	EPA 8270C
1,2,4-Trichlorobenzene	EPA 8260B
	EPA 8270C
2-Chloronaphthalene	EPA 8270C
Hexachlorobenzene	EPA 8270C
Hexachlorobutadiene	EPA 8260B
	EPA 8270C
Hexachlorocyclopentadiene	EPA 8270C
Hexachloroethane	EPA 8270C
Hexachloropropene	EPA 8270C
Pentachlorobenzene	EPA 8270C
Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
MCPA	EPA 8151A
MCPP	EPA 8151A
Haloethers	
4-Bromophenylphenyl ether	EPA 8270C
4-Chlorophenylphenyl ether	EPA 8270C
Bis (2-chloroisopropyl) ether	EPA 8270C
Bis(2-chloroethoxy)methane	EPA 8270C
Haloethers	
Bis(2-chloroethyl)ether	EPA 8270C
Low Level Polynuclear Aromatic Hydrocarbons	
Acenaphthene	EPA 8310
Acenaphthylene	EPA 8310
Anthracene	EPA 8310
Benzo(a)anthracene	EPA 8310
Benzo(a)pyrene	EPA 8310
Benzo(b)fluoranthene	EPA 8310
Benzo(g,h,i)perylene	EPA 8310
Benzo(k)fluoroanthene	EPA 8310
Chrysene	EPA 8310
Dibenzo(a,h)anthracene	EPA 8310
Fluoranthene	EPA 8310
Fluorene	EPA 8310
Indeno(1,2,3-cd)pyrene	EPA 8310
Naphthalene	EPA 8310
Phenanthrene	EPA 8310
Pyrene	EPA 8310
Metals I	
Barium, Total	EPA 6010B
Cadmium, Total	EPA 6010B
	EPA 6020
Calcium, Total	EPA 6010B
Chromium, Total	EPA 6010B
	EPA 6020
Copper, Total	EPA 6010B
	EPA 6020

Serial No.: 40042

Property of the New York State Department of Health. Valid only at the address shown. Must be conspicuously posted. Valid certificates have a raised seal. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify laboratory's accreditation status.

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Metals I	
Iron, Total	EPA 6010B
Lead, Total	EPA 6010B
	EPA 6020
Magnesium, Total	EPA 6010B
Manganese, Total	EPA 6010B
Nickel, Total	EPA 6010B
	EPA 6020
Potassium, Total	EPA 6010B
Silver, Total	EPA 6010B
Sodium, Total	EPA 6010B
Strontium, Total	EPA 6010B
Metals II	
Aluminum, Total	EPA 6010B
Antimony, Total	EPA 6010B
	EPA 6020
Arsenic, Total	EPA 6010B
	EPA 6020
	EPA 7060A
Beryllium, Total	EPA 6010B
	EPA 6020
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471A
Selenium, Total	EPA 6010B
Vanadium, Total	EPA 6010B
Zinc, Total	EPA 6010B
Metals III	
Cobalt, Total	EPA 6010B
Metals III	
Molybdenum, Total	EPA 6010B
Thallium, Total	EPA 6010B
	EPA 6020
Tin, Total	EPA 6010B
Titanium, Total	EPA 6010B
Miscellaneous	
Boron, Total	EPA 6010B
Cyanide, Total	EPA 9012A
Hydrogen Ion (pH)	EPA 9040B
	EPA 9045C
Phenols	EPA 9066
Specific Conductance	EPA 9050
Nitroaromatics and Isophorone	
1,2-Dinitrobenzene	EPA 8270C
1,3,5-Trinitrobenzene	EPA 8330
1,3-Dinitrobenzene	EPA 8330
1,4-Dinitrobenzene	EPA 8270C
1,4-Naphthoquinone	EPA 8270C
2,4,6-Trinitrotoluene	EPA 8330
2,4-Dinitrotoluene	EPA 8270C
2,6-Dinitrotoluene	EPA 8270C
2-Amino-4,6-dinitrotoluene	EPA 8330
4-Amino-2,6-dinitrotoluene	EPA 8330
Isophorone	EPA 8270C
Nitrobenzene	EPA 8270C
	EPA 8330
Nitroquinoline-1-oxide	EPA 8270C

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Nitroaromatics and Isophorone	
Octahydro-tetranitro-tetrazocine	EPA 8330
Pyridine	EPA 8270C
Nitrosoamines	
N-Nitrosodiethylamine	EPA 8270C
N-Nitrosodimethylamine	EPA 8270C
N-Nitrosodi-n-butylamine	EPA 8270C
N-Nitrosodi-n-propylamine	EPA 8270C
N-Nitrosodiphenylamine	EPA 8270C
N-nitrosomethylethylamine	EPA 8270C
N-nitrosomorpholine	EPA 8270C
N-nitrosopiperidine	EPA 8270C
N-Nitrosopyrrolidine	EPA 8270C
Organophosphate Pesticides	
Azinphos methyl	EPA 8141A
Bolstar	EPA 8141A
Chlorpyriphos	EPA 8141A
Coumaphos	EPA 8141A
Demeton-O	EPA 8141A
Demeton-S	EPA 8141A
Diazinon	EPA 8141A
Dichlorvos	EPA 8141A
Disulfoton	EPA 8141A
EPN	EPA 8141A
Ethion	EPA 8141A
Ethoprop	EPA 8141A
Famphur	EPA 8141A
Fensulfothion	EPA 8141A

Organophosphate Pesticides	
Fenthion	EPA 8141A
Malathion	EPA 8141A
Mevinphos	EPA 8141A
NALED	EPA 8141A
Parathion ethyl	EPA 8141A
Parathion methyl	EPA 8141A
Phorate	EPA 8141A
Ronnel	EPA 8141A
Tokuthion	EPA 8141A
Trichloronate	EPA 8141A
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015 B
Gasoline Range Organics	EPA 8015 B
Oil & Grease Total Recoverable (HEM)	EPA 9071 (Solvent:Hexane)
Phthalate Esters	
Benzyl butyl phthalate	EPA 8270C
Bis(2-ethylhexyl) phthalate	EPA 8270C
Diethyl phthalate	EPA 8270C
Dimethyl phthalate	EPA 8270C
Di-n-butyl phthalate	EPA 8270C
Di-n-octyl phthalate	EPA 8270C
Polychlorinated Biphenyls	
PCB-1016	EPA 8082
PCB-1221	EPA 8082
PCB-1232	EPA 8082
PCB-1242	EPA 8082

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Polychlorinated Biphenyls	
PCB-1248	EPA 8082
PCB-1254	EPA 8082
PCB-1260	EPA 8082
PCB-1262	EPA 8082
PCB-1268	EPA 8082
Polynuclear Aromatic Hydrocarbons	
7,12-Dimethylbenzyl (a) anthracene	EPA 8270C
Acenaphthene	EPA 8270C
Acenaphthylene	EPA 8270C
Anthracene	EPA 8270C
Benzo(a)anthracene	EPA 8270C
Benzo(a)pyrene	EPA 8270C
Benzo(b)fluoranthene	EPA 8270C
Benzo(ghi)perylene	EPA 8270C
Benzo(k)fluoranthene	EPA 8270C
Chrysene	EPA 8270C
Dibenzo(a,h)anthracene	EPA 8270C
Fluoranthene	EPA 8270C
Fluorene	EPA 8270C
Indeno(1,2,3-cd)pyrene	EPA 8270C
Naphthalene	EPA 8260B
	EPA 8270C
Phenanthrene	EPA 8270C
Pyrene	EPA 8270C
Priority Pollutant Phenols	
2,4,6-Trichlorophenol	EPA 8270C
2,4-Dichlorophenol	EPA 8270C

Priority Pollutant Phenols	
2,4-Dimethylphenol	EPA 8270C
2,4-Dinitrophenol	EPA 8270C
2-Chlorophenol	EPA 8270C
2-Methyl-4,6-dinitrophenol	EPA 8270C
2-Methylphenol	EPA 8270C
2-Nitrophenol	EPA 8270C
4-Chloro-3-methylphenol	EPA 8270C
4-Methylphenol	EPA 8270C
4-Nitrophenol	EPA 8270C
Pentachlorophenol	EPA 8151A
	EPA 8270C
Phenol	EPA 8270C
Purgeable Aromatics	
1,2,4-Trimethylbenzene	EPA 8021B
	EPA 8260B
1,2-Dichlorobenzene	EPA 8260B
	EPA 8270C
1,3,5-Trimethylbenzene	EPA 8021B
	EPA 8260B
1,3-Dichlorobenzene	EPA 8260B
	EPA 8270C
1,4-Dichlorobenzene	EPA 8260B
	EPA 8270C
2-Chlorotoluene	EPA 8260B
4-Chlorotoluene	EPA 8260B
Benzene	EPA 8021B
	EPA 8260B
Bromobenzene	EPA 8260B

Serial No.: 40042

NELAP Recognized

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER
RICHARD F. DAINES, M.D.

