ARCADIS Design & Consultancy for natural and built assets

Respondents to Administrative Order on Consent for Remedial Design

PRE-DESIGN INVESTIGATION WORK PLAN

Lower Ley Creek Sub-site

Operable Unit 25 of the Onondaga Lake Superfund Site

City of Syracuse/Town of Salina

Onondaga County, New York

December 2016

PRE-DESIGN INVESTIGATION WORK PLAN

Lower Ley Creek Sub-site
Operable Unit 25 of the Onondaga Lake Superfund Site
City of Syracuse/Town of Salina
Onondaga County, New York

Prepared for:

Respondents to Administrative Order on Consent for Remedial Design

Prepared by:

Arcadis of New York, Inc.
6723 Towpath Road
P.O. Box 66
Syracuse
New York 13214-0066
Tel 315 446 9120
Fax 315 449 0017

Our Ref.:

B0035101.0001

Date:

December 2016

Mark O. Gravelding
Project Coordinator

Todd Cridge
Project Manager

CONTENTS

TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

ASTM	ASTM International
BEHI	bank erosion hazard index
BNA	Base/neutral/acid organic compounds
EA	EA Science and Technology
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
ft	feet
GM	General Motors
GPS	global positioning system
HEC-RAS	Hydrologic Engineering Centers River Analysis System
IFG	Inland Fisher Guide
mg/kg	milligram per kilogram
NPL	National Priorities List
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDI	Pre-Design Investigation
ppm	parts per million
PRG	preliminary remediation goal
RCRA	Resource Conservation and Recovery Act
RI	Remediation Investigation
ROD	Record of Decision
SEL	Severe Effect Level
SERAS	Scientific, Engineering, and Analytical Services
SPT	standard penetration testing
SVOC	semi-volatile organic compound
TCLP	toxicity characteristic leaching procedure
TSCA	Toxic Substances Control Act

USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
µg/L	micrograms per liter

1 INTRODUCTION

This Pre-Design Investigation (PDI) Work Plan, prepared on behalf of the Respondents to Administrative Order on Consent (AOC) for Remedial Design (Respondents), describes the approach for sampling and data collection activities to support the remedial design of the selected remedy for the Lower Ley Creek Sub-site (the Sub-site) of the Onondaga Lake Superfund Site pursuant to the United States Environmental Protection Agency (USEPA) Record of Decision dated September 2016 (ROD, USEPA 2014). The Sub-site (Superfund Site Identification Number: NYD986913580) is located in Onondaga County, New York within the City of Syracuse and the Town of Salina (see Figure 1-1). As illustrated on Figure 1-2, the Sub-site consists of the lower 2 miles of Lower Ley Creek and adjacent upland soil areas between the State Route 11 Bridge and Onondaga Lake as well as the Old Ley Creek Channel, which is a remnant of the Creek located near the upstream-most portion of the Sub-site adjacent to the Town of Salina Landfill.

1.1 Description of the Selected Remedy

The selected remedy for the Sub-site, as presented in USEPA ROD, is primarily based on the presence of poly-chlorinated biphenyls (PCBs) in Ley Creek sediments and soils. The remedy involves excavating impacted sediment from Lower Ley Creek between the Route 11 Bridge and I-81 as well as from the Old Ley Creek Channel and soils associated with former dredge spoil deposits in the floodplains and the Old Ley Creek Channel area. The selected remedy includes the following components:

- Excavating an estimated 75,000 cubic yards (cy) of impacted soils located on the northern and southern banks of Lower Ley Creek;
- Excavating an estimated 12,000 cy of impacted sediment from the wetland area;
- Excavating an estimated 73,000 cy of impacted sediment from Lower Ley Creek;
- Capping soils that cannot be safely excavated due to existing oil and natural gas pipelines that run along the north bank of Lower Ley Creek;
- Capping sediments under the Route 11 bridge if necessary in order to protect the structural integrity of the bridge;
- Capping sediments that cannot be safely excavated due to the existing gas pipeline which crosses the Creek;
- Transporting excavated soils and sediments containing PCB concentrations greater than 50 milligrams per kilogram (mg/kg) to a Toxic Substances Control Act (TSCA) compliant facility;
- Transporting any excavated soils and sediments that fail toxicity characteristic leaching procedure (TCLP) testing, are determined to be characteristic hazardous waste, and are non-TSCA waste (i.e., PCB concentrations less than 50 mg/kg) to an off-site Resource Conservation and Recovery Act- (RCRA) compliant facility;
- Transporting excavated soils and sediments that are not TSCA-regulated (i.e., PCB concentrations less than 50 mg/kg) and are not characteristic hazardous waste to a local disposal facility, if available/feasible;

- Restoring excavated areas with clean substrate and vegetation consistent with an approved habitat restoration plan to be developed as part of the remedial design;
- Developing a Site Management Plan (SMP) that will provide for the proper management of all post-construction remedy components; and
- Implementing institutional controls in the form of an environmental easement/restrictive covenant to restrict intrusive activities in areas where contamination remains (including areas where municipal refuse was disposed of) unless the activities are in accordance with a USEPA-approved SMP.

The ROD specified removal areas are illustrated on Figures 1-3a through 1-3c.

1.2 Work Plan Organization

Before the remedy described in the ROD can be implemented, and in accordance with the AOC, and the associated Statement of Work (SOW) entered into by USEPA and the Respondents effective July 18, 2016 (Index No. 02-2016-2014), additional information and Sub-site related data will be collected as part of a remedy specific PDI program. This PDI Work Plan describes the tasks related to the development of Sub-site specific data and field observations sufficient to proceed with the remedial design process. The remainder of this PDI Work Plan is organized as follows.

- Section 2 presents a summary of the background and history of the Sub-site, including a summary of previous investigations at the Sub-site and related existing data, and a description of data gaps.
- Section 3 describes the PDI activities to be implemented.
- Section 4 describes treatability study activities to be implemented in conjunction with the remedial design.
- Section 5 describes the reporting requirements for the PDI.
- Section 6 presents the anticipated schedule for implementing the PDI.
- Section 7 presents the documents referenced in this PDI Work Plan.

In addition this PDI Work Plan provides a Field Sampling Plan (FSP) that documents the standard operations and field practices to be employed during the performance of field investigations; a Quality Assurance Project Plan (QAPP) outlining the laboratory analytical procedures and standards to be used for collected field samples; and a Health and Safety Plan (HASP) that details the health and safety principles and protocols to be followed in the performance of the field activities described herein; and an Emergency Response Plan (ERP) that documents the appropriate planned responses to various environmental or weather emergencies that may be encountered during the performance of field activities.

2 SITE BACKGROUND AND HISTORY

2.1 Sub-site Description

The Sub-site is designated as Operable Unit (OU) 25 of the Onondaga Lake Superfund Site, which was listed on the National Priorities List (NPL) on December 16, 1994. The Sub-site is located within the urbanized area of eastern Syracuse, New York (see Figure 1-2). The Sub-site consists of the lower two miles of Lower Ley Creek between the State Route 11 Bridge and Onondaga Lake. The Sub-site also includes a 3.7-acre wetland situated on the southern bank of the Creek adjacent to the Cooper Crouse-Hinds North Landfill and the Old Ley Creek Channel, which was an original section of the Creek before Ley Creek was widened and reconfigured during a flood control project in the 1970s. In addition, the Sub-site includes several sections along the banks of the Creek where dredged contaminated sediments were placed during the flood control project.

The Sub-site is located within an area zoned as an Industrial District. It is bordered by parking lots, the Town of Salina and Cooper Crouse-Hinds North landfills, other historically landfilled areas, manufacturing operations, several undeveloped properties, and a railroad line. An underground natural gas pipeline owned by National Grid and an underground oil pipeline owned by Buckeye Pipeline Company run parallel to the northern bank of the Creek for much of this section.

Lower Ley Creek passes under bridges along State Route 11, 7th North Street, and Interstate 81. Bear Trap Creek enters Lower Ley Creek upstream of 7th North Street. The Lower Ley Creek channel is well defined and the banks of Lower Ley Creek are near vertical in many areas. The bottom of the stream is dominated by soft sediment with little stone or other hard surfaces. Much of the stream is shallow, but water may be 14 feet (ft) deep in certain sections, particularly downstream of the 7th North Street Bridge. In general, Lower Ley Creek is narrower and shallower upstream of the 7th North Street Bridge, and wider and deeper downstream of the 7th North Street Bridge. The immediate banks of the stream are bordered predominantly by herbaceous vegetation. Some woody shrubs are also mixed in with herbaceous vegetation and sections of the bank are wooded. Beyond the narrow strip of vegetation, Lower Ley Creek is surrounded by industrial operations, parking lots, landfills, and railroad tracks.

A New York State-regulated freshwater wetland is present on both sides of Lower Ley Creek downstream of 7th North Street. Some of the designated wetland area located on either side of Lower Ley Creek was historically filled with municipal refuse or was developed. The identified wetland area and other site features are illustrated on Figure 2-1a through 2-1c.

2.2 Site History

The Onondaga Lake Superfund Site includes the lake itself, seven major and other minor tributaries, and various upland areas identified as sources of contamination. Assessments were performed or are currently being performed at a number of potential sub-sites in the general area to determine their relationship, if any, to the Onondaga Lake Superfund Site.

Prior to the early 1970s, poor channel conditions and large impermeable areas in the watershed caused extensive flooding of Ley Creek. These flooding events led to the formation of the Ley Creek Drainage District and the clearing and dredging of Ley Creek. Dredging of Ley Creek by the Onondaga County Department of Drainage and Sanitation included the following:

- In 1970, a section of the Lower Ley Creek between the 7th North Street Bridge and State Route 11 was dredged.
- In 1971, portions of Lower Ley Creek between the 7th North Street Bridge and Onondaga Lake were dredged.
- In 1975, a section of Lower Ley Creek from Townline Road (approximately 1.5 miles north of the Sub-site) to Onondaga Lake was dredged.
- In 1983, a section of Lower Ley Creek north of the Sub-site (Townline Road to State Route 11) was dredged.

Material (i.e., dredge spoils) generated during these activities was placed along the banks of Ley Creek. Prior to the dredging activities, Ley Creek did not flow through the Town of Salina Landfill.

The Town of Salina Landfill is depicted on Figures 1-2 and 3-2b. A ROD for the Salina Landfill was signed in 2007 and included plans for installing a cap in accordance with 6 New York Codes, Rules and Regulations (NYCRR) Part 360; implementing storm water collection and drainage improvements; and installing a groundwater/leachate collection trench to the north and south of Lower Ley Creek. USEPA and NYSDEC issued an amended ROD for the Town of Salina Landfill in September 2010 that included the consolidation of the landfill and excavation of the 5-acre portion on the south side of Lower Ley Creek. Remedial activities at the Town of Salina Landfill were completed in 2013 (subject to long term operation and maintenance).

2.3 Summary of Previous Investigations

Several previous investigations have been completed to collect samples and characterize Sub-site conditions. This section summarizes previous investigation activities and results. Complete details of these activities can be found in the Final Feasibility Study Report submitted in 2015 (HydroGeologic, 2014).

2.3.1 Lower Ley Creek Investigations

The New York State Department of Environmental Conservation (NYSDEC) and the Onondaga County Department of Health collected three soil samples adjacent to the north bank of Ley Creek along the Salina Landfill and four surface water samples from the same stretch of Ley Creek and drainage ditches north and east of the landfill in 1986. Polychlorinated biphenyls (PCB) were detected in the soil samples collected adjacent to Ley Creek.

In 1987, NUS Corporation collected five soil samples from the main fill area north of Ley Creek, and three surface water and three sediment samples from Ley Creek. These samples consisted of one surface water and one sediment sample from an upstream location in Ley Creek (west of Route 11), one surface water and one sediment sample alongside the landfill, and one surface water and one sediment sample just downstream of the landfill in Ley Creek. The soil samples contained polycyclic aromatic hydrocarbon

compounds (PAHs), metals, volatile organic compounds (VOCs) and pesticides in low levels, but no PCBs. In general, surface water and sediment samples collected downstream from the landfill did not contain higher concentrations of contaminants than the samples collected upstream of the landfill.

In 1997 and prior investigations, limited NYSDEC sampling indicated the presence of PCBs at elevated levels in both the former channel sediments and subsurface soils. In addition, the 1997 former channel sediment sampling showed levels of heavy metals exceeding the NYSDEC Fish & Wildlife Severe Effect Levels (SELs).

In 1998, Ley Creek channel sediments were sampled as part of the Salina Landfill RI/FS, and were found to contain levels of PCBs at greater than 80 parts per million (ppm), chromium at levels greater than 1,700 ppm, and other heavy metals exceeding their respective SELs (HydroGeologic 2013).

During the most recent RI at Lower Ley Creek in 2012, fish tissue samples, surface water samples, soil samples, and sediment samples were collected and analyzed to characterize the nature and extent of contamination at the Site (Scientific, Engineering, and Analytical Services [SERAS] 2012). The results are detailed below:

- The fish tissue samples exhibited detectable concentrations of metals (including arsenic and mercury), organic compounds, PCBs, and dioxins/furans.
- The surface water samples exhibited detections of metals, VOCs, and base/neutral/acid organic compounds (BNA). BNAs were detected at or above their respective NYSDEC Water Quality Standards at several surface water sample locations. No metals, PCBs, or VOCs were detected above NYSDEC Water Quality Standards.
- Sediment samples were collected along the entire 2-mile length of the Lower Ley Creek Site. Pesticides, metals, cyanide, PCBs, VOCs, BNAs, and dioxins/furans were detected in the sediment samples. Pesticides, metals, mercury, PCBs, VOCs, and BNAs were detected above their respective unrestricted use NYS sediment criteria. Cyanide and all the dioxins/furans detected in sediment samples have no New York State sediment criteria for comparison. However, some dioxins/furans in sediment were detected above the USEPA preliminary remediation goal for dioxins in residential soil. The highest metal concentrations in sediment appear to be in the middle and upstream portions of Lower Ley Creek, with decreasing concentrations towards Onondaga Lake. The highest BNA, PCB, and pesticide concentrations in sediment also appear to be in the middle and upstream portions of Lower Ley Creek, with decreasing concentrations towards Onondaga Lake.
- Soil samples exhibited detections of pesticides, metals, cyanide, PCBs, VOCs, BNAs, and dioxins/furans. Pesticides, metals, mercury, PCBs, VOCs, and BNAs were detected above their respective unrestricted use NYS soil criteria. Although the dioxins/furans detected in soil do not have NYS soil criteria for comparison, some dioxins/furan analytical results were above the USEPA preliminary remediation goal (PRG) for dioxins in residential soil.

2.3.2 Old Ley Creek Channel Investigation

In 2010, the NYSDEC tasked EA Engineering, P.C., and its affiliate EA Science and Technology (EA), to perform an RI and FS at the Old Ley Creek Channel Site (EA 2010). The Old Ley Creek Channel is located west of the intersection of Factory Avenue and State Route 11 in the Town of Salina, Onondaga County,

New York. The approximately 3.5-acre site is within an overgrown and wooded area adjacent to the banks of the Old Ley Creek Channel between Route 11 and Ley Creek (see Figure 1-2).

The 2010 RI of the Old Ley Creek Channel documented the following:

- VOCs, semi-volatile organic compounds (SVOCs), metals, pesticides, and PCBs were detected in groundwater but exhibited limited impact. Some metals were detected at concentrations greater than their respective NYSDEC Water Quality Standards.
- Metals, pesticides, and PCBs were detected in surface water during two of the sampling rounds at concentrations greater than their respective NYSDEC Water Quality Standards.
- SVOCs, pesticides, PCBs, and metals were detected in soils at concentrations exceeding NYSDEC unrestricted use soil criteria from the surface to several feet below grade with the highest concentrations being within the first 2 feet. Only limited low-level impacts to soils by VOCs were identified.
- VOCs, SVOCs, pesticides, PCBs, and metals were detected in sediment at concentrations exceeding NYSDEC sediment criteria from the surface to 2 feet below grade.

2.4 Data Usability Assessment

The available data were compiled for the PDI and design activities using the information provided in Appendix F of the RI report as a primary source. This appendix included much of the data collected by USEPA in 2009 and 2010, but excluded data collected by NYSDEC in 2010 and USEPA in 2011. The additional data utilized in the RI along with older data were compiled from a variety of sources.

For consistency with the data utilized throughout the RI/FS process the following data for the Sub-site have been adopted for use moving forward:

- Soil and sediment data collected by USEPA in 2009, 2010, and 2011
- Soil and sediment data collected by NYSDEC in 2010

These data were further screened for design purposes using a geographical filter to include only samples collected from the reach of Lower Ley Creek and its floodplain between Interstate 81 and State Route 11 since no remediation is included outside of this reach.

Additional data evaluated but not carried forward for design purposes due to concerns about temporal relevance and location accuracy concerns included:

- Soil and sediment data collected by NYSDEC in 1996/1997
- Soil, waste and sediment data collected by the Town of Salina in 1998
- Sediment data collected by other parties in 1992

Soil and sediment data evaluated and its status determination for use in the PDI and design activities are summarized below:

Matrix	Program	Locations (n)	Samples (n)
Sediment	2009 EPA	28	94
Sediment	2010 DEC	8	15
Sediment	2010 EPA	14	62
Sediment	2011 EPA	3	23
Sediment	**Total**	**53**	**194**
Soil	2009 EPA	5	17
Soil	2010 DEC	56	161
Soil	2010 EPA	19	57
Soil	2011 EPA	53	164
Soil	**Total**	**133**	**399**

In total 194 sediment samples from 53 locations and 399 soil samples from 133 locations with PCB data were retained to assist in the PDI and Design activities moving forward. These sample counts included duplicate samples as well as samples analyzed in the field laboratory for PCBs.

For the purposes of this work plan the maximum total PCB analytical result for a given sample interval at a location was utilized in evaluating data gaps and needs. Should additional information become available on the existing data set moving forward, different choices may be made as part of the design process.

3 PRE-DESIGN INVESTIGATION

3.1 Pre-Design Investigation Objectives

The PDI activities will be undertaken to support the design of the selected remedy for the Sub-site. As part of the PDI, additional data will be collected from areas within and adjacent to Lower Ley Creek in the areas identified in the ROD to achieve the following objectives:

- Gather information about properties in the vicinity of Lower Ley Creek to evaluate the potential for using such properties for access and material handling/staging to support the remediation activities
- Obtain additional characterization data for soil and sediment in the areas identified for remediation in the ROD to determine the boundaries and depths for remediation, using PCBs as the indicator compound for other contaminants
- Obtain additional data for the soil and sediment targeted for remediation to identify appropriate waste characterization and disposal requirements
- Determine the geotechnical properties of the soil and sediment in areas identified for remediation in the ROD to support bank and structural stability evaluation and excavated material dewatering/stabilization design
- Gather information on saturated soil conditions and elevations in deep excavation areas to evaluate potential for slope failure and support the excavation design
- Obtain survey data to identify ground surface and Lower Ley Creek bed elevations to support the remedial design and hydrologic modeling
- Compile available information associated with bridges, pipelines, and other structures in the vicinity of the areas targeted for remediation to support structural stability evaluation and an evaluation of potential setbacks
- Gather terrestrial and aquatic habitat information to support the development of a habitat restoration plan as part of the design
- Collect material to support future treatability/processing testing

The remainder of this section identifies data needs, and describes the related field activities and assessments developed to inform the ensuing remediation design tasks. The field investigations and sample collection activities described in this section will be performed in accordance with the FSP included in Appendix A, and associated analytical procedures and data management/validation tasks will be performed in accordance with the QAPP included in Appendix B. All field activities and sample collection/processing tasks will be performed in accordance with the HASP included in Appendix C. In addition, any field activities performed within the areas covered under the *Site Management Plan Town of Salina Landfill – Sub-Site to the Onondaga Lake NPL Site Closure* of which a draft was submitted to USEPA in March 2015 (CHA, 2015), will be performed in accordance with the applicable requirements of that plan.

3.2 Access Agreements

Prior to initiating field investigation activities, best efforts will be made pursuant to Section XI of the AOC to obtain written consent for access from the owners of all parcels needed to perform the PDI activities described herein. The properties anticipated to require an access agreement for the PDI are listed in Table 3-1 and illustrated on Figure 3-1.

To compile Table 3-1 and Figure 3-1, the most recent tax records obtained from Onondaga County were reviewed to identify property owners. Access agreements were obtained from all Respondent property owners.

A letter and access agreement form were mailed to each of the non-Respondent owners of the properties listed in Table 3-1. Following this initial mailing, attempts were made to contact (via telephone) any property owners that did not respond to the initial mailing. The status of outreach efforts for each property is being tracked in a table, and updates have been and will be provided to USEPA on outreach efforts and progress.

If access agreements are not obtained from any necessary property owners, USEPA will be notified. If USEPA cannot facilitate obtaining access within an appropriate time frame (i.e., prior to demobilization of field activities), that property may be excluded from PDI sampling, following consultation with USEPA.

3.3 Field Reconnaissance

Prior to PDI sample collection, field reconnaissance activities will be performed by making visual observations of the remediation areas identified in the ROD and the areas where PDI activities will be performed. The field reconnaissance will document observed and relevant site features including, but not limited to, structures, utilities, and stream and ground features such as riffles, depositional areas (e.g., sand bars, gravel bars), evidence of bank undercutting or scour, potential wetlands, and other topographic depressions within the floodplain. Field reconnaissance activities will be documented using location-specific field notes, photography/video, and global positioning system (GPS) equipment.

The information gathered during the field reconnaissance efforts will be reviewed to evaluate how best to access the PDI areas and to determine whether any adjustments to the scope of the PDI are warranted. Any significant modifications to the PDI scope needed based on the results of the field reconnaissance (and/or due to field discoveries during the PDI activities) will be presented for review and approval by the USEPA. Minor modifications or adjustments to the PDI will be documented in the PDI Evaluation Report (see Section 5).

3.4 Pre-Design Investigation Sampling Plan

This section describes the sampling activities to be conducted as part of the PDI field activities. The sampling activities, including the targeted number of samples and the analyses to be performed, are summarized in Tables 3-2 through 3-4. Proposed sample collection locations are illustrated on Figures 3-2a through 3-2i. The specific sampling protocols and proposed laboratory testing protocols are outlined in the FSP included in Appendix A.

Prior to implementing the field activities as described below, associated figures and tables will be updated, if necessary, to reflect adjustments based on the site reconnaissance activities and submitted for USEPA review and approval prior to initiating the field activities.

3.4.1 Sample Collection for Chemical Characterization

3.4.1.1 Soil Sampling Program

To address elevated PCB concentrations in floodplain soils, impacted materials will be excavated within the ROD-defined soil removal areas. Existing PCB data, which guided the determination of excavation limits in the ROD, and the additional PDI sampling defined below, will refine the vertical and horizontal extent of PCB impacts in areas to be excavated, as well as the associated estimated soil excavation volumes. PDI soil sampling of the top two feet performed along the National Grid and Buckeye Pipeline Company pipelines will help assess soil conditions and determine the limits of material that can be safely removed along the pipelines.

The soil sampling program was developed under the following assumptions:

- The soil sampling program relies on PCBs as the indicator compound for the refinement of removal limits, consistent with the ROD and Sec. 3.1(a) of the SOW.
- Similar to the decision regarding pre-defined removal limits in SED-A post-removal confirmation sampling is assumed to not be required in soil removal areas that are driven only by previous metals Soil Cleanup Objective (SCO) exceedances. Delineation samples have been included in and around the perimeter of soil removal areas driven by previously detected PCB SCO exceedances, and will be used to validate the removal limits defined in the ROD.
- Other than the National Grid and Buckeye pipelines, with the exception of certain overhead utilities present within the Sub-site, no other utilities have been identified within the soil removal areas. If additional information collected during pre-design activities indicates other utilities are present, these areas will be further assessed in consultation with USEPA, to determine whether adjustment of the proposed pre-design activities are necessary.

Soil borings will be installed by hand or with a tractor mounted boring rig, with individual samples collected from respective borings in one-foot increments. A summary of the PDI soil sampling program, and the targeted data gaps associated with the ensuing remedial design, is provided in Table 3-2, with proposed sample collection locations illustrated on Figures 3-2a through 3-2i. Specific soil removal areas included in the soil sampling program include:

- Soil-A – Removal in this area is driven by metals exceedances and will not be subject to further delineation or post RA confirmation sampling.
- Soil-B – In addition to pipeline corridor samples discussed below, two borings will be installed on the perimeter of this area to validate the ROD-defined removal limits. These samples will be collected in the 0 to 1 and 1 to 2 foot depth increments for PCB analysis, with additional samples collected from the 2 to 3, and 3 to 4 foot depth increments and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.

- Soil-C – In addition to pipeline corridor samples discussed below, two borings will be installed on the perimeter of this area near the north and south ends of the PCB driven removal to validate the ROD defined removal limits. These samples will be collected in the 0 to 1 and 1 to 2 foot depth increments for PCB analysis, with additional samples collected from the 2 to 3, and 3 to 4 foot depth increments and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal. Note that a portion of the removal defined for at the southern boundary of Soil-C is driven entirely by metals exceedances, and as a result, this area will not be subject to further delineation or post RA confirmation sampling,
- Soil-D – In addition to pipeline corridor samples discussed below, eight borings will be installed on the perimeter of this area to validate the ROD defined removal limits. These samples will be collected in the 0 to 1 and 1 to 2 foot depth increments for PCB analysis, with additional samples collected from the 2 to 3, and 3 to 4 foot depth increments and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.
- Soil-E – Six borings will be installed on the perimeter of this area to validate the ROD-defined removal limits. These samples will be collected in the 0 to 1 and 1 to 2 foot depth increments for PCB analysis, with additional samples collected from the 2 to 3, and 3 to 4 foot depth increments and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.
- Soil-F – Removal in this area is driven by metals exceedances and will not be subject to further delineation or post RA confirmation sampling.
- Soil-G – Removal in this area is driven by metals exceedances and will not be subject to further delineation or post RA confirmation sampling.
- Soil-H – Four borings will be installed on the perimeter of this area to validate the ROD-defined removal limits. These samples will be collected in the 0 to 1 and 1 to 2 foot depth increments for PCB analysis, with additional samples collected from the 2 to 3, and 3 to 4 foot depth increments and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.
- Soil-I – Eleven borings will be installed on the perimeter of this area to validate the ROD-defined removal limits. These samples will be collected in the 0 to 1 and 1 to 2 foot depth increments for PCB analysis, with additional samples collected from the 2 to 3, and 3 to 4 foot depth increments and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.
- Soil-I1 – Three borings will be installed with samples collected from the 2 to 3, 3 to 4, and 4 to 5 foot depth increments and analyzed for PCBs to delineate the 5-foot removal depth identified in the ROD associated with samples collected in the north east corner of this removal area.
- Soil-L – Two borings will be installed on the perimeter of this area to validate the ROD-defined removal limits. These samples will be collected in the 0 to 1 and 1 to 2 foot depth increments for PCB analysis, with additional samples collected from the 2 to 3, and 3 to 4 foot depth increments and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.

- Soil-L3 – One boring will be installed in this area to confirm the 8-foot removal depth identified in the ROD. Samples from this boring will be collected from the 2 to 3 foot increment to the 7 to 8 foot increment for analysis of PCBs with additional samples collected from the 8 to 9 and 9 to 10 foot depth increments and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.
- Soil-L4 – One boring will be installed in this area to confirm the 14-foot removal depth identified in the ROD. Samples from this boring will be collected from the 2 to 3 foot increment to the 13 to 14 foot increment for analysis of PCBs with additional samples collected from the 14 to 15 and 15 to 16 foot depth increments and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.
- Soil-L5 – Two borings will be installed in this area to confirm the 8-foot removal depth identified in the ROD. In each boring, one sample will be collected from the 2 to 3 foot depth increment for PCB analysis, with additional 1-foot samples collected to 10 feet and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.
- Soil-L6 – Two borings will be installed in this area to confirm the 8-foot removal depth identified in the ROD. In each boring, one sample will be collected from the 2 to 3 foot depth increment for PCB analysis, with additional 1-foot samples collected to 10 feet and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.
- Soil-L7 –One boring will be installed in this area to confirm the 14-foot removal depth identified in the ROD. Samples from this boring will be collected from the 2 to 3 foot increment to the 13 to 14 foot increment for analysis of PCBs with additional 1-foot samples collected to 16 feet and held for analysis based on the analytical results of samples collected from shallower depth increments. In this specific boring, additional samples from these same depth increments will also be collected and held for potential metals analysis. In this instance, if PCB results indicate that removal to the prescribed depth may not be necessary, archived samples will be released for metals analysis with materials released for analysis and a comparison to the SCOs for metals as defined in the ROD, to confirm that there are no non-PCB impacts and the removal depth can be revised to reflect actual conditions.
- Soil-L8 – Two borings will be installed in this area to confirm the 8-foot removal depth identified in the ROD. In each boring, one sample will be collected from the 2 to 3 foot depth increment for PCB analysis, with additional 1-foot samples collected to 10 feet and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal. In this specific boring, additional samples from these same depth increments will also be collected and held for potential metals analysis. In this instance, if PCB results indicate that removal to the prescribed depth may not be necessary, archived samples will be released for metals analysis with materials released for analysis and a comparison to the SCOs for metals as defined in the ROD, to confirm that there are no non-PCB impacts and the removal depth can be revised to reflect actual conditions.
- Soil-L9 – One boring will be installed in this area to confirm the 14-foot removal depth identified in the ROD. From this boring, one sample will be collected from the 2 to 3 foot depth increment for PCB analysis, with additional 1-foot samples collected to 16 feet and held for analysis based on the

analytical results of samples collected from shallower depth increments and a comparison to the PCB performance standards.

- Soil-M – Four borings will be installed on the perimeter of this area to validate the ROD-defined removal limits. These samples will be collected in the 0 to 1 and 1 to 2 foot depth increments for PCB analysis, with additional samples collected from the 2 to 3, and 3 to 4 foot depth increments and held for analysis based on the analytical results of samples collected from shallower depth increments and a comparison to the depth-specific PCB clean up goal.

In addition to the sampling described above, after a pipeline and utility location survey, soil borings along the National Grid and Buckeye pipelines will be installed by hand to a depth of 2 feet at an approximate 100-foot interval on either side of the pipeline in soil removal areas Soil-B, -C, and –D. Samples will be collected from the 0- to 2-foot interval and analyzed for PCBs. Analytical results associated with these samples will be used to determine if soil removal in the vicinity of the pipeline is required, confirm the removal in these areas described in the ROD, and characterize materials in the top two feet that may be left in place as a soil cover if it is determined that removal of deeper materials in this area is impractical, or cannot be completed in a safe manner or without jeopardy to the integrity of the pipeline.

Overall, the soil sampling program proposed herein will involve the collection of approximately 188 soil samples from 84 locations for analysis of PCBs with an additional 201 samples held for analysis of either PCBs or metals contingent upon the analytical results associated with the original 188 samples as detailed above and in Table 3-2. Note that based on the results of the investigations described herein, the Respondents may propose limited supplemental investigations and soil sample collection activities. As necessary, additional soil sample collection locations (either inboard or outboard as suggested by the results of the PDI) would be added and used in concert with the results of the initial PDI activities to confirm the potential expansion and/or contraction of the ROD defined removal extents. Any such additional investigations would be presented for discussion with USEPA prior to initiation.