Expires 12:01 AM April 01, 2010
Issued April 21, 2009

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

DR. TIMOTHY S. OOSTDYK
LANCASTER LABORATORIES INC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670
EPA Lab Code: PA00009

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Purgeable Aromatics

Chlorobenzene	EPA 8260B
Ethyl benzene	EPA 8021B
	EPA 8260B
Isopropylbenzene	EPA 8021B
	EPA 8260B
n-Butylbenzene	EPA 8260B
n-Propylbenzene	EPA 8260B
p-Isopropyltoluene (P-Cymene)	EPA 8260B
sec-Butylbenzene	EPA 8021B
	EPA 8260B
Styrene	EPA 8260B
tert-Butylbenzene	EPA 8021B
	EPA 8260B
Toluene	EPA 8021B
	EPA 8260B
Total Xylenes	EPA 8021B
	EPA 8260B

Purgeable Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260B
1,1,1-Trichloroethane	EPA 8260B
1,1,2,2-Tetrachloroethane	EPA 8260B
1,1,2-Trichloroethane	EPA 8260B
1,1,2-Trifluoro-1,2,2-Trichloroethane	EPA 8260B
1,1-Dichloroethane	EPA 8260B
1,1-Dichloroethene	EPA 8260B
1,1-Dichloropropene	EPA 8260B
1,2,3-Trichloropropane	EPA 8260B
1,2-Dibromo-3-chloropropane	EPA 8260B

Purgeable Halocarbons

1,2-Dibromoethane	EPA 8260B
1,2-Dichloroethane	EPA 8260B
1,2-Dichloropropane	EPA 8260B
1,3-Dichloropropane	EPA 8260B
2,2-Dichloropropane	EPA 8260B
2-Chloroethylvinyl ether	EPA 8260B
3-Chloropropene (Allyl chloride)	EPA 8260B
Bromochloromethane	EPA 8260B
Bromodichloromethane	EPA 8260B
Bromoform	EPA 8260B
Carbon tetrachloride	EPA 8260B
Chloroethane	EPA 8260B
Chloroform	EPA 8260B
Chloromethane	EPA 8260B
cis-1,2-Dichloroethene	EPA 8260B
cis-1,3-Dichloropropene	EPA 8260B
Dibromochloromethane	EPA 8260B
Dibromomethane	EPA 8260B
Dichlorodifluoromethane	EPA 8260B
Methylene chloride	EPA 8260B
Tetrachloroethene	EPA 8260B
trans-1,2-Dichloroethene	EPA 8260B
trans-1,3-Dichloropropene	EPA 8260B
Trichloroethene	EPA 8260B
Trichlorofluoromethane	EPA 8260B
Vinyl chloride	EPA 8260B

Purgeable Organics

1,4-Dioxane	EPA 8260B

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All approved analytes are listed below:

Purgeable Organics	
2-Butanone (Methylethyl ketone)	EPA 8260B
2-Hexanone	EPA 8260B
4-Methyl-2-Pentanone	EPA 8260B
Acetone	EPA 8260B
Acetonitrile	EPA 8260B
Carbon Disulfide	EPA 8260B
Isobutyl alcohol	EPA 8260B
Methyl tert-butyl ether	EPA 8260B
o-Toluidine	EPA 8270C
Propionitrile	EPA 8260B
tert-Butyl alcohol	EPA 8260B
Vinyl acetate	EPA 8260B
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270C
2-Methylnaphthalene	EPA 8270C
4-Amino biphenyl	EPA 8270C
Acetophenone	EPA 8270C
Benzoic Acid	EPA 8270C
Benzyl alcohol	EPA 8270C
Caprolactam	EPA 8270C
Dibenzofuran	EPA 8270C
Ethyl methanesulfonate	EPA 8270C
Isosafrole	EPA 8270C
Methyl methanesulfonate	EPA 8270C
O,O,O-Triethyl phosphorothioate	EPA 8270C
Phenacetin	EPA 8270C
Safrole	EPA 8270C

Sample Preparation Methods
EPA 1311
EPA 3005A
EPA 3010A
EPA 3020A
EPA 3050B
EPA 3060A
EPA 3540C
EPA 3545
EPA 3550B
EPA 5030B
EPA 5035

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ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Amines	
Diphenylamine	EPA 8270C
Priority Pollutant Phenols	
2,4,5-Trichlorophenol	EPA 8270C
Semi-Volatile Organics	
Aramite	EPA 8270C

Serial No.: 40043

Property of the New York State Department of Health. Valid only at the address shown. Must be conspicuously posted. Valid certificates have a raised seal. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify laboratory's accreditation status.

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LANCASTER, PA 17601-5994

NY Lab Id No: 10670
EPA Lab Code: PA00009

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Acrylates	
Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA TO-14A
	EPA TO-15
Hexachlorobutadiene	EPA TO-14A
	EPA TO-15
Polynuclear Aromatics	
Naphthalene	EPA TO-15
Purgeable Aromatics	
1,2,4-Trimethylbenzene	EPA TO-14A
1,2-Dichlorobenzene	EPA TO-14A
	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-14A
1,3-Dichlorobenzene	EPA TO-14A
1,4-Dichlorobenzene	EPA TO-14A
Benzene	EPA TO-14A
	EPA TO-15
Chlorobenzene	EPA TO-14A
	EPA TO-15
Ethyl benzene	EPA TO-14A
	EPA TO-15
Styrene	EPA TO-14A
	EPA TO-15
Toluene	EPA TO-14A
	EPA TO-15
Purgeable Aromatics	
Total Xylenes	EPA TO-14A
	EPA TO-15
Purgeable Halocarbons	
1,1,1-Trichloroethane	EPA TO-14A
	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-14A
	EPA TO-15
1,1,2-Trifluoro-1,2,2-Trichloroethane	EPA TO-14A
	EPA TO-15
1,1-Dichloroethane	EPA TO-14A
	EPA TO-15
1,1-Dichloroethene	EPA TO-14A
	EPA TO-15
1,2-Dibromoethane	EPA TO-14A
	EPA TO-15
1,2-Dichloro-1,1,2,2-tetrafluoroethane	EPA TO-14A
Bromoform	EPA TO-15
Bromomethane	EPA TO-14A
	EPA TO-15
Carbon tetrachloride	EPA TO-14A
	EPA TO-15
Chloroethane	EPA TO-14A
	EPA TO-15
Chloroform	EPA TO-14A
	EPA TO-15
Chloromethane	EPA TO-14A
	EPA TO-15

Serial No.: 40044

NELAP Recognized

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER
RICHARD F. DAINES, M.D.

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2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670
EPA Lab Code: PA00009

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Purgeable Halocarbons

cis-1,2-Dichloroethene	EPA TO-14A
	EPA TO-15
cis-1,3-Dichloropropene	EPA TO-14A
Dichlorodifluoromethane	EPA TO-14A
Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-14A
	EPA TO-15
trans-1,2-Dichloroethene	EPA TO-15
trans-1,3-Dichloropropene	EPA TO-14A
	EPA TO-15
Trichloroethene	EPA TO-14A
	EPA TO-15
Trichlorofluoromethane	EPA TO-14A
Vinyl chloride	EPA TO-15

Volatile Organics

2-Butanone (Methylethyl ketone)	EPA TO-15
Hexane	EPA TO-15
Vinyl acetate	EPA TO-15

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APPENDIX D

SITE-SPECIFIC HEALTH AND SAFETY PLAN

1. Project Information

Project Name Former IBM Kingston New York Site

Tasks Membrane Interface Probe/Electric Conductivity Investigation, Geoprobe® Activities and Groundwater/Soil/Sewer Sampling

Requested by Anthony Savino

Proposed Start-Up Date 04/15/2009 Project/Task No. 083-87071

Prepared by

Printed Name Courtney Jackson

Signature _____ Date _____

Reviewed by Project Health and Safety Officer

Printed Name James Valenti

Signature _____ Date _____

Approved by Project Manager

Printed Name Anthony Savino

Signature _____ Date _____

Title Senior Consultant

Note to Project Managers:

A signed and completed copy of the Health and Safety Plan and a signed and completed copy of the safety briefing (p. 14) must be included in the project file.

2. Project Description:

IBM has been conducting site investigation and remedial action activities at the former IBM Kingston New York Site, pursuant to a RCRA Corrective Action (6 NYCRR Part 373 Hazardous Waste Management Permit #3-5154-00067/00090, dated October 24, 1996). Golder Associates Inc. (Golder) has been retained by IBM to provide consulting services associated with certain portions of the Site.

The 258-acre property was developed by IBM in 1954, with manufacturing operations beginning in 1955. Operations included, but were not limited to: computer manufacturing, metal plating, circuit board production and electric typewriter production. IBM ceased operations at the Site during the mid-1990's. In 1998, IBM sold the site to AG Properties of Kingston, LLC and Ulster Business Complex, LLC, who renamed the Site, TechCity and subdivided the property into multiple parcels. The Site is currently owned and managed by Tech City Properties (TechCity).

Thirty-two (32) Solid Waste Management Units (SWMUs) have been identified on-site. Twenty eight (28) SWMUs have been proposed for No Further Action; and four (4) SWMUs for remediation using interim corrective measures (ICMs). Primary constituents of concern (COCs) identified at the Site include: 1,1,1-trichloroethane (TCA), trichloroethene (TCE) and tetrachloroethene (PCE) and related degradation products (i.e., 1,1-dichloroethene [1,1-DCE], 1,1-dichloroethane [1,1-DCA], and 1,2-dichloroethene [1,2-DCE]). Other volatile organic compounds (VOCs) have been detected in groundwater, including carbon tetrachloride, Freon and petroleum (BTEX) hydrocarbons; however, the concentrations of these VOCs are generally lower and less extensive than the chlorinated compounds that are present.

Proposed Site activities include the use of Membrane Interface Probe/Electrical Conductivity (MIP/EC) technology for field screening purposes, a direct-push (Geoprobe®) drilling rig to obtain subsurface soil and groundwater samples and the collection of stormwater samples. Groundwater samples will be collected using temporary well points or existing monitoring wells. Stormwater sewer samples will be collect at the surface from manholes. No entry into the storm sewers will be permitted or required. The possibility of exposure exists via direct contact with and/or inhalation of contaminants found in the site soil, groundwater or stormwater to be investigated and sampled.

This Health and Safety Plan (HASP) has been developed to address the potential physical and chemical hazards that workers may be exposed to while performing field activities at the Site and establishes procedures to minimize worker exposures through the use of personal protective equipment and safe work practices. This HASP has been developed to meet the requirements of the Occupational Safety and Health Administration (OSHA) regulation, Title 29, Code of Federal Regulations, Part 1910.120 (20 CFR 1910.120), "Hazardous Waste Operations and Emergency Response (HAZWOPER)." The HASP is intended for the protection of Golder employees. Anyone else, including the client, subcontractors, and visitors may review this HASP and follow its procedures. However, these entities are responsible for the safety and health of its employees and must provide their own HASP to address any specialized work or activities being performed.

3. Location:

The Site address is 300 Enterprise Avenue, Kingston, New York, 12401. The Site is located approximately 4 miles north of the City of Kingston. The property is bound to the east by retail properties, the north by Old Neighborhood Road, the northwest and southwest by Esopus Creek, and the south and west by residential properties.

4. Facility/Work Site Description:

Approximately 25 buildings are found on-Site. Some of the buildings are occupied by tenants of TechCity while other buildings are vacant and in a state of disrepair. Field investigations, including MIP/EC screening, soil boring and environmental media sampling will be conducted at various locations as presented in the work plans. Specific reference is made to the work plans and the RFI Management Plans for additional details. Both the work plans and the RFI Management Plans are incorporated into this HASP by reference.