3.4.1.2 Sediment Sampling Program

Additional sediment data are needed to refine sediment removal limits in some ROD-defined removal areas. PDI sampling proposed below will refine the limits of the sediment excavation and the associated sediment removal volume.

Sediment samples will be collected from the State Route 11 to just upstream of SED-A for chemical characterization. In SED-A, which is the most down-stream sediment removal area extending to the Interstate 81 bridge, the ROD requires removal of 1 foot of sediment followed by backfill, and this will be the basis for the design so further sampling is not needed for design purposes.

Sediment samples from all areas other than SED-A will be collected from the water surface with barge mounted vibra-core equipment, with sediment cores collected location-specific depths based on proposed removal depths identified in the ROD. A summary of the PDI sediment sampling program is provided below and details are provided in Table 3-3 and Figures 3-2a through 3-2i;

- In sediment removal areas with removal depths of two feet (i.e., SED-B, -D, -H, -I, -K, and –L), single cores will be collected at the approximate mid-channel location over the length of the removal areas in areas where there is limited existing data, Samples from the 2 to 3 foot increment will be submitted for PCB analysis to confirm the 2-foot removal depth is appropriate to remove PCBs above 1 mg/kg. Additional samples will be collected from the two subsequent 1-foot increments (i.e., the 3 to 4 and 4

to 5 foot increments) and held for analysis contingent upon the analytical results of the shallower samples in order to refine the removal depth/extent as dictated by the results.

- In removal areas where the ROD specifies removal depths of 5 feet or greater (i.e., SED-E, -F, -G, and -J) sediment will be collected at three locations across the channel (i.e., mid channel, and the left and right approximate toe of slope). Samples in these locations will be collected to confirm removal depths defined in the ROD based on the performance standard of 1 mg/kg PCBs with additional samples held for analysis based on the results of the shallower samples in order to refine the removal depth/extent as dictated by the results.
- In certain instances, specific sample transects have been added to bound or refine the length of Lower Ley Creek over which removal depths equal or greater than 5 feet is driven by a single sample representing relatively long intervals of the channel. Removal areas SED-E, -G, and -J include proposed samples for this purpose. Samples in these locations will be collected to confirm removal depths defined in the ROD based on the sediment cleanup goal of 1 mg/kg PCBs with additional samples held for analysis based on the results of the shallower samples in order to refine the removal depth/extent as dictated by the results.
- To refine the delineation of TSCA wastes, sample locations are established stepping out from existing PCB data equal to or greater than 50 mg/kg.
- In removal areas SED-E, -F, -H, -I, -K, and –L, where PDI sampling may alter the removal limits, and potentially result in leaving in place materials identified for removal based on PCB concentrations below the cleanup goal of 1 mg/kg; samples will be archived pending PCB analytical results. If PCB concentrations in these samples are below 1 mg/kg, the archived samples will be run for analysis of other constituents for which cleanup goals are listed in the ROD to evaluate whether removal is needed based on these other constituents. In this fashion, PCB serves as the indicator compound, but levels of other constituents would be tested to determine if adjustment of the ROD removal limits is appropriate.
- Within the section of Lower Ley Creek identified for removal activities in the ROD, there are several “gaps”, between removal areas (i.e., between removal areas SED-A and –B, SED-E and –F, SED-H and –I, and SED-K and –L) where there was no removal called for in the ROD. In these gaps, samples will be taken to confirm that PCB concentrations in sediments are below the cleanup goal. If PCB analytical result exceed the cleanup goal, the ROD removal limits will be extended to add all or a portion of these “gap” areas as needed to ensure that areas with PCBs greater than 1 mg/kg are removed. These cores will be collected at the approximate mid-channel location with samples collected in 1-foot increments starting at the surface and proceeding to the maximum approximate removal depth of the adjacent ROD defined removal areas. Specific sample depth intervals are defined in Table 3-3.

Analytical results from all of the sediment samples will be used in comparison with the PCB clean up goal (i.e. 1 mg/kg in sediment) and/or the low exposure limit (LEL) for metals in sediment as defined in the ROD. Sediment removal areas and associated depths defined in the ROD will then be revised based on the new analytical results and the comparison to the above referenced performance standards.

Overall, the sediment sampling program proposed herein will involve the collection of 206 sediment samples for analysis of PCBs and/or metals from a total of 84 locations with an additional 275 samples

held for analysis contingent upon the analytical results associated with the original 106 samples in order to refine the removal depth/extent as dictated by the results.

3.4.1.3 Sample Analytical Procedures

The PDI sampling programs described above will be conducted following the procedures set forth in the FSP included in Appendix A. The analytical procedures for the analysis of soil and sediment samples will be consistent with USEPA-approved procedures presented in Table 1 of the QAPP included in Appendix B. The field procedures will follow the standard operating procedures (SOPs) presented in appendices to the FSP and the QAPP.

Samples collected for PCB analysis will be analyzed for Aroclor-specific PCBs using USEPA Method 8082 in accordance with the QAPP. PCB results will be reported on a dry-weight basis with a detection limit of 0.05 ppm for all Aroclors. Samples subject to metals analysis will be analyzed using USEPA Method 6010C/7470A in accordance with the QAPP. Analyte-specific reporting limits can be found in the QAPP.

Quality control samples (i.e., matrix spike/matrix spike duplicates, field duplicates, trip blanks, and field blanks) will be collected at the frequency specified in the QAPP for each sample matrix collected. The QAPP present the quality control criteria and corrective action procedures to be followed for each of the analytical procedures and for field-generated quality control samples. Overall project quality assurance will be maintained by following the procedures specified in the FSP and the QAPP for sample collection and analysis, corrective action, and data reporting and validation.

3.4.2 Waste Characterization Sampling

Waste characterization sampling will be performed to characterize materials that will be removed during implementation of the selected remedy in order to support the selection of appropriate disposal facilities.

Composite sediment and/or soil samples will be collected from amongst the remediation areas identified in the ROD. Each composite sample will be composed of a minimum of three aliquots collected from soil and sediment borings spatially distributed within each targeted area. The waste characterization soil and sediment samples will be collected in conjunction with the soil sampling and sediment sampling activities described above, with waste characterization materials collected from the same borings/cores. As needed, additional sample collection locations will be added based on material sample volume needs. Figures 3-2a through 3-2i illustrate the proposed waste characterization sampling locations.

The waste characterization samples will be submitted for laboratory analysis for the following parameters: TCLP VOCs, TLCP SVOCs, TCLP metals, ignitability, reactivity, and corrosivity. In addition to these parameters, PCB data collected from the soil and sediment sampling locations described above, will be evaluated to determine appropriate waste characterization requirements.

3.4.3 Geotechnical Sampling

The areas of deeper dredging excavation and dredging require additional considerations regarding bank stability and potential excavation shoring design and analysis. In-water and upland geotechnical borings will be installed in areas of anticipated excavation/dredging, specifically in deeper areas, adjacent to existing infrastructure, and in areas of potential shoreline stability evaluations during dredging.

Geotechnical borings located near bridge abutments of State Route 11 and 7th North Street will be used to evaluate potential stability concerns around the bridge foundation during dredging operations. Temporary conditions that may occur during removal need to be evaluated and analyzed for any additional design considerations in these critical areas. The following geotechnical soil investigations will be conducted:

- Installation of six in-water geotechnical borings and thirteen geotechnical borings upland
- Standard penetration testing (SPT) and geotechnical soil sampling (i.e. split spoons and Shelby tubes)
- Geotechnical laboratory analyses

The in-water geotechnical borings are anticipated to be installed utilizing a drill rig mounted on a barge. Drilled borehole methods will be used, whereby steel casing will be seated into the sediment for water quality considerations and for drilling rod stability through the water column. Upland soil borings will be drilled using a track or all-terrain vehicle rig to maneuver around any upland obstacles and trees. The soil borings will be completed using hollow stem auger drilling methods. Proposed geotechnical boring locations can be found in Figures 3-2a through 3-2i. A GPS handheld unit with sub-meter accuracy will be used to establish boring locations during implementation. The locations of theses borings may be adjusted in the field, based on observations made during site reconnaissance or obstacles encountered during field activities. Standard operating procedures for geotechnical sample collection and processing are included in the FSP included in Appendix A.

The geotechnical borings will be advanced to three times the anticipated dredge/excavation depth, with a minimum boring depth of 15 feet. The borings will range from 15 feet to 25 feet in-water and 15 feet to 45 feet upland, or until refusal. Sampling for the geotechnical borings will be include the following:

- Standard Penetration Testing: SPT will be performed continuously throughout the soil column to boring termination. SPT will be performed in accordance with ASTM D1586.
- Shelby Tube Sampling: Approximately nine Shelby tubes will be collected at an approximate frequency of one tube every three borings if fine grained soils are encountered. Shelby tube sampling will be performed in accordance with ASTM D1587 and will generally be performed between sample intervals.

Upon completion of the sampling, select split-spoon sample intervals and Shelby tube samples will be selected for the following laboratory analysis.

- Grain-size analysis in accordance with ASTM D422;
- Moisture content in accordance with ASTM D2216;
- Atterberg limits in accordance with ASTM D4318;
- Specific gravity in accordance with ASTM D584;
- Unconsolidated-Undrained (UU) triaxial compression with pore pressure in accordance with ASTM D2850;
- Consolidated-Undrained (CU) triaxial compression with pore pressure in accordance with ASTM D4767; and

- One-dimensional consolidation properties in accordance with ASTM D2435/D2535M.

The number of samples to be submitted for testing will be determined by the project geotechnical engineer upon completion of the drilling program. Table 3-4 includes the general number of samples per test that will be analyzed upon completion of the program and evaluation of the conditions encountered. A geotechnical engineer or geologist will observe the completion of the geotechnical borings and record the necessary information.

3.5 Topographic, Bathymetric, and Sediment Thickness Surveys

Surveys of the channel and adjacent floodplain will be performed to characterize the existing physical conditions and elevations of the channel bottom and banks.

3.5.1 Hydrographic Survey

A bathymetric survey will be performed with boat mounted single or multibeam echo sounding equipment, with resultant data correlated with global positioning information to define channel bottom elevations. This data, together with topographic survey data described below, will support development of bathymetric (i.e. top of sediment) elevations for removal design, and will also support hydraulic analysis of the channel.

In conjunction with the bathymetric survey, a side scan sonar, and sub-bottom profile survey will also be performed to: 1.) identify and locate channel bottom features and or subsurface stratigraphic layers, and 2.) identify and geo-reference surface and near surface obstructions (e.g., pipelines, debris) that may impede investigation and/or remediation activities. Minimum standards for performing the bathymetric survey will be based on the United States Army Corps of Engineers (USACE) Engineer Manual 1110-2-1003 dated January 1, 2002.

3.5.2 Floodplain/Upland Topographic Surveys

Topographic data will be collected within the remedial areas along approximately 40 pre-defined transects located between State Route 11 and the creek mouth at Onondaga Lake. The transect survey will include the portion of the creek downstream of Interstate 81 for hydraulic modeling purposes. The length of each proposed transect is based on the 100-year flood plain as depicted in the Federal Emergency Management Agency (FEMA) flood study mapping. Transect lengths may change based on field conditions.

Survey data collected along the length of each transect will include a longitudinal profile of the stream channel and cross-sections of the stream channel to document floodplain extent, top of bank elevation, ordinary high water elevation, water elevation, toe of bank slope, bed elevations, channel thalweg elevation, with increased survey location density in the near shore area where echo sounding data (from the hydrographic survey described in Section 3.5.1) may be inadequate, and any other critical grade changes. Survey data will also be collected to identify surface cover types (e.g., brush, trees, gravel) along with photographs of the surface types to allow for determination of roughness coefficients used in the hydraulic model. The transect survey will also identify any infrastructure that may be affected during the 100-year flood analysis (e.g., bridges, roads, pipes) not identified in the historic Ley Creek hydraulic model. The resultant survey data will be input into associated hydraulic models to provide greater accuracy of the Lower Ley Creek hydraulic geometry within the remedial areas. Proposed survey transect locations are illustrated on Figures 3-3a through 3-3c.

3.5.3 Sediment Thickness Probing

Concurrent with the topographic survey described above, sediment probing will be performed to evaluate sediment thickness along the same transects used for the topographic survey. Sediments will be probed at 10 to 15 foot intervals along each transect, and at each probing location, a graduated metal rod will be pushed using manual force into the sediment until refusal. At each probed location, a field scientist will record water depth, depth to bottom of soft sediment, and a qualitative description will be recorded of apparent sediment type and related field observations.

3.6 Hydrodynamic Modeling

As part of the remedial design activities, a hydraulic model of the channel and flood plain using the USACE Engineering Centers River Analysis System (HEC-RAS) will be developed. This model will be used to evaluate potential flow and flood conditions for the Lower Ley Creek during and after construction to allow for assessment of remedial design options. To facilitate this modeling, it will be necessary to obtain certain data and information.

Hydraulic Model

For the purposes of this PDI Work Pan, it is assumed that an operable hydraulic model (HEC-RAS or similar model) exists and is available from the FEMA database (or other source) for use in further assessment of hydraulic conditions in Lower Ley Creek. The FEMA Flood Insurance Study for Onondaga County, New York (Revised Preliminary May 29, 2015) documents model computed flood elevations. This existing model will be utilized to as the basis (for development of a more detailed hydraulic (HEC-RAS) model, by incorporating survey data to be obtained during the PDI.

Field Observations

Prior to use of the existing hydraulic model, it will be necessary to review and confirm appropriateness of model input parameters (e.g., flow coefficients, transect geometry, infrastructure data) used in the existing hydraulic model. This review will consist of conducting a field reconnaissance at select locations to observe and document current site conditions (e.g., surface cover characteristics, physical site features, channel configuration, fringe area extents). These observed conditions will be compared to relevant parameter inputs used in the existing model for the purpose of assessing the models representation of current conditions.

Creek Flow Data

Flow conditions for Ley Creek at Park Street are available on the U.S. Geological Survey (USGS) – National Weather Information System web site (http://waterdata.usgs.gov/usa/nwis/uv?site_no=04240120) and will be reviewed as part of the updated flow modeling work.

3.7 Infrastructure and Utility Setback Evaluation

An infrastructure and utility setback evaluation will be completed as part of the PDI activities to determine the logistics anticipated for implementation of the removal program (e.g., access to potential removal areas near structures) and associated field data collection needs (e.g., measurements of clearances).

Under this task, the locations and dimensions of structures within and adjacent to the Sub-site will be documented.

3.7.1 Compilation and Review of Available Engineering Records

Existing information regarding the physical characteristics of the infrastructure and utilities in the area of the Sub-site will be obtained, to the extent feasible, from available resources such as the New York State Department of Transportation records, the Onondaga Country Department of Public Works and permitting department records, and the active utility companies in the area (e.g., National Grid, Buckeye Pipeline). If available, as-built drawings will be requested from the appropriate agency such that information can be compiled as to the location and design of the infrastructure and utilities, including both surface and subsurface components.

An engineering review will be performed regarding the compiled information regarding infrastructure and utilities in or adjacent to the Sub-site. The review will focus on the proximity of such features to the proposed removal areas, and the potential need to offset or stabilize excavations that may affect the stability of nearby features.

3.7.2 Infrastructure Survey

In addition, during performance of field surveys (see Section 3.5), information evaluated during the engineering review will be field verified. Specifically, the physical condition of the visible features of the infrastructure and utilities within the Sub-site will be photo-documented, and physical measurements will be recorded. The elevation and horizontal limit of the feature(s), including subsurface pipelines/utilities will be surveyed. Field verification measures may include but not be limited to ground penetrating radar, hand digging, and air knifing. As appropriate, an additional engineering review may be performed if new or different information is identified in the field.

3.8 Habitat Characterization

Habitat characterization activities will be performed to obtain information to support the remedial design and habitat restoration planning. Proposed activities include reconnaissance to document the habitat characteristics of the terrestrial, Lower Ley Creek, and bank habitats in the areas where remedial activities are planned.

3.8.1 Terrestrial Habitat

Existing information indicates that due to historical modifications and disturbances of the upland area within the Sub-site there is limited remaining terrestrial habitat of high value. Nevertheless, terrestrial habitats in the areas where remedial activities are planned will be characterized to support the habitat restoration design. As part of this effort, a cover-type map will be developed that identifies the types, locations, and sizes of the various identified terrestrial habitats within the Sub-site. Identified habitats will be classified into broad categories, such as hardwood forest, coniferous forest, mixed forest, shrubland, or upland field. Meander surveys will be performed in representative areas of each habitat category and woody vegetation monitoring plots of approximately 900 square feet in size will be established at a density of three per acre of disturbed habitat to determine woody plant density and species distribution. Vegetation data will be used to design the restoration program for disturbed upland habitats.

3.8.2 Lower Ley Creek Habitat

Existing information indicates that Lower Ley Creek provides little high value aquatic habitat due to historical modifications to the natural channel course and the resultant absence of typical riffle, pool, run sequencing. Therefore, detailed classification and characterization activities regarding Lower Ley Creek will not be performed. However, a qualitative in-stream aquatic habitat characterization survey, supported by instrument surveying, will be performed to identify significant in-stream habitat components that may be disturbed through remedial activities. The type, location, material composition, and elevation of identified structures providing significant habitat will be considered in the restoration design for the stream channel. Significant habitat structures could include riffles, depositional areas (e.g., sand bars, gravel bars), backwater areas, large woody debris piles, deep pools, boulders, or macrophyte beds. Information obtained in the field will be documented using field notes, photography, and GPS equipment.

3.8.3 Lower Ley Creek Bank Characteristics

In addition to the aquatic habitat characterization efforts, the banks of Lower Ley Creek will be characterized to evaluate their current geometry and stability to assist in the selection of the most appropriate bank restoration technique for the portions of Lower Ley Creek to be disturbed. The bank characterization effort will consist of collecting data to describe the existing banks in terms of height, slope, material composition, vegetative cover, and stability. A bank erosion hazard index (BEHI) will be calculated in accordance with the methodology presented in Applied River Morphology (Rosgen 1996) for the range of bank conditions observed in potential bank disturbance areas. The BEHI integrates information regarding bank height, vertical extent of root penetration in the bank, root density, bank angle, and the percentage of bank surface protected by vegetation to identify a qualitative erosion hazard ranking between very low and extreme. This effort will identify bank areas that are currently stable and should be restored to a similar condition, as well as banks that are not currently stable and may, therefore, require a different bank restoration application to create a more stable bank during bank restoration. Photographs will be taken at representative bank locations to be disturbed to document conditions prior to disturbance. A range of bank restoration techniques will be developed as part of the remedial design to address the bank conditions observed and characterized under this effort.

3.9 Wetland Delineation and Characterization

Based on existing data and a review of publicly available National Wetland Inventory and New York State Freshwater Wetland Maps, wetlands are present in portions of the floodplain areas along Lower Ley Creek where remedial activities will be implemented. Figures 2-1a through 2-1c show the locations of the mapped wetlands within the Sub-site. As shown, a scrub-shrub wetland (PSS1E) is mapped in the vicinity of Old Ley Creek and a forested/scrub-shrub wetland (PFO1/SS1E) is mapped along the east bank of Lower Ley Creek, just north of 7th North Street. A New York State Freshwater Wetland (SYW-11) is mapped in areas on both sides of Lower Ley Creek, but not directly adjacent to the Lower Ley Creek. The mapped state wetland covers areas developed since map preparation, including NBT Bank baseball stadium and the Syracuse Regional Transportation Center. These maps provide general information regarding potential wetland locations, types, and sizes, but do not define the jurisdictional limits of federally- and state-regulated wetlands. Jurisdictional boundaries must be identified in the field using approved delineation methods, as discussed below.

As part of the PDI, wetland delineation activities will be performed in areas where remedial activities are planned. The boundaries of identified wetlands will be delineated and the vegetation of each wetland will be characterized to assist with resource impact quantification, project permitting, and restoration design. Wetland boundaries will be delineated based on observed characteristics of Sub-site vegetation, hydrology, and soils consistent with the requirements of the Routine Method presented in the 1987 USACE *Wetlands Delineation Manual* (Environmental Laboratory 1987), the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (USACE 2012), and the New York State Freshwater Wetlands Delineation Manual (NYSDEC 1995). Vegetation, hydrology, and soils in paired upland and wetland data collection plots located along the wetland boundary will be visually observed and documented on field data forms required by the USACE methodology. Sequentially numbered flagging will be placed to mark the wetland boundary for subsequent surveying for use in the remedial design and restoration planning.

During the wetland boundary delineation effort, characteristics of the various identified wetland types will be determined for restoration design purposes. A meander survey will be performed to identify the vegetative communities of each wetland and observations of soil and hydrologic conditions influencing vegetative communities will be recorded. The density, diameters, and species of trees and shrubs in forested wetlands will be characterized using data collected from sampling plots of approximately 900 square feet in size that will be established in representative areas of the wetland at a density of three plots per acre. The data from these plots will be used to develop restoration plans for disturbed wetlands.

A wetland delineation report will be prepared to document the observations supporting the delineated wetland boundaries. The report will include: copies of appropriate portions of state and federal wetland maps, topographic maps, and soil survey maps; a photographic log of the identified wetlands; completed field data forms; and a site plan presenting the surveyed wetland boundaries.

4 TREATABILITY STUDY WORK PLAN

The selected remedy set forth in the ROD includes an evaluation of the disposal of select excavated materials at a local disposal facility. Excavated materials may require processing, treatment and/or conditioning to allow for hauling to and placement in the landfill. Additionally, water collected during processing of saturated materials (e.g., supernatant, stormwater that comes in contact with excavation spoils) may require treatment prior to discharge. Specifically, this treatability study will investigate (1) the solidification and stabilization of removed sediments, and (2) the treatment of water generated during dewatering and storm water events. All research will be performed in a laboratory permitted by the USEPA to accept toxic and hazardous materials, and to perform treatability studies on these materials focusing in the remediation of contaminated soils, sludges, and waters.

4.1 Objectives

The characteristics of the sediment to be dredged from Lower Ley Creek will be evaluated to determine if processing is required to allow for transport to and/or placement in a local disposal facility. Additionally, water collected during sediment processing will be evaluated. Evaluations will include both desktop reviews (to determine criteria for sediment transport/disposal and supernatant discharge) as well as physical and/or analytical testing of sediment and water to determine if processing or treatment will be required following excavation.

4.2 Field Sampling

Bulk materials collected within select sediment removal areas defined in the ROD will be composited to form representative samples from each area. Figures 4-1a through 4-1c, illustrate the proposed sampling locations, with sample collection depths based on the respective area specific removal depth. The required volume of sample to be collected at each location for use in the treatability testing described below is approximately 15 gallons of sediment. Sample selection locations may be subject to change/modification based on conditions encountered in the field. Samples will be collected in a 10 to 20 foot radius around the target locations identified on Figures 4-1a through 4-1c, depending on the number of cores required to obtain adequate volume for testing. In addition, 10 gallons of river water will also be collected from select locations for mixing with the sediment to obtain sediment/water mixes that are representative of anticipated material properties during dredging.

4.3 Treatability Assessments

Evaluations will include both desktop reviews (to determine criteria for sediment transport/disposal and supernatant discharge) as well as physical and/or analytical testing of sediment and water to determine the most efficient and/or economical methodologies for sediment processing and water treatment that may be implemented.

4.3.1 Sediment Processing Evaluations

Various methods of sediment processing will be evaluated to determine the most efficient or economical methods that may be implemented to meet the requirements for transport and landfill disposal of the sediment.

Dewatering - Potential methods for dewatering dredged sediments will be reviewed and evaluated. This may include evaluation of basic methods (e.g., passive stockpiling and gravity drainage), mechanical (e.g., size separation [desanding], filter press), geotextile tube applications as well as the addition of agents (polymers) to enhance dewatering.

Solidification/stabilization (S/S) Treatment - S/S agents will be identified and may include lime, lime kiln dust, cement kiln dust, Portland cement, wood fiber, and/or commercially available polymers. Preliminary selection of S/S agents for evaluation (mix design) will be based on review of initial sediment index properties and transport/disposal requirements and Arcadis experience with similar projects.

Geotechnical testing will be performed on the dewatered and/or S/S treated sediment to confirm meeting transport and disposal requirements. The testing is anticipated to include:

- Moisture Content (ASTM D2216)
- Grain Size (Sieve Analysis with Hydrometer; ASTM D422)
- Atterberg (Liquid and Plastic) Limits (ASTM D4318)
- Dry Density (ASTM D2937)
- Organic Content (ASTM D2974)
- Unconfined Compressive Strength (ASTM D2166)
- Paint Filter Test (USEPA Method 9095B)

Final TCLP analyses will also be performed in order to evaluate the effect, if any, on solidification of the stabilized material.

4.3.2 Water Treatment Evaluations

A series of bench-scale jar tests will be performed to determine both the type of polymer and dosage potentially needed to settle and condition solids from the various water streams. One criterion used to evaluate the success of the jar tests will be the measured total suspended solids (TSS) concentration of the water. The goal will be to reduce TSS to such a concentration that it can be conveyed to a dual-media filter for subsequent treatment.

Field and analytical testing will be performed on samples of the water before and after polymer addition. The testing is anticipated to include:

- Total suspended solids by USEPA SW486 Method 160.2
- pH analysis by USEPA SW846 Method 9045C
- Volatile organic hydrocarbons by USEPA SW846 Method 8260B
- Semi-volatile organic hydrocarbons by USEPA SW846 Method 8270C

- Metals by SW846 Method 6010, 7000, 7470
- PCBs by SW846 Method 8082

5 REPORTING

5.1 Reporting

The findings of the pre-design investigation and evaluation activities will be presented in PDI Data Evaluation Report, which will be submitted to the USEPA for review and comment within 90 days of completing the field activities and receiving final laboratory reports and data validation packages. It is anticipated that this report will include the following:

- Narrative summaries of the performance and related results, including any interpretation or statistical analyses, of the completed pre-design investigation and evaluation activities described in this PDI WP;
- Tabulated summaries of laboratory analytical data for soil and sediment samples, and a comparison of analytical results to applicable cleanup levels;
- A summary of validated laboratory analytical results including associated data validation reports and analytical laboratory data reports;
- Site plans showing surveyed sample locations, 1-foot topographic contours reflecting the ground-based survey, and delineated boundaries of wetlands and/or other special areas;
- Revised bathymetric contours for Lower Ley Creek;
- Topographic elevations of soil removal areas;
- Locations of pipelines and other utilities;
- Tabulated summaries of measured water depths and sediment thicknesses in Lower Ley Creek;
- Representative photographic documentation of the work performed;
- Revised target removal areas and depths and associated removal volumes for areas where PCB concentrations in sediment exceed 1 mg/kg and soils where PCB soil concentrations exceed 1 mg/kg in the upper two feet and/or 10 mg/kg below two feet; and
- Based on the results of the PDI activities described herein, any conclusions and critical design parameters associated with the ensuing remedial design.

6 PRE-DESIGN INVESTIGATION SCHEDULE

The PDI work described herein will be initiated within one month of the approval to proceed from USEPA, weather and creek conditions permitting. The proposed field work will be performed once access is granted from the necessary property owners, and notification will be provided to USEPA at least 14 days in advance of planned initiation of field activities. It is anticipated that the PDI field activities will be completed in 8 to 10 weeks, assuming no delays due to weather, access, or other unforeseen events.

Note that based on the progress of the ongoing remediation of the Upper Ley Creek Sub-site, certain portions of the PDI activities described herein may be delayed. Specifically, based on the potential for changes in surface sediment conditions due to overtopping or releases to the Lower Ley Creek Sub-site over the duration of Upper Ley Creek construction the surficial sediment sampling may be delayed.

As discussed above, a report on the completion of the performance and results of the PDI activities described herein will be submitted within 90 days of the receipt of validated data.

7 REFERENCES

EA. 2010. Final Remedial Investigation Report, Old Ley Creek Channel Site (7-34-074), Town of Salina, New York. November.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

HydroGeologic, Inc. 2013. Final Remedial Investigation Report. Lower Ley Creek, Sub-site of the Onondaga Lake Superfund Site, Syracuse, New York. June.

HydroGeologic, Inc. 2014. Final Feasibility Study Report: Lower Ley Creek, Sub-site of the Onondaga Lake Superfund Site, Syracuse, New York. March.

Martin, Elizabeth, Associate AIA. January 8, 2014. Personal Communication. Ms. Martin is Historic Sites Restoration Coordinator at the Division for Historic Preservation, New York State Office of Parks, Recreation, and Historic Preservation, Peebles Island, Waterford, New York.

New York Archaeological Council. 1994. Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State. Adopted by the New York State Office of Parks, Recreation and Historic Preservation.

New York Archaeological Council. 2000. Cultural Resource Standards Handbook. Guidance for Understanding and Applying the New York State Standards for Cultural Resource Investigations. Adopted by the New York State Office of Parks, Recreation and Historic Preservation.

NYSDEC. 1995. New York State Freshwater Wetlands Delineation Manual. July 7, 2014 from: http://www.dec.ny.gov/docs/wildlife_pdf/wdelman.pdf

NYSDEC. 2009. Salina Landfill Fact Sheet No. 5. A Sub-Site of the Onondaga Lake Superfund Site and NYS Superfund Site Registry No. 7-34-036.

New York State Office of Parks, Recreation and Historic Preservation. 2005. New York State Historic Preservation Office (SHPO) Archaeological Report Format Requirements. Waterford, New York.

Rosgen, David L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado

SERAS. 2012. Field Activity Summary Report, Lower Ley Creek Superfund Site, WA #SER0007 – Trip Report. January.

USACE. 2011. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-12-1. Vicksburg, MS; U.S. Army Engineer Research and Development Center.

USEPA. August 1989. CERCLA Compliance with Other Laws Manual: Part II; EPA/540/G-89/009, OSWER Directive 9234.1-02.

USEPA. 2014. Record of Decision. Lower Ley Creek Sub-site of the Onondaga Lake Superfund Site, City of Syracuse/Town of Onondaga County, New York. September.

TABLES

Table 3-1
Properties Potentially Requiring Access Agreements
Pre-Design Investigation Work Plan
Lower Ley Creek Subsite to the Onondaga Lake Superfund Site

ARCADIS Design & Consultancy for natural and built assets

Parcel ID	Owner	Property Size (acres)	Property Address	City/Town	Street	City	State	Zip Code
086.-02-19.4	213 TERMINAL ROAD EAST LLC, C/O JOHN PARADIS	4.02	305 TERMINAL ROAD E	SALINA	79 EAST RIVER DR	PHOENIX	NY	13135
086.-02-19.5	213 TERMINAL ROAD EAST LLC, C/O JOHN PARADIS	2.03	TERMINAL ROAD E	SALINA	79 EAST RIVER DR	PHOENIX	NY	13135
074.-03-03.1	DESTINY USA R&D PARK LLC, THE CLINTON EXCHANGE	41.85	7TH NORTH STREET	SALINA	4 CLINTON SQ	SYRACUSE	NY	13202
074.-03-03.1	DESTINY USA R&D PARK LLC, THE CLINTON EXCHANGE	1.60	7TH NORTH STREET	SALINA	4 CLINTON SQ	SYRACUSE	NY	13202
074.-03-03.1	DESTINY USA R&D PARK LLC, THE CLINTON EXCHANGE	1.13	7TH NORTH STREET	SALINA	4 CLINTON SQ	SYRACUSE	NY	13202
086.-02-19.3	GIARRUSSO ATTILIO	10.68	TERMINAL ROAD W	SALINA	108 LAKEVIEW TER	LIVERPOOL	NY	13088
073.-01-10.3	PARATORE JOHN V	1.13	BREWERTON ROAD	SALINA	1551 BREWERTON RD	SYRACUSE	NY	13208
073.-01-10.3	PARATORE JOHN V	5.77	BREWERTON ROAD	SALINA	1551 BREWERTON RD	SYRACUSE	NY	13208
073.-01-10.1	PLAZA EAST LLC	38.62	BREWERTON ROAD	SALINA	PO BOX 156	EAST SYRACUSE	NY	13057
073.-01-06.0	SOLVENTS & PETROLEUM SERVICES	5.21	1401 BREWERTON ROAD	SALINA	1405 BREWERTON RD	SYRACUSE	NY	13208
073.-01-05.0	SOLVENTS & PETROLEUM SERVICES	1.11	1405 BREWERTON ROAD	SALINA	1405 BREWERTON RD	SYRACUSE	NY	13208
001.1-01-01.0	COUNTY OF ONONDAGA	0.30	635 SEVENTH NORTH STREET REAR	SYRACUSE	650 HIAWATHA BLVD W	SYRACUSE	NY	13204
001.2-02-19.0	COUNTY OF ONONDAGA	3.05	2190 PARK STREET REAR	SYRACUSE	650 W HIAWATHA BLVD	SYRACUSE	NY	13204
074.-03-03.2	ONONDAGA COUNTY	3.35	7TH NORTH STREET	SALINA	100 ELWOOD DAVIS RD	NORTH SYRACUSE	NY	13212
086.-02-17.0	ONONDAGA COUNTY	2.53	TERMINAL RD E (BEHIND 243)	SALINA	650 HIAWATHA BLVD W	SYRACUSE	NY	13204
073.-01-10.2	TOWN OF SALINA	6.83	BREWERTON ROAD	SALINA	201 SCHOOL RD	LIVERPOOL	NY	13088
074.-03-03.3	TOWN OF SALINA	0.77	7TH NORTH STREET	SALINA	201 SCHOOL RD	LIVERPOOL	NY	13088
073.-01-08.3	COOPER CROUSE HINDS LLC	12.18	7TH NORTH STREET	SALINA	PO BOX 4446	HOUSTON	TX	77210
001.1-01-03.0	CROUSE-HINDS CO	19.41	635 SEVENTH NORTH STREET	SYRACUSE	PO BOX 4446	HOUSTON	TX	77210
073.-01-09.1	NATIONAL GRID	1.80	BREWERTON ROAD (ROW)	SALINA	300 ERIE BLVD W	SYRACUSE	NY	13202
073.-01-09.2	NATIONAL GRID	0.36	BREWERTON ROAD (ROW)	SALINA	300 ERIE BLVD W	SYRACUSE	NY	13202
074.-03-04.0	NATIONAL GRID	2.14	7TH NORTH STREET (ROW)	SALINA	300 ERIE BLVD W	SYRACUSE	NY	13202
086.-02-16.1	NATIONAL GRID	14.95	7TH NORTH STREET (ROW)	SALINA	300 ERIE BLVD W	SYRACUSE	NY	13202
001.2-02-20.0	NIAGARA MOHAWK POWER CORP	0.89	1900 SPRING STREET & CITY LINE	SYRACUSE	300 ERIE BLVD W	SYRACUSE	NY	13202

Notes:
1. Information based on tax parcel information obtained from Onondaga County in 2015.
2. The above list does not include road right-of-ways (i.e., Route 11/Brewertown Road, 7th North Street, and Interstate 81).

Table 3-2
Proposed Soil Sample Collection Program
Pre-Design Investigation Work Plan
Lower Ley Creek Subsite to the Onondaga Lake Superfund Site

ARCADIS Design & Consultancy for natural and built assets

Soil Investigation Area	Sample Location ID	ROD Removal Depth (ft)	Sample Depth Interval (ft)[2,3]															
			0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	
SOIL-B	SOIL-B-001	2	X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Pipeline characterization
	SOIL-B-002		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-B-003		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-B-004		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-B-005		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-B-006		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Delineation Samples
	SOIL-B-007		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
SOIL-C	SOIL-C-001	2	X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Pipeline characterization
	SOIL-C-002		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-003		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-004		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-005		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-006		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-007		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-008		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-009		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-010		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-011		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-012		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-013		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-014		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-015		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-016		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-017		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-018		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-019		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-020		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-021		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-022		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-C-023		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Delineation Samples
	SOIL-C-024		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
SOIL-D	SOIL-D-001	2	X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Pipeline characterization
	SOIL-D-002		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-D-003		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-D-004		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-D-005		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-D-006		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Delineation Samples
	SOIL-D-007		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-D-008		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-D-009		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-D-010		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-D-011		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-D-012		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-D-013		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
SOIL-E	SOIL-E-001	2	X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Delineation Samples
	SOIL-E-002		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-E-003		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-E-004		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-E-005		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-E-006		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
SOIL-H	SOIL-H-001	2	X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Delineation Samples
	SOIL-H-002		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-H-003		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-H-004		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	

Soil Investigation Area	Sample Location ID	ROD Removal Depth (ft)	Sample Depth Interval (ft)[2,3]																
			0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	
SOIL-I	SOIL-I-001	2	X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Delineation Samples
	SOIL-I-002		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-I-003		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-I-004		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-I-005		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-I-006		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-I-007		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-I-008		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-I-009		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-I-010		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-I-011		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
SOIL-I1	SOIL-I1-001	5	--	--	X	X	X	hold	hold	--	--	--	--	--	--	--	--	--	Bookend deep removal in NE corner of SOIL I1
	SOIL-I1-002		--	--	X	X	X	hold	hold	--	--	--	--	--	--	--	--	--	
	SOIL-I1-003		--	--	X	X	X	hold	hold	--	--	--	--	--	--	--	--	--	
SOIL-L	SOIL-L-001	2	X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Delineation Samples
	SOIL-L-002		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
SOIL-L3	SOIL-L3-001	8	--	--	X	X	X	X	X	X	hold	hold	--	--	--	--	--	--	no reliable 1-ft data, PCB exceedance in 4 foot sample to 8 ft
SOIL-L4	SOIL-L4-001	14	--	--	X	X	X	X	X	X	X	X	X	X	X	X	hold	hold	no reliable 1-ft data, PCB exceedance in 4 foot sample to 12 ft
SOIL-L5	SOIL-L5-001	8	--	--	X	hold	hold	hold	hold	hold	hold	hold	--	--	--	--	--	--	no exceedance beyond 1 foot
	SOIL-L5-002		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	--	--	--	--	--	
SOIL-L6	SOIL-L6-001	8	--	--	X	hold	hold	hold	hold	hold	hold	hold	--	--	--	--	--	--	no exceedance beyond 1 foot
	SOIL-L6-002		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	--	--	--	--	--	
SOIL-L7	SOIL-L7-001	14	--	--	X	X	X	X	X	X	X	X	X	X	X	X	hold	hold	no reliable 1-ft data, Metals exceedance in 4 foot sample to 12 ft
SOIL-L8	SOIL-L8-001	8	--	--	X	hold	hold	hold	hold	hold	hold	hold	--	--	--	--	--	--	no exceedance beyond 2 feet
	SOIL-L8-002		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	--	--	--	--	--	
SOIL-L9	SOIL-L9-001	14	--	--	X	hold	hold	hold	hold	hold	hold	hold	hold	hold	hold	hold	hold	hold	no exceedance beyond 2 feet
SOIL-M	SOIL-M-001	2	X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	Delineation Samples
	SOIL-M-002		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-M-003		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
	SOIL-M-004		X	X	hold	hold	--	--	--	--	--	--	--	--	--	--	--	--	
Total Samples for PCB Analysis			**71**	**71**	**13**	**6**	**6**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**0**	**0**	**188**
Total Samples to Laboratory Archive			**0**	**0**	**71**	**78**	**7**	**10**	**10**	**7**	**8**	**8**	**1**	**1**	**1**	**1**	**3**	**3**	**201**

Notes:

1. See Figures 3-1a through 3-1h showing the proposed soil sampling locations.
2. With certain exceptions, sample depth intervals designated with an "X" indicate samples that will be analyzed for PCBs with sample material held for analysis of metals.
3. Sample depth intervals designated as "hold" indicate samples that will archived by the analytical laboratory and may be subject to subsequent laboratory analysis after reviewing the analytical results for other sample locations or sample depth intervals.

Table 3-3
Proposed Sediment Sample Collection Program
Pre-Design Investigation Work Plan
Lower Ley Creek Subsite to the Onondaga Lake Superfund Site

ARCADIS Design & Consultancy for natural and built assets

Sediment Investigation Area	Sample Location ID	ROD Removal Depth (ft)	Sample Depth Interval (ft)[2,3]											
			0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	
SED-AB	SED-AB-001	--	X	X	hold	hold	--	--	--	--	--	--	--	4
	SED-AB-002		X	X	X	X	hold	hold	--	--	--	--	--	6
	SED-AB-003		X	X	X	X	hold	hold	--	--	--	--	--	6
SED-B	SED-B-001	2	--	--	X	hold	hold	--	--	--	--	--	--	5
	SED-B-002		--	--	X	hold	hold	--	--	--	--	--	--	5
	SED-B-003		--	--	X	X	hold	hold	--	--	--	--	--	6
SED-D	SED-D-001	2	--	--	X	X	hold	hold	--	--	--	--	--	6
	SED-D-002		--	--	X	hold	hold	--	--	--	--	--	--	5
SED-E	SED-E-001L	5	--	--	X	hold	hold	--	--	--	--	--	--	4
	SED-E-001C		--	--	X	hold	hold	--	--	--	--	--	--	4
	SED-E-001R		--	--	X	hold	hold	--	--	--	--	--	--	4
	SED-E-002L		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-E-002C		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-E-002R		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-E-003L		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-E-003C		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-E-003R		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-E-004L		--	--	X	hold	hold	--	--	--	--	--	--	5
	SED-E-004R		--	--	X	hold	hold	--	--	--	--	--	--	5
SED-EF	SED-EF-001	--	X	X	X	X	X	hold	hold	--	--	--	--	7
	SED-EF-002		X	X	X	X	hold	hold	--	--	--	--	--	6
SED-F	SED-F-001L	4	--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-F-001C		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-F-001R		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-F-002L		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-F-002C		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-F-002R		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-F-003L		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-F-003C		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-F-003R		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-F-004		--	--	X	X	X	hold	hold	--	--	--	--	7
	SED-F-005		--	--	X	X	X	hold	hold	hold	hold	hold	--	10

Gap area samples Metals exceedance at R2-6 to 2 ft Metals exceednace at R2-7 to 4 ft
No data below 2 ft, PCB and metals exceedances at 2 ft Confirm excavation depth, define lateral extent
No data below 2 ft, PCB and metals exceedances at 2 ft Cut off deep removal from SED-E
Bookend deep removal driven by R2-15 No clean bottom, and no metals data below two feet Transect samples to define removal slope
Gap area samples Metals exceedance at R2-17 to 2 ft Cut off deep removal from SED-E and SED-F
Bookend deep removal driven by R3-12 Metals exceedance at 7 ft at R3-12 Transect samples to define removal slope
no data, trim 4 foot removal driven by R3-12
no data, trim 4 foot removal driven by R3-12, contingent on SED F 004

Table 3-3
Proposed Sediment Sample Collection Program
Pre-Design Investigation Work Plan
Lower Ley Creek Subsite to the Onondaga Lake Superfund Site

ARCADIS Design & Consultancy for natural and built assets

Sediment Investigation Area	Sample Location ID	ROD Removal Depth (ft)	Sample Depth Interval (ft)[2,3]											
			0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	
SED-G	SED-G-001L	8	--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-001C		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-001R		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-002L		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-002C		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-002R		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-003L		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-G-003C		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-G-003R		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-G-004L		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-G-004C		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-G-004R		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-G-005L		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-005C		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-005R		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-006L		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-006C		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-G-006R		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
SED-H	SED-H-001	2	--	--	X	hold	hold	--	--	--	--	--	--	5
	SED-H-002		--	--	X	hold	hold	--	--	--	--	--	--	5
	SED-H-003		--	--	X	hold	hold	--	--	--	--	--	--	5
	SED-H-004		--	--	X	hold	hold	--	--	--	--	--	--	5
SED-HI	SED-HI-001	--	X	X	X	hold	hold	--	--	--	--	--	--	5
	SED-HI-002		X	X	X	hold	hold	--	--	--	--	--	--	5
SED-I	SED-I-001	2	--	--	X	hold	hold	--	--	--	--	--	--	5
	SED-I-002		--	--	X	hold	hold	--	--	--	--	--	--	5

Bookend deep removal driven by R3-3 PCB exceedance at 8 ft at R3-3, no clean bottom Transect samples to define removal slope
Trim removal driven by R3-11 Metals and PCB exceedance at 2 ft, no clean bottom
Gap area samples
No data below 2 ft, PCB and metals exceedances at 2 ft

Table 3-3
Proposed Sediment Sample Collection Program
Pre-Design Investigation Work Plan
Lower Ley Creek Subsite to the Onondaga Lake Superfund Site

ARCADIS Design & Consultancy for natural and built assets

Sediment Investigation Area	Sample Location ID	ROD Removal Depth (ft)	Sample Depth Interval (ft)[2,3]											
			0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	
SED-J	SED-J-001L	8	--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-001C		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-001R		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-002L		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-J-002C		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-J-002R		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-J-003L		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-J-003C		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-J-003R		--	--	X	X	X	X	X	X	X	hold	hold	11
	SED-J-004L		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-004C		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-004R		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-005L		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-005C		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-005R		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-006L		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-006C		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
	SED-J-006R		--	--	X	hold	hold	hold	hold	hold	hold	hold	--	10
SED-K	SED-K-001	2	--	X	hold	hold	--	--	--	--	--	--	--	4
	SED-K-002		--	X	hold	hold	--	--	--	--	--	--	--	4
SED-KL	SED-KL-001	--	X	X	hold	hold	--	--	--	--	--	--	--	4
	SED-KL-002		X	X	hold	hold	--	--	--	--	--	--	--	4
SED-L	SED-L-001	2	--	--	X	hold	hold	--	--	--	--	--	--	5
	SED-L-002		--	--	X	hold	hold	--	--	--	--	--	--	5
	SED-L-003		--	--	X	hold	hold	--	--	--	--	--	--	5
	SED-L-004		--	--	X	hold	hold	--	--	--	--	--	--	5
Total Samples for PCB Analysis			**7**	**9**	**78**	**34**	**30**	**12**	**12**	**12**	**12**	**0**	**0**	**206**
Total Samples to Laboratory Archive			**0**	**0**	**4**	**48**	**48**	**46**	**42**	**25**	**25**	**37**	**12**	**275**

SED-J	Bookend deep removal driven by R3-8 PCB exceedance at 8 ft at R3-8, no clean bottom Transect samples to define removal slope
SED-K	No data below 1 ft, PCB and metals exceedances at 1 ft
SED-KL	Gap area samples
SED-L	No data below 2 ft, PCB and metals exceedances at 2 ft

Notes:
1. See Figures 1-1a through 1-1h that show the proposed sediment sampling locations.
2. With certain exceptions, sample depth intervals designated with an "X" indicate samples that will be analyzed for PCBs with sample material held for analysis of metals.
3. Sample depth intervals designated as "hold" indicate samples that will archived by the analytical laboratory and may be subject to subsequent laboratory analysis after reviewing the analytical results for other sample locations or sample depth intervals.

Table 3-4
Proposed Geotechnical Sample Collection Program
Pre-Design Investigation Work Plan
Lower Ley Creek Subsite to the Onondaga Lake Superfund Site

ARCADIS Design & Consultancy for natural and built assets

Geotechnical Parameters	Analytical Method	Sample Container	Number of Samples to be Tested
SOIL/SEDIMENT SAMPLES			
Moisture Content	ASTM D2216	Glass Jar or Shelby Tube	25
Grain Size Analysis	ASTM D422	Glass Jar or Shelby Tube	20
Atterberg Limits	ASTM D4318	Glass Jar or Shelby Tube	12
Specific Gravity	ASTM D584	Glass Jar or Shelby Tube	4
Unconsolidated-Undrained (UU) Triaxial Compression with Pore Pressure	ASTM D2850	Shelby Tube	1
Consolidated-Undrained (CU) Triaxial Compression with Pore Pressure	ASTM D4767	Shelby Tube	1
One-Dimensional Consolidation	ASTM D2435/D2535M	Glass Jar or Shelby Tube	2

FIGURES

0 1,500 3,000 Feet

GRAPHIC SCALE

NOTE:

1. 2013 SYRACUSE WEST TOPOGRAPHIC QUADRANGLE OBTAINED FROM THE UNITED STATES GEOLOGICAL SURVEY (USGS) AT: http://store.usgs.gov.

LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE

PRE-DESIGN INVESTIGATION WORK PLAN

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1-1

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDI\WorkPlan\mxd\SiteLocationMap_v2.mxd 8/5/2016 12:19:17 PM

LEGEND:

- RAILROAD
- PIPELINE
- CREEK SHORELINE (APPROXIMATE)
- LOWER LEY CREEK/OLD LEY CREEK SITE BOUNDARY
- FORMER CITY OF SYRACUSE LANDFILL AREA
- CROUSE HINDS LANDFILL
- TOWN OF SALINA LANDFILL

0 700 1,400 Feet

GRAPHIC SCALE

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. LANDFILL DATA LAYERS AND CREEK SHORELINE LAYERS OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
4. PIPELINE, ROAD AND RAILROAD DATA LAYERS WERE OBTAINED FROM ELECTRONIC FILES PROVIDED BY HYDROGEOLOGIC, INC. IN JULY 2015.

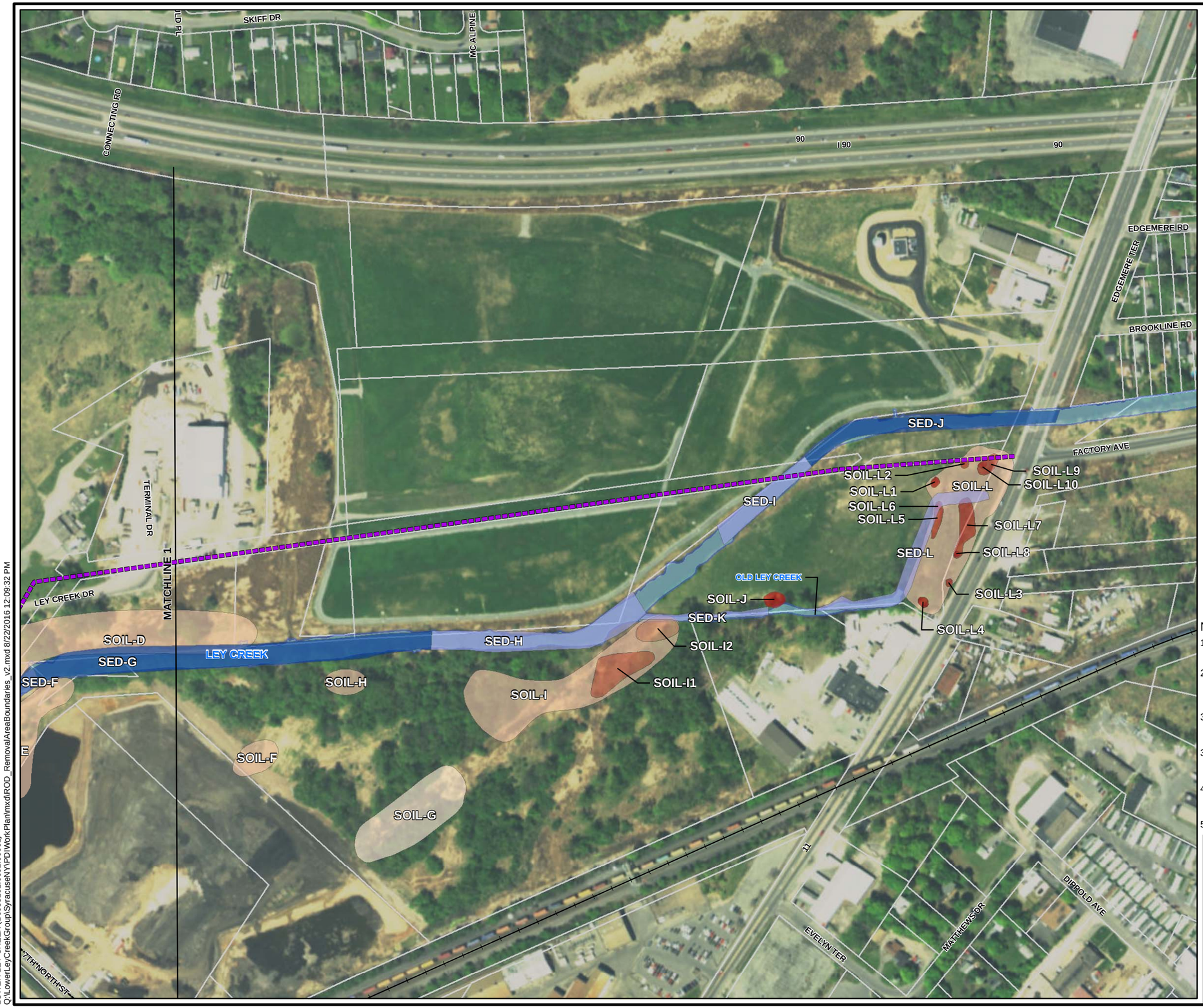
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

SITE LAYOUT

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1-2

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxd\LowerLeyCreek_SiteLayout_v2.mxd 8/5/2016 12:30:46 PM



LEGEND:

- RAILROAD
- NATURAL GAS AND OIL PIPELINE
- LEY CREEK
- PARCEL BOUNDARY

ROD SEDIMENT REMOVAL AREA:

- 1ft
- 2ft
- 3ft
- 4ft
- 5ft
- 8ft

ROD SOIL REMOVAL AREA:

- 0.5ft
- 2ft
- 3ft
- 5ft
- 8ft
- 14ft

0 300 600 Feet

GRAPHIC SCALE

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL REMOVAL EXTENTS AND NATURAL GAS AND OIL PIPELINEWERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. FEASABILITY STUDY SOURCE FILE NOT AVAILABLE.
3. SOIL SITE BOUNDARY IS APPROXIMATE AND WAS DIGITIZED FROM FIGURE 1.2 IN THE LOWER LEY CREEK REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013. REMEDIAL INVESTIGATION SOURCE FILE NOT AVAILABLE.
3. LEY CREEK SHORELINE, CSO LOCATIONS AND SURFACE WATER INPUT LOCATION LAYERS OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
4. NATURAL GAS AND OIL PIPELINE, ROAD AND RAILROAD DATA LAYERS WERE OBTAINED FROM ELECTRONIC FILES PROVIDED BY HYDROGEOLOGIC, INC. IN JULY 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.

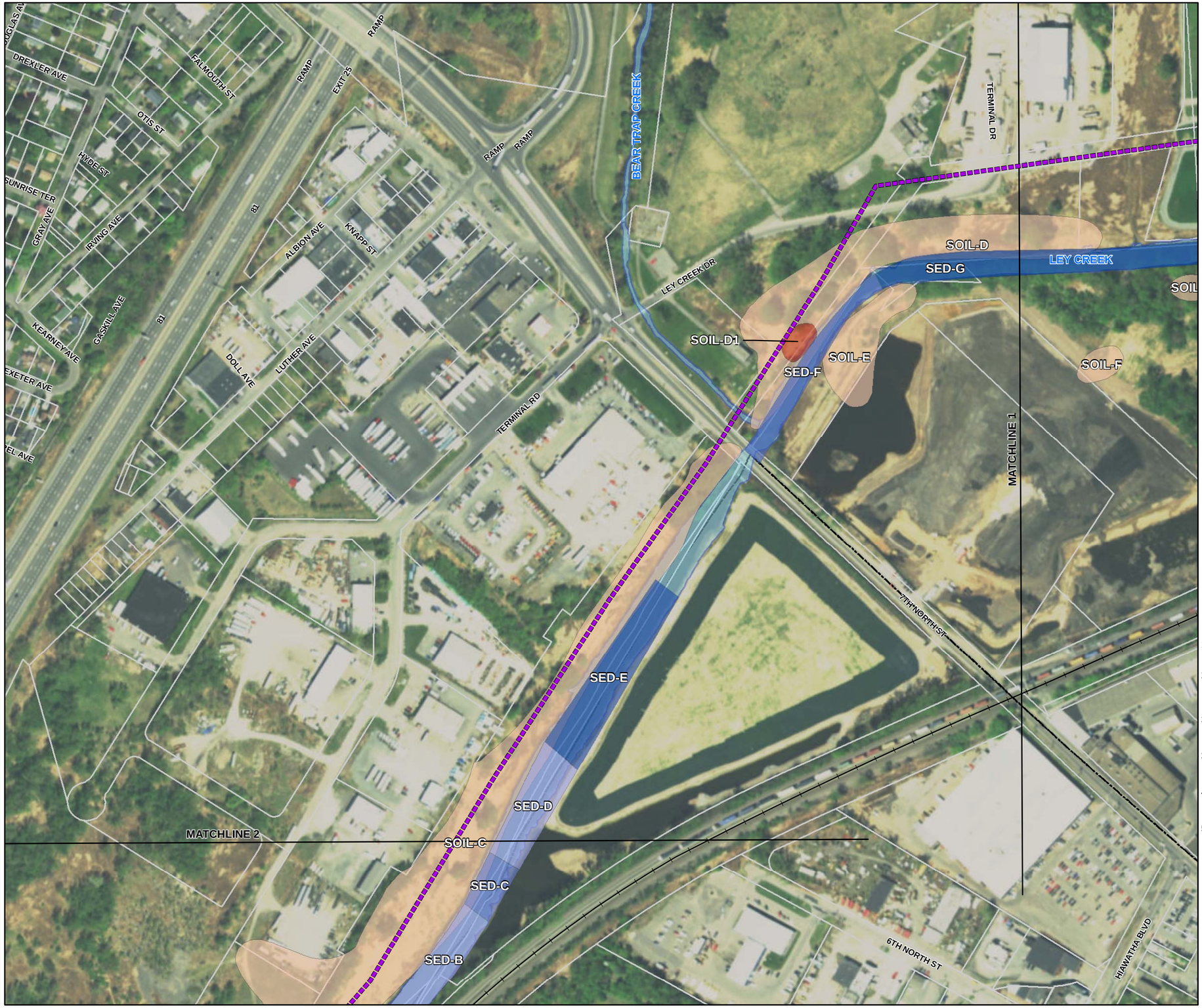
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

ROD REMOVAL AREA BOUNDARIES

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1-3a

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\Lower\LeyCreekGroup\Syracuse\NY\PDI\Work Plan\mxd\ROD_RemovalAreaBoundaries_v2.mxd 8/22/2016 12:09:32 PM



LEGEND:

- RAILROAD
- NATURAL GAS AND OIL PIPELINE
- LEY CREEK
- PARCEL BOUNDARY

ROD SEDIMENT REMOVAL AREA:

- 1ft
- 2ft
- 3ft
- 4ft
- 5ft
- 8ft

ROD SOIL REMOVAL AREA:

- 0.5ft
- 2ft
- 3ft
- 5ft
- 8ft
- 14ft

0 300 600 Feet

GRAPHIC SCALE

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL REMOVAL EXTENTS AND NATURAL GAS AND OIL PIPELINEWERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. FEASABILITY STUDY SOURCE FILE NOT AVAILABLE.
3. SOIL SITE BOUNDARY IS APPROXIMATE AND WAS DIGITIZED FROM FIGURE 1.2 IN THE LOWER LEY CREEK REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013. REMEDIAL INVESTIGATION SOURCE FILE NOT AVAILABLE.
3. LEY CREEK SHORELINE, CSO LOCATIONS AND SURFACE WATER INPUT LOCATION LAYERS OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
4. NATURAL GAS AND OIL PIPELINE, ROAD AND RAILROAD DATA LAYERS WERE OBTAINED FROM ELECTRONIC FILES PROVIDED BY HYDROGEOLOGIC, INC. IN JULY 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.

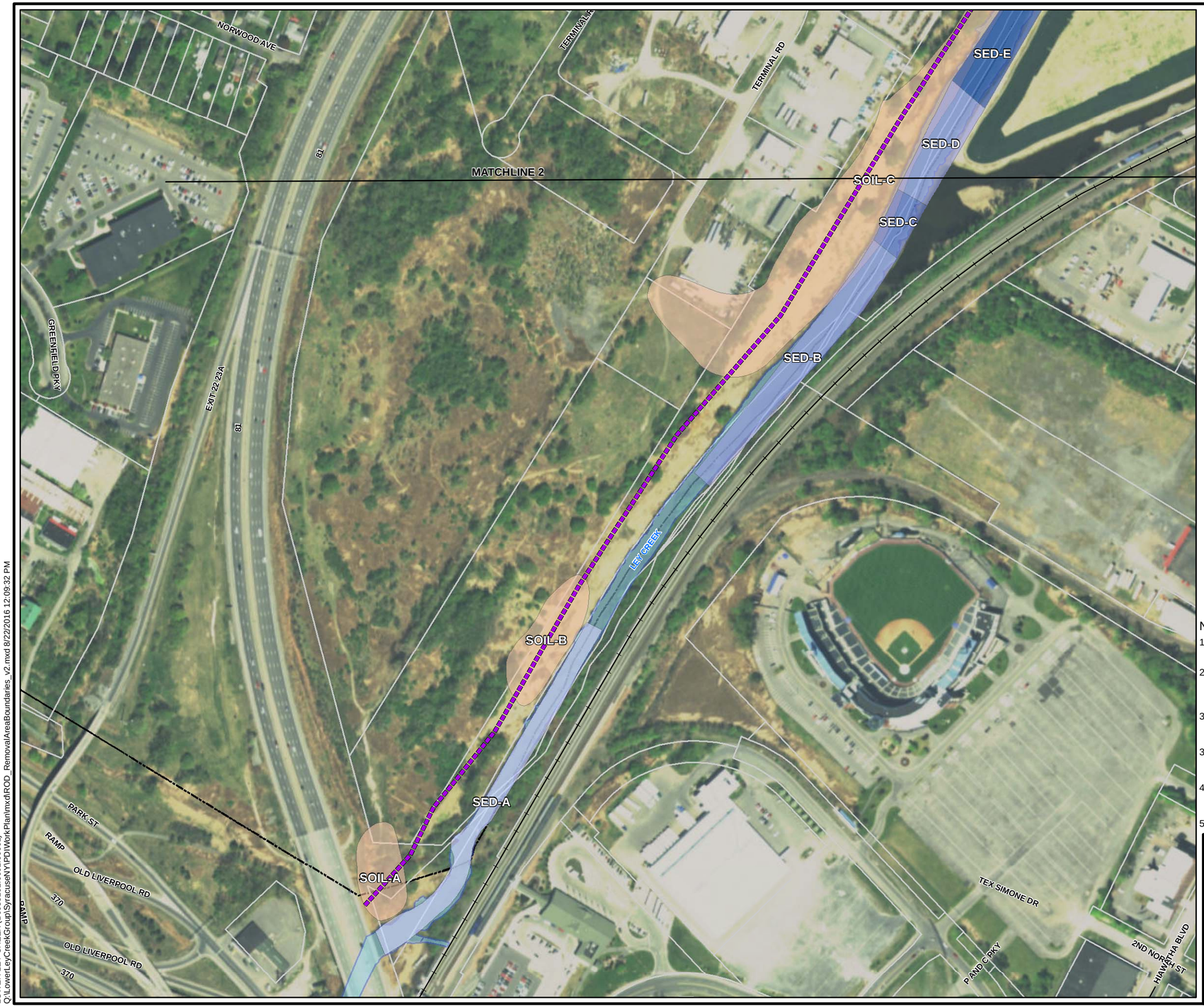
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

ROD REMOVAL AREA BOUNDARIES

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1-3b

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDI\WorkPlan\mxd\ROD_RemovalAreaBoundaries_v2.mxd 8/22/2016 12:09:32 PM



LEGEND:

- RAILROAD
- NATURAL GAS AND OIL PIPELINE
- LEY CREEK
- PARCEL BOUNDARY

ROD SEDIMENT REMOVAL AREA:

- 1ft
- 2ft
- 3ft
- 4ft
- 5ft
- 8ft

ROD SOIL REMOVAL AREA:

- 0.5ft
- 2ft
- 3ft
- 5ft
- 8ft
- 14ft

0 300 600 Feet

GRAPHIC SCALE

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL REMOVAL EXTENTS AND NATURAL GAS AND OIL PIPELINEWERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. FEASABILITY STUDY SOURCE FILE NOT AVAILABLE.
3. SOIL SITE BOUNDARY IS APPROXIMATE AND WAS DIGITIZED FROM FIGURE 1.2 IN THE LOWER LEY CREEK REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013. REMEDIAL INVESTIGATION SOURCE FILE NOT AVAILABLE.
3. LEY CREEK SHORELINE, CSO LOCATIONS AND SURFACE WATER INPUT LOCATION LAYERS OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
4. NATURAL GAS AND OIL PIPELINE, ROAD AND RAILROAD DATA LAYERS WERE OBTAINED FROM ELECTRONIC FILES PROVIDED BY HYDROGEOLOGIC, INC. IN JULY 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.