5. Proposed Personnel and Tasks:

Project Manager Anthony Savino

Field Team Leader Daniel Gorman

Proposed Field Team	Job Function/Tasks
Anthony Savino	Project Management
Christopher Hemingway	Senior Hydrogeologist
Daniel Gorman	Field Team Leader
To Be Assigned	Field Personnel

6. Confined Space Entry:

A confined space is defined as any space not currently used or intended for human occupancy, having a limited means of egress, which is subject to the accumulation of toxic contaminants, a flammable or oxygen deficient atmosphere, or other hazards, such as engulfment, or electrical or mechanical hazards should equipment be inadvertently activated while an employee is in the space. Confined spaces include but are not limited to storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, air pollution control devices, smoke stacks, underground utility vaults, sewers, septic tanks, and open top spaces more than four feet in depth such as test pits, waste disposal trenches, sumps and vats.

Will this task require entry into any confined or partially confined space? ☐ YES - Describe below
☒ No

Note: Stormwater samples will be collected as part of this work. Samples are to be collected from the surface pursuant to the Standards Operating Procedures provided in the RFI Management Plans (i.e., the Quality Assurance Project Plan [QAPP]), which incorporated into this HASP by reference.

7. Cutting and Welding:

Will this task involve use of a cutting torch or welding? ☐ YES - Describe below
☒ No

8. Other Potential Hazards:

- ☒ Chemical
- ☐ Radiological
- ☐ Fire/Explosion
- ☒ Heat Stress
- ☒ Electrical
- ☒ Machinery/Mechanical Equipment
- ☒ Cold Stress
- ☒ Trips, Slips, Falls
- ☐ Trenching/Shoring
- ☒ Heavy Equipment/Vehicular Traffic
- ☒ Overhead Hazards
- ☒ Unstable/Uneven Terrain
- ☒ Other - Describe below

See attached Standard Work Practice Exhibits and/or other descriptions provided in the HASP.

Description/Other:

The use of a MIP/EC introduces the potential for contact with extremely hot metal surfaces. Special precaution should be taken to reduce potential contact with the probe. The driller should hold the MIP/EC with an attached rod extension or after is has been set aside to cool.

Drilling activities will be conducted at various locations within the Site as per the work plans (see Standard Work Practice Exhibits).

The use of cones and barriers must be used to create a safety zone and to divert traffic in areas where the potential for or know vehicular or other forms of traffic are known or may occur during the performance of the work.

Prior to any subsurface work, a Utility One call will be performed and historical operation utilities identified.

Subcontractors will utilize standard work gloves while handling the Geoprobe® and associated tools. Only retractable utility knives will be allowed on-Site for the extraction of soil from macro-core liners.

9. Cold Stress:

Personnel exposed to cold temperatures (especially during windy conditions) may be subjected to cold stress in the form of frost nip, frost bite or hypothermia. Workers shall monitor themselves and others for signs of frost nip when cold weather occurs. Extra caution will be exercised when working in windy conditions and/or when clothing becomes wet. Standard Work Procedures for Cold Stress are attached.

10. Heat Stress

Personnel exposed to warm temperatures may be subjected to heat stress in the form of heat rash, heat cramps, heat exhaustion, or heat stroke. Workers shall monitor themselves and others for signs of heat stroke when hot weather occurs. To prevent and monitor heat stress, be sure drink plenty of water, acclimate workers to Site conditions, take breaks in cool, shaded areas, wear proper personal skin protection and clothing. Standard Work Procedures for Heat Stress are attached.

11. I, Anthony Savino, attest that this information is accurate to the best of my knowledge and hereby request a Health and Safety Plan for the task(s) designated above.

Signature _____ Date _____

Title Senior Consultant

12. Chemical/Radiological Hazard Evaluation:

Waste Media

- ☒ Airborne Contamination
- ☒ Surface Contamination
- ☒ Contaminated Soil
- ☒ Contaminated Groundwater
- ☒ Contaminated Stormwater
- ☐ Solid Waste
- ☐ Liquid Waste
- ☐ Sludge

Hazardous Characteristics

- ☐ Ignitable
- ☐ Corrosive
- ☐ Reactive
- ☐ Explosive
- ☒ Toxic (non-radiological)
- ☐ Radioactive

Substance:

This task will involve the reasonable possibility of exposure to the substances listed below at concentrations or in quantities which may be hazardous to the health of the site personnel.

PRIMARY HAZARD (Rate: Low, Med, High, Ext)								
Substance	Inhalation of Gases / Vapors	Inhalation of Dusts / Mists	Ingestion	Dermal Absorption of Solids / Liquids and/or Skin Contamination	Dermal Absorption of Gases / Vapors	Corrosive / Irritant	Ignitability	Reactivity / Explosion
1,1,1-Tri-chloroethane	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Trichloro-ethylene	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Tetra-chloroethane	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW

1,1-Dichloro-ethene	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
1,1-Dichloro-ethane	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
1,2-Dichloro-ethene	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Carbon Tetrachloride	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Freon 113	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Benzene	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Toluene	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Ethylbenzene	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
Total Xylene	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW

Know Chemicals On-site	Media	PEL/TLV	IDLH	Symptoms
1,1,1-Trichloroethane CAS No. 71-55-6	Soil/GW/ SW	350 ppm	700 ppm	Irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]
Trichloroethylene (TCE) CAS No. 79-01-6	Soil/GW/ SW	200 ppm	1,000 ppm	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
Tetrachloroethane (PCE) CAS No. 127-18-4	Soil/GW Soil Gas/ SW	100 ppm	150 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, uncoordination; headache,

Know Chemicals On-site	Media	PEL/TLV	IDLH	Symptoms
				drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen] carcinogen]
1,1-Dichloroethene CAS No. 75-35-4	Soil/GW/ SW	100 ppm	3,000 ppm	Irritation skin; liver, kidney, lung damage; [potential occupational carcinogen]
1,1-Dichloroethane CAS No. 75-34-3	Soil/GW/ SW	100 ppm	3,000 ppm	Irritation skin; central nervous system depression; liver, kidney, lung damage
1,2-Dichloroethene CAS No. 540-59-0	Soil/GW/ SW	200 ppm	1000 ppm	Irritation eyes, respiratory system; central nervous system depression
Carbon Tetrachloride CAS No. 56-23-5	Soil/GW/ SW	5 ppm	200 ppm	Irritation eyes, nose; central nervous system depression; liver, kidney damage; drowsiness; dizziness; incoordiantion [potential occupational carcinogen]
Freon 113 CAS No. 76-13-1	Soil/GW/ SW	1000 ppm	2000 ppm	Irritation skin, throat; drowsiness, dermatitis; cardiac arrhythmias; narcosis; central nervous system depression
Benzene CAS No. 71-43-2	Soil/GW/ SW	0.5 ppm	500 ppm	Irritation eyes, nose; respiratory system; headache; nausea, staggered gait; anorexia; lassitude; dermatitis; bone marrow depression [potential occupational carcinogen]
Toluene CAS No. 108-88-3	Soil/GW/ SW	50 ppm	500 ppm	Irritation eyes, nose; headache; nausea; lassitude; dermatitis; liver, kidney damage; drowsiness; muscle fatigue; insomnia; lacrimation; parasthesia; anxiety
Ethylbenzene CAS No. 100-41-4	Soil/GW/ SW	100 ppm	800 ppm	Irritation eyes, skin; dermatitis; mucous membrane; headache; narcosis, coma
Total Xylenes CAS No. 95-47-6	Soil/GW/ SW	100 ppm	900 ppm	Irritation eyes, nose, throat; dizziness, excitement; drowsiness; incoordination; corneal vacuolization; nausea, staggered gait; anorexia; vomiting; abdominal pain; dermatitis

PEL = Permissive Exposure Limit (OSHA & NIOSH)
TLV = Threshold Limit Value (ACGIH)
IDLH = Immediately Dangerous to Life and Health (NIOSH)

13. Ambient Air/Site Monitoring Procedures:

The following instruments shall be used to monitor the work environment and workers' breathing zones prior to site entry and at the specified intervals.

Instrument	Monitoring Frequency
__X__ PID (HNU, OVM) w/ __11.7__ eV lamp	**Cont**. 15min 30min. hourly other
_____ OVA	Cont. 15min. 30min. hourly other
__X__ Combustible Gas Indicator	Cont. 15min. 30min. hourly other
__X__ H_2S Detector	Cont. 15min. 30min. hourly other
_____ Colorimetric Detector Tubes	Cont. 15min. 30min. hourly other
_____ Other (describe below)	

PID monitoring will be conducted continuously while in the Exclusion Zone during drilling activities and soil groundwater and sewer sampling.

Combustible gas and H_2S monitoring will be performed during any storm sewer sampling activities.

14. Action Levels:

Task personnel shall observe the following Action Levels:

Instrument	Action Level/Criteria	Specific Action
Mini Rae 2000 Photo Ionization Detector (PID)	If the PID reading is 1.0 ppm above background level (in breathing zone)	Cease work and evacuate area. Upgrade to Level C for emergency stabilization/demobilization purposes only. Evaluate if mechanical ventilation is feasible.
Mini Rae 2000 Photo Ionization Detector (PID)	If the PID reading is 5.0 ppm above background level	Cease work and evacuate area. Upgrade to Level C for emergency stabilization/demobilization purposes only.

Instrument	Action Level/Criteria	Specific Action
	(in breathing zone)	Evaluate if mechanical ventilation is feasible.
	Continuously greater than 25ppm or frequent peaks greater >50ppm	Cease work and evacuate area. Upgrade to Level B for emergency stabilization/demobilization purposes only. Evaluate of mechanical ventilation is feasible.

15. Personal Monitoring:

☐ Passive Dosimeter ☐ Personal Air Sampling ☐ Other ☒ Not applicable

16. Special Instructions:

In addition to the potential contaminants listed in the tables in Section 12, workers should also be cognizant of hazards such as heat and cold stress and working around drilling equipment. To ensure compliance and understanding of safety issues, a daily safety meeting will be conducted at the job site each morning prior to commencement of work activities. Attendance by all workers is mandatory, and a Daily Safety Briefing form will be signed by everyone in attendance of the daily safety meeting.