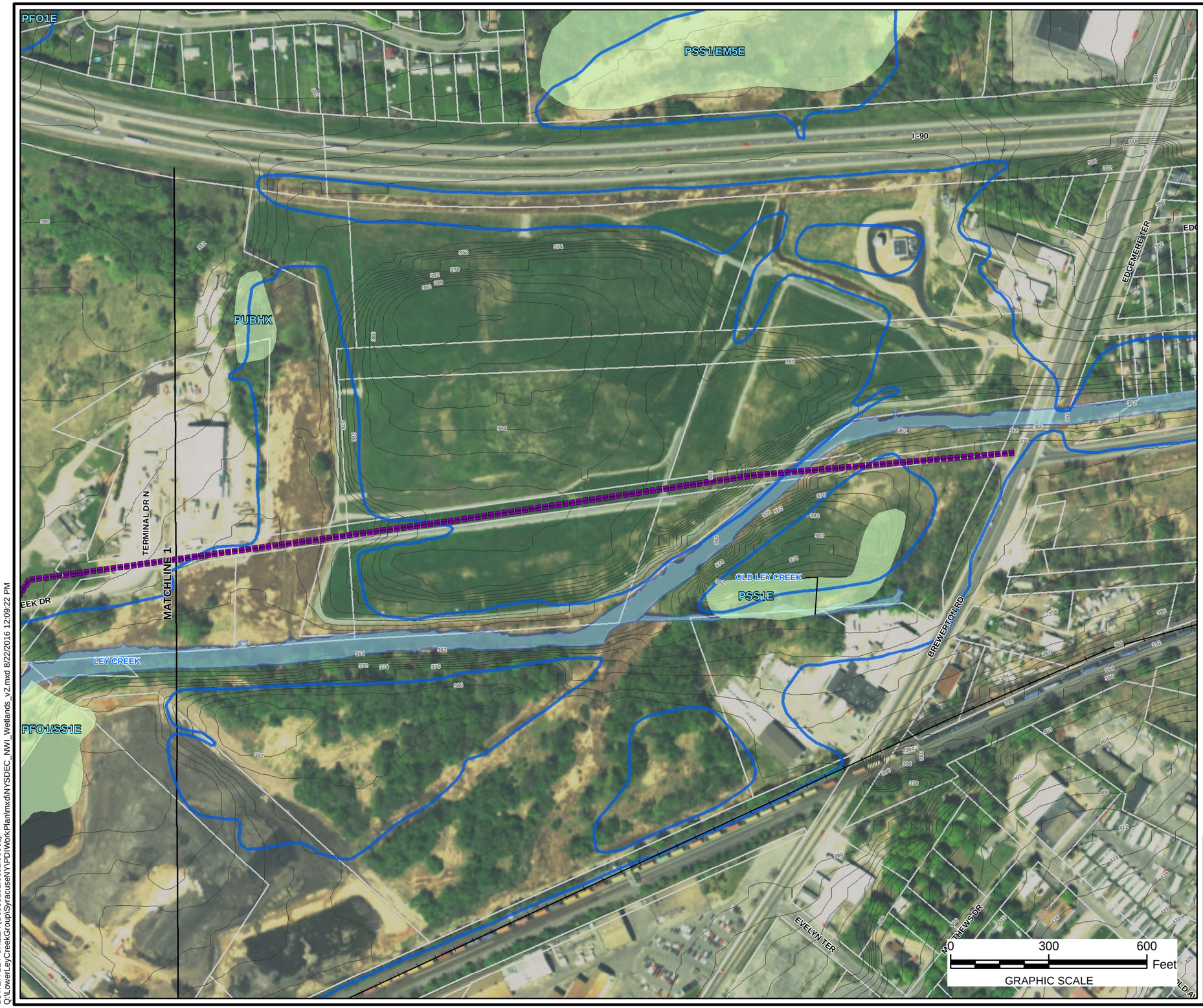
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

ROD REMOVAL AREA BOUNDARIES

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1-3c

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDI\WorkPlan\mxd\ROD_RemovalAreaBoundaries_v2.mxd 8/22/2016 12:09:32 PM



LEGEND:

- PIPELINE
- 2 FT CONTOUR
- RAILROAD
- PARCEL BOUNDARY
- LEY CREEK
- 100 YR FLODPLAIN
- NWI WETLAND
- NYSDEC WETLAND

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. LEY CREEK SHORELINE, CSO LOCATIONS, SURFACE WATER INPUT LOCATIONS AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
3. NATIONAL WETLAND INVENTORY WETLANDS DATA OBTAINED FROM THE US FISH AND WILDLIFE SERVICE AT: www.fws.gov
4. NYSDEC WETLAND DATA OBTAINED FROM THE CORNELL UNIVERSITY GEOSPATIAL INFORMATION REPOSITORY (CUGIR) AT: http://cugir.mannlib.cornell.edu/

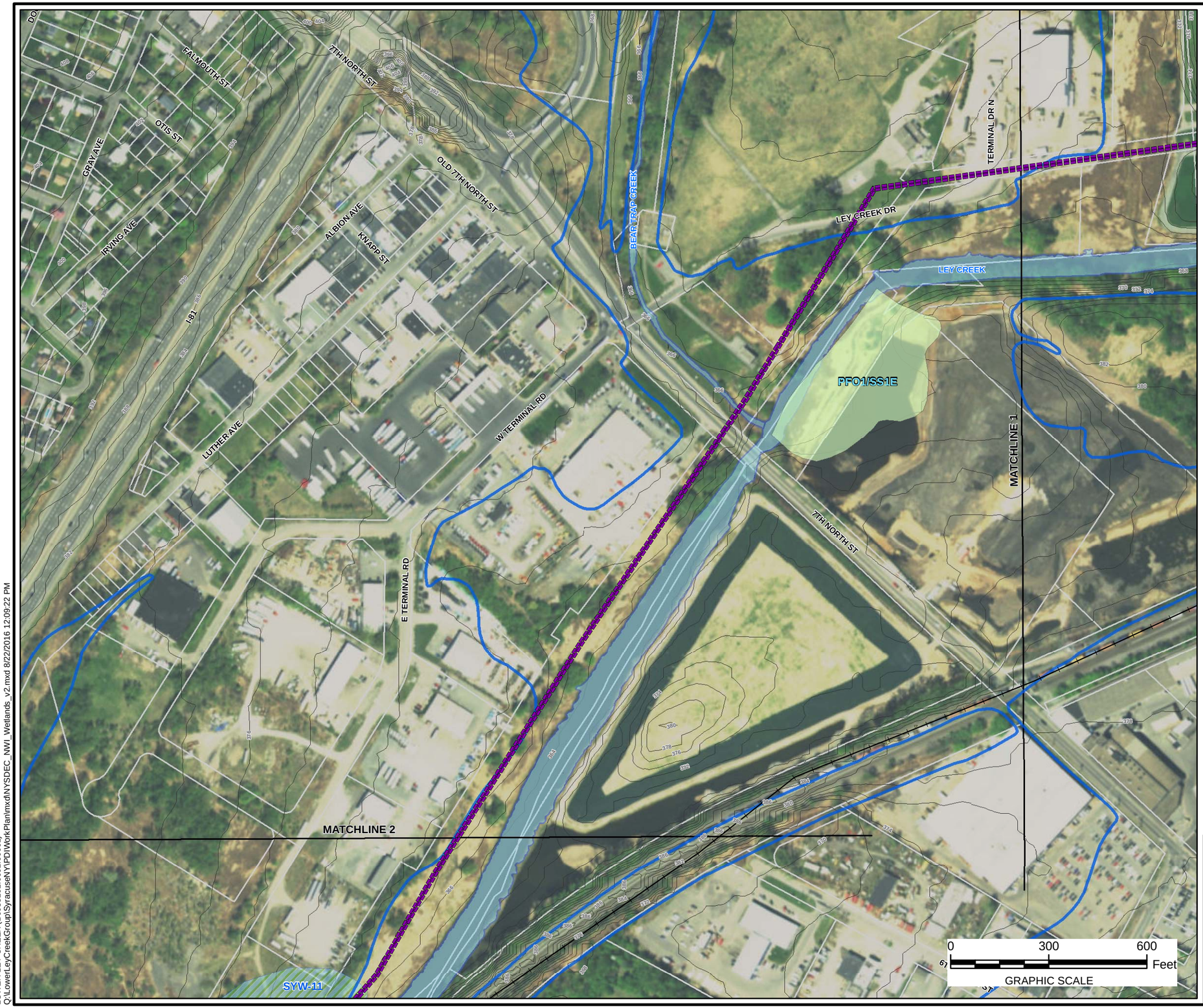
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

LOWER LEY CREEK WETLANDS AND SITE FEATURES MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2-1a

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxd\NYSDEC_NWI_Wetlands_v2.mxd 8/22/2016 12:09:22 PM



LEGEND:

- PIPELINE
- 2 FT CONTOUR
- RAILROAD
- PARCEL BOUNDARY
- LEY CREEK
- 100 YR FLODPLAIN
- NWI WETLAND
- NYSDEC WETLAND

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. LEY CREEK SHORELINE, CSO LOCATIONS, SURFACE WATER INPUT LOCATIONS AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
3. NATIONAL WETLAND INVENTORY WETLANDS DATA OBTAINED FROM THE US FISH AND WILDLIFE SERVICE AT: www.fws.gov
4. NYSDEC WETLAND DATA OBTAINED FROM THE CORNELL UNIVERSITY GEOSPATIAL INFORMATION REPOSITORY (CUGIR) AT: http://cugir.mannlib.cornell.edu/

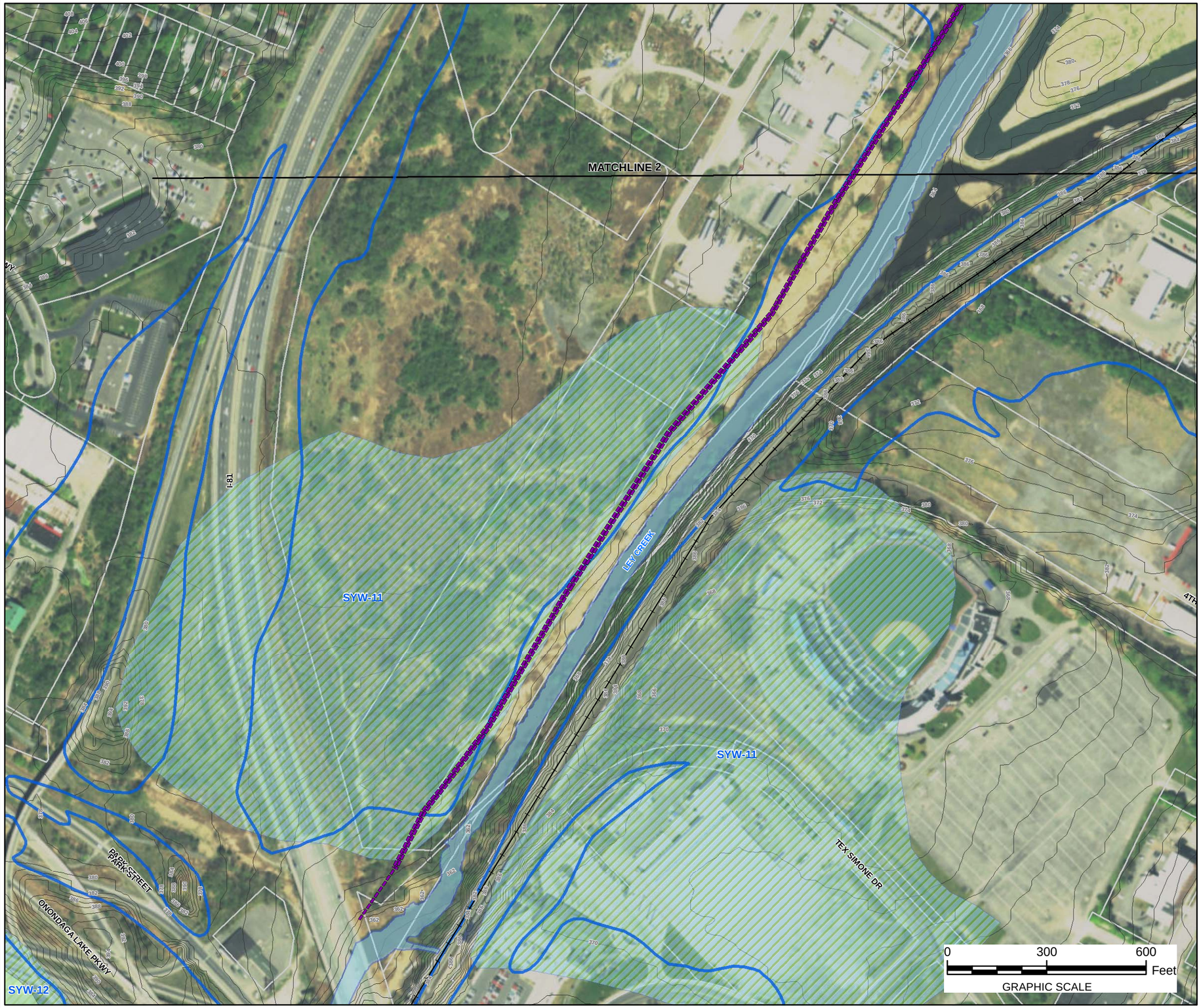
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

LOWER LEY CREEK WETLANDS AND SITE FEATURES MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 2-1b

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxd\NYSDEC_NWI_Wetlands_v2.mxd 8/22/2016 12:09:22 PM



LEGEND:

- PIPELINE
- 2 FT CONTOUR
- RAILROAD
- PARCEL BOUNDARY
- LEY CREEK
- 100 YR FLODPLAIN
- NWI WETLAND
- NYSDEC WETLAND

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. LEY CREEK SHORELINE, CSO LOCATIONS, SURFACE WATER INPUT LOCATIONS AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
3. NATIONAL WETLAND INVENTORY WETLANDS DATA OBTAINED FROM THE US FISH AND WILDLIFE SERVICE AT: www.fws.gov
4. NYSDEC WETLAND DATA OBTAINED FROM THE CORNELL UNIVERSITY GEOSPATIAL INFORMATION REPOSITORY (CUGIR) AT: http://cugir.mannlib.cornell.edu/

LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

LOWER LEY CREEK WETLANDS AND SITE FEATURES MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 2-1c

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxd\NYSDEC_NWI_Wetlands_v2.mxd 8/22/2016 12:09:22 PM

074.-03-03.1
DESTINY USA
R&D PARK LLC
1.6 ACRES

074.-03-03.3
TOWN OF SALINA
2.44 ACRES

073.-01-09.1
NATIONAL GRID
1.8 ACRES

073.-01-10.3
PARATORE JOHN V
1.13 ACRES

074.-03-03.1
DESTINY USA
R&D PARK LLC
41.85 ACRES

074.-03-03.2
ONONDAGA COUNTY
3.35 ACRES

074.-03-03.3
TOWN OF SALINA
0.77 ACRES

074.-03-04.0
NATIONAL GRID
2.14 ACRES

073.-01-10.3
PARATORE JOHN V
5.77 ACRES

074.-03-03.2
ONONDAGA
COUNTY
6.88 ACRES

073.-01-10.2
TOWN OF SALINA
9.54 ACRES

073.-01-09.2
NATIONAL GRID
0.36 ACRES

073.-01-10.2
TOWN OF SALINA
6.83 ACRES

074.-03-05.0
DESTINY USA
R&D PARK LLC
2.25 ACRES

073.-01-05.0
SOLVENTS &
PETROLEUM SVCS
1.11 ACRES

073.-01-10.1
PLAZA EAST LLC
38.62 ACRES

073.-01-06.0
SOLVENTS & PETROLEUM SERV
5.21 ACRES

086.-02-15.0
PARADIS JOHN T
10.11 ACRES

086.-02-14.2
MARTISCO CORP
2.19 ACRES

086.-02-14.1
PARADIS JOHN
3.15 ACRES

001.1-01-03.0
CROUSE-HINDS CO
19.41 ACRES

074.-03-03.1
DESTINY USA
R&D PARK LLC
1.13 ACRES

073.-01-08.1
COOPER CROUSE HINDS LLC
7.67 ACRES

073.-01-08.3
COOPER CROUSE HINDS LLC
12.18 ACRES

086.-02-19.4
213 TERMINAL ROAD EAST LL
4.02 ACRES

086.-02-16.1
NATIONAL GRID
14.95 ACRES

086.-02-19.5
213 TERMINAL ROAD EAST LL
2.03 ACRES

001.1-01-01.0
COUNTY OF ONONDAGA
0.3 ACRES

086.-02-17.0
ONONDAGA COUNTY
2.53 ACRES

086.-02-19.3
GIARRUSSO ATTILIO
10.68 ACRES

13.05 ACRES

001.2-02-20.0
NIAGARA MOHAWK
POWER CORP
0.89 ACRES

001.2-02-19.0
COUNTY OF ONONDAGA
3.05 ACRES

BEAR TRAP CREEK
LEY CREEK
OLD LEY CREEK

I 90
EDGEMERE RD
BROOKLINE RD
FACTORY AVE
LEY CREEK DR
TERMINAL RD
7TH NORTH ST
6TH NORTH ST
4TH NORTH ST
2ND NORTH ST
1ST NORTH ST
DOLLIN ST
VARDON ST
PINKERTON ST
LIBBY ST
RAY ST
DREXLER ST
LEE ST
PLEASANTVIEW DR
DREXLER AVE
DOUGLAS AVE
FALMOUTH ST
GLENDALE AVE
FARPOINT AVE
FAIRMOUNT AVE
SUNRISE TER
OTIS ST
GRAY AVE
IRVING AVE
KEARNEY AVE
BUCKLEY RD
KNAPP ST
GASKILL AVE
81
EXETER AVE
LAUREL AVE
LUTHER AVE
FERNCLIFF AVE
BEECHWOOD AVE
DEXTER AVE
AVON AVE
RIDGE AVE
NORWOOD AVE
GREENFIELD PKY
EXIT 22 22A
370
OLD LIVERPOOL RD
PARK ST
HARBORSIDE DR
P AND C PKY
EVELYN TER
MATTHEWS DR
DIPPOLD AVE
WESTVIEW
HARFORD R
WADSWORTH ST
MERRILL ST
MALVERNE
LOMA AVE
GILBERT ST
MARTIN ST
KENWOOD AVE
MARCIA ST
CADILLAC ST
SAINT MARYS TER
SAINT LERT AVE
GANNETT ALY
STEDMAN ST
WILLUMAE DR
BELLSHIRE LN
HIAWATHA BLVD
PENNSYLVANIA AVE
BURDICK AVE
FORDLAND AVE
GRANT BLVD
MURRAY AVE
ARMITS PL
TURTLE ST
BRACE ST
LEMOYNE AVE
298
MICHAELS AVE
HOOD AVE
ROSS PARK
DALE
KIRKPATRICK ST

LEGEND:
- RAILROAD
- PIPELINE
- CREEK SHORELINE (APPROXIMATE)
- PARCEL BOUNDARY
- PARCEL LIKELY REQUIRING ACCESS AGREEMENT FOR THE PDI

0 700 1,400 Feet
GRAPHIC SCALE

NOTES AND ABBREVIATIONS:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. CREEK SHORELINE AND PIPELINE OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
3. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.

PDI: PRE-DESIGN INVESTIGATION

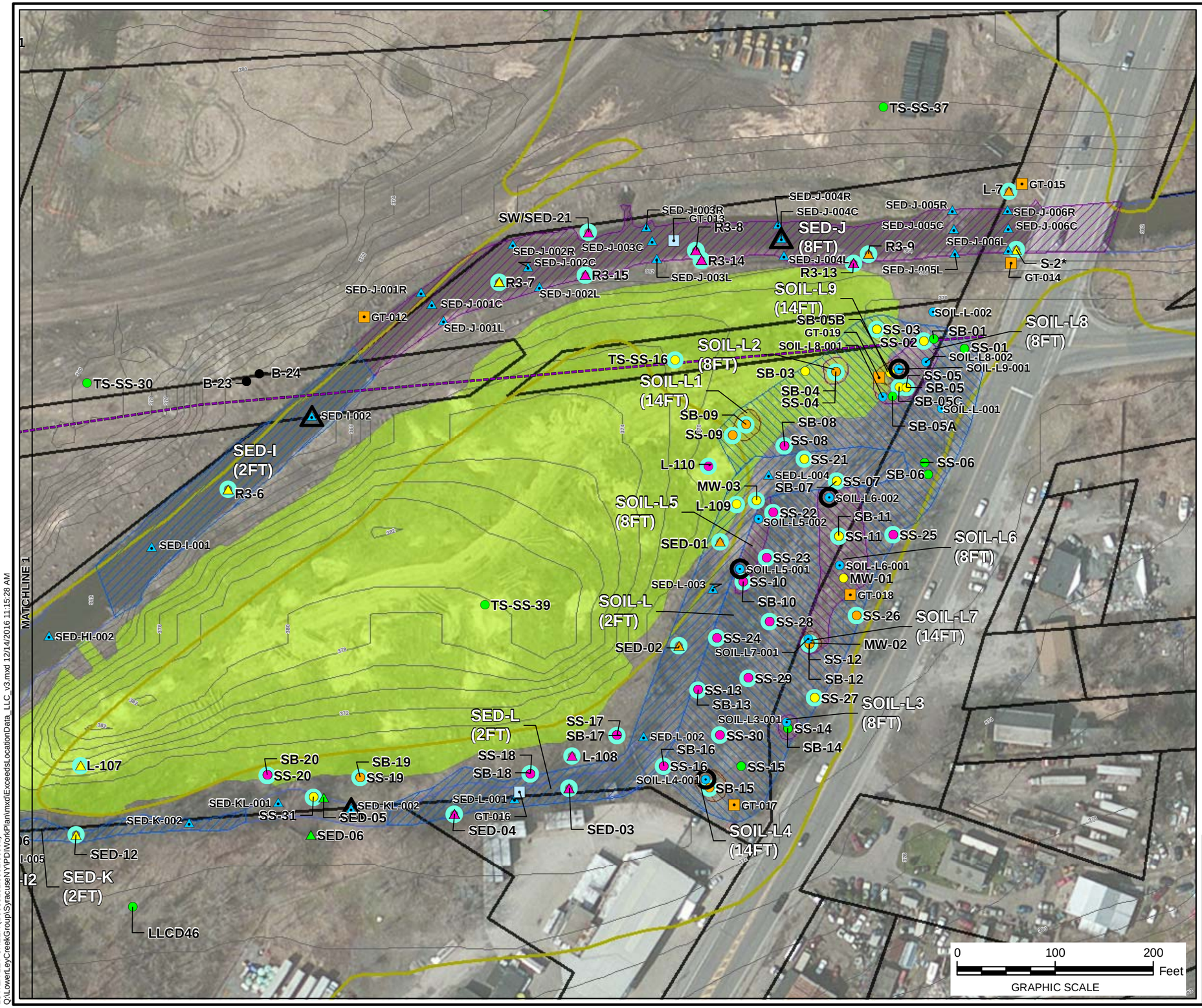
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PARCELS LIKELY REQUIRING ACCESS AGREEMENTS FOR THE PDI

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3-1

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDI\WorkPlan\mxd\ParcelBoundaries_Overall_v2.mxd 8/22/2016 12:08:52 PM



LEGEND:

- PROPOSED WASTE CHARACTERIZATION SEDIMENT COLLECTION LOCATION
- PROPOSED WASTE CHARACTERIZATION SOIL MATERIAL COLLECTION LOCATION
- PROPOSED UPLAND GEOTECHNICAL INVESTIGATION LOCATION
- PROPOSED IN-WATER GEOTECHNICAL INVESTIGATION LOCATION
- 2016 PROPOSED SEDIMENT SAMPLE LOCATION
- 2016 PROPOSED SOIL SAMPLE LOCATION
- EXISTING SEDIMENT SAMPLE LOCATION
- EXISTING SOIL SAMPLE LOCATION

MAXIMUM PCB RESULTS (mg/kg):

- < 1
- 1 - 10
- 10 - 50
- > 50
- SAMPLE LOCATION EXCEEDS PCB REMEDIAL CRITERIA (SEE NOTE 6)
- PIPELINE
- 2 FT CONTOUR

ROD SEDIMENT REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 1 ft
- 2 ft
- 3 ft
- 4 ft
- 5 ft
- 8 ft

ROD SOIL REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 0.5 ft
- 2 FT
- 3 ft
- 5 ft
- 8 ft
- 14 ft
- LEY CREEK
- 100 YEAR FLOODPLAIN
- CREEK SHORELINE (APPROXIMATE)
- PARCEL BOUNDARY
- TOWN OF SALINA - PARCEL 6 EXCAVATION LIMITS

NOTES AND ABBREVIATIONS:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL INVESTIGATION SUB AREAS ADAPTED FROM ROD SEDIMENT AND ROD SOIL REMOVAL AREAS THAT WERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. DEPTHS ARE BASED ON THOSE PRESENTED IN THE FEASIBILITY STUDY. FEASIBIITY STUDY SOURCE FILE NOT AVAILABLE.
3. EXISTING SAMPLE LOCATIONS ARE BASED ON THE REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013.
4. CREEK SHORELINE AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.
6. PRIOR TO INITIATING FIELD INVESTIGATIONS, THE LOCATION AND ALIGNMENT OF ALL UTILITIES (E.G., PIPELINES) WILL BE FIELD VERIFIED. SAMPLE LOCATIONS SHOWN ARE APPROXIMANTE, AND MAY BE ADJUSTED BASED ON THE RESULTS OF UTILITY LOCATION ACTIVITIES AND/OR UNANTICIPATED FIELD CONDITIONS.

FT: FEET
MG/KG: MILLIGRAMS PER KILOGRAM
PCB: POLYCHLORINATED BIPHENYL
ROD: RECORD OF DECISION

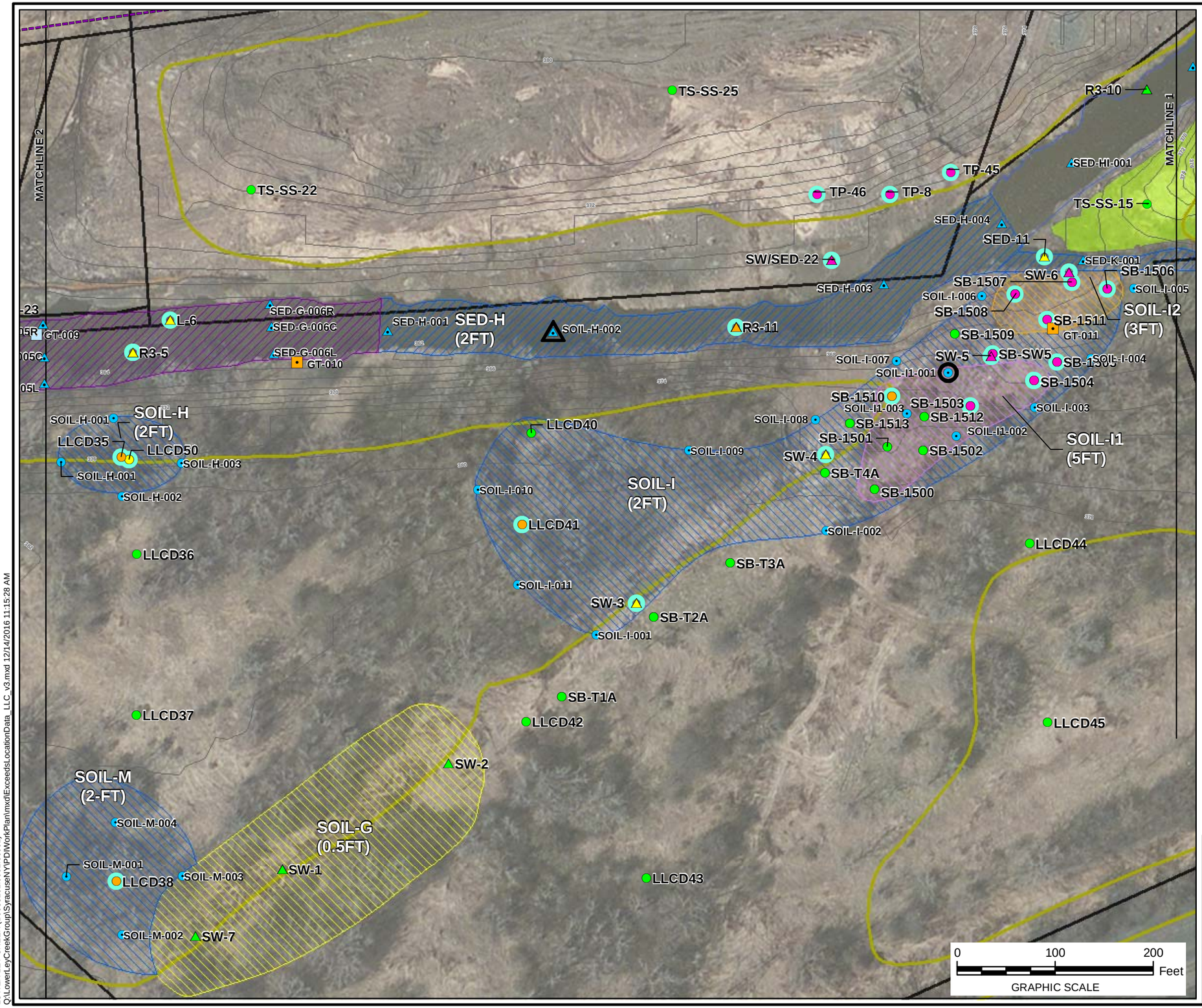
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 3-2b

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxd\ExceedsLocationData_LLC_v3.mxd 12/14/2016 11:15:28 AM



LEGEND:

- PROPOSED WASTE CHARACTERIZATION SEDIMENT COLLECTION LOCATION
- PROPOSED WASTE CHARACTERIZATION SOIL MATERIAL COLLECTION LOCATION
- PROPOSED UPLAND GEOTECHNICAL INVESTIGATION LOCATION
- PROPOSED IN-WATER GEOTECHNICAL INVESTIGATION LOCATION
- 2016 PROPOSED SEDIMENT SAMPLE LOCATION
- 2016 PROPOSED SOIL SAMPLE LOCATION
- EXISTING SEDIMENT SAMPLE LOCATION
- EXISTING SOIL SAMPLE LOCATION

MAXIMUM PCB RESULTS (mg/kg):

- < 1
- 1 - 10
- 10 - 50
- > 50
- SAMPLE LOCATION EXCEEDS PCB REMEDIAL CRITERIA (SEE NOTE 6)
- PIPELINE
- 2 FT CONTOUR

ROD SEDIMENT REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 1 ft
- 2 ft
- 3 ft
- 4 ft
- 5 ft
- 8 ft

ROD SOIL REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 0.5 ft
- 2 FT
- 3 ft
- 5 ft
- 8 ft
- 14 ft
- LEY CREEK
- 100 YEAR FLOODPLAIN
- CREEK SHORELINE (APPROXIMATE)
- PARCEL BOUNDARY
- TOWN OF SALINA - PARCEL 6 EXCAVATION LIMITS

NOTES AND ABBREVIATIONS:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL INVESTIGATION SUB AREAS ADAPTED FROM ROD SEDIMENT AND ROD SOIL REMOVAL AREAS THAT WERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. DEPTHS ARE BASED ON THOSE PRESENTED IN THE FEASIBILITY STUDY. FEASIBIITY STUDY SOURCE FILE NOT AVAILABLE.
3. EXISTING SAMPLE LOCATIONS ARE BASED ON THE REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013.
4. CREEK SHORELINE AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.
6. PRIOR TO INITIATING FIELD INVESTIGATIONS, THE LOCATION AND ALIGNMENT OF ALL UTILITIES (E.G., PIPELINES) WILL BE FIELD VERIFIED. SAMPLE LOCATIONS SHOWN ARE APPROXIMANTE, AND MAY BE ADJUSTED BASED ON THE RESULTS OF UTILITY LOCATION ACTIVITIES AND/OR UNANTICIPATED FIELD CONDITIONS.

FT: FEET
MG/KG: MILLIGRAMS PER KILOGRAM
PCB: POLYCHLORINATED BIPHENYL
ROD: RECORD OF DECISION

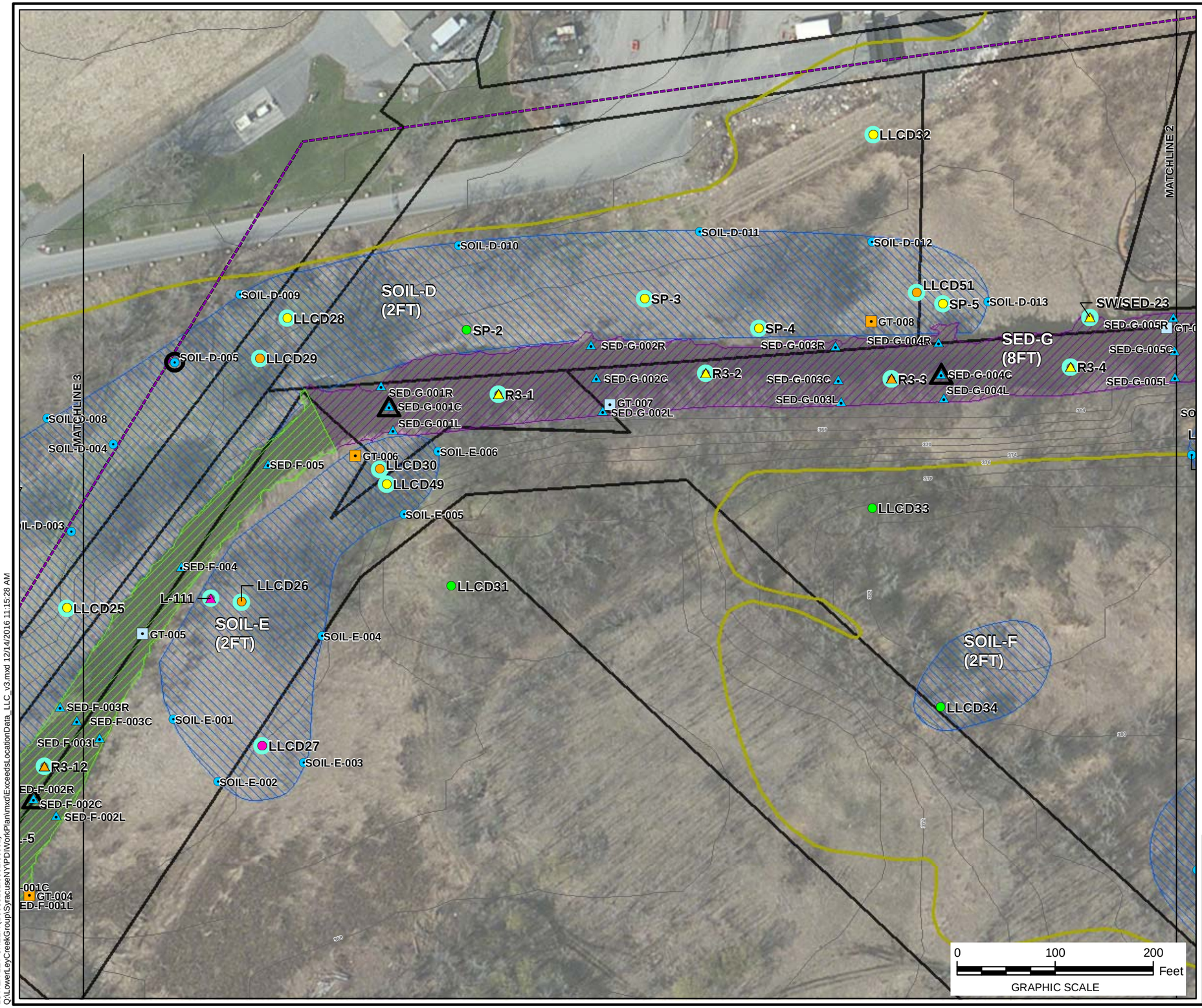
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3-2c

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxd\ExceedsLocationData_LLC_v3.mxd 12/14/2016 11:15:28 AM



LEGEND:

- PROPOSED WASTE CHARACTERIZATION SEDIMENT COLLECTION LOCATION
- PROPOSED WASTE CHARACTERIZATION SOIL MATERIAL COLLECTION LOCATION
- PROPOSED UPLAND GEOTECHNICAL INVESTIGATION LOCATION
- PROPOSED IN-WATER GEOTECHNICAL INVESTIGATION LOCATION
- 2016 PROPOSED SEDIMENT SAMPLE LOCATION
- 2016 PROPOSED SOIL SAMPLE LOCATION
- EXISTING SEDIMENT SAMPLE LOCATION
- EXISTING SOIL SAMPLE LOCATION

MAXIMUM PCB RESULTS (mg/kg):

- < 1
- 1 - 10
- 10 - 50
- > 50
- SAMPLE LOCATION EXCEEDS PCB REMEDIAL CRITERIA (SEE NOTE 6)
- PIPELINE
- 2 FT CONTOUR

ROD SEDIMENT REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 1 ft
- 2 ft
- 3 ft
- 4 ft
- 5 ft
- 8 ft

ROD SOIL REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 0.5 ft
- 2 FT
- 3 ft
- 5 ft
- 8 ft
- 14 ft
- LEY CREEK
- 100 YEAR FLOODPLAIN
- CREEK SHORELINE (APPROXIMATE)
- PARCEL BOUNDARY

NOTES AND ABBREVIATIONS:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL INVESTIGATION SUB AREAS ADAPTED FROM ROD SEDIMENT AND ROD SOIL REMOVAL AREAS THAT WERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. DEPTHS ARE BASED ON THOSE PRESENTED IN THE FEASIBILITY STUDY. FEASIBIITY STUDY SOURCE FILE NOT AVAILABLE.
3. EXISTING SAMPLE LOCATIONS ARE BASED ON THE REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013.
4. CREEK SHORELINE AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.
6. PRIOR TO INITIATING FIELD INVESTIGATIONS, THE LOCATION AND ALIGNMENT OF ALL UTILITIES (E.G., PIPELINES) WILL BE FIELD VERIFIED. SAMPLE LOCATIONS SHOWN ARE APPROXIMANTE, AND MAY BE ADJUSTED BASED ON THE RESULTS OF UTILITY LOCATION ACTIVITIES AND/OR UNANTICIPATED FIELD CONDITIONS.

FT: FEET
MG/KG: MILLIGRAMS PER KILOGRAM
PCB: POLYCHLORINATED BIPHENYL
ROD: RECORD OF DECISION

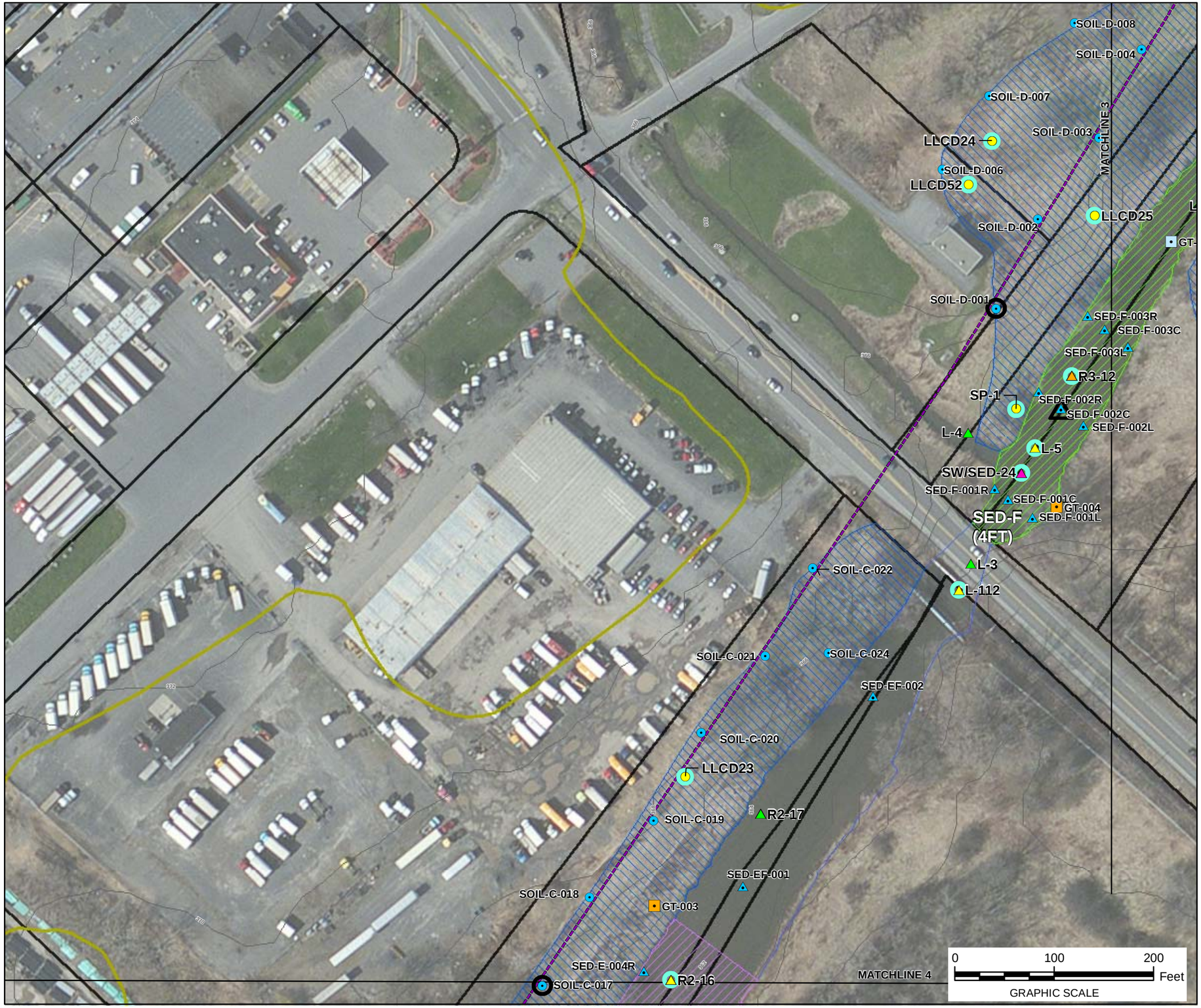
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3-2d

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxd\ExceedsLocationData_LLC_v3.mxd 12/14/2016 11:15:28 AM



LEGEND:

- PROPOSED WASTE CHARACTERIZATION SEDIMENT COLLECTION LOCATION
- PROPOSED WASTE CHARACTERIZATION SOIL MATERIAL COLLECTION LOCATION
- PROPOSED UPLAND GEOTECHNICAL INVESTIGATION LOCATION
- PROPOSED IN-WATER GEOTECHNICAL INVESTIGATION LOCATION
- 2016 PROPOSED SEDIMENT SAMPLE LOCATION
- 2016 PROPOSED SOIL SAMPLE LOCATION
- EXISTING SEDIMENT SAMPLE LOCATION
- EXISTING SOIL SAMPLE LOCATION

MAXIMUM PCB RESULTS (mg/kg):

- < 1
- 1 - 10
- 10 - 50
- > 50
- SAMPLE LOCATION EXCEEDS PCB REMEDIAL CRITERIA (SEE NOTE 6)
- PIPELINE
- 2 FT CONTOUR

ROD SEDIMENT REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 1 ft
- 2 ft
- 3 ft
- 4 ft
- 5 ft
- 8 ft

ROD SOIL REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 0.5 ft
- 2 FT
- 3 ft
- 5 ft
- 8 ft
- 14 ft
- LEY CREEK
- 100 YEAR FLOODPLAIN
- CREEK SHORELINE (APPROXIMATE)
- PARCEL BOUNDARY

NOTES AND ABBREVIATIONS:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL INVESTIGATION SUB AREAS ADAPTED FROM ROD SEDIMENT AND ROD SOIL REMOVAL AREAS THAT WERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. DEPTHS ARE BASED ON THOSE PRESENTED IN THE FEASIBILITY STUDY. FEASIBIITY STUDY SOURCE FILE NOT AVAILABLE.
3. EXISTING SAMPLE LOCATIONS ARE BASED ON THE REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013.
4. CREEK SHORELINE AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.
6. PRIOR TO INITIATING FIELD INVESTIGATIONS, THE LOCATION AND ALIGNMENT OF ALL UTILITIES (E.G., PIPELINES) WILL BE FIELD VERIFIED. SAMPLE LOCATIONS SHOWN ARE APPROXIMANTE, AND MAY BE ADJUSTED BASED ON THE RESULTS OF UTILITY LOCATION ACTIVITIES AND/OR UNANTICIPATED FIELD CONDITIONS.

FT: FEET
MG/KG: MILLIGRAMS PER KILOGRAM
PCB: POLYCHLORINATED BIPHENYL
ROD: RECORD OF DECISION

LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3-2e

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxdIExceedsLocationData_LLC_v3.mxd 12/14/2016 11:15:28 AM

MATCHLINE 4

SED-E-004R
SOIL-C-017
R2-16
SED-E-004L
SOIL-C-016
SED-E-003R
SED-E-003C
LLCD22
SED-E-003L
SOIL-C-015
R2-15
SED-E-002R
GT-002
SED-E-002C
SOIL-C-014
SED-E (5FT)
SED-E-002L
SOIL-C-013
R2-14
SED-E-001R
LLCD20
GT-001
SED-E-001C
SOIL-C-012
SED-E-001L
LLCD21
SOIL-C-011
R2-13
SED-D (2FT)
SOIL-C-010
SED-D-002
R2-12
SOIL-C-009
SOIL-C-008
SED-D-001
LLCD18
LLCD48
SOIL-C-007
LLCD19
R2-11
SED-C (3FT)
SOIL-C (2FT)
SOIL-C-006
SED-B-003
MATCHLINE 5

0 100 200 Feet
GRAPHIC SCALE

LEGEND:

- PROPOSED WASTE CHARACTERIZATION SEDIMENT COLLECTION LOCATION
- PROPOSED WASTE CHARACTERIZATION SOIL MATERIAL COLLECTION LOCATION
- PROPOSED UPLAND GEOTECHNICAL INVESTIGATION LOCATION
- PROPOSED IN-WATER GEOTECHNICAL INVESTIGATION LOCATION
- 2016 PROPOSED SEDIMENT SAMPLE LOCATION
- 2016 PROPOSED SOIL SAMPLE LOCATION
- EXISTING SEDIMENT SAMPLE LOCATION
- EXISTING SOIL SAMPLE LOCATION

MAXIMUM PCB RESULTS (mg/kg):

- < 1
- 1 - 10
- 10 - 50
- > 50
- SAMPLE LOCATION EXCEEDS PCB REMEDIAL CRITERIA (SEE NOTE 6)
- PIPELINE
- 2 FT CONTOUR

ROD SEDIMENT REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 1 ft
- 2 ft
- 3 ft
- 4 ft
- 5 ft
- 8 ft

ROD SOIL REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 0.5 ft
- 2 FT
- 3 ft
- 5 ft
- 8 ft
- 14 ft
- LEY CREEK
- 100 YEAR FLOODPLAIN
- CREEK SHORELINE (APPROXIMATE)
- PARCEL BOUNDARY

NOTES AND ABBREVIATIONS:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL INVESTIGATION SUB AREAS ADAPTED FROM ROD SEDIMENT AND ROD SOIL REMOVAL AREAS THAT WERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. DEPTHS ARE BASED ON THOSE PRESENTED IN THE FEASIBILITY STUDY. FEASIBIITY STUDY SOURCE FILE NOT AVAILABLE.
3. EXISTING SAMPLE LOCATIONS ARE BASED ON THE REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013.
4. CREEK SHORELINE AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.
6. PRIOR TO INITIATING FIELD INVESTIGATIONS, THE LOCATION AND ALIGNMENT OF ALL UTILITIES (E.G., PIPELINES) WILL BE FIELD VERIFIED. SAMPLE LOCATIONS SHOWN ARE APPROXIMANTE, AND MAY BE ADJUSTED BASED ON THE RESULTS OF UTILITY LOCATION ACTIVITIES AND/OR UNANTICIPATED FIELD CONDITIONS.

FT: FEET
MG/KG: MILLIGRAMS PER KILOGRAM
PCB: POLYCHLORINATED BIPHENYL
ROD: RECORD OF DECISION

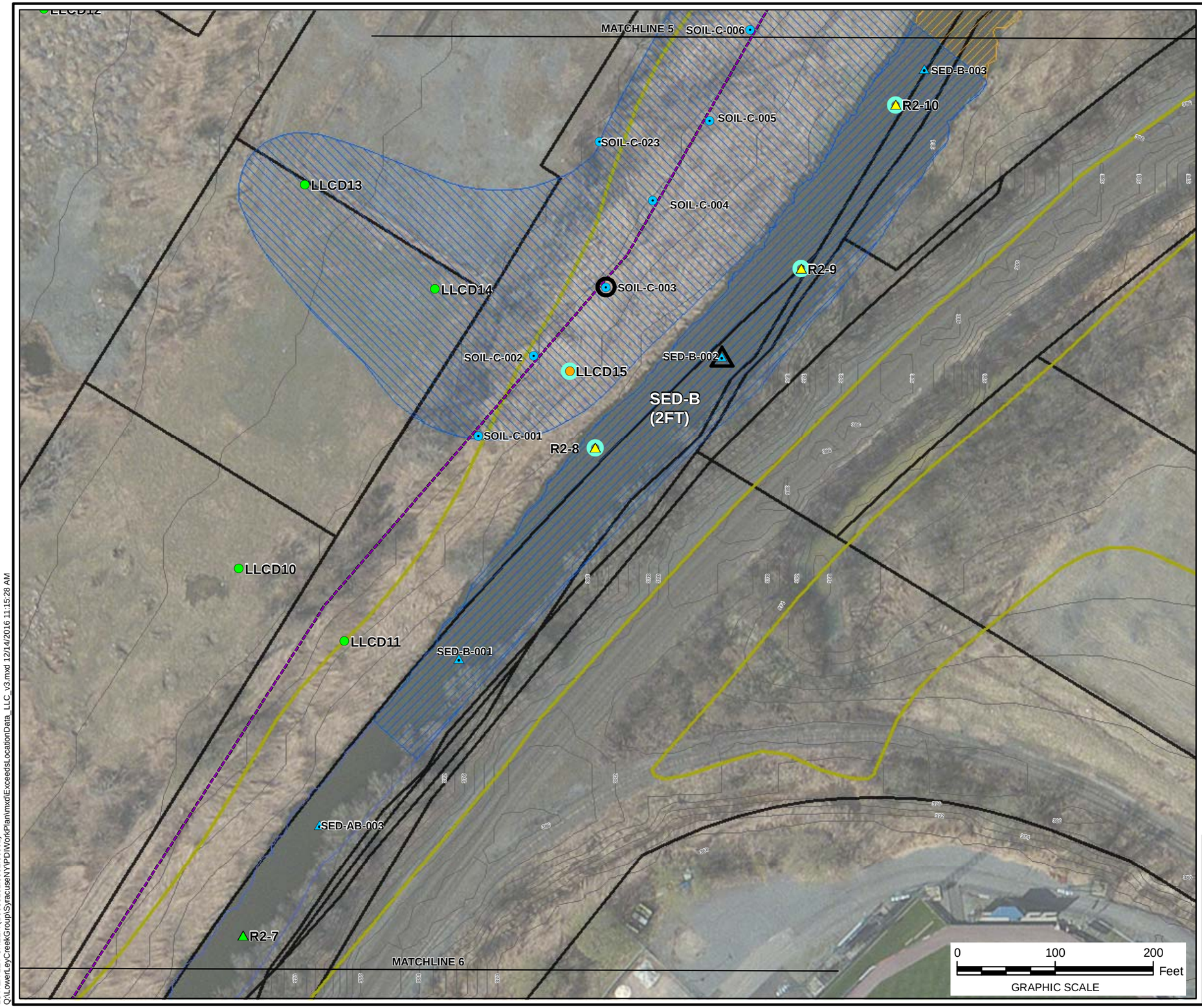
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3-2f

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxd\ExceedsLocationData_LLC_v3.mxd 12/14/2016 11:15:28 AM



LEGEND:

- PROPOSED WASTE CHARACTERIZATION SEDIMENT COLLECTION LOCATION
- PROPOSED WASTE CHARACTERIZATION SOIL MATERIAL COLLECTION LOCATION
- 2016 PROPOSED SEDIMENT SAMPLE LOCATION
- 2016 PROPOSED SOIL SAMPLE LOCATION
- EXISTING SEDIMENT SAMPLE LOCATION
- EXISTING SOIL SAMPLE LOCATION

MAXIMUM PCB RESULTS (mg/kg):

- < 1
- 1 - 10
- 10 - 50
- > 50
- SAMPLE LOCATION EXCEEDS PCB REMEDIAL CRITERIA (SEE NOTE 6)
- PIPELINE
- 2 FT CONTOUR

ROD SEDIMENT REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 1 ft
- 2 ft
- 3 ft
- 4 ft
- 5 ft
- 8 ft

ROD SOIL REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 0.5 ft
- 2 FT
- 3 ft
- 5 ft
- 8 ft
- 14 ft
- LEY CREEK
- 100 YEAR FLOODPLAIN
- CREEK SHORELINE (APPROXIMATE)
- PARCEL BOUNDARY

NOTES AND ABBREVIATIONS:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL INVESTIGATION SUB AREAS ADAPTED FROM ROD SEDIMENT AND ROD SOIL REMOVAL AREAS THAT WERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. DEPTHS ARE BASED ON THOSE PRESENTED IN THE FEASIBILITY STUDY. FEASIBIITY STUDY SOURCE FILE NOT AVAILABLE.
3. EXISTING SAMPLE LOCATIONS ARE BASED ON THE REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013.
4. CREEK SHORELINE AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.
6. PRIOR TO INITIATING FIELD INVESTIGATIONS, THE LOCATION AND ALIGNMENT OF ALL UTILITIES (E.G., PIPELINES) WILL BE FIELD VERIFIED. SAMPLE LOCATIONS SHOWN ARE APPROXIMANTE, AND MAY BE ADJUSTED BASED ON THE RESULTS OF UTILITY LOCATION ACTIVITIES AND/OR UNANTICIPATED FIELD CONDITIONS.

FT: FEET
MG/KG: MILLIGRAMS PER KILOGRAM
PCB: POLYCHLORINATED BIPHENYL
ROD: RECORD OF DECISION

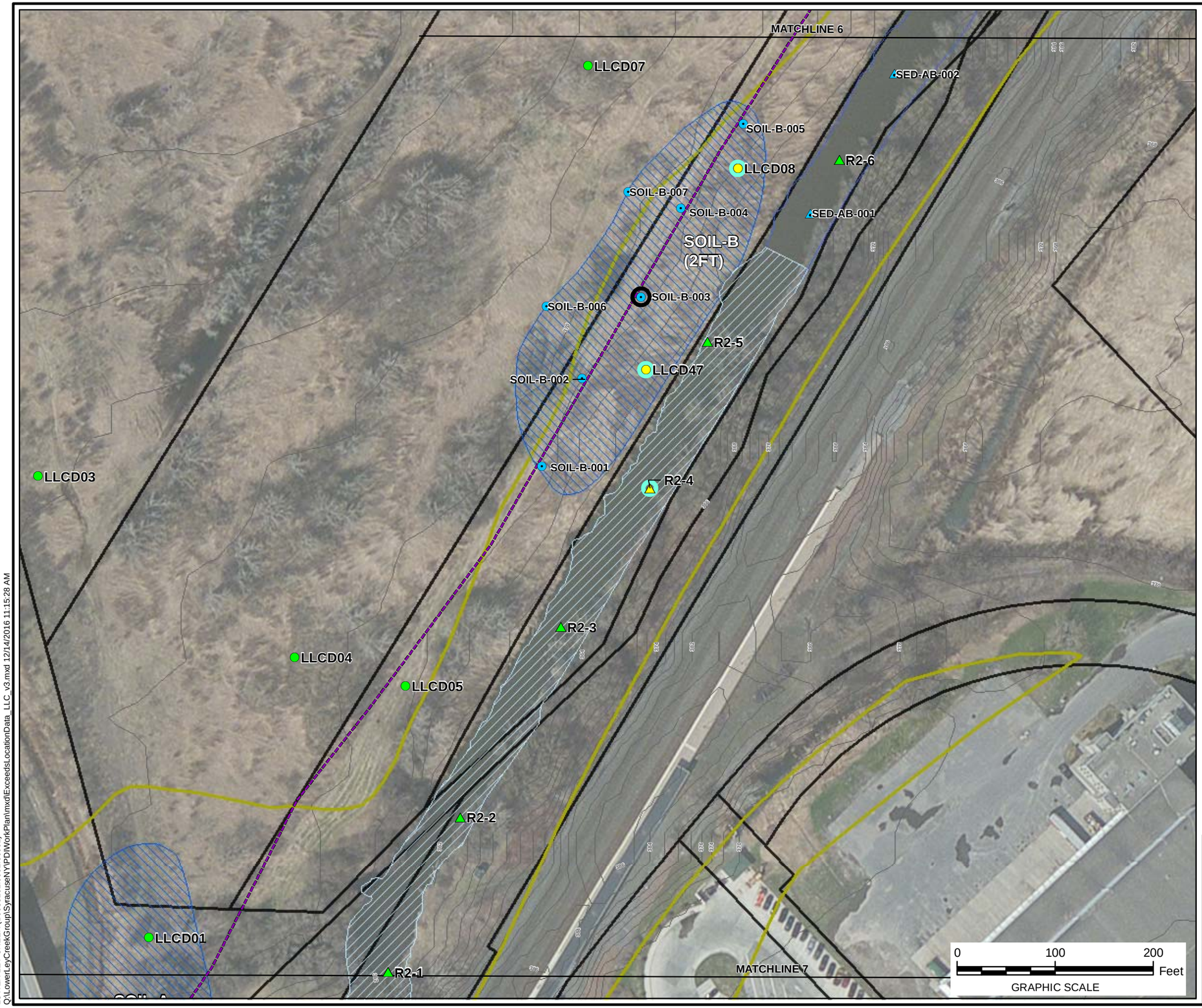
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3-2g

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDI\WorkPlan\mxd\ExceedsLocationData_LLC_v3.mxd 12/14/2016 11:15:28 AM



LEGEND:

- PROPOSED WASTE CHARACTERIZATION SOIL MATERIAL COLLECTION LOCATION
- 2016 PROPOSED SEDIMENT SAMPLE LOCATION
- 2016 PROPOSED SOIL SAMPLE LOCATION
- EXISTING SEDIMENT SAMPLE LOCATION
- EXISTING SOIL SAMPLE LOCATION

MAXIMUM PCB RESULTS (mg/kg):

- < 1
- 1 - 10
- 10 - 50
- > 50
- SAMPLE LOCATION EXCEEDS PCB REMEDIAL CRITERIA (SEE NOTE 6)
- PIPELINE
- 2 FT CONTOUR

ROD SEDIMENT REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 1 ft
- 2 ft
- 3 ft
- 4 ft
- 5 ft
- 8 ft

ROD SOIL REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 0.5 ft
- 2 FT
- 3 ft
- 5 ft
- 8 ft
- 14 ft
- LEY CREEK
- 100 YEAR FLOODPLAIN
- CREEK SHORELINE (APPROXIMATE)
- PARCEL BOUNDARY

NOTES AND ABBREVIATIONS:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL INVESTIGATION SUB AREAS ADAPTED FROM ROD SEDIMENT AND ROD SOIL REMOVAL AREAS THAT WERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. DEPTHS ARE BASED ON THOSE PRESENTED IN THE FEASIBILITY STUDY. FEASIBIITY STUDY SOURCE FILE NOT AVAILABLE.
3. EXISTING SAMPLE LOCATIONS ARE BASED ON THE REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013.
4. CREEK SHORELINE AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.
6. PRIOR TO INITIATING FIELD INVESTIGATIONS, THE LOCATION AND ALIGNMENT OF ALL UTILITIES (E.G., PIPELINES) WILL BE FIELD VERIFIED. SAMPLE LOCATIONS SHOWN ARE APPROXIMANTE, AND MAY BE ADJUSTED BASED ON THE RESULTS OF UTILITY LOCATION ACTIVITIES AND/OR UNANTICIPATED FIELD CONDITIONS.