17. On-Site Control:

Drilling activities will be conducted at various locations within the Site as per the work plans. The use of cones and barriers must be used to create a safety zone and to divert traffic in areas where the potential for or know vehicular or other forms of traffic are known or may occur during the performance of the work.

Visitor and observer access must be controlled at all times. If present, these individual are to only be allowed in areas deemed safe (e.g., Support Zone) and never in the Exclusion Zone.

18. Personal Protective Equipment:

Location	Job Function/Task	Initial Level of Protection
Exclusion/Hot Zone	Drilling, Sampling (upgrade to level C or B for emergency stabilization/demob only)	D B C D1, D2, D3 other
Decon/Contamination Control & Support Zone	Decontamination or personnel and/or equipment	D B C D1, D2, D3 other

Specific protective equipment and material for the different Levels of Protection.

Level B ☐ - Emergency stabilization and demobilization only.
☒ Full face Supplied-air respirator (MSHA/NIOSH approved)
☒ Disposable, full body protective clothing (poly-coated Tyvek)
☒ Hard hat, steel toed boots
☒ Ear protection during drill rig operation
☒ Double latex gloves
☒ Outer NBR (Nitrile Butyl Rubber) gloves
☒ Boot covers

Level C ☐ - Emergency stabilization and demobilization only.
☐ Half face air purifying respirator with organic vapor cartridges in combination with dust and mist filters
☒ Full face air purifying respirator with organic vapor cartridges in combination with dust and mist filters
☐ Full face canister Air Purifying Respirator
☒ Disposable, full body protective clothing
☒ Hard hat, steel toed boots
☒ Ear protection during drill rig operation
☒ Double latex gloves
☒ Outer NBR (Nitrile Butyl Rubber) gloves
☒ Boot covers

Level D ☒
☒ Standard work clothes
☒ Hard hat, steel toed boots, safety glasses
☒ Ear protection during geoprobe operation
☒ Latex gloves
☒ Safety Vest

Where air purifying respirators are authorized (Level C - emergency stabilization/demobilization), organic vapor cartridges in combination with dust and mist filters are the appropriate respiratory protection equipment for use with the specific substances and concentrations anticipated. Level C will only be implemented to stabilize the site for demobilization in the event conditions exist which prevents working in Level D. If Level C is required, cartridges will be properly discarded after use.

No changes to the specified levels of protection shall be made without the knowledge and approval of the Health and Safety Officer, the Site Safety Officer, the Field Operations Leader and/or the Project Manager.

19. On-Site Control, Organization and Coordination:

Daniel Gorman has been designated as person responsible to coordinate access control on the work site. No unauthorized person shall be allowed beyond the Support Zone.

Project Manager: **Anthony Savino**
Field Operations Leader: **Daniel Gorman**
Site Safety Officer: **Daniel Gorman**

20. Sanitation Requirements:

Potable water supply available on work site? ☐Yes ☒ No

Portable toilets required on work site? ☒ Yes, how many? Unknown ☐ No

Temporary washing/shower facilities required at work site? ☐ Yes, describe below. ☒ No

21. Decontamination:

Decontamination is required for all equipment prior to drilling activities, before advancing each borehole and between each sample collection. All equipment will be decontaminated using Alconox soap or equivalent, and/or steam cleaned.

Field personnel should change gloves between each borehole and each sample location.

22. Confined Entry Procedures: ☒ Not Applicable

Yes	N/A		Yes	N/A	
☐	☐	Provide Forced Ventilation	☐	☐	Refer to Personal Protective Equip.
☐	☐	Test Atmosphere For	☐	☐	Refer to Emergency Procedures
☐	☐	(a) $\%O_2$	☐	☐	Other Special Procedures
☐	☐	(b) %LEL			
☐	☐	(c) Other			

23. Cutting/Welding Procedures: ☒ Not Applicable

Yes	N/A	
☐	☐	Relocate or Protect Combustibles
☐	☐	Wet Down or Cover Combustible Floor
☐	☐	Check Flammable Gas Concentrations (%LEL) in air
☐	☐	Cover Wall, Floor, Duct and Tank Openings
☐	☐	Provide Fire Extinguisher

24. Electrical:

An additional hazard exists in the use of electrical appliances such as drills, welding machines on wet surfaces. The water is a potential source of conductance for electricity and therefore electric equipment should not be operated under wet conditions. **Golder employees should avoid approaching any area where the equipment or its power cord is in contact with water.**

The following precautions should be taken when working around potential electrical hazards:

- Employees should be aware of the fact that high voltage is not necessary for serious electric shock;
- All electrical wiring and equipment must be of a type listed by Underwriters Laboratory (UL) or Factory Mutual Engineering Corporation (FMEC) for the specific application;
- All installations must comply with the National Electrical Safety Code (NESC), National Electrical Code (NEC), or U.S. Coast Guard regulations;
- All electrical work must be by personnel familiar with code requirements and qualified for the class of work to be performed;
- Live parts of wiring or equipment must be guarded to protect all persons or objects from harm;
- All electrical wiring passing through a work area must be covered or elevated in order to protect it from damage by vehicles, foot traffic, projections, sharp corners, or pinching. This includes temporary wiring;
- If it is necessary to work on energized lines or equipment, rubber gloves and other protective equipment or hotline tools designed to meet the provisions of the American National Standards Institute (ANSI) J-6 series will be used;
- Before any work is initiated, ascertain by inquiry, direct observation or instruments whether any part of an electrical power circuit, exposed or concealed, is located in such a way that allows contact with persons, tools or machines. Whenever possible, de-energize all equipment or circuits to be worked on before work is started, and make sure that all personnel are protected by clearance procedures and grounding;
- Patched, oil soaked, worn or frayed electrical cords must not be used;
- Do not hang extension cords with staples or nails, or suspend them from base wire;

- All portable and semi-portable electrical tools and equipment, floodlights and work lights must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle;
- All flexible cord sets must be of a type listed by UL. Sets used on construction sites will contain the number of conductors required for the service plus equipment ground wire. The cords must be Type ST, STO, SJT, SJTO, S, SO, SEO, W, or G;
- Portable electrical lighting used in confined, wet, or hazardous locations (drums, tanks, vessels) must be explosion proof or low voltage, operating at 12 volts or less;
- Clearance of overhead lines must be adequate for the movement of vehicles and for the operation of construction equipment; and
- All ladders, drill rigs, man lifts or any other aerial extensions must be established so there is no possibility of accidental contact with any electrical transmission line or device.

25. Slips, Trips and Falls:

There are many situations that can cause slips, trips, and falls, such as ice, wet spots, grease, polished floors, loose flooring or carpeting, uneven walking surfaces, clutter, electrical cords, open desk drawers and filing cabinets, and damaged ladder steps. The controls needed to prevent these hazards are usually obvious, but too often ignored, such as keeping walkways and stairs clear of scrap and debris; coiling up extension cords, lines, and hoses when not in use; keeping electrical and other wires out of the way; wearing lug soles in icy weather; clearing parking lots, stairs, and walkways in snowy weather; and using salt/sand as needed. Be aware of your surroundings and take the time to maintain an orderly worksite. This will reduce chances of slips, trips and falls. Proper footwear (safety shoes) may improve foot/ankle support and traction to prevent slips, trips and falls.

26. Heavy Equipment / Vehicular Traffic:

Vehicular traffic along the roadways will be an important hazard to recognize during drilling and sample collection activities. All personnel will stay off of the roads during periods of high traffic activity; and wear orange reflective safety vests. If working in an area of heavy traffic, notify the Project Manager and use extreme caution.

The following precautions should be taken when working around heavy equipment and vehicular traffic:

- Check with local authorities for appropriate regulations, need for traffic control and site specific hazards;
- Adequate barricades, channelization cones, flashing lights, flagmen, and warning signs shall be provided at all project sites adjacent to or in public traffic lanes;
- Adequate safety precautions must be observed when parking vehicles. Whenever a vehicle or heavy equipment is parked, the parking brake must be set. Equipment parked on inclines must have the wheels chocked or track mechanism blocked and the parking brake set; and
- Hard hats and reflective clothing must be worn while performing work in the vicinity of moving traffic.

27. Overhead Hazards:

Overhead hazards occur whenever there is moving equipment such as hoists, conveyors, drilling tools, etc., protrusions from machinery, or structural members present above eye level, or whenever an employee must work where other work activities being conducted above him (or her).

The following precautions should be followed:

- Be alert for potential overhead hazards;
- When working "below grade", be sure to keep all hand-tools, equipment and materials such as pipe, braces, lumber, etc., well back from the edge of the trench or hole so it doesn't get kicked in on your head; and
- Always wear a hard hat when working in the vicinity of potential overhead hazards whether it is a "hard-hat area" or not. All hardhats must comply with ANSI Z89.1-1986.

28. Field Safety Procedures Change Authorization:

This Safety Procedures Change Authorization Form will be completed and signed before any safety procedures identified in this HASP can be modified by the Field Team. All revisions to safety procedures must be approved by the Project Manager.

Instruction Number _____ Duration of Authorization Requested

Date:

To be changed ☐ Today only

☐ Duration of Task

Description of Procedures Modification:

Justification:

Person Requesting Change:	**Verbal Authorization Received From:**
Name	Name Time
Title	Title
Signature	Approved By (Signature of person named above to be obtained within 48 hours of verbal authorization)

29. Emergency Procedures:

This section of the Health & Safety Plan, and the Hospital Route Figure, are to be posted at a prominent location on site. The Hospital Route Figure which has written directions is included on Page 24.

Yes	No	
☐	☒	On-site Communications Required? Emergency Channel: NA

Nearest Telephone: Field Staff Cell Phone

30. Fire and Explosion:

In the event of a fire or explosion, if the situation can be readily controlled with available resources without jeopardizing the health and safety of yourself, the public, or other site personnel, take immediate action to do so, otherwise:

1. Notify emergency personnel by calling 911.
2. If possible, isolate the fire to prevent spreading.
3. Evacuate the area and meet at the Designated Location.