FT: FEET
MG/KG: MILLIGRAMS PER KILOGRAM
PCB: POLYCHLORINATED BIPHENYL
ROD: RECORD OF DECISION

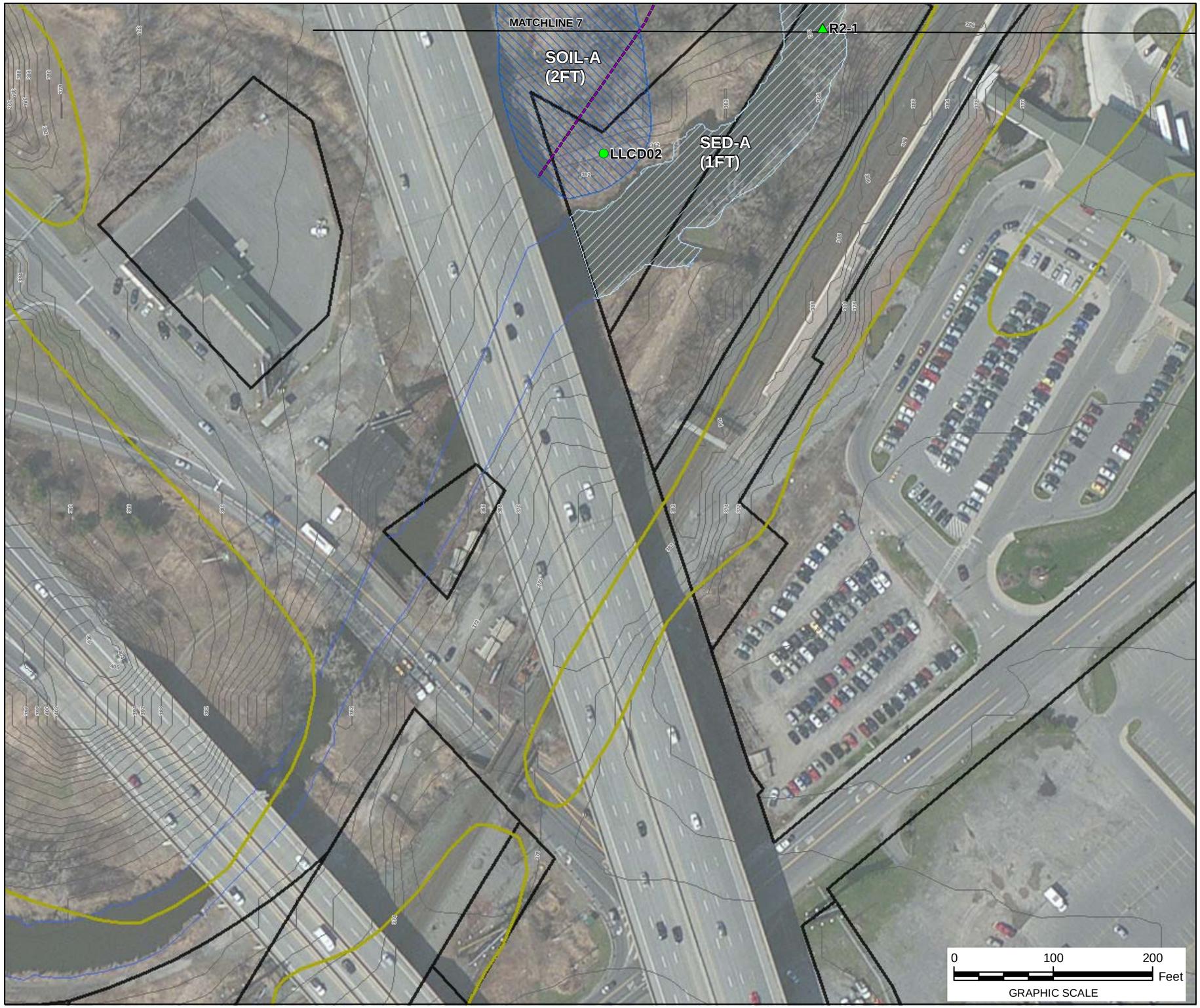
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3-2h

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDI\WorkPlan\mxd\ExceedsLocationData_LLC_v3.mxd 12/14/2016 11:15:28 AM



LEGEND:

- EXISTING SEDIMENT SAMPLE LOCATION
- EXISTING SOIL SAMPLE LOCATION

MAXIMUM PCB RESULTS (mg/kg):

- < 1
- 1 - 10
- 10 - 50
- > 50
- SAMPLE LOCATION EXCEEDS PCB REMEDIAL CRITERIA (SEE NOTE 6)
- PIPELINE
- 2 FT CONTOUR

ROD SEDIMENT REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 1 ft
- 2 ft
- 3 ft
- 4 ft
- 5 ft
- 8 ft

ROD SOIL REMOVAL AREA (ESTIMATED TARGET REMEDIAL DEPTH):

- 0.5 ft
- 2 FT
- 3 ft
- 5 ft
- 8 ft
- 14 ft
- LEY CREEK
- 100 YEAR FLOODPLAIN
- CREEK SHORELINE (APPROXIMATE)
- PARCEL BOUNDARY

NOTES AND ABBREVIATIONS:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL INVESTIGATION SUB AREAS ADAPTED FROM ROD SEDIMENT AND ROD SOIL REMOVAL AREAS THAT WERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. DEPTHS ARE BASED ON THOSE PRESENTED IN THE FEASIBILITY STUDY. FEASIBIITY STUDY SOURCE FILE NOT AVAILABLE.
3. EXISTING SAMPLE LOCATIONS ARE BASED ON THE REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013.
4. CREEK SHORELINE AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.
6. PRIOR TO INITIATING FIELD INVESTIGATIONS, THE LOCATION AND ALIGNMENT OF ALL UTILITIES (E.G., PIPELINES) WILL BE FIELD VERIFIED. SAMPLE LOCATIONS SHOWN ARE APPROXIMANTE, AND MAY BE ADJUSTED BASED ON THE RESULTS OF UTILITY LOCATION ACTIVITIES AND/OR UNANTICIPATED FIELD CONDITIONS.

FT: FEET
MG/KG: MILLIGRAMS PER KILOGRAM
PCB: POLYCHLORINATED BIPHENYL
ROD: RECORD OF DECISION

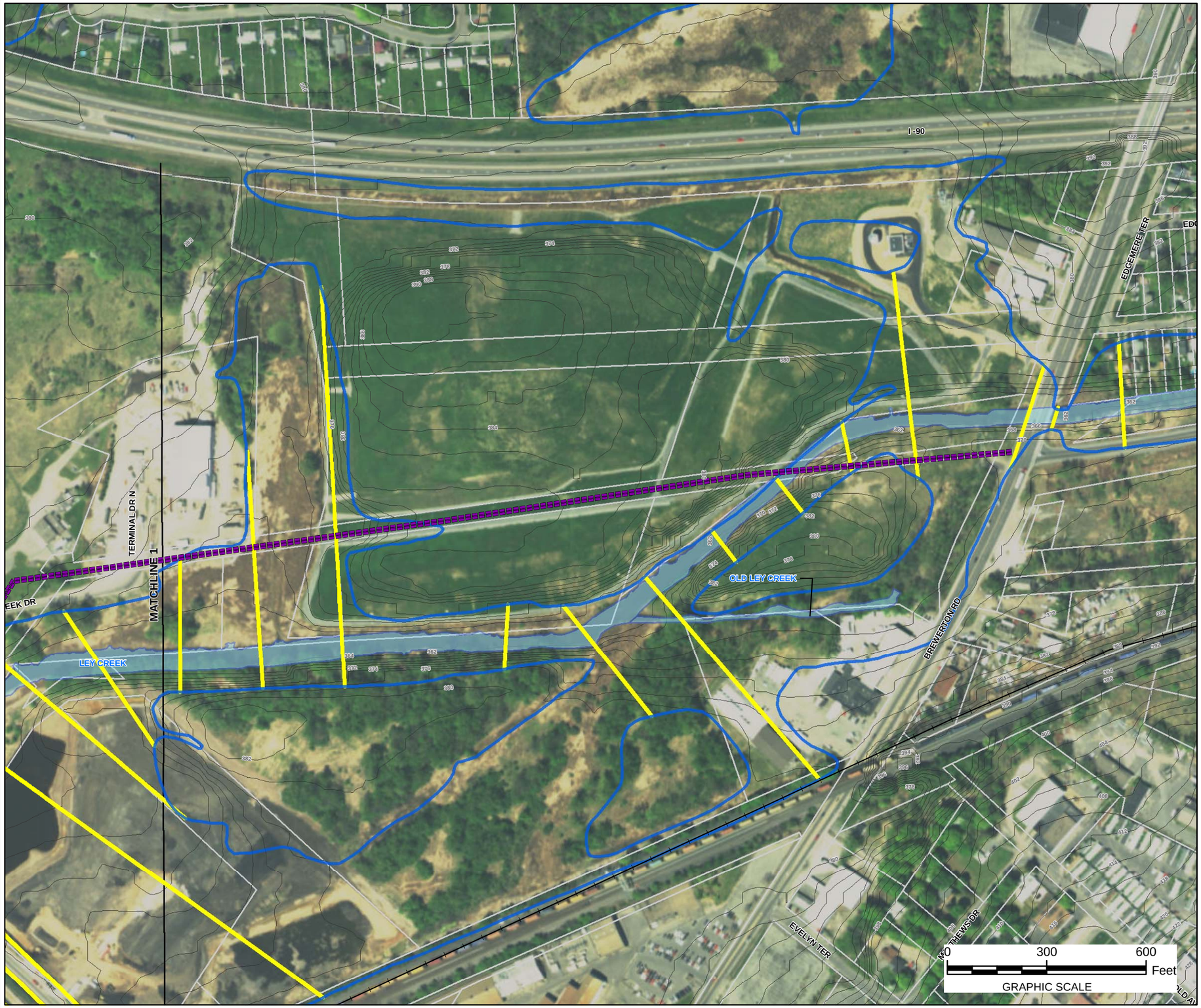
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 3-2i

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxd\ExceedsLocationData_LLC_v3.mxd 12/14/2016 11:15:28 AM



LEGEND:

- PIPELINE
- 2 FT CONTOUR
- RAILROAD
- PROPOSED SURVEY TRANSECT
- PARCEL BOUNDARY
- LEY CREEK
- 100 YR FLODPLAIN

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. LEY CREEK SHORELINE, CSO LOCATIONS, SURFACE WATER INPUT LOCATIONS AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.

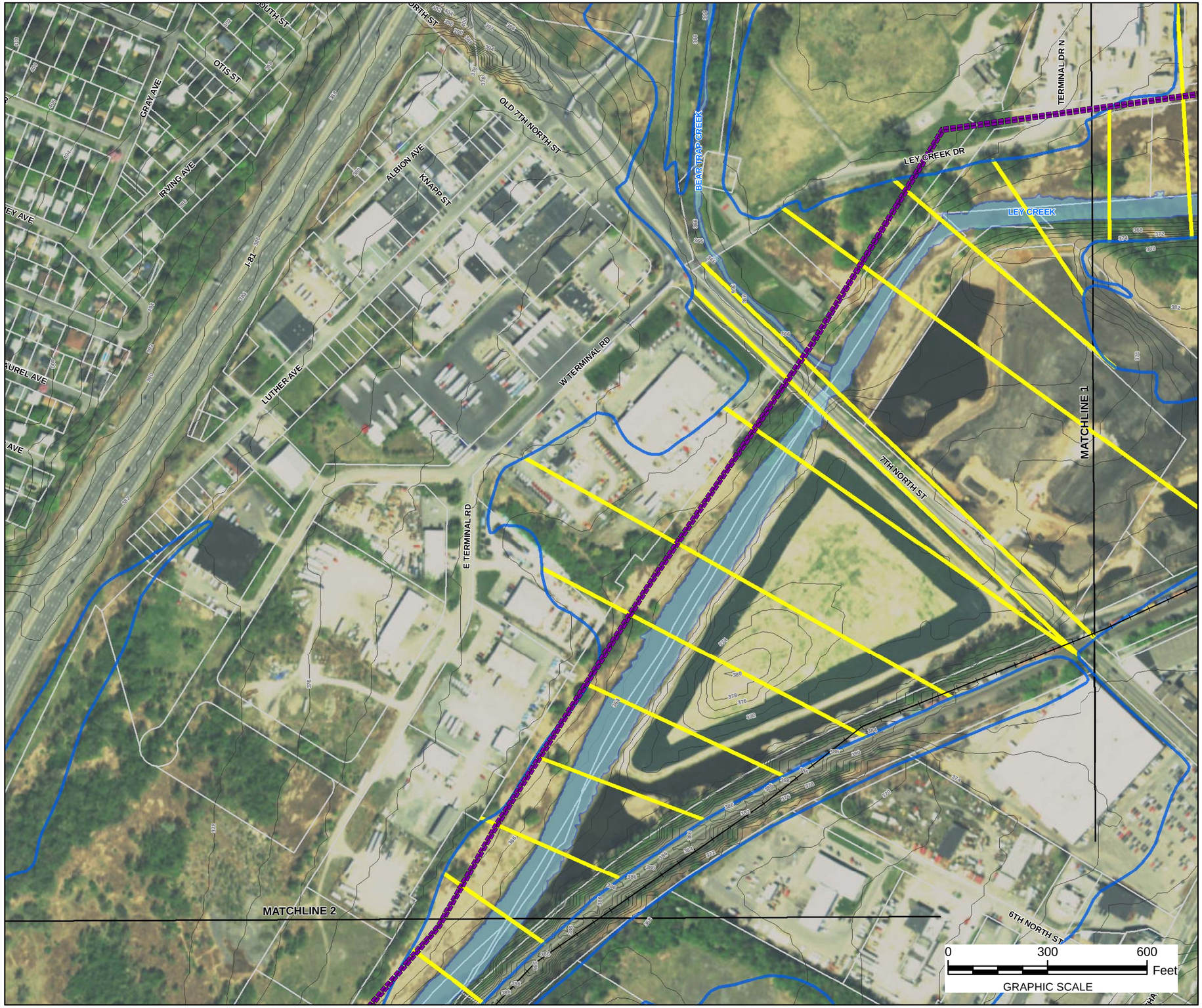
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED BATHYMETRIC AND TOPOGRAPHIC SURVEY TRANSECT LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 3-3a

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDIWorkPlan\mxd\ProposedBathymetricAndTopographicSurveyLocs.mxd 8/19/2016 3:28:58 PM



LEGEND:

- PIPELINE
- 2 FT CONTOUR
- RAILROAD
- PROPOSED SURVEY TRANSECT
- PARCEL BOUNDARY
- LEY CREEK
- 100 YR FLODPLAIN

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. LEY CREEK SHORELINE, CSO LOCATIONS, SURFACE WATER INPUT LOCATIONS AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.

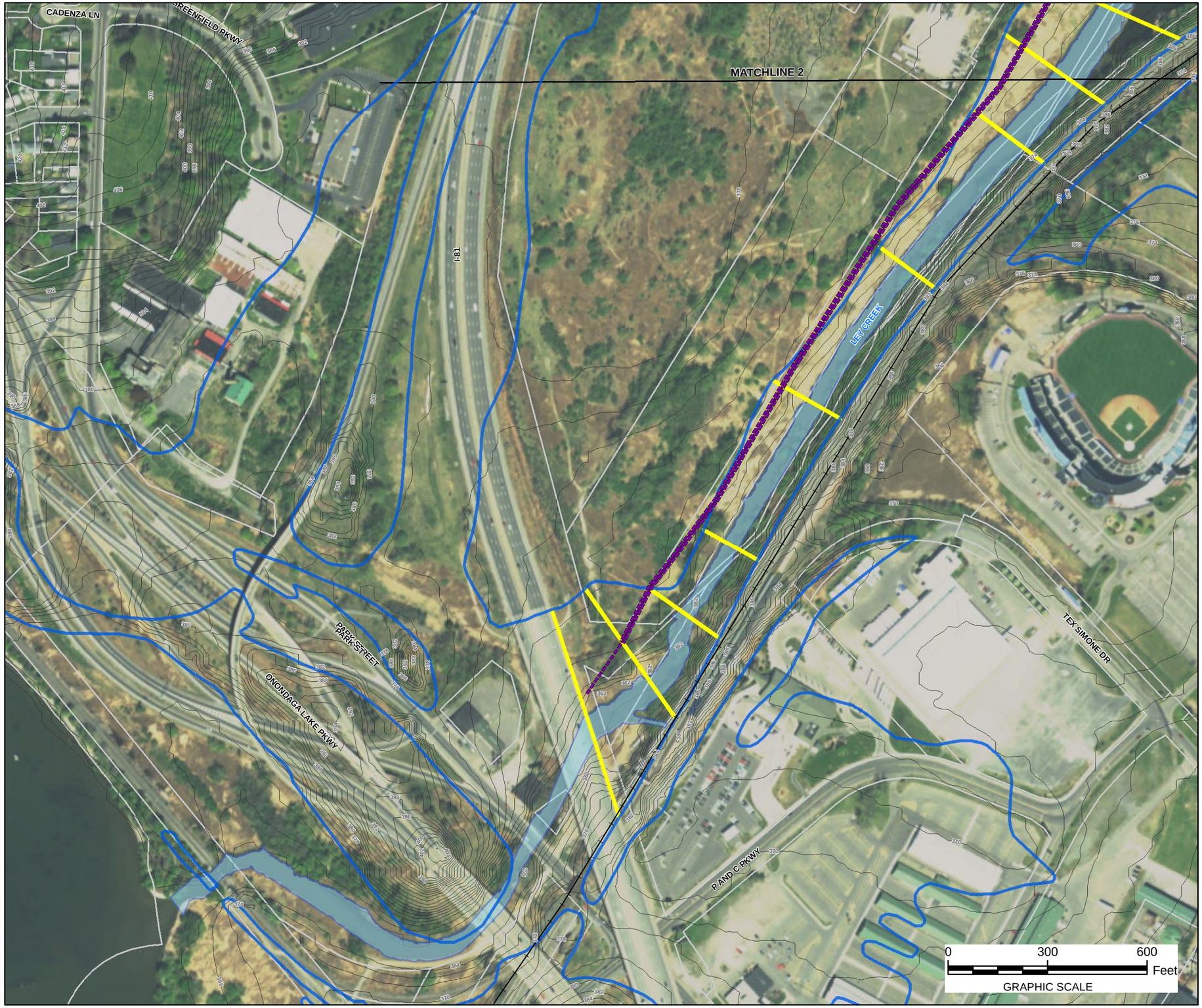
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED BATHYMETRIC AND TOPOGRAPHIC SURVEY TRANSECT LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 3-3b

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDI\WorkPlan\mxd\ProposedBathymetricAndTopographicSurveyLocs.mxd 8/19/2016 3:28:58 PM



LEGEND:

- PIPELINE
- 2 FT CONTOUR
- RAILROAD
- PROPOSED SURVEY TRANSECT
- PARCEL BOUNDARY
- LEY CREEK
- 100 YR FLODPLAIN

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. LEY CREEK SHORELINE, CSO LOCATIONS, SURFACE WATER INPUT LOCATIONS AND TOPOGRAPHIC CONTOUR LAYER OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.

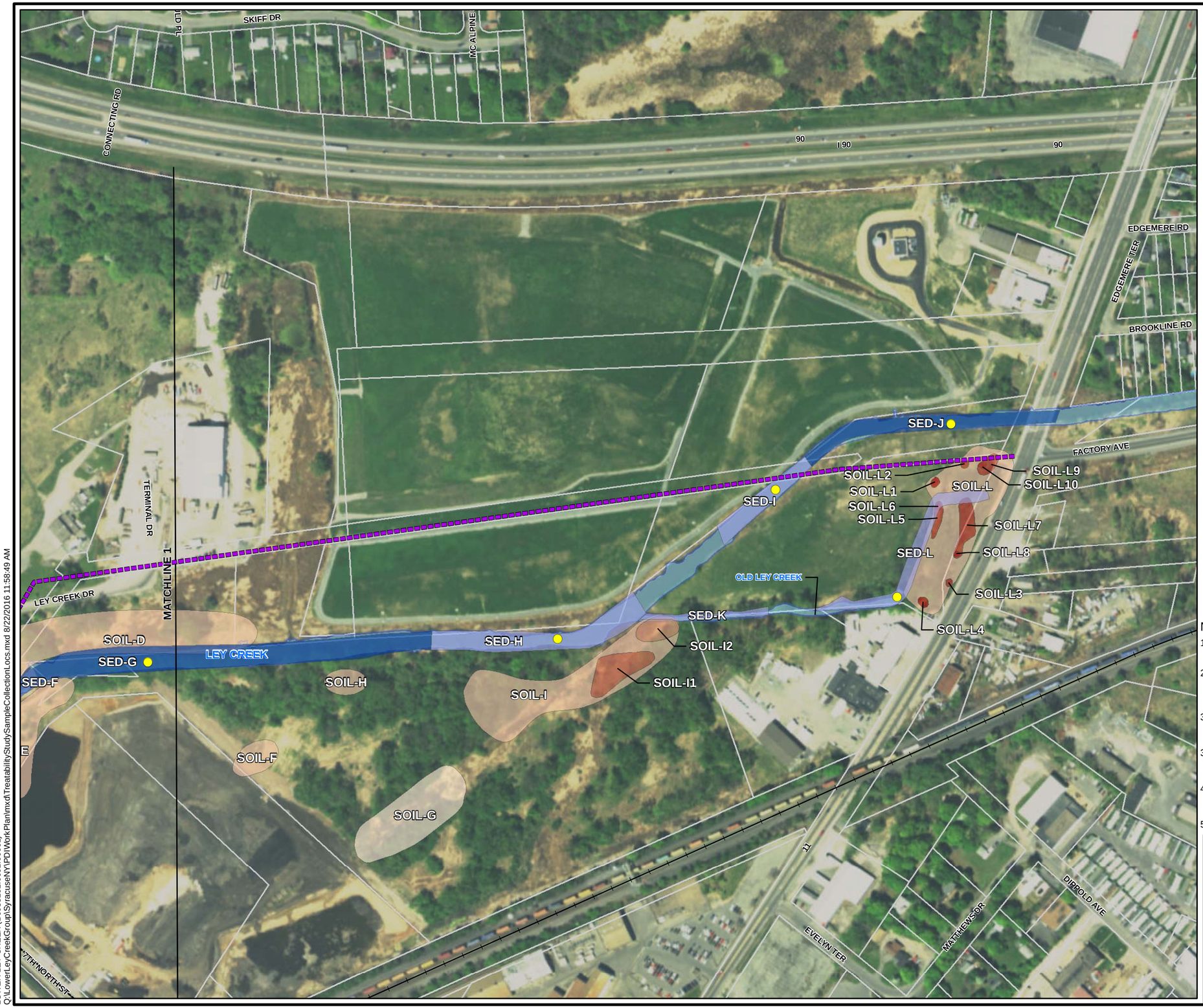
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED BATHYMETRIC AND TOPOGRAPHIC SURVEY TRANSECT LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 3-3c

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\Lower LeyCreekGroup\SyracuseNY\PDI\Work Plan\mxd\ProposedBathymetricAndTopographicSurveyLocs.mxd 8/19/2016 3:28:58 PM



LEGEND:

- PROPOSED TREATABILITY STUDY MATERIALS COLLECTION LOCATION
- RAILROAD
- NATURAL GAS AND OIL PIPELINE
- LEY CREEK
- PARCEL BOUNDARY

ROD SEDIMENT REMOVAL AREA:

- 1ft
- 2ft
- 3ft
- 4ft
- 5ft
- 8ft

ROD SOIL REMOVAL AREA:

- 0.5ft
- 2ft
- 3ft
- 5ft
- 8ft
- 14ft

0 300 600 Feet

GRAPHIC SCALE

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL REMOVAL EXTENTS AND NATURAL GAS AND OIL PIPELINEWERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. FEASABILITY STUDY SOURCE FILE NOT AVAILABLE.
3. SOIL SITE BOUNDARY IS APPROXIMATE AND WAS DIGITIZED FROM FIGURE 1.2 IN THE LOWER LEY CREEK REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013. REMEDIAL INVESTIGATION SOURCE FILE NOT AVAILABLE.
3. LEY CREEK SHORELINE, CSO LOCATIONS AND SURFACE WATER INPUT LOCATION LAYERS OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
4. NATURAL GAS AND OIL PIPELINE, ROAD AND RAILROAD DATA LAYERS WERE OBTAINED FROM ELECTRONIC FILES PROVIDED BY HYDROGEOLOGIC, INC. IN JULY 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.

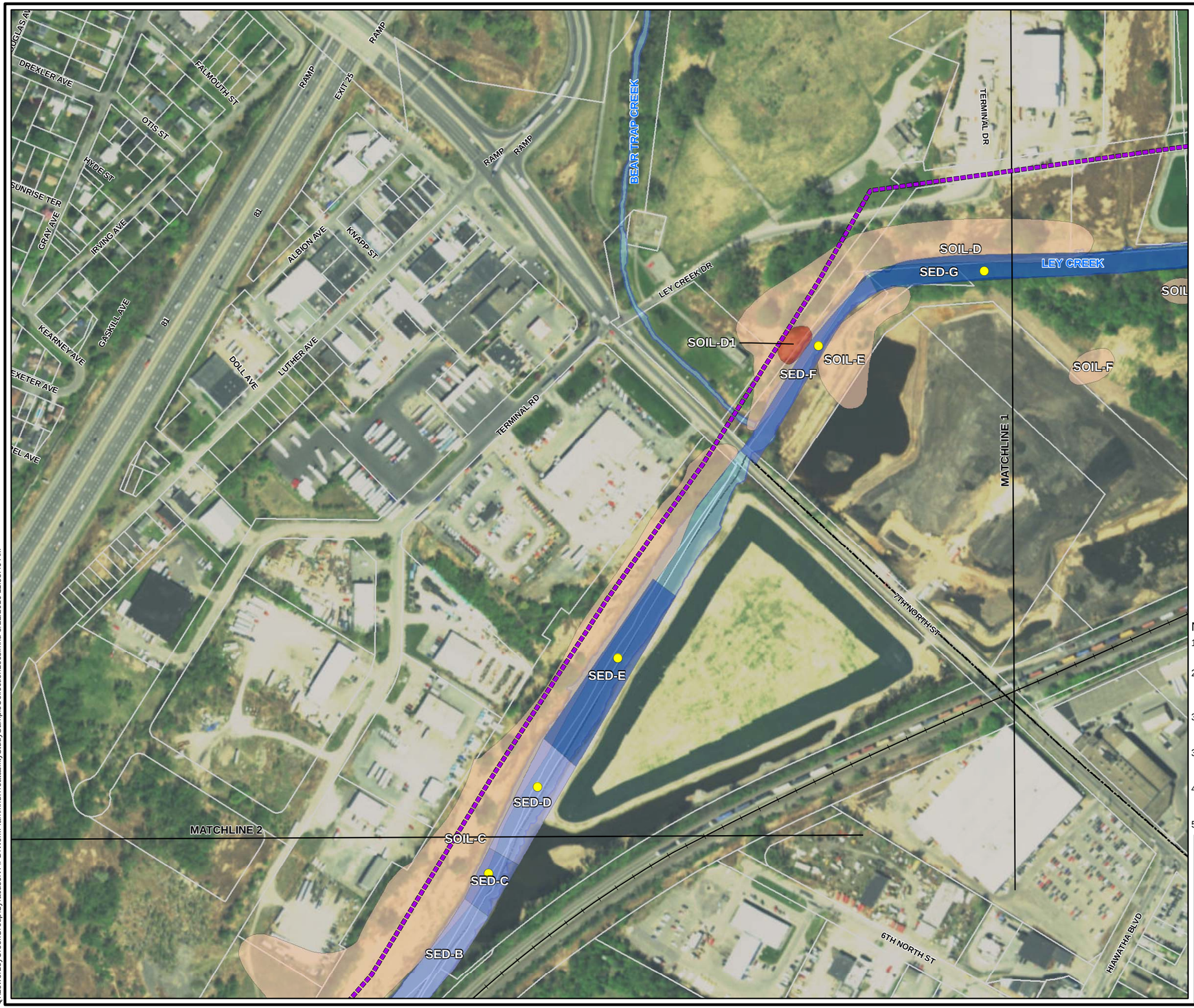
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED TREATABILITY STUDY SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE **4-1a**

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\Lower Ley Creek Group\Syracuse NY\PDI\Work Plan\mxd\Treatability Study Sample Collection Locs.mxd 8/22/2016 11:58:49 AM



LEGEND:

- PROPOSED TREATABILITY STUDY MATERIALS COLLECTION LOCATION
- RAILROAD
- NATURAL GAS AND OIL PIPELINE
- LEY CREEK
- PARCEL BOUNDARY

ROD SEDIMENT REMOVAL AREA:

- 1ft
- 2ft
- 3ft
- 4ft
- 5ft
- 8ft

ROD SOIL REMOVAL AREA:

- 0.5ft
- 2ft
- 3ft
- 5ft
- 8ft
- 14ft

0 300 600 Feet

GRAPHIC SCALE

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL REMOVAL EXTENTS AND NATURAL GAS AND OIL PIPELINEWERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. FEASABILITY STUDY SOURCE FILE NOT AVAILABLE.
3. SOIL SITE BOUNDARY IS APPROXIMATE AND WAS DIGITIZED FROM FIGURE 1.2 IN THE LOWER LEY CREEK REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013. REMEDIAL INVESTIGATION SOURCE FILE NOT AVAILABLE.
3. LEY CREEK SHORELINE, CSO LOCATIONS AND SURFACE WATER INPUT LOCATION LAYERS OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
4. NATURAL GAS AND OIL PIPELINE, ROAD AND RAILROAD DATA LAYERS WERE OBTAINED FROM ELECTRONIC FILES PROVIDED BY HYDROGEOLOGIC, INC. IN JULY 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.

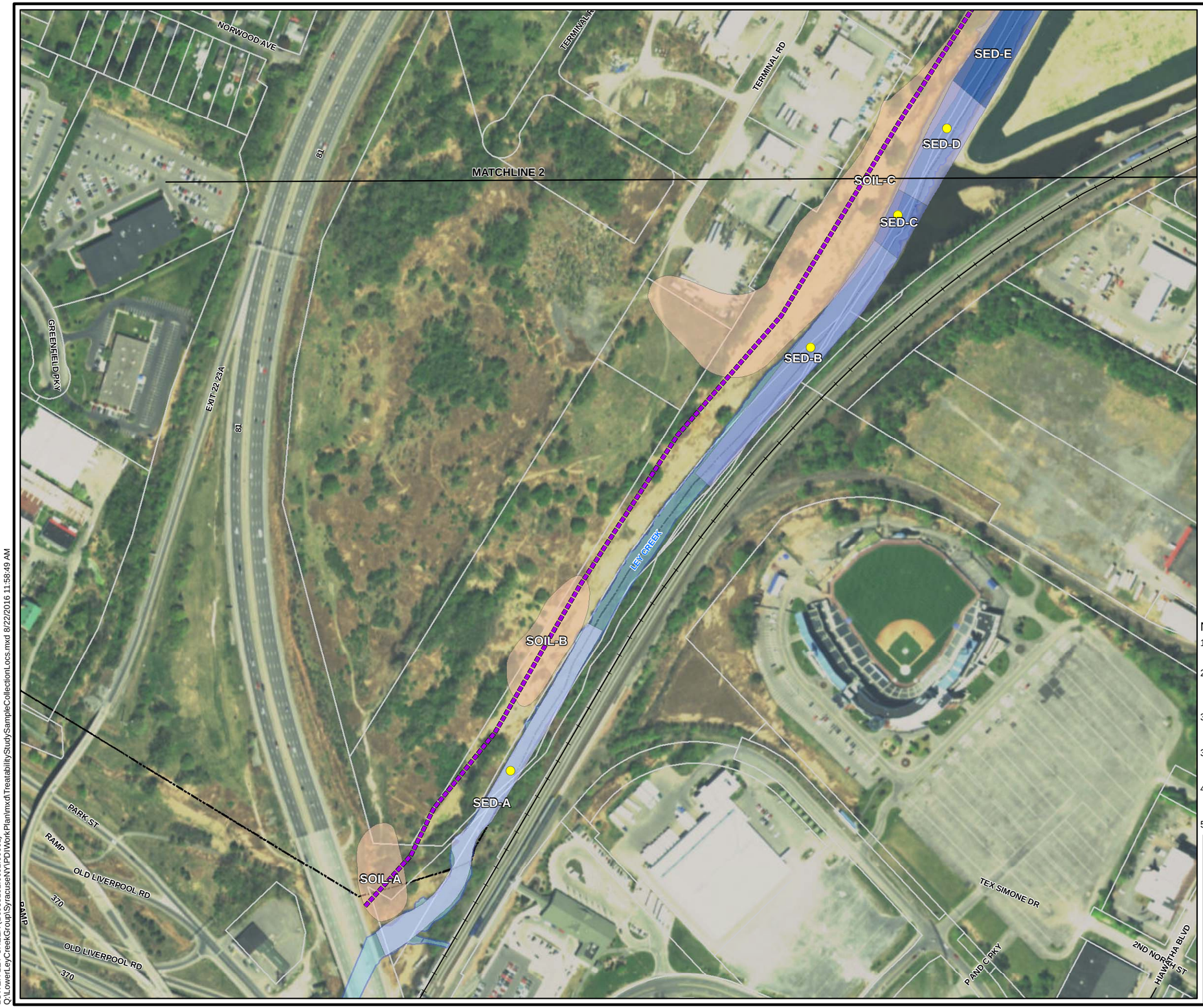
LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED TREATABILITY STUDY SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4-1b

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDI\WorkPlan\mxd\TreatabilityStudySampleCollectionLocs.mxd 8/22/2016 11:58:49 AM



LEGEND:

- PROPOSED TREATABILITY STUDY MATERIALS COLLECTION LOCATION
- RAILROAD
- NATURAL GAS AND OIL PIPELINE
- LEY CREEK
- PARCEL BOUNDARY

ROD SEDIMENT REMOVAL AREA:

- 1ft
- 2ft
- 3ft
- 4ft
- 5ft
- 8ft

ROD SOIL REMOVAL AREA:

- 0.5ft
- 2ft
- 3ft
- 5ft
- 8ft
- 14ft

0 300 600 Feet

GRAPHIC SCALE

NOTES:

1. JUNE 2013 NATIONAL AGRICULTURE IMAGERY PROGRAM (NAIP) IMAGERY OBTAINED FROM ESRI IMAGE SERVICE.
2. SEDIMENT AND SOIL REMOVAL EXTENTS AND NATURAL GAS AND OIL PIPELINEWERE DIGITIZED FROM A FIGURE IN THE LOWER LEY CREEK FEASIBILITY STUDY, DATED 2013. FEASABILITY STUDY SOURCE FILE NOT AVAILABLE.
3. SOIL SITE BOUNDARY IS APPROXIMATE AND WAS DIGITIZED FROM FIGURE 1.2 IN THE LOWER LEY CREEK REMEDIAL INVESTIGATION REPORT, DATED JUNE 2013. REMEDIAL INVESTIGATION SOURCE FILE NOT AVAILABLE.
3. LEY CREEK SHORELINE, CSO LOCATIONS AND SURFACE WATER INPUT LOCATION LAYERS OBTAINED FROM A GEODATABASE PROVIDED BY GZA/PALMERTON IN JUNE 2015.
4. NATURAL GAS AND OIL PIPELINE, ROAD AND RAILROAD DATA LAYERS WERE OBTAINED FROM ELECTRONIC FILES PROVIDED BY HYDROGEOLOGIC, INC. IN JULY 2015.
5. PARCEL BOUNDARY DATA OBTAINED FROM ONONDAGA COUNTY IN 2015.

LOWER LEY CREEK
SUBSITE OF THE ONONDAGA LAKE SUPERFUND SITE
PRE-DESIGN INVESTIGATION WORK PLAN

PROPOSED TREATABILITY STUDY SAMPLE COLLECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4-1c

City: SYR Div/Group: IM/DV Created By: J.RAPP Last Saved By: Kives
LOWER LEY CREEK (B0035101.0001.00001)
Q:\LowerLeyCreekGroup\SyracuseNY\PDI\WorkPlan\mxd\TreatabilityStudySampleCollectionLocs.mxd 8/22/2016 11:58:49 AM

APPENDIX A

Field Sampling Plan

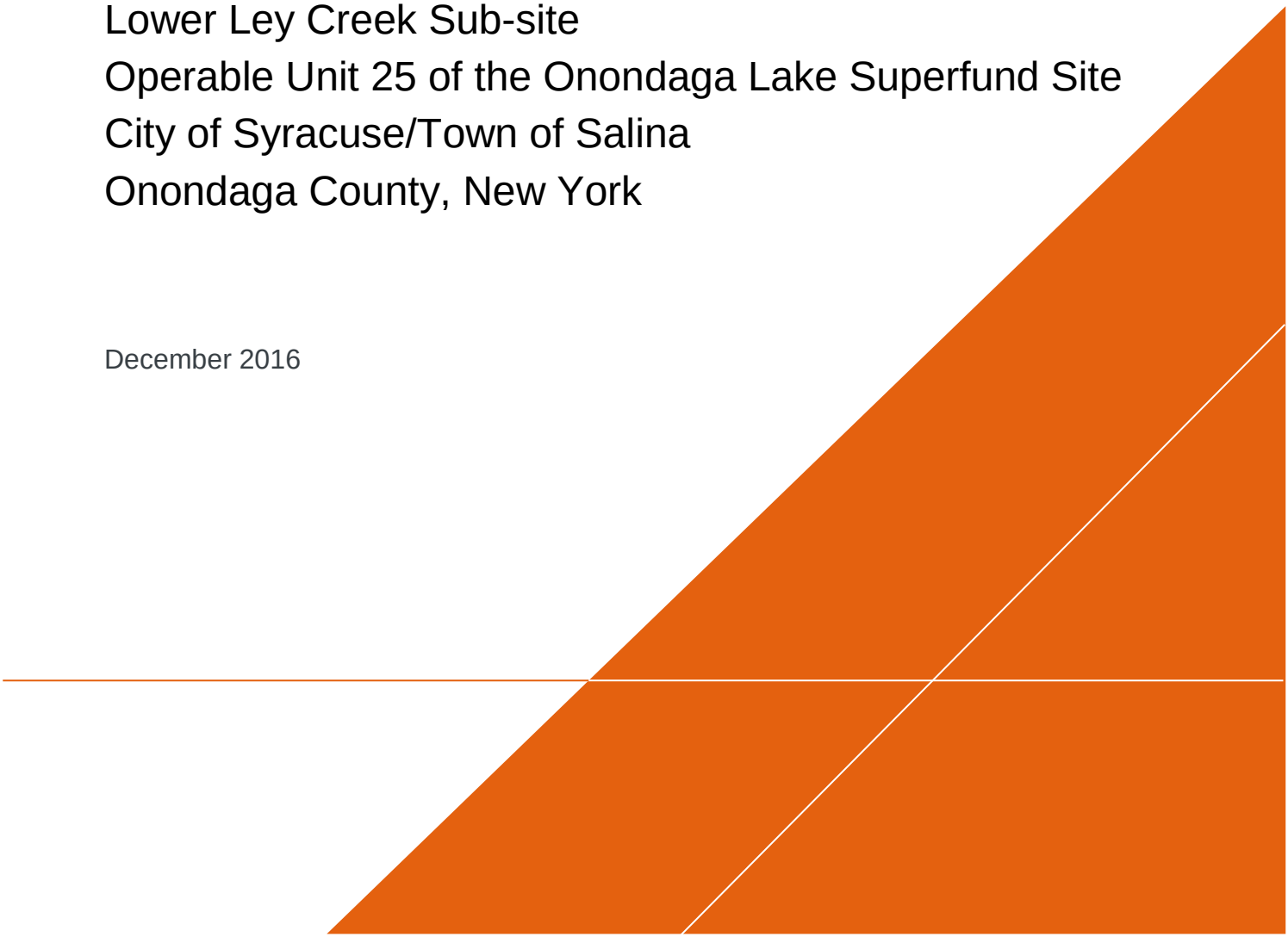
ARCADIS Design & Consultancy for natural and built assets

Respondents to Administrative Order on Consent for Remedial Design

FIELD SAMPLING PLAN

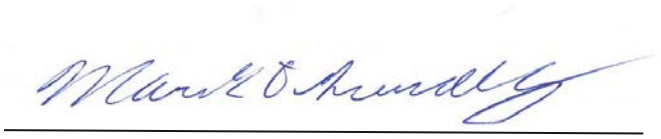
Lower Ley Creek Sub-site
Operable Unit 25 of the Onondaga Lake Superfund Site
City of Syracuse/Town of Salina
Onondaga County, New York

December 2016



FIELD SAMPLING PLAN

Lower Ley Creek Sub-site
Operable Unit 25 of the Onondaga Lake Superfund Site
City of Syracuse/Town of Salina
Onondaga County, New York



Mark O. Gravelding
Project Coordinator

Todd Cridge
Project Manager

Prepared for:
Respondents to Administrative Order on Consent for Remedial Design

Prepared by:
Arcadis of New York, Inc.
6723 Towpath Road
P.O. Box 66
Syracuse
New York 13214-0066
Tel 315 446 9120
Fax 315 449 0017

Our Ref.:
B0035101.0001

Date:
December 2016

CONTENTS

TABLE

ATTACHMENTS

1 INTRODUCTION

This Field Sampling Plan (FSP) contains procedures related to the collection and analysis of soil and sediment samples, geotechnical samples, and other field investigations at the Lower Ley Creek Sub-site (the Sub-site) of the Onondaga Lake Superfund Site. The Sub-site (Superfund Site Identification Number: NYD986913580) is located in Onondaga County, New York within the City of Syracuse and the Town of Salina. Specifically, this FSP specifies the various procedures that will be followed in performing investigation activities pursuant to the Remedial Design Statement of Work for the Onondaga Lake Superfund Site Operable Unit 25 – Lower Ley Creek Sub-site (SOW) agreed upon with the United States Environmental Protection Agency Region 2 (USEPA).

This FSP identifies the various procedures, protocols, and methodologies to be employed during the performance of environmental investigations associated with the Sub-site. The purpose for doing so is to ensure that the various investigations are performed consistently to produce a representative characterization of site conditions and to provide a reliable basis for subsequent evaluations and activities.

This FSP focuses on the general components of the environmental investigations, including sampling and field procedures for each media, laboratory analytical methods, and sample handling and documentation procedures. Details concerning the scope of a particular sampling activity (e.g., specific objectives, type, location, rationale, quantity, frequency, depths, constituents to be analyzed for) is identified in the Pre-Design Investigation Work Plan (PDI WP) to which this FSP is an Appendix, with references provided (as appropriate) to this plan.

Included in this FSP is information on sample designation, sampling equipment and procedures, sample handling and custody, field quality control checks, split sampling procedures, parameters for field measurements, and planned preventive maintenance procedures for various field sampling equipment. In support of the text described above, the appendices to this FSP contain standard operating procedures (SOPs) for all phases of sampling at the Site, including sample collection, handling and shipment, and equipment decontamination procedures.

Note that the procedures described in this FSP, particularly as they relate to field investigation protocols, are intended to be general guidelines and may be subject to certain modifications if deemed appropriate or necessary based on field considerations, provided that such modifications do not compromise the integrity of the data. All sampling and field procedures will be conducted in accordance with the requirements of the Health and Safety Plan for the LLC Site (Appendix C to the PDI WP).

2 FIELD SAMPLING PROTOCOLS

This section presents a summary of the sample collection and field investigation procedures, sample container requirements, and sample and document custody procedures, as well as a discussion of equipment decontamination and the management of investigation-derived waste (IDW). The field sampling quality assurance/quality control (QA/QC) requirements are discussed in the Quality Assurance Project Plan (QAPP; Appendix B to the PDI WP).

2.1 Sampling Procedures

The specific types of samples to be collected at the Sub-site – e.g., soil, sediment, and/or geotechnical samples -- are described in the PDI WP. The PDI WP will also set forth the Data Quality Objectives for the specific investigations in question (see the QAPP for more information on DQOs) to the extent necessary to describe the purpose of the investigation and to identify the type, locations, and quality of data to be collected to meet that purpose. As part of these field investigations, data collection, monitoring, and/or sampling procedures may be performed involving one or more of the SOPs listed below.

- Attachment 1 Chain of Custody, Handling, Packing, and Shipping Standard Operating Procedures
- Attachment 2 Soil Borings and Soil Sampling Standard Operating Procedures
- Attachment 3 Sediment Probing and Sampling Standard Operating Procedures
- Attachment 4 Geotechnical Sampling Standard Operating Procedures
- Attachment 5 Field Documentation Standard Operating Procedures
- Attachment 6 Field Equipment Decontamination Standard Operating Procedures

The field sampling SOPs have been developed with the goal of standardizing methodology, to the extent practical, to ensure that data are collected utilizing consistent and “best practices” methodology. Any planned deviations from these SOPs, based on site-specific conditions, will be proposed in the task-specific work plans.

2.2 Sample Containers

The samples for each analytical parameter will be collected and preserved in the appropriate sample containers as presented in the QAPP. The sample containers provided by the analytical laboratories will be new, pre-cleaned, and certified by the manufacturer. Sample container certifications will be maintained by the analytical laboratories in a manner that will allow each sample container (e.g., glassware, bottles) order to be traced to its respective certification. At a minimum, the sample containers supplied by the laboratory will meet EPA’s Specifications and Guidance for Contaminant Free Sample Containers (EPA 540/R-931051, December 1992).

2.3 Sample Designation

A unique identification (ID) number will be assigned to each sample prior to collection. Field duplicate samples, which will receive an entirely separate sample ID number, will be noted under sample description in the field book (described below).

2.4 Sample Handling and Documentation

The information presented below is intended to provide specific information regarding sample and document custody procedures. The objective of field custody is to assure the samples are not tampered with from the time of collection through time of transport to the analytical laboratory. Field custody

documentation consists of both field books and field Chain of Custody (COC) forms as discussed below, while Attachment 1 provides additional information relevant to this topic.

2.4.1 Field Books

Field books provide the means of recording sample collection activities. As such, entries will be described in as much detail as possible so that individuals returning to the site or reviewing the analytical data can reconstruct a particular situation. Details on the information to be included in the field book are provided in Attachment 5.

Field books will be stored in a secure location when not in use. Entries into the books will be made in indelible and waterproof ink and will contain a variety of information including, the equipment used to collect samples will be noted, time of sampling, sample ID (discussed above), sample description, sample location and coordinates (X, Y, and Z), depth at which the sample was collected, and volume and number of containers.

2.4.2 Chain of Custody and Sample Labels

The SOP for the COC establishment for all samples collected in the field is set forth in Attachment 1. (The SOP for COC for samples in the laboratory will be established by the laboratory handling the sample.) As described in Attachment 1, complete COC forms will be required for samples to be analyzed. COC forms will be initiated by the sampling crew in the field and will be completed in indelible ink. The COC forms will contain the sample's unique ID number, sample date and time, sample description, sample type, preservation (if any), and analyses required. The original COC form will accompany the samples to the laboratory. Copies of the COC will be made prior to shipment (or multiple copy forms used) for field documentation. The COC forms will remain with the samples at all times. The samples and signed COC forms will remain in the possession of the sampling crew until the samples are delivered to the express carrier (e.g., Federal Express), hand delivered to the laboratory or their courier, or placed in secure storage.

Sample labels will be completed for each sample using indelible ink. The labels will include sample information such as sample ID and location, type of sample, date and time of sampling, sampler's name (or initials), preservation method, and analyses to be performed. The completed sample labels will be affixed to each sample container and covered with clear tape.

Whenever samples are split with another party (e.g., USEPA), a separate Sample Receipt will be prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the other party should request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses to sign, this should be noted in the "Received By" space.

2.5 Equipment Decontamination

Non-disposable equipment will be cleaned after completing each sampling event, between sampling events, and prior to leaving the LLC Site. Equipment decontamination procedures are described in Attachment 6, and include the cleaning well as the cleaning of subsurface sampling equipment.

2.6 Management of Investigation-Derived Waste

IDW that will be generated during sediment, soil, and geotechnical sampling may include excess sample material, decontamination fluids, used personal protective equipment (PPE), and disposable equipment. The management of these materials is discussed below.

Any excess sample material will be containerized and placed in 55-gallon drums and temporarily stored on site in a secured location. All drums will include a record of the materials contained within including, sample locations and the dates on which the material was generated. These materials will be characterized as necessary for profile approval, and then transported off-site for disposal at a permitted facility.

Any decontamination fluids containing non-indigenous materials (e.g., hexane, alconox solution) generated during performance of the sediment and soil sampling will be containerized in 55-gallon drums. These drum(s) will be temporarily stored on site in a secured location. These materials will be characterized as necessary for profile approval, and then transported off-site for disposal at a permitted facility.

Used PPE, disposable equipment, and other debris (e.g., plastic, tubes, etc.) will be containerized in 55-gallon drums. These drum(s) will be temporarily stored on site in a secured location. These materials will be characterized as necessary for profile approval, and then transported off-site for disposal at a permitted facility. [Note: Need to discuss secure on-site location for IDW storage.]

3 ANALYTICAL LABORATORY TESTING

The analyses to be performed for the environmental samples is specified in the PDI WP. The specific analytical protocols to be followed for the various groups of analytes are summarized in Table 1, unless otherwise specified in the project-specific work plan. In general, analytical services will employ the EPA's SW-846 protocols, other EPA-approved protocols, or certain proprietary protocols developed by the laboratories, as specified in Table 1. The analytical laboratory testing QA/QC requirements are discussed in the QAPP (Appendix B to the PDI WP).

Quality control samples (i.e., matrix spike/matrix spike duplicates, field duplicates, trip blanks, and field blanks) will be collected at the frequency specified in the QAPP for each sample matrix collected. The QAPP present the quality control criteria and corrective action procedures to be followed for each of the analytical procedures and for field-generated quality control samples. Overall project quality assurance will be maintained by following the procedures specified in the FSP and QAPP for sample collection and analysis, corrective action, and data reporting and validation.

TABLE

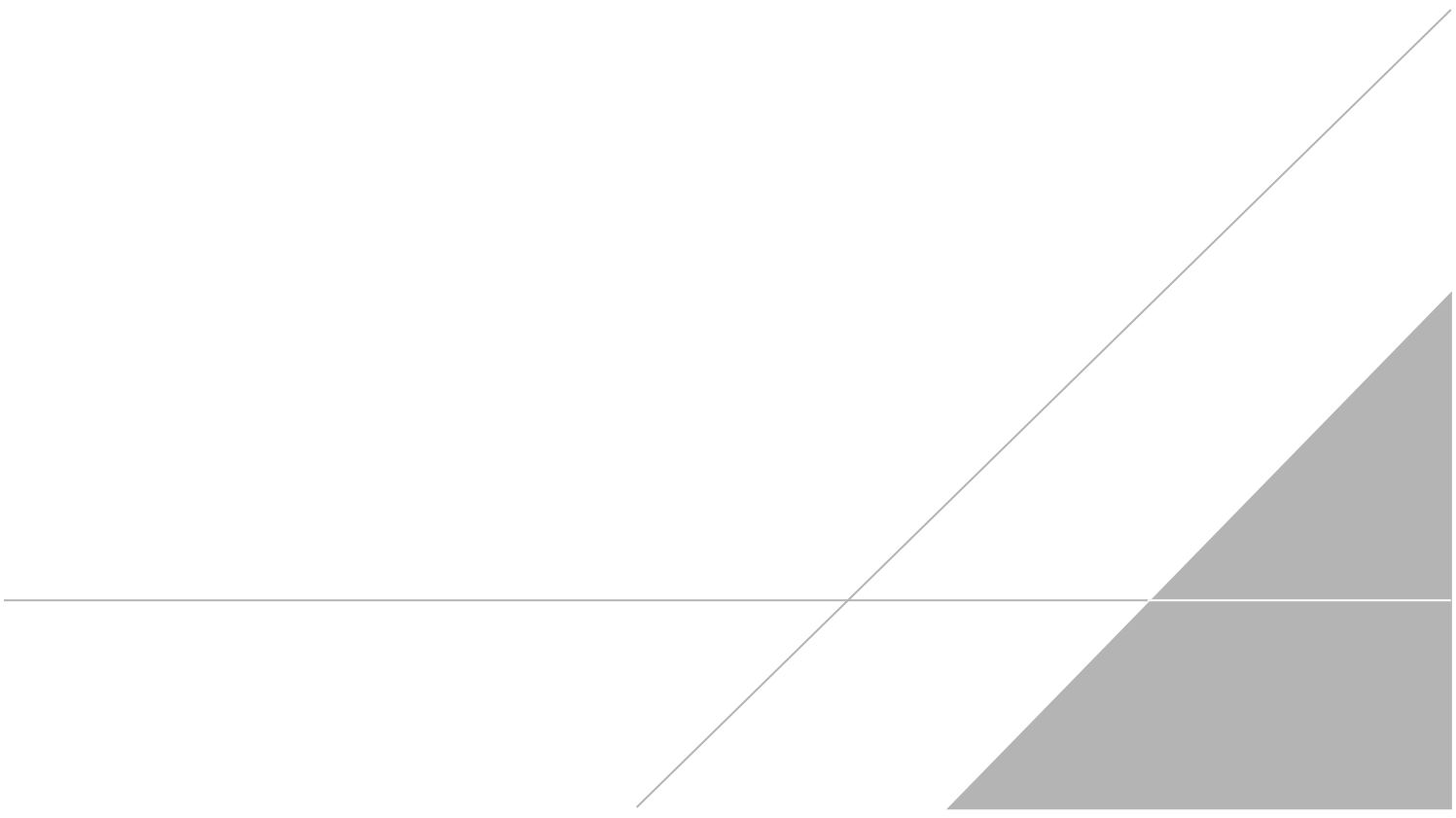


TABLE 1
LABORATORY ANALYTICAL METHODS

ARCADIS Design & Consultancy for natural and built assets

Parameter	Analytical Method
SOIL/SEDIMENT SAMPLES	
PCBs (Aroclor-specific)	USEPA SW-846 Method 8082
Target Analyte List Metals	USEPA SW-846 Method 6010B & 7471A (mercury)
Grain Size Analysis	ASTM Method D422-63 (2007)
SOIL/SEDIMENT WASTE CHARACTERIZATION	
TCLP Volatile Organics	SW-846 Method 8260B
TCLP Semi-Volatile Organics	SW-846 Method 8270C
TCLP Metals - except mercury	SW-846 Method 6010/6020
Mercury	SW-846 Method 7470A
SOIL/SEDIMENT GEOTECHNICAL CHARACTERIZATION	
Grain Size Analysis	ASTM D422;
Moisture Content	ASTM D2216
Atterberg Limits	ASTM D4318
Specific Gravity	ASTM D584
Unconsolidated-Undrained (UU) Triaxial Compression with pore pressure	ASTM D2850
Consolidated-Undrained (CU) triaxial compression with pore pressure	ASTM D4767
One-Dimensional Consolidation	ASTM D584
Mercury	ASTM D2435/D2535M

ATTACHMENT 1

Chain of Custody, Handling, Packing, and Shipping Standard Operating Procedures

1 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the chain-of-custody (COC), handling, packing, and shipping procedures for the management of samples to decrease the potential for cross-contamination, tampering, misidentification, and breakage, and to insure that samples are maintained in a controlled environment from the time of collection until receipt by the analytical laboratory.

2 EQUIPMENT LIST

The following materials and supplies, as appropriate, are necessary for chain-of custody handling, packing, and shipping:

- Indelible ink pens (black or blue)
- Polyethylene bags (resealable-type)
- Clear packing tape, strapping tape, duct tape
- COC forms
- Department Of Transit (DOT) shipping forms, as applicable
- Custody seals or tape
- Appropriate sample containers and labels
- Insulated coolers of adequate size for samples and ice
- Ice
- Cushioning and absorbent material (i.e., bubble wrap or bags)
- Temperature blank (if provided by laboratory)
- Sample return shipping papers and addresses
- Field log book

3 CHAIN-OF-CUSTODY PROCEDURES

- Prior to collecting samples, complete the COC form header information by filling in the project number, project name, and the name(s) of the sampling technician(s). Please note that it is important that COC information is printed legibly using indelible ink. An example COC form is provided as Exhibit 1-1.
- After sample collection, enter the individual sample information on the COC as described below. Note that the descriptions below are based on a typical COC; however information included may be modified based on the selected laboratory's preference.

- Sample Identification indicates the station number or location that the sample was collected from (including depth) and the year of sampling. An example of a complete sample name is “SB-3-2015 (0.5-1.0)”, where the 0.5-1.0 represents the depth interval in feet from where the sample was collected. Please note it is very important that the use of hyphens in sample names and the depth units (i.e., feet or inches) remain consistent for all samples entered on the COC form. Sample names may also use the abbreviations “MS/MSD,” “FB,” “TB,” and “DUP” as prefixes or suffixes to indicate that the sample is a matrix spike/matrix spike duplicate, field blank, trip blank, or field duplicate, respectively. Requirements for the development of QA/QC samples, in addition to the actual field samples, such as those listed above are included in the QAPP.
- List the date of sample collection. The date format to be followed should be mm/dd/yyyy (e.g., 10/01/2015).
- List the time at which the sample was collected. The time value should be presented using the military format. For example, 3:15 P.M. should be entered as 15:15.
- The “composite” field should be marked with an “X” if the sample was collected as a composite of a period of time or from several different locations and mixed prior to placing in sample containers.
- The “grab” field should be checked if the sample was collected as an individual grab sample.
- Any sample preservation should be noted.
- The analytical parameters for which the samples are being analyzed should be written legibly on the diagonal lines. As much detail as possible should be presented to allow the analytical laboratory to properly analyze the samples. For example, polychlorinated biphenyl (PCB) analyses may be represented by entering “PCBs” or “Method 8082.” These columns should also be used to present project-specific parameter lists. Each sample that requires a particular parameter analysis will be identified by placing the number of containers in the appropriate analytical parameter column.
- Number of containers for each method requested. This information may be included under the parameter or as a total for the sample based on the COC form used.
- Note any special analytical requirements to the laboratory. These requirements may be on a per sample basis such as “extract and hold sample until notified” or may be used to inform the laboratory of special reporting requirements for the sample. Reporting requirements that should be specified in the remarks column include: 1) turnaround time; 2) contact and address where data reports should be sent; 3) name of laboratory project manager; and 4) type of sample preservation used (if any).
- If available, attach or reference the Laboratory Work Authorization forms.
- Provide contact name and phone number in the event there are problems encountered when the samples are received by the laboratory.
- The “Relinquished By” field should contain the signature of the sampling technician that relinquished custody of the samples to the shipping courier or the analytical laboratory.

  - The "Date" field following the signature block indicates the date that the samples were relinquished. The date format should be mm/dd/yyyy (e.g., 10/01/2015).
  - The "Time" field following the signature block indicates the time that the samples were relinquished. The time value should be presented using the military format. For example, 3:15 P.M. should be entered as 15:15.
  - The "Received By" section is signed by the sample courier or laboratory representative that received the samples from the sampling technician or it is signed upon laboratory receipt from the overnight courier service.
- Complete as many COC forms as necessary to properly document the collection and transfer of the samples to the analytical laboratory.
- Upon completion of the COC forms, forward two copies to the analytical laboratory and retain one for the field records. A copy of the completed chain-of-custody form will be sent to the Project Manager or designee for review.
- If electronic chain-of-custody forms are utilized, sign the form and make one copy for Arcadis of New York, Inc.'s (Arcadis') internal records and forward the original with the samples to the laboratory.

4 HANDLING

- After completing the sample collection procedures, record the following information in the field notebook with indelible ink:
  - project number and site name;
  - sample identification code and other sample identification information, if appropriate;
  - sampling method;
  - date;
  - name of sampler(s);
  - time;
  - location (project reference);
  - location(s) that field quality control (QC) samples were collected including blind duplicates and additional sample volume for matrix spikes; and
  - any other comments.
- Fill in sample label with the following information in indelible ink (note that the descriptions below are based on a typical labels; however information included may be modified based on the selected laboratory's preference):
  - sample type (e.g., sediment);
  - project number and site name;

- sample identification code and other sample identification information, if applicable;
- analysis required;
- date sampled;
- time sampled;
- initials of sampling personnel;
- sample type (composite or discrete);
- tissue preparation procedure (biota; e.g. fillets, whole body), if applicable; and
- preservative added, if applicable.

An example label is provided in Exhibit 1-2.

- If water proof labels are not used, cover the label with clear packing tape to secure the label onto the container.
- Check the caps on the sample containers to ensure that they are tightly sealed.
- In some instances it may be necessary to wrap the sample container cap with clear packing tape to prevent it from becoming loose.
- Custody seal label evidence tape may be placed on the shipping container or they may be placed on each sample container such that the cooler or cap cannot be removed without breaking the custody seal. The custody seal should be initialed and dated prior to relinquishing the samples. An example custody seal is provide in Exhibit 1-3.

5 PACKING PROCEDURES

Following collection, samples must be placed on wet ice to initiate cooling to 6°C immediately. Retain samples on ice until ready to pack for shipment to the laboratory.

- Using duct tape, secure the outside and inside of the drain plug at the bottom of the cooler that is used for sample transport.
- Place each container or package in individual polyethylene bags (resealable-type) and seal. If a cooler temperature blank is supplied by the laboratory, it should be packaged following the same procedures as the samples. If the laboratory did not include a temperature blank, do not add one since the sample temperature will be determined by the laboratory using a calibrated infrared thermometer.
- Place 1 to 2 inches of cushioning material (i.e., vermiculite) at the bottom of the cooler.
- Place the sealed sample containers upright in the cooler.
- Package ice or blue ice in small resealable-type plastic bags and place loosely in the cooler. Do not pack ice so tightly that it may prevent addition of sufficient cushioning material. Samples placed on ice will be cooled to and maintained at a temperature of approximately 6°C.