31. Chemical Exposure:

Site workers must notify the site safety officer immediately in the event of any injury or any of the signs or symptoms of overexposure to hazardous substances identified in the following table.

Know Chemicals On-site	Symptoms	First Aid
1,1,1-Trichloroethane CAS No. 71-55-6	Irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]	Eye: Irrigate Immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
Trichloroethylene (TCE) CAS No. 79-01-6	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eye: Irrigate Immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
Tetrachloroethane (PCE) CAS No. 127-18-4	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, uncoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen] carcinogen]	Eye: Irrigate immediately; Skin: Soap wash promptly; Breath: Respiratory support; Swallow: Medical attention immediately
1,1-Dichloroethene CAS No. 75-35-4	Irritation skin; liver, kidney, [potential occupational carcinogen]	Skin: Soap wash immediately

Know Chemicals On-site	Symptoms	First Aid
1,1-Dichloroethane CAS No. 75-34-3	Irritation skin; central nervous system depression; liver, kidney, lung damage	Eye: Irrigate Immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
1,2-Dichloroethene CAS No. 540-59-0	Irritation eyes, respiratory system; central nervous system depression	Eye: Irrigate Immediately Breath: Respiratory support; Swallow: Medical attention immediately
Carbon Tetrachloride CAS No. 56-23-5	Irritation eyes, nose; central nervous system depression; liver, kidney damage; drowsiness; dizziness; incoordiantion [potential occupational carcinogen]	Eye: Irrigate Immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
Freon 113 CAS No. 76-13-1	Irritation skin, throat; drowsiness, dermatitis; cardiac arrhythmias; narcosis; central nervous system depression	Eye: Irrigate Immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
Benzene CAS No. 71-43-2	Irritation eyes, nose; respiratory system; headache; nausea, staggered gait; anorexia; lassitude; dermatitis; bone marrow depression [potential occupational carcinogen]	Eye: Irrigate Immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
Toluene CAS No. 108-88-3	Irritation eyes, nose; headache; nausea; lassitude; dermatitis; liver, kidney damage; drowsiness; muscle fatigue; insomnia; lacrimation; parasthesia; anxiety	Eye: Irrigate Immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
Ethylbenzene CAS No. 100-41-4	Irritation eyes, skin; dermatitis; mucous membrane; headache; narcosis, coma	Eye: Irrigate Immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately
Total Xylenes CAS No. 95-47-6	Irritation eyes, nose, throat; dizziness, excitement; drowsiness; incoordination; corneal vacuolization; nausea, staggered gait; anorexia; vomiting; abdominal pain; dermatitis	Eye: Irrigate Immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

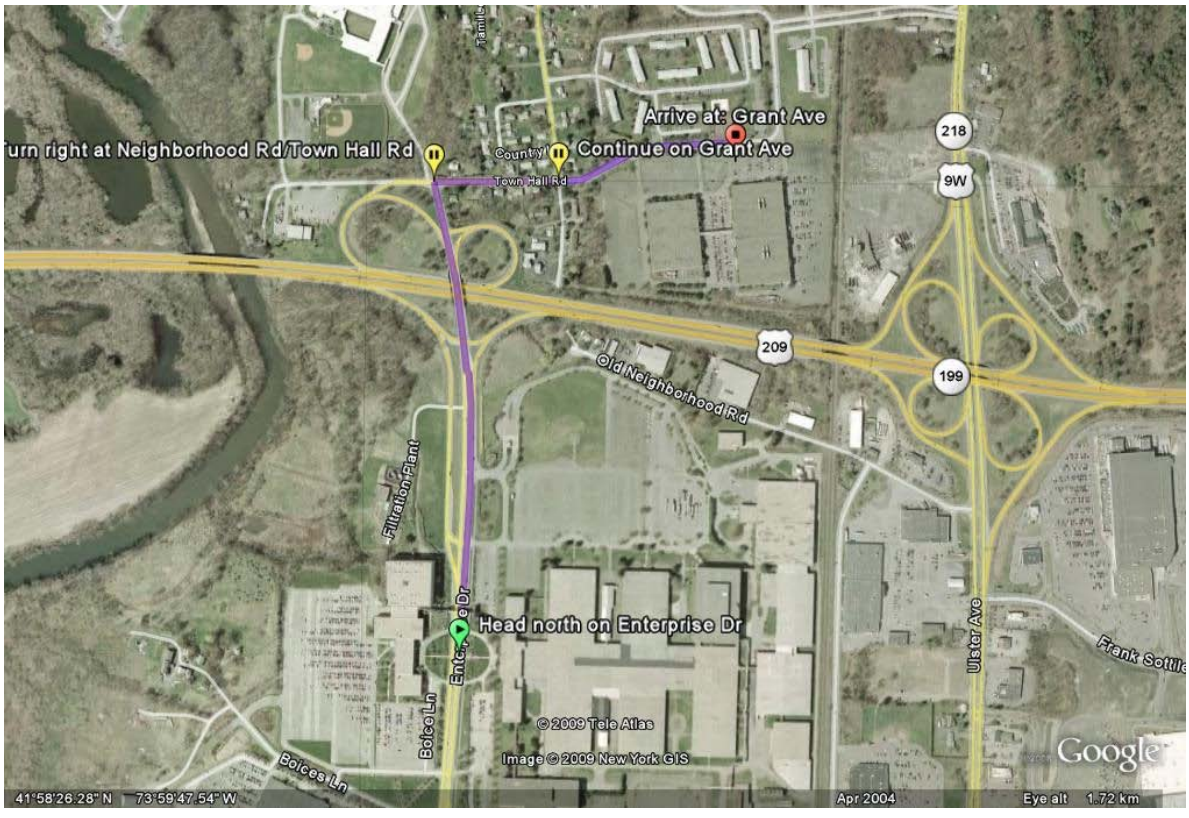
32. On Site Injury Or Illness:

In the event of an injury requiring more than minor first aid, or any employee reporting any sign or symptom of exposure to hazardous substances, immediately take the victim to **Kingston Hospital** located at **741 Grant Avenue, Lake Katrine, NY**, phone **(845)336-0526**. In the event of life-threatening or traumatic injury, implement appropriate first-aid and immediately call for emergency medical assistance at **911.**

The nearest designated trauma center is **Kingston Hospital** located at **741 Grant Avenue, Lake Katrine, NY**, phone **(845)336-0526**. Police assistance can also be reached at **911**.

Hospital Directions:

Start at **300 Enterprise Drive**, Kingston, New York. Turn **left** on Enterprise Drive, heading north. Turn **right** at Neighborhood Road / Town Hall Road. Neighborhood Road turns into Grant Avenue. Continue on Grant Ave. Arrive at **Kingston Hospital, 741 Grant Avenue**.



Personnel with First Aid/CPR Training (Names):

Daniel Gorman

Required Emergency Back-Up Equipment:

Fully-charged ABC Class fire extinguisher
First Aid Kit

Emergency Response Authority:

The Site Safety Officer is the designated site emergency coordinator and has final authority for first response to on-Site emergency situations. The Project Manager is the designated back-up Site emergency coordinator.

Upon arrival of the appropriate emergency response personnel, the Site emergency coordinator shall defer all authority but shall remain on the scene if necessary to provide any and all possible assistance. At the earliest opportunity, the Site Safety Officer or the site emergency coordinator shall contact the Project Manager or Health and Safety Officer.

Project Manager: **Anthony Savino** Phone (w) 973-645-1922
(cell) 845-216-9160

Health and Safety Officer: **Jim Valenti** Phone (w) 856-793-2005
(cell) 609-413-5474

33. Health & Safety Briefing

The following personnel were present at pre-job/daily safety briefing conducted at _____ (time) on _____ (date) at _____ (location), and have read the above plan and are familiar with its provisions:

Name	Signature

Fully charged ABC Class fire extinguisher available on site? ☐ YES

Fully stocked First Aid Kit available on site? ☐ YES

All project personnel advised of location of nearest phone? ☐ YES

All project personnel advised of location of designated medical facility or facilities? ☐ YES

Printed Name of Field Team Leader or Site Safety Officer

_____ _____

Signature Date

STANDARD WORK PRACTICES

SAMPLING CONTAMINATED SOIL/WASTE PILES

DEFINITIONS

Photo ionizing air monitoring instrument (PID): A direct reading air monitoring instrument equipped with an ultraviolet light source that ionizes organic vapors with ionization potentials less than that of the lamp.
Flame ionizing air monitoring instrument (FID): A direct reading air monitoring instrument equipped with a hydrogen flame that ionizes (through combustion) all combustible organic vapors.

KEY HAZARDS

- Chemical exposure via inhalation, skin contact or ingestion (See Chemical SWP).
- Heat or cold stress (See Inclement Weather SWP).
- Lightning and high winds.
- Drilling (See Drilling SWP).
- Motor vehicles.
- Slip, Trip and Fall.
- Electrical (See Electrical SWP).
- Excavations (See Excavation SWP).
- Working near or over water (See Working over water SWP).

Chemical Hazards

Sampling of contaminated soils involves obtaining representative samples from waste piles, beneath bodies of water, on level or sloped grounds and in excavations. Avoid any direct contact from contaminated soil with a skin surface or eyes. Air monitoring should be performed utilizing an intrinsically safe photo ionizing or flame ionizing instrument that can measure a minimum of 0.5 PPM organic vapor. Calibrate the air monitoring instrument daily as described in the literature provided. In general, total organic vapor readings of less than 1 PPM are safe. Steady breathing zone measurements at 1 PPM or above warrant engineering controls (ventilation) or personal protective equipment (respiratory protection) to reduce exposure; however, review of the site specific health and safety plan will aid in understanding the site-specific hazards. Concentrations in excavations that exceed 500 PPM could indicate a large quantity of organic vapor; not only toxicity risks but also a flammability risk. Soils with high organic vapor concentrations should be sampled carefully with attention paid to the types of tools used, since some tools may be or aid sources of ignition.
Maintain material safety data sheets (MSDS) or equivalent for all chemicals of concern at the site. Detailed chemical safety information can be found at www.osha.gov and www.cdc.gov/NIOSH.

Sampling in excavations and over water entail additional risks requiring the use of additional SWPs.

PRECAUTIONS

Sampling for contaminated soils or sludges often occurs at sites that are known hazardous waste sites or adjacent to those sites. Follow all local regulations in regards to working at such properties.

This project task commonly presents construction-related hazards such as trips, falls, and slips, and resulting injuries which are typical of undeveloped or industrial sites. In order to aid in preventing these types of hazards:

- Wear proper footwear including steel toes for earthwork.
- Wear long pants and long sleeve shirts.
- Clean boots and testing equipment as needed, since slips may result from mud on a hard surface.
- Avoid jumping across obstacles (i.e.: anchor trenches).
- Exercise caution while walking on improvised plank bridges across ditches or anchor trenches.
- Wear high visibility clothing (reflective vests) to aid motor vehicle operators in noticing your presence.

When traversing a site by foot or when operating a motor vehicle observe site traffic rules and right-of-way practices at all times. Heavy equipment and trucks should be assumed to have the right-of-way. Generally, the following rules apply to determining the right-of-way:

- The heavier piece of equipment has the right-of-way.
- Loaded trucks and equipment have precedence over unloaded ones.
- Equipment moving down slope has precedence over one going upslope.

MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard hat as required.
- Safety glasses.
- Respirator with appropriate cartridges as required.
- High visibility clothing (reflective vest).
- Steel-toed and shank safety boots.
- Nitrile (or equivalent) gloves.

TRAINING

- 10 hour OSHA Construction Training
- Golder and site specific induction
- Emergency and First Aid Course

SAMPLING CONTAMINATED GROUNDWATER

Photo ionizing air monitoring instrument – A direct reading air monitoring instrument equipped with an ultraviolet light source that ionizes organic vapours with ionization potentials less than that of the lamp.
Flame ionizing air monitoring instrument – A direct reading air monitoring instrument equipped with a hydrogen flame that ionizes (through combustion) all combustible organic vapours.

KEY HAZARDS

- Chemical exposure via inhalation, skin contact or ingestion (See Chemical SWP);
- Heat or cold stress (See Extreme Weather SWP);
- Lightning and high winds;
- Drilling (See Drilling SWP)
- Motor vehicles;
- Slip, Trip and Fall and
- Electrical (See Electrical SWP)
- Insect bites/stings
- Heavy lifting

Chemical Hazards

Groundwater sampling often involves the use of line operated pumps to extract water from the subsurface. Ensure that the generator utilized is equipped with ground fault interrupter (GFI) circuitry to prevent possible shock hazards. Collect development or purge water in containers as required for proper disposal. Protect the public and client staff from investigation derived waste (IDW) by utilizing secure areas for storage. If internal combustion engines are used (generators), they must be in an area with adequate ventilation, and in an area free of combustible materials (i.e. dry grass, gasoline, etc.).

Keep your face as far as possible from the opening of the well to avoid inhalation of volatile contaminants. Avoid any direct contact with a skin surface or eyes from ground water. Air monitoring should be performed utilizing a photo ionizing or flame ionizing instrument that can measure a minimum of 0.5 PPM organic vapour. Calibrate the air monitoring instrument daily as described in the literature provided. In general, total organic vapour readings of less than 1 PPM are safe. Steady breathing zone measurements at 1 PPM or above warrant engineering controls (ventilation) or personal protective equipment (respiratory protection) to reduce exposure. Concentrations in the well opening that exceed 500 PPM could indicate a large quantity of organic vapour, not only a toxicity risk but also a

flammability risk. Wells with high organic vapour concentrations should be sampled carefully with a minimum of ferrous tools or other sources of ignition.

Maintain material safety data sheets (MSDS) or equivalent for all chemicals of concern at the site including any chemicals required as part of the sampling program (i.e. calibration gas, sample preservatives, etc.). Detailed chemical safety information can be found at www.osha.gov and www.cdc.gov/NIOSH

PRECAUTIONS

Sampling for contaminated groundwater often occurs at sites that are known hazardous wastes or adjacent to those sites. Follow all local regulations in regards to working at such properties.

This project presents construction related hazards such as trips, falls, and slips, and resulting injuries which are typical of undeveloped or industrial sites.

- Wear proper footwear including steel toes for earthwork
- Clean boots and testing equipment, since slips may result from mud on a hard surface.
- Avoid jumping across obstacles (ie: anchor trenches).
- Exercise caution while walking on improvised plank bridges across ditches or anchor trenches.

Observe site traffic rules and right-of-way practices at all times. Heavy equipment and trucks should be assumed to have the right-of-way. Generally, the following rules apply to determining the right-of-way:

- The heavier piece of equipment has the right-of-way.
- Loaded trucks and equipment have precedence over unloaded ones.
- Equipment moving down slope has precedence over one going upslope.

Other general site vehicle operation rules are as follows:

- Observe speed limits within the site which usually do not exceed 15 miles per hour;
- Do not follow another vehicle closely; material may fall off the vehicle or be thrown by the tires when in motion;
- Large equipment may have a significant “blind spot” on the right side of the vehicle. Avoid passing heavy equipment unless specifically instructed to do so by the operator of that equipment. Assume the equipment operator does not know you are present in an area and maneuver accordingly;
- Listen for and heed back-up alarms from heavy equipment;
- When possible, make eye contact with equipment operators;
- Park the company vehicle near the work location to mark your presence in the area. Wear high visibility clothing (reflective vests) to aid the operator in noticing your presence. Use extreme caution when operating in dusty conditions. Drive with your headlights on to increase your visibility. If conditions become dusty and significantly reduce visibility across the site, leave the area and wait for conditions to improve and contact the Golder Project Manager.

- Do not ride on the contractor's equipment, and do not attempt to operate any such equipment.
- Do not ride on anything that does not have a seat designed for human occupancy.
- Wear your seatbelt at all times.

Because monitoring wells may provide habitat for insects such as bees, spiders and wasps, caution should be take when initially opening the well. When opening the well protective cover, open the cover and stand back for a few minutes to allow any flying insects an opportunity to leave. Prior to removing the well cap, inspect the inside of the protective casing to make sure no inhabitants of the well are present.

MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard hat as required
- Safety glasses
- Respirator with appropriate cartridges as required.
- High visibility clothing (reflective vest)
- Steel-toed and shank safety boots
- Nitrile (or equivalent) gloves

TRAINING

- 40 hour HAZWOPER or equivalent local requirement (8 hour annual refresher required)
- Golder and site specific induction
- Emergency and First Aid Course

HEAT STRESS

Employees may experience heat stress due to a combination of elevated ambient temperatures and the concurrent use of personal protection equipment; this depends in part on the location of the site, the type of work, and the time of year. The project manager (PM) should consider the need to monitor heat stress during the project planning stage. The Site Safety Officer (SSO) and/or field staff will evaluate heat stress using the techniques specified below whenever the ambient temperature exceeds 21^{o}C or 70^{o}F.

HEAT STRESS RELATED PROBLEMS

- **Heat Rash** - caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat, as well as being a nuisance;
- **Heat Cramps** - caused by profuse perspiration with inadequate fluid intake and chemical replacement. Signs: muscle spasms and pain in the extremities and abdomen;
- **Heat Exhaustion** - caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool, moist skin; profuse sweating; dizziness, and lassitude. If symptoms occur, the employee should leave the work area and proceed to the nearest air-conditioned location, drinks liquids such as water or Gatorade, and rest until the symptoms pass. Contact the Golder PM immediately; and
- **Heat Stroke** - the most severe form of heat stress. Body must be cooled immediately to prevent severe injury and/or death. Signs: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma. Medical help must be obtained immediately. If heat stroke is suspected, implement emergency response plan. Remove excess clothing and cool the person by sponging with cool or luke warm water. Never place ice on the person or throw water on the individual. Contact the Golder Project Manager as soon as time permits.

HEAT STRESS MANAGEMENT

Heat Stress Monitoring

The American Conference of Governmental Industrial Hygienists (1992) states that workers should not be permitted to work when their deep body temperature exceeds 38°C (100.4°F).

For strenuous field activities that are part of ongoing site work activities in hot weather, the following procedures shall be used to monitor the body's physiological response to heat, and to monitor the work cycle of each site worker. There are two phases to this monitoring: initial work/rest cycle determination and physiological monitoring. The initial work/rest cycle is used to estimate how long the first work shifts of the day should be. Heart rate monitoring of each worker will establish the length of the successive work periods.

Determination of Initial work/Rest Cycles

Measure the air temperature with a standard thermometer. Estimate the fraction of sunshine by judging what percent the sun is out: 100% sunshine - no cloud cover = 1.0; 50 % sunshine and 50% cloud cover = 0.5; 0% sunshine = full cloud cover = 0.0.

Plug these variable into the following equation to determine the adjusted temperature:
T (^{o}C, adjusted) = T (^{o}C, actual) + (7.2 x fraction sunshine)

Use the chart below to determine the length of the first work shift. At the first break, initiate the heart rate monitoring as described in the next section.

ADJUSTED TEMPERATURE	NORMAL WORK CLOTHING	IMPERMEABLE CLOTHING
21° - 25°C (70-77°F)	150 Minutes	120 Minutes
25° - 28°C (77-82°F)	120 Minutes	90 Minutes
28° - 31°C (82-88°F)	90 Minutes	60 Minutes
31° - 32°C (88-90°F)	60 Minutes	30 Minutes
>32°C (>90°F)	45 Minutes	15 Minutes

Heart Rate Monitoring

Heart rate (HR) should be measured by radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33 percent while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work period should be further shortened by 33 percent while the length of the rest period stays the same.

Heat Stress Prevention

The best approach is preventive heat stress management. In general:

- have workers drink additional water before beginning work;
- provide disposable cups of water that is maintained at 10 to 16°C (50 to 60 °F);
- urge workers to drink one to two cups of water every 20 minutes or at each rest break for a total of four to eight litres per day;
- provide a cool, preferably air-conditioned area for rest breaks;
- discourage the drinking of alcohol at night and discourage the intake of coffee during working hours;
- monitor for signs of heat stress;
- acclimatise workers to site work conditions by slowly increasing workloads, ie., do not begin site work activities with extremely demanding activities; and
- Reschedule your work hours so that you are not working in the heat of the day between 10 am and 2 pm.

Sun Protection

- Employees are encouraged to maximize use of the shade provided by trees, buildings and other structures. Where there is limited access to natural shade, fixed or portable shade structures may be used and will be provided where practical.
- Rotate your work with others between indoor/shaded areas and outdoor/exposed locations to minimize time spent in the sun.
- The selection of appropriate protective clothing will take into account both the need to block out UV and the need to reduce the effects of heat.
- It is recommended that Golder employees tight woven clothing which has a minimum UPF of at least 30. Clothing should be lightweight, loose fitting and have a collar to assist with keeping cool.

- Hats provide shade and the bigger the brim the greater the amount of shade that is provided. Hats should be made of close-weave material and have a wide brim or be legionnaire-style. In circumstances where the wearing of a broad-brimmed hat causes difficulties due to their size sunscreen and other protective measures should be used instead.
- Safety glasses will be supplied to protect the eyes from effects of UV radiation and potential eye injuries from flying objects, dust or chemical splashes. Safety glasses complying with **ANSI Z87.1-2003** are recommended.
- Sunscreen does not offer complete protection and should always be used in conjunction with other protection such as protective clothing. Broad spectrum and water-resistant sunscreen with a sun protection factor (SPF) of 30+ should be used.
- Staff using sunscreen are encouraged to regularly check use by dates to ensure sunscreen is not out of date.
- Sunscreen will be placed in an easily accessible location and employees instructed in correct application and use. Sunscreen should be generously applied to all areas of exposed skin at least twenty minutes before going outside and should be reapplied at least every two hours.

COLD ENVIRONMENT – COLD STRESS

In a cold environment, body heat must be conserved to maintain the core temperature at normal levels and to ensure an adequate blood flow to the brain and extremities. Feelings of cold and discomfort should not be ignored, since these may be early warning signals. The effects of cold are such that problems can occur before the worker is aware of them, and furthermore, over-exposure to cold may affect judgment.

MAIN FACTORS INVOLVED IN CAUSING COLD STRESS

- Temperature
- Humidity
- Movement of air
- Radiant temperature of the surroundings
- Clothing/physical activity

COLD STRESS RELATED PROBLEMS

- **Frostbite** is a condition in which the skin and underlying tissues freeze. Usually affects fingers, hands, toes, feet, ears and nose.
- **Hypothermia** is a condition in which a person's body temperature falls below 95^0 F or 35 degrees Centigrade. Hypothermia occurs when more heat is lost from the body than the body can produce. It usually happens when a person is exposed to extremely cold temperatures but it can occur even at moderate temperatures. It does not have to be freezing outside for a person to become hypothermic. For example, falling into cold water or wearing wet clothing in cold weather can bring on hypothermia. Failing to wear a hat in cold weather can also lead to hypothermia, since a large amount of body heat escapes from the head. Extreme fatigue, hunger or lack of fluids can also lead to hypothermia. As well, excessive wind can increase the amount of heat lost and cause hypothermia.

FROSTBITE MANAGEMENT

- Move person to a warm dry area. Don't leave the person alone.
- Minimize walking on frozen feet.
- Do not apply any lotions or ointments to frozen skin.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- **DO NOT** rub the affected area, because rubbing causes damage to the skin and tissue.
- **Gently** place the affected are in a warm (105ºF) water bath and monitor the water temperature to slowly warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. NOTE: If there is a chance the affected are may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible and contact the Site Safety Officer.

HYPOTHERMIA MANAGEMENT

The most obvious sign of hypothermia is a low core body temperature. The person with hypothermia may not realize that his or her prolonged exposure to cold requires emergency medical care. Other signs and symptoms include:

- apathy or loss of interest in surroundings
- lethargy or difficulty moving
- confusion
- drowsiness
- loss of coordination
- cold skin
- shock caused by decreased blood flow
- slurred speech
- uncontrollable shivering
- weakness

If a person is suspected of suffering from hypothermia, contact the Site Safety Officer, and apply first aid.

What should be done (land):

- Move the person to a warm, dry area. Don't leave the person alone. Remove any wet clothing and replace with warm, drying clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. **Avoid** drinks with caffeine (coffee, tea or hot chocolate) or alcohol.
- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck and head areas. **DO NOT** rub the person's body or place them in a warm bath. This may stop their heart.

What should be done (water):

- **DO NOT** remove any clothing. Button, buckle, zip and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.
- Get out of the water as quickly as possible or climb on anything floating. **DO NOT** attempt to swim unless a floating object technical water rescue can be reached because swimming or other physical activity uses the body's heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

PRECAUTIONS

- Use the buddy system.

- Recognize the environment and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the sign and symptoms of cold induced illnesses/injuries and what to do to help the worker.
- Dress appropriately for expected weather conditions. Dress in a minimum of three layers (a skin layer to absorb moisture and keep the skin dry, an insulating layer, and an outer protective layer), wear a hat and gloves, in addition to underwear that will keep water away from the skin.
- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Eat warm, high calorie foods like hot pasta dishes.
- Avoid vasodilators, which allow the body to lose heat faster - which can accelerate hypothermia. These include alcohol and drugs;
- Avoid vasoconstrictors, including tobacco products, which constrict blood vessels and can accelerate the onset of frostbite;
- Avoid touching cold metal with bare skin; and
- Keep active.

SLIPS, TRIPS AND FALLS

Over half of all office injuries are the result of falls. The majority of falls occur on slippery, uneven, defective, cluttered or obstructed walking surfaces. A significant number of debilitating falls are the result of a person falling out of his or her own chair, typically while in the process of sitting down, or leaning back. Falls from elevations while reaching for an overhead object are also common, and frequently cause severe injuries.

PRECAUTIONS WHEN IN THE OFFICE - HOUSEKEEPING

- Watch your step! Wipe up spilled liquids immediately. Tripping hazards such as defective floors, missing floor tiles, loose or matted carpeting, bunched-up floor mats, extension cords, phone cords, etc., should be corrected or reported and repaired immediately. Don't carry loads that are so large or bulky that the line of vision is impaired.
- Be careful when sitting down. Sitting on the edge of a seat, sitting too far back, or kicking the chair out from under one's self can result in a fall and fractured vertebrae. Occasionally check the mechanical condition of chairs commonly used.
- Be especially careful going up and down stairs. Avoid using stairs if both arms are loaded. Watch your step and if possible always have one hand free to use a railing. Maintain 3 points of contact when ascending/descending.

PRECAUTIONS WHEN OUT IN THE FIELD

In the field, falls are the second leading cause of work-related deaths.

TYPES OF FALLS

Falls are of two basic types: elevated falls and same-level falls. Same-level falls are most frequent, but elevated falls are more severe.

- Same-Level Falls: high frequency--low severity
- Elevated Falls: lower frequency--high severity

Same-level falls are generally slips or trips. Injury results when the individual hits a walking or working surface or strikes some other object during the fall. Over 60 percent of elevated falls are from less than 10 feet.

SAME-LEVEL FALLS

Examples of same-level falls are described below.

SLIP AND FALL

Slips are primarily caused by a slippery surface and compounded by wearing the wrong footwear. In normal walking, two types of slips occur. The first of these occurs as the heel of the forward foot contacts the walking surface. Then, the front foot slips forward, and the person falls backward.

The second type of fall occurs when the rear foot slips backward. The force to move forward is on the sole of the rear foot. As the rear heal is lifted and the force moves forward to the front of the sole, the foot slips back and the person falls.

The force that allows you to walk without slipping is commonly referred to as "traction." Common experience shows that dry concrete sidewalks have good traction, while icy surfaces or freshly waxed floors can have low traction. Technically, traction is measured as the "coefficient of friction." A higher coefficient of friction means more friction, and therefore more traction. The coefficient of friction depends on two things: the quality of both the walking surface and the soles of your shoes.

To prevent slips and falls, a high coefficient of friction (COF) between the shoe and walking surface is needed. On icy, wet, and oily surfaces, the COF can be as low as 0.10 with shoes that are not slip resistant. A COF of 0.40 to 0.50 or more is needed for excellent traction. To put these figures in perspective, a brushed concrete surface and a rubber heel will often show a COF greater than 1.0. Leather soles on a wet smooth surface, such as ceramic tile or ice, may have a COF as low as 0.10.

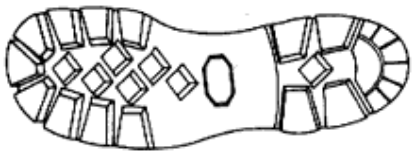


Figure 1. Shoes with soft rubber soles and heels with rubber cleats provide a high coefficient of friction (COF).

Providing dry walking and working surfaces and slip-resistant footwear are the answer to slips and their resultant falls and injuries. Obviously, high heels, with minimal heel-to-surface contact, taps on heels, and shoes with leather or other hard, smooth-surfaced soles lead to slips, falls, and injuries. Shoes with rubber-cleated, soft soles and heels provide a high COF and are recommended for most agricultural work.

In work areas where the walking and working surface is likely to be slippery, non-skid strips or floor coatings should be used. Since a COF of 0.40 to 0.50 is preferred for walking and working surfaces, we should strive for a surface which provides a minimum of 50 percent of this friction. If the working surface is very slippery, no footwear will provide a safe COF.

Trip and Fall Trips occur when the front foot strikes an object and is suddenly stopped. The upper body is then thrown forward, and a fall occurs.

As little as a 3/8" rise in a walkway can cause a person to "stub" his toe resulting in a trip and fall. The same thing can happen going up a flight of stairs: only a slight difference in the height of subsequent steps and a person can trip and fall.

CONTRIBUTING FACTORS

Proper housekeeping in work and walking areas can contribute to safety and the prevention of falls. Not only is it important to maintain a safe working environment and walking surface, these areas must also be kept free of obstacles which can cause slips and trips. One method which promotes good housekeeping in work environments is the painting of yellow lines to identify working and walking areas. These areas should never be obstructed by objects of any kind.

Adequate lighting to ensure proper vision is also important in the prevention of slips and falls. Moving from light to dark areas, or vice versa, can cause temporary vision problems that might be just enough to cause a person to slip on an oil spill or trip over a misplaced object.

Carrying an oversized object can also obstruct one's vision and result in a slip or a trip. This is a particularly serious problem on stairs.

BEHAVIORS THAT LEAD TO FALLS

In addition to wearing the wrong footwear, there are specific behaviors which can lead to slips, trips, and falls. Walking too fast or running can cause major problems. In normal walking, the most force is exerted when the heel strikes the ground, but in fast walking or running, one lands harder on the heel of the front foot and pushes harder off the sole of the rear foot; thus, a greater COF is required to prevent slips and falls. Rapid changes in direction create a similar problem.

Other problems that can lead to slips, trips and falls are: distractions; not watching where one is going; carrying materials which obstruct view; wearing sunglasses in low-light areas; and failure to use handrails. These and other behaviors, caused by lack of knowledge, impatience, or bad habits developed from past experiences, can lead to falls, injuries, or even death.

WORKING AROUND HEAVY EQUIPMENT

The following safety protocol is intended for persons visiting sites that employ the use of heavy equipment. Such sites include surface and underground mines, remediation areas and construction sites. Heavy equipment activity may change daily or hourly, with differing potential hazards to be identified and addressed.

KEY HAZARDS

- Haulage trucks and dump trucks
- Shovels and Draglines
- Excavators
- Bulldozers
- Mobile Drill rigs
- Cranes
- Other mobile equipment, such as water trucks, graders, and pick-up trucks

One of the most important points to remember about working around any piece of heavy equipment is that the operator has a limited field of vision. Always make eye contact with the operator of the equipment prior to moving into swing/operating radius.

PRECAUTIONS

- Make arrangements / discuss protocols with operator during daily tailgate or at shift change or when operators and/or operations change.
- Never approach an operational piece of heavy equipment until the operator is aware of your presence, your desire to approach and signals the OK – where possible use radio contact.
- Stand in a safe location well outside the maximum extended reach of the shovel, dragline or excavator arm, and out of the way of other mobile equipment. With an excavator, the optimum location is within the quadrant of the operator's visual coverage.
- When contact is made, either radio or visual, advise the operator of your wish to approach the equipment. The operator may want to complete a task prior to shutting down. If so, remain at the same location until the operator signals the OK to advance. Usually this will involve the bucket being lowered to the floor, however practices may vary between sites. It is advisable to check with the site superintendent/foreman before entering areas where heavy equipment is operating.
- Advise the operator of your task and requirements. Complete your task, advise the operator that you have completed your work, and depart the work area.

SAFE DRIVING PRACTICES

- All pieces of haulage equipment and large mobile equipment will have the right of way on all roadways. All other equipment will give way and will keep a safe distance until the roadway is

cleared.

- In areas of traffic congestion and narrow travel-ways, the smallest vehicle shall always yield to larger vehicles.
- When following heavy equipment, a safe travelling distance should be maintained at all times. The driver's side mirror should always be visible to you, and hence you to the operator.
- On the majority of operating surface mines, all traffic travels on the left-hand side of the road. However practices may vary between sites. Check with the site superintendent/foreman before travelling on site roadways.
- Overtaking haulage trucks and dump trucks should be done only when told to by the operator of the truck. Visual and/or radio contact must be made with the operator.

RESPONSIBILITIES

It is your responsibility to understand the traffic and equipment operating rules of the site. Ask the site superintendent/foreman for this information upon entering the site for the first time. This information should be reviewed during daily tailgate meetings.

MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard Hat
- Safety Boots
- High Visibility Vest
- Hearing Protection
- Safety Glasses

DRILLING

Drilling techniques include auger, rotary, percussion, and sonic which all have high-speed rotating and moving components which require caution to avoid injury when working.

Drilling can be safely undertaken in all types of terrain and in all types of conditions, if proper precautions are taken. Because of the variety of situations staff may experience, it is important to recognize and be aware of potential hazards associated with this operation.

KEY HAZARDS

- Impact by moving equipment;
- Encountering subsurface utilities;
- Mast contact with overhead wires;
- Traversing uneven ground to drill, document and sample:
- Clothing, fingers or other body parts caught in high speed and high torque rotating equipment.
- Noise generated by the equipment or surroundings
- Dust generated by equipment

PRECAUTIONS

Before Drilling:

- Inform staff of the emergency shut-off switch on the rig and have the driller test it daily.
- Get as much site-specific information as possible concerning ground conditions and surface obstructions. Ask the Project Manager and, if possible, the Client or Client Contact.
- Use available soils information (i.e., previous reports, US Geological Survey Surficial Geology Maps, colleagues who have had experience in the area) to ascertain potential subsurface conditions.
- Each drilling location should be inspected by the GAI field leader and subcontractor supervisor and approved as safe for drilling. Consider access requirements, and look for evidence of underground services (i.e., buried utility lines, wire, conduits, tanks, service boxes, plugs, exposed pipe, trenches, etc.), and locate the boreholes accordingly (see Test Pit).
- Always utilize state, local, or 811 utility location services to get clearance to proceed at each drilling location. Plan at least 48 hours in advance prior to scheduled work.
- Look for surface and overhead features that may represent a hazard. Overhead power lines are a major concern and must be avoided or de-energized. Even without direct contact, electricity can arc from the power lines to another object (see Test Pit)
- Do not pile drill spoil such that it could endanger workers (see Test Pit)
- Drill rigs should not be operated within 12 feet of lines less than 132 KV; within 20 feet of lines 132 to 330 KV; or within 26 feet of lines greater than 330 KV.
- Drill rig should not be moved from one location to the next with the mast raised.
- Drill rig equipment should be safety inspected by the subcontractor on a daily basis dependent on specific use, field conditions, and manufacturer's recommendations.

During Drilling

- Identify a safe viewing area where you can observe the drilling operations, but not so close that you are either in danger of being struck by the equipment swinging from wirelines or winch cables.
- Always make sure you have a route of escape, should things go wrong. Be aware of wind direction and consider escaping upwind if subsurface contaminants are involved
- Make sure the drill crew knows where you are **at all times**.
- Approach the drill rig during times when it is safest to do so. If necessary, signal the operator first and make sure the equipment is stopped before you approach.
- Avoid the temptation to act as the driller's helper. Do not handle heavy rods or equipment. Remember that the drilling contractor is responsible for providing the necessary drilling equipment and personnel who are trained in its safe use. This also includes traffic control needs, unless otherwise specifically indicated by GAI project manager (i.e. for road drilling where GAI provided the necessary traffic control.)
- Know where everyone is at all times;
- Never use gasoline or any other combustible solvent as a cleaning agent. It is a fire and explosion hazard;
- Use a personal fall arrest system while working at any height above 5 feet on the mast or on top of the rig;
- Do not perform maintenance while the rig is running;
- Do not remove any blocking or jacks from under rig while the rig is drilling;
- Stand clear of cables as much as possible while pulling pipe or while the rig is under a heavy strain;
- When racking drill rods for rotary drilling/sampling, the total length of rods racked shall not be more than 1.5 times the height of the mast;
- Do not wear loose clothing or jewelry around moving machinery;
- Be on guard for pinch and shear hazards for fingers and toes--especially around the drill string;
- Practice good housekeeping--keep excess spoil material and unnecessary equipment well out of the way;
- When jumping batteries during cold weather starting, be sure of terminal connections. Connect the positive terminal first, then the negative terminal. Batteries can explode, spraying acid to eyes and skin; wear protective goggles and clothing;
- Communicate effectively; if using hand signals, make sure everyone knows what they are;
- Know where fire extinguisher(s) are and how to use them. Check the charge condition before the start of project activities, and periodically thereafter;
- All hoses carrying high pressure air or fluids should have safety chains or cables at connectors;
- Lighting on the site or rig shall be properly installed and sufficient in quantity to provide adequate illumination for night work. All receptacles shall be protected with a ground fault circuit interrupter (GFCI);
- Weight indicators should be standard equipment;
- All hooks shall have safety latches and be checked between borings;
- Do not ride on hook ropes or other traveling lines on rig;
- Keep walkways clear;

- Using a properly calibrated real-time air quality instrumentation,, monitor for suspected airborne gas hazards (combustible and/or toxic as applicable);
- Ear protection must be worn by employees working in close proximity to equipment that generates noise (85 dB(A) or greater);
- Wear required respiratory protective equipment when hazards from toxic chemicals are suspected (See Respiratory Protection);
- Observe proper lifting techniques;
- Fuel tanks should be properly installed according to local fire codes with appropriate secondary contaminant;
- Wastewater and drilling fluids must be properly diverted or contained;
- Containerize drilling spoils and fluids suspected to be contaminated as required by environmental regulatory requirements;
- Protect the public by use of proper barricades, ramps over pipes, warning signs and guard rails;
- Use caution during welding activities, remain at a safe distance and do not look directly at the welding arc. The drillers will need to wear welding goggles and gloves; properly ground arc-welding equipment; properly vent PVC solvent glue vapors from installed well casings before cutting or welding the casings; and
- Have a first-aid safety kit handy.

After Drilling

- Properly decontaminate all drilling equipment, as required, before leaving. This includes drilling tools, pipe, pumping equipment, and mud-pits, in addition to the drill rig and drill string;
- Never leave a borehole open for an extended period. Always backfill and compact the near surface soil after you have completed sampling, any instrumentation installation(s) and documentation activities. Open drill holes represent a potential hazard to yourself and others.
- Clean up waste materials from drilling operations, such as discarded containers, hoses, damaged tools or blocking, and wasted pipe and casing, etc. Dispose of properly.

MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard Hat
- Steel Toe Safety Boots
- High Visibility Vest
- Hearing Protection
- Safety Glasses
- Close fitting clothing
- Dust Mask (Respirator if required)
- Gloves

TRAINING

- OSHA 10 hour Construction Safety course
- First Aid and CPR courses

APPLICABLE OSHA REGULATION PARTS

The following are the major OSHA standards impacted by this work: 29 CFR 1926

- .21 Safety Training
- .23 First Aid
- .52 Noise Exposure
- .59 Hazard Communication
- .96 Foot Protection
- .100 Head Protection
- .101 Hearing Protection
- .102 Eye and Face Protection
- .103 Respiratory Protection
- .351 Arc Welding
- .403 General Electrical
- .404 Wiring
- .500-503 Fall Protection
- .601 Motor Vehicles
- Subpart Z – Toxic and Hazardous Substances