- Fill the remaining space in the cooler with cushioning material. The cooler must be securely packed and cushioned in an upright position and be surrounded (Note: to comply with 49 CFR 173.4, filled cooler must not exceed 64 pounds).
- Place the completed COC forms in a large resealable-type bag and tape the bag to the inside of the cooler lid.
- Close the lid of the cooler and fasten with packing tape.
- Wrap strapping tape around both ends of the cooler.
- Mark the cooler on the outside with the following information: shipping address, return address, “Fragile, Handle with Care” labels on the top and on one side, and arrows indicating “This Side Up” on two adjacent sides.
- Place custody seal evidence tape over front right and back left of the cooler lid, initial and date, and then cover with clear plastic tape.

Note: Some procedures may be modified in cases where laboratories provide customized shipping coolers. These coolers are designed so the sample bottles and ice packs fit snugly within preformed Styrofoam cushioning and insulating packing material.

6 SHIPPING PROCEDURES

All samples will be delivered by an express carrier within 48 hours of sample collection. Alternatively, a laboratory courier may be used for sample pickup or the samples may be hand delivered.

The following COC procedures will apply to sample shipping:

- Relinquish the sample containers to the laboratory via express carrier or laboratory courier. The signed and dated forms should be included in the cooler. The express carrier will not be required to sign the COC forms.
- When the samples are received by the laboratory, the laboratory personnel shall complete the COC by recording the data and time of receipt of samples, measure and record the internal temperature of the shipping container, and then check the sample identification numbers on the containers to ensure that they correspond to the COC forms.
- If parameters with short holding times are required, sampling personnel will take precautions to ship or deliver samples to the laboratory so that the holding times will not be exceeded.
- Samples must be maintained at 6°C±2°C until shipment and through receipt at the laboratory.
- All shipments must be in accordance with DOT regulations and dangerous goods shipping requirements.
- When the samples are received by the laboratory, the laboratory personnel shall complete the COC by recording the data and time of receipt of samples, measure and record the internal temperature of

the shipping container, and then check the sample identification numbers on the containers to ensure that they correspond to the COC forms.

Any deviations between the COC and the sample containers, broken containers, or temperature excursions will be communicated to Arcadis immediately by the laboratory.

ARCADIS

CHAIN OF CUSTODY LABORATORY ANALYSIS REQUEST FORM

Lab Work Order #

Send Results to:

Contact & Company Name:	Telephone:
Address:	Fax:
City State Zip	E-mail Address:
Project Name/Location (City, State):	Project #:
Sampler's Printed Name:	Sampler's Signature:

Preservative								
Filtered (✓)								
# of Containers								
Container Information								

PARAMETER ANALYSIS & METHOD

Keys

Preservation Key:	Container Information Key:
A. H2SO4	1. 40 mL Vial
B. HCL	2. 1 L Amber
C. HNO3	3. 250 mL Plastic
D.NaOH	4. 500 mL Plastic
E. None	5. Encore
F.	6. 2 oz. Glass
G.	7. 4 oz. Glass
H.	8. 8 oz. Glass
	9. 125 mL Plastic
	10. 4 oz. Amber

Matrix Key:

SO- Soil	SE- Sediment	NL- NAPL/Oil
W- Water	SL- Sludge	SW- Sample Wipe
T- Tissue	A- Air	

Sample ID	Collection Date	Collection Time	Type Comp	Type Grab	Matrix	REMARKS

Special Instructions/Comments:

☐ **Special QA/QC Instructions (✓)**

Laboratory Information and Receipt		Relinquished By	Received By	Relinquished By	Laboratory Received By
Lab Name: Test America	Cooler Custody Seal (✓)	Printed Name: Ronald D Kuhn	Printed Name:	Printed Name:	Printed Name:
☑ Cooler packed with ice (✓)	☐ Intact ☐ Not Intact	Signature:	Signature:	Signature:	Signature:
Specify Turnaround Requirements 24-48hr	Sample Receipt:	Firm: Arcadis	Firm:	Firm:	Firm:
Shipping Tracking #:	Condition/Cooler Temp:	Date/Time: 7/23/09	Date/Time:	Date/Time:	Date/Time:

ARCADIS

Project #		Date
Sample I.D.		
Sample Type ☐ Soil/Sediment ☐ Water	Collection Mode ☐ Composite ☐ Grab	Time
Analysis		
Sampler(s)	Preservative	

CUSTODY SEAL

ARCADIS

SEALED BY

DATE _____ TIME _____

6723 Towpath Road, P.O. Box 66 • Syracuse, New York 13214-0066 • Tel 315.446.9120

ATTACHMENT 2

Soil Borings and Soil Sampling Standard Operating Procedures

1 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the field sampling procedures to install soil borings and to collect soil samples. Soil samples may be collected through a variety of mechanisms, typically the hollow-stem auger drilling method, the driven casing drilling method, or a direct push technique. In situations where physical site features limit the use of drill rigs, soil borings will be completed with hand-driven equipment or a portable power auger depending on the required depth and subsurface material. A detailed discussion of the selection of drilling methods is presented in Exhibit 2-1, Selection of Drilling Methods. Samples of subsurface material encountered during the drilling of soil borings will typically be collected continuously to the required depth of the boring, or as directed by the supervising geologist or technician, using the methods described in Section 3 below.

Personnel will also be responsible for documenting drilling events in the field log notebook. Only qualified personnel (e.g., holds degree in engineering, geology, or related science, and/or has at least two years of relevant experience) will provide descriptions of soil samples. The drilling contractor will be responsible for obtaining accurate and representative samples, informing the supervising geologist of changes in drilling pressure and loss of circulation, and keeping a separate general log of soils encountered, including blow counts (i.e., the number of blows from a soil sampling drive weight [140 pounds] required to drive the split-spoon sampler in 6-inch increments), if applicable.

2 EQUIPMENT LIST

The following materials and supplies, as appropriate, shall be available during soil sampling:

- Health and safety equipment (as required in the Site Health and Safety Plan [HASP]);
- Cleaning equipment (as required in Attachment 8 to this FSP);
- All drilling equipment required by the American Society of Testing and Materials (ASTM) document D1586, entitled Standard Method for Penetration Test and Split-Barrel Sampling of Soils (Annual Book of ASTM Standards, Volume 04.08), as applicable (see Section 3);
- Appropriate sample containers and forms;
- Coolers with ice or "blue ice;"
- Hand augur;
- Push rod;
- Spatula or knife (or equivalent clean dedicated/disposable equipment);
- Hand spade;
- Aluminum pan;
- Stainless steel utensils (or equivalent clean dedicated/disposable equipment);
- Measuring tape;

1. Introduction

This Exhibit provides information to be utilized when selecting a drilling method to install soil borings, collect soil samples, collect geotechnical data, and/or install monitoring wells. These differing objectives, combined with the variety of subsurface conditions at different sampling locations, require that judgment be made regarding the drilling methodology to be employed. Drilling may be performed utilizing one or more of the following techniques: hollow-stem auger, direct-push/percussion, driven casing, spun casing, air and mud rotary, and rotosonic or sonic drilling. The appropriate sampling method will be identified prior to the onset of sampling, but may be modified in the field depending on the conditions encountered.

2. Selection of Drilling Method

The specific goal of the drilling program, known subsurface conditions, site accessibility/space restrictions, and type of terrain should be considered prior to selection of the drilling method to be utilized. In addition, cost, installation time, and the ability to recover undisturbed and reliable samples should also be considered. In certain situations, multiple drilling methods may be necessary. The following drilling methods may be utilized for a variety of situations:

- *Hollow-Stem Auger* - The hollow-stem auger method is frequently used to install monitoring wells in unconsolidated materials/soils. The augers rotate as they drill into the ground, evacuating soil along a continuous flight outside of the augers. The system (powered mechanically or hydraulically) uses a cutting head attached to the lead auger to penetrate soils. An auger plug or interior bit may be inserted into the lead auger during advancement to stop any cuttings from coming up into the stem. Samples are collected by driving a split-spoon or pushing a Shelby tube (for clay soils) in front of the auger advancement to obtain undisturbed samples.

  Advantages to this form of drilling include ease of mobilization, relatively fast operation, and monitoring wells (screen and riser) can be installed prior to the removal of the augers, ensuring a good sand pack and bentonite seal, and reducing the possibility of cave-in. In addition, hollow-stem augering does not require that drilling fluids or lubricants be introduced into the subsurface. Disadvantages include difficulty drilling in dense soils or cobbles and the generation of a high volume of waste cuttings. In addition, flowing or water-bearing sands may pose a problem to auger drilling, as these conditions have a tendency to push the saturated sands into the auger stem due to head pressure, which can inhibit soil sampling and may lock up the augers. Overall, the hollow-stem auger is the most commonly used form of drilling for environmental investigations, particularly for geotechnical purposes, due to the ability to obtain blow counts during split-spoon sampling.

- *Direct-Push* - Direct-push drilling involves the advancement of a hollow barrel containing a PVC tubular liner using hydraulics and a hammering mechanism (typically by Geoprobe® or Powerprobe® drill rigs, although sampling can also be performed manually or through the use of a jackhammer) for the collection of soil samples. Direct-push methods may vary slightly depending on the drill rig manufacturer. The hollow barrels or samples are typically 4 feet in length and 1 to 2 inches in diameter, and are advanced and retracted for sample analysis/observation. The disposable PVC

liners are removed from the samplers and split to obtain the soil sample. The liners are attached to the inside of the lead barrel by a cutting shoe and are driven continually deeper into the ground using extension rods. Direct-push probing units can also be utilized to collect discrete groundwater samples using a stainless steel screen contained in the outer barrel. The sampler is advanced to the desired depth using an expendable drive point, upon which time the outer sheath is retracted, exposing the screen. Water entering the screen is then sampled using a peristaltic pump, positive displacement tubing with foot valve, or bailer. Shallow, small diameter piezometers/monitoring wells can also be installed by most direct-push drill rigs.

The primary advantages of direct-push drilling include rapid sampling to shallow and minimal amounts of waste soil generation. Decreased possibility of cross-contamination due to disposable/one-time-use sampling equipment and reduced contamination time also make this form of drilling desirable. The disadvantages to direct-push drilling include the inability to penetrate dense or gravelly material, inability to obtain geotechnical information via blow counts, and the potential introduction of cave-in into the borehole while retracting the sampler. Due to the small diameter of the borehole, standard size monitoring wells cannot be installed in direct-push borings.

- *Spun Casing* - In this technique, a straight casing is advanced by rapid rotation and hydraulic down-force pressure. The lead casing is equipped with a spin shoe/cutter head, enabling it to cut/tear through the unconsolidated soils. Water is typically introduced into the casing stem during advancement to cool the bit and clean out the cuttings from the borehole. For sampling purposes, a split-spoon sampler or Shelby tube is advanced through and in front of the casing in order to obtain undisturbed samples. Similar to hollow-stem augers, spun casing allows the placement of a monitoring well prior to removal from the ground, ensuring the integrity of the borehole and allowing for a good sand pack and seal. The advantage of spinning casing as compared to augering is the ability to penetrate through more dense and cobbly soil without sacrificing borehole integrity. Wells installed through spun casing tend to develop more readily than those installed with augers since the borehole is installed with a straight casing, minimizing disturbance to the remaining soils and the majority of soil cuttings are flushed to the surface inside the casing rather than along the soil wall outside the augers. The main disadvantage of using casing over augers is the addition of water or mud to the boring for cooling and evacuation purposes. In addition to increased generation of waste materials, the use of water may inhibit identification of the water table within soil samples, as well as limit the use of the collected samples for chemical characterization.

- *Driven Casing (Drive and Wash)* - This method is very similar to spun casing except that the casing is advanced by driving the casing either mechanically (typically using a 300-pound hammer) or hydraulic hammering, as opposed to spinning. Instead of a cutting head, the lead casing is equipped with a sharper drive shoe. Because no rotary motion or drilling fluid is applied during casing advancement, soil enters the hollow-stem and is removed through the use of a roller bit and the injection of water into the casing until the soil is cleaned out. Undisturbed split-spoons or Shelby tube samples are collected through and in front of the casing string. This method of drilling enables the collection of blow count data for split-spoon sampling and also during advancement of the outer casing, for use in additional geotechnical applications.

The advantage of driven casing, as compared to augering, is the ability to install and retrieve the casing through flowing sands. Wells installed through driven casing, like those in spun casing, tend to develop more readily than those installed with augers. Disadvantages include decreased production rates, particularly in cobbly material, as well as issues related to the introduction of water into the borehole and subsequent waste handling.

- *Mud Rotary* - In this method of drilling, boreholes are advanced by rotating a drill pipe by means of a hydraulic powered top head drive, with a bit attached to the bottom of the pipe. The bit cuts and breaks up the material as it penetrates the formations. Drilling fluid or mud is pumped through the rotating drill pipe and through holes in the bit. This fluid swirls in the bottom of the hole, picking up material broken by the bit, then flows upward in the space outside the drill pipe, carrying the cuttings to the surface and clearing the hole. The drill pipe and bit move downward deepening the hole as the operation proceeds. At the surface, drilling mud flows into a tank and the cuttings settle to the bottom. From the settling chamber of the tank, fluid overflows into another chamber from which it is picked up by the suction hose of the mud pump and recirculated through the drill pipe. In the rotary drilling method, the casing pipe is not introduced until after the drilling operations are completed. The walls of the hole are held in place by the pressure of the drilling mud against the sides of the borehole. Split-spoon soil samples may be collected for stratigraphic characterization and geotechnical purposes, but the presence of the drilling mud may preclude the acquisition of useful samples for chemical characterization.

  Advantages of this form of drilling include the ability to advance through dense unconsolidated or cobbly soils, running sands, and bedrock at great depths. A common use of mud rotary drilling is in the installation of cased borings or double-cased monitoring wells. Mud rotary drilling may be utilized to drill through difficult terrain and to set an upper casing. The casing is then cleaned out and drilling proceeds using a different drilling method, as necessary. Disadvantages primarily involve the employment of the drilling mud, which must be properly disposed of and may increase the possibility of cross-contamination between different soil layers, as well as have an impact on well development. Sufficient space is required to place a mud pit or recirculation tub to utilize this drilling method.

- *Air Rotary* - This method is basically the same as mud rotary except that the mud pump is replaced by an air compressor. The air line is connected to a swivel hose at the top of the head drive. Compressed air is forced down through the drilling pipe and out through the holes at the bottom of the rotary drill bit. A small stream of water is often introduced into the air system to help cool the drill bit and control dust. The air serves to cool the drill bit and force cuttings up out of the hole, where they are collected through a cyclone at the top of the hole. Advantages of air rotary over mud include the reduced chance of cross-contamination between soil layers and the reduced amount of waste water generated. However, unlike mud rotary drilling, once the air pressure is turned off, loose formations may cave in against the drill pipe. Therefore, this method is not as useful for installing casings in certain formations.

- *Sonic Drilling* - Sonic drilling (also referred to as vibratory or rotosonic drilling) uses a combination of mechanically-generated vibrations and rotation (typically slow) to penetrate the subsurface material. The drill head consists of two counter-rotating, out of balance rollers (oscillator) that cause the drill

pipe to vibrate. Resonance occurs when the frequency of the vibrations equals to the natural frequency of the drill pipe. The resonance and weight of the drill pipe, along with the down force of the drill head, permit penetration of the formation without the additional of drilling mud or lubricating fluids. A dual string assembly allows advancement of an inner casing used to collect core samples while an outer casing maintains borehole integrity. Small amounts of air and water can be used to remove the material between the inner and outer casing. Advantages to this form of drilling include its extremely high drilling rates and low generation of waste cuttings. The possibility of sand bridging during well installations is also minimized due to the vibratory feature of the rig. Disadvantages to this form of drilling are its high cost, use of drilling fluid, and limited availability of this relatively new drilling technology.

- *Coring/Rotary Diamond Drilling* - This method employs industrial diamonds embedded into a spin shoe attached to a core barrel (typically 10 to 26 feet in length). The barrel is spun down through bedrock while water is being added to cool the cutting surface. The bit advances through rock with a solid core remaining inside the tube or core barrel. The bedrock cores are retrieved and inspected in approximate 5-foot lengths. This method is limited to sampling bedrock.

- Camera; and
- Field notebook.

3 SOIL BORING INSTALLATION

Details related to the primary drilling methods to be utilized (i.e., hollow-stem augers, driven casing, and direct-push methodologies) are provided below. General procedures for the installation of soil borings using a variety of drilling methodologies are presented in Exhibit 2-1.

When hollow-stem augers or driven casing methodologies are employed, soil cores will be collected using standard 2-inch by 2-foot split-spoons driven by a 140-pound hammer or standard Shelby tubes, unless otherwise specified in the project-specific work plan. The split-spoons or Shelby tubes will be advanced to the depth specified in the project-specific work plan. Additional information regarding potential methods for collecting such cores may be found in ASTM Standard D1586 entitled "Standard Method for Penetration Test and Split-barrel Sampling of Soils" and ASTM Standard D6282-98 entitled "Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations," unless an alternate approach is specified in the project-specific work plan. Soil samples will be collected following the procedures described in the following sections.

Direct-push drilling methods also may be used to collect soil cores. Examples of this technique include the Diedrich ESP vibratory probe system or AMS Power Probe™ dual tube system. Environmental probe systems typically use a hydraulically operated percussion hammer. Depending on the equipment used, the hammer delivers 140 to 350 foot pounds of energy with each blow. The hammer, operated at 1,200 blows per minute, provides the force needed to penetrate very stiff to medium-dense soil formations. The hammer simultaneously advances an outer steel casing which contains a disposable plastic liner that is utilized to collect soil samples. Soil samples will be collected following the procedures described in the following sections.

At locations where the soil sampler cannot be advanced to the total depth specified in the project work plan due to subsurface refusal, a minimum of three attempts will be made to advance the boring to the total depth at nearby locations. Similarly, if soil sample recovery is less than 50% for the target analytical sampling interval specified in the project-specific work plan, a minimum of three attempts will be made to collect additional soil from the same sampling interval. However, this additional sampling need not be conducted at areas where the field sampling team and USEPA field representatives agree that the nature of the subsurface materials are not likely to allow proper sample recovery (e.g., coarse gravel, loose fine sands, concrete rubble, fill, etc.).

The proper starting depth of all surficial soil and surficial soil boring samples will be dependent on location and surface cover. The initial soil sampling interval will generally start at the soil interface, not at the top of vegetation, gravel, and pavement or building floor. For example, if soil samples are to be collected at a location consisting of a 6-inch thick gravel lot, the 0- to 1-foot soil sample will be collected from the first foot of soil beginning just below the base of the gravel rather than either collecting 6 inches of gravel along with the underlying soil, or discarding the gravel, but only collecting soil from 6 inches to 1 foot below ground surface (bgs). In some cases, the starting point of soil sampling will be dependent on future design considerations for the area in question (i.e., 0- to 1-foot surface samples may not be necessary at

areas where a soil cover will be installed, or conversely, the 0- to 1-foot surface samples may be collected at depths beginning 1 foot below thick concrete floors that will be subject to removal).

4 SUBSURFACE SOIL SAMPLING PROCEDURES

- Identify the area to be sampled and locate position on aerial photographs or detailed mapping.
- Don personal protective equipment (PPE) as required by HASP.
- As borings are processed, qualified personnel will describe each soil sample. Additional information regarding procedures to identify soil types may be found in ASTM Standard D2488-00, entitled "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)." Soil descriptions will be entered in the field notebook or on the Subsurface Log (Exhibit 2-2) for the following parameters.
    - soil type;
    - color;
    - percent recovery;
    - moisture content;
    - texture;
    - grain size and shape;
    - consistency;
    - blow counts, if collected; and
    - miscellaneous observations.

A common soil sample description format should be utilized in the field notes, such as: Color; primary constituent (underlined or capitalized); secondary constituent(s) designated by "and" (if approximately 50 % of the sample, should only be utilized if a second primary constituent is identified), "some" (if approximately 30% to 50% of the sample), "little" (if approximately 10% to 30% of the sample), and/or "trace" (if less than 10% of the sample); description of consistency; moisture content; miscellaneous observations; and initial interpretations (capitalized in parentheses).

- Example 1: Brown fine SAND, some Silt, little medium-coarse Sand, trace concrete and brick debris, loose, wet, trace black staining.
- Example 2: Olive-gray SILT and CLAY, trace fine Gravel, angular dense, moist.

In addition, the boring logs must identify the specific depth of a landfill waste/native soil interface (if present) and will provide a detailed description of any debris observed in the fill. Observations of staining, sheens, or other potential visual indicators of impacted soil should also be described in detail, including the starting and ending depths of such observations.

Each sampling interval will be recorded based on any spaces or gaps and the recovery of the core. For example, if a soil sampler is advanced from 4 to 8 feet bgs, but the soil recovery is only 2.5 feet, the log

will indicate that the description only applies to 4 to 6.5 feet bgs (i.e., assume that lower portion of the soil sample was not recovered), unless reasons to infer otherwise are evident in the sample or adjacent samples. If soil sample recovery for the target analytical sampling interval is less than 50%, additional sampling attempts will be made, as specified in Section 3 of this SOP.

- Place soil from each sample interval in a clean disposable aluminum pan and remove any debris (e.g., rocks, sticks) greater than ½-inch-diameter. Photograph the material in the aluminum pan. Homogenize the soil in the pan and place directly into clean, laboratory-supplied sample containers for analysis of polychlorinated biphenyls (PCBs).
- Sample containers will be labeled, stored on site, and transported to the appropriate testing laboratory. Label all sample containers with the following:
    - site;
    - project number;
    - boring number;
    - sample interval;
    - date;
    - time of sample collection; and
    - initials of sampling personnel.
- Handle, pack, and ship the samples in accordance with the procedures set forth in Attachment 1 to the FSP
- Record all appropriate information in the field notebook and on the proper forms.

5 SURFICIAL SOIL SAMPLING

Surficial soil samples will be collected using a hand-driven split-spoon sampler, a stainless steel bucket auger, or a spade and scoop as determined by the field team depending on the subsurface material. Samples of material encountered during this operation will be collected in 6-inch or 12-inch increments as indicated in the PDI Work Plan.

6 SURFICIAL SOIL SAMPLING PROCEDURES

The following procedures will be employed to collect surficial soil samples:

- Identify the area to be sampled and locate position on aerial photographs or detailed mapping.
- Don PPE as required by HASP.
- If the sample location is a grassed area or an area that exhibits overlying material (i.e., gravel, leaves, roots), the sod or overlying material should be removed and the underlying soil should be collected. The sod refers to the grass and dense root matter below the grass, including the soil within the dense root matter. Replace the sod following sample collection.

- Secure representative soil from the appropriate depth and place in a clean disposable aluminum pan and remove any debris (e.g., rocks, sticks) greater than ½-inch-diameter. Homogenize the soil in the pan and place directly into clean, laboratory-supplied sample containers for analysis of PCBs.
- Sample containers will be labeled, stored on site, and transported to the appropriate testing laboratory. Label the sample containers with the following:
    - site;
    - project number;
    - boring number;
    - sample interval;
    - date;
    - time of sample collection; and
    - initials of sampling personnel.
- Handle, pack, and ship the samples in accordance with the procedures set forth in Attachment 1 to the FSP
- Record all appropriate information in the field notebook and on the proper forms.

7 DUPLICATE SAMPLE COLLECTION

Field duplicates will be prepared by homogenizing soil collected at the same time and depth and then filling two sets of sample jars. The duplicate sample will be labeled in such a way that the sample designations will not indicate the duplicate nature of the samples. Information concerning the source of sample duplicates should be documented in the field notebook and on the version of the chain-of-custody form that is retained by the sampling team. This information should NOT be provided in the copy of the chain-of-custody form that is submitted to the laboratory

8 SURVEY

A field survey control program will be conducted using standard instrument survey techniques to document the boring or surficial soil sampling location and elevation. Generally, to accomplish this, a local control baseline will be set up. This local baseline control can then be tied into the appropriate vertical and horizontal datum for the site, as specified in the PDI Work Plan.

9 FIELD CLEANING PROCEDURES

Cleaning of sampling equipment is to follow the procedures specified in Attachment 8 to the FSP. If disposable / sample-specific equipment is not used, the sampling equipment is to be cleaned prior to the start of sampling activities, between samples, and following the completion of sampling activities. In addition, tools utilized in the handling and opening of sampling equipment, such as wrenches for opening split-spoon samplers or knives for cutting direct-push sample liners, are to be cleaned with a non-

phosphate soap and water prior to the start of sampling activities, between boreholes, and following the completion of sampling activities, at a minimum.

10 DISPOSAL METHODS

Rinse water, PPE, and other residuals generated during the equipment cleaning procedures will be placed in appropriate containers. Containerized waste will be disposed of consistent with the disposal practices outlined in the FSP.

Date Start/Finish: / Drilling Company: Driller's Name: Drilling Method: Bit Size: Auger Size : Rig Type: Spoon Size:	Northing: Easting: Well Casing Elev.: ft. Corehole Depth: ft. Borehole Depth: ft. Ground Surface Elev.: ft. Descriptions by:	Well No. Client: Site:

DEPTH / ELEVATION	Sample Depth / Sample Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation ft.									GROUND SURFACE	
5										
10										
15										

Remarks:

Water Levels

Date / Time	Elevation	Depth

ATTACHMENT 3

Sediment Probing and Sampling Standard Operating Procedures

1 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the field sampling procedures to for soil probing and sampling. Sediment samples may be collected through a variety of mechanisms, however hand-driven Lexan® tubing will be the primary method used to collect sediment cores. The core will be inserted with a straight, vertical entry into the sediments so as to secure a reliably representative cross-section sample. In situations where physical site features limit the use of hand-driven Lexan® tubing, sediment samples will be collected by Vibracore techniques using aluminum or Lexan® tubing. Samples of subsurface material encountered during the core collection will typically be collected continuously to the required depth of the core, or as directed by the supervising geologist or technician, using the methods described below.

Personnel will also be responsible for documenting probing and sampling events in the field log notebook. Only qualified personnel (e.g., holds degree in engineering, geology, or related science, and/or has at least two years of relevant experience) will provide descriptions of sediment samples.

2 SEDIMENT PROBING

Sediment probing will be conducted prior to sediment sampling to identify areas of significant sediment deposition. Sediment probing will be accomplished by floating in a boat and/or by wading along shallow areas and physically probing with a metal rod for sediment deposition areas. Sediment sampling locations may be modified based on data collected during the sediment probing activities.

2.1 Probing Equipment

The following equipment/materials will be available as required during sediment probing activities:

- Health and safety equipment (as required in the Site Health and Safety Plan [HASP]);
- Cleaning equipment (as required in Attachment 7 to this FSP);
- Boat;
- Surveyor's rod or 6-foot rule;
- Graduated rod for sediment depth measurements;
- Measuring tape;
- Camera; and
- Field notebook.

2.2 Probing Procedures

- Identify the area to be probed and locate position on aerial photographs or detailed mapping;
- Don personal protective equipment (PPE) as required by HASP;

- Begin physically probing for sediments with a metal rod by floating in a boat and/or by wading along the identified area. Probe the bottom at regular intervals (i.e., probe along both sides of channel and across the mid-section of the stream) to identify the location of significant sediment deposits. Soft areas which are penetrable with the rod will be considered sediment deposits. As sediment deposits are located, each will be marked in the field using survey techniques and later plotted on detailed mapping of the probed area;
- Probe the sediment deposit area to determine the approximate average sediment depth;
- Obtain the approximate measurements of the sediment deposits to determine surface area;
- Record the following information in the field record book: approximate location, date, personnel, weather, average sediment depth, length and width of sediment deposit, average water depth cover, stream width, sediment type, type of depositional environment, and any other pertinent comments.

3 SEDIMENT SAMPLING

3.1 Sampling Equipment

The following equipment, as appropriate, shall be available during sediment sampling:

- Health and safety equipment (as required in the HASP);
- Cleaning equipment (as required in Attachment 7);
- Boat;
- Vibracore device (Rossfelder P-3C or equivalent);
- Stainless steel core driver block;
- 3-inch (outside diameter) core tube (Lexan® and/or aluminum) with end caps;
- Surveyor’s rod or 6-foot rule;
- Graduated rod for sediment depth measurement;
- Duct tape;
- Hacksaw;
- Appropriate sample containers and forms;
- Coolers with ice or "blue ice;"
- Push rod;
- Aluminum pan;
- Stainless steel utensils (or equivalent clean dedicated/disposable equipment);
- Measuring tape;

- Camera; and
- Field notebook.

3.2 Sediment Sampling Procedures

- Identify the area to be sampled and navigate the boat to the target sample location;
- Don personal protective equipment (PPE) as required by HASP;
- Secure the boat in place using spuds, anchors, or tie lines;
- Select the appropriate length of core tube (Lexane® or aluminum, depending on collection method – use Lexane® with either the hand-push or Vibracore methods in soft sediments and aluminum with the Vibracore method for coarse sediments) based on the probing information in the target sample location;
- For hand-push core collection method:
    - Lower a section of Lexan® tube until it just reaches the top of sediment. Measure the depth of water, and survey the water surface elevation (see Survey section below).
    - Push the Lexan® tube into the sediment by hand until refusal. Measure and record the depth of the sediment.
    - Drive the tube several more inches using a stainless steel core driver block and measure the distance. This procedure is to obtain a “plug” at the bottom of the core and prevent the loose sediment from escaping.
    - Place a cap on the top end of the Lexan® tube to create a vacuum to prevent the sediment/plug from escaping.
    - Slowly pull the tube from the sediment, twisting it slightly as it is removed (if necessary).
    - Before the tube is fully removed from the water, place a cap on the bottom end of the tube while it is still submerged.
    - Keeping the tube upright, wipe the bottom end dry, seal the cap with duct tape, and label. Evaluate the integrity of the core. If the core is not suitably intact, repeat coring procedure within 5 to 10 feet of the first location attempted.
    - Place a second cap on top of the core tube labeled with the site location ID and the word “top.” Secure the cap in place with duct tape. Rinse the outside of the core tube with a small amount of site water.
    - Measure and record the length of sediment recovered.
- For Vibracore core collection method:
    - Mount a clean coring tube into the Vibracore device.

  - Lower the coring apparatus with the core tube attached vertically through the water column, tube end first, until the sediment surface is reached. Measure the depth of water, and survey the water surface elevation (see Survey section below).
  - Vibrate the core into the sediment to refusal. Measure and record the depth of the sediment.
  - Pull the apparatus upward out of the sediment (using a winch) and raise it to the surface while maintaining the core in a vertical position.
  - Before the tube is fully removed from the water, place a cap on the bottom end of the tube while it is still submerged.
  - Keeping the tube upright, wipe the bottom end dry, seal the cap with duct tape, and label. Evaluate the integrity of the core. If the core is not suitably intact, repeat coring procedure a minimum distance of 2 feet from the previously attempted location but within 5 to 10 feet of the first location attempted. A maximum of three attempts to collect a core will be made for a given location.
  - Water overlying the core tube in the coring apparatus will be allowed to drain prior to removal of the core tube.
  - Remove the core tube from the Vibracore device and place a second cap on top of the core tube labeled with the site location ID and the word “top.” Secure the cap in place with duct tape. Rinse the outside of the core tube with a small amount of site water.
  - Measure and record the length of sediment recovered. The length of the cores recovered in the Lexan® tubing will be determined by visual observation and direct measurement. The approximate length of the cores recovered in the aluminum tubing will be determined indirectly by tapping the core with a metal rod. The spot where the pitch of the sound changes corresponds to the approximate top of the recovered core. The distance between the top of the sediment in the core tube and the bottom of the coring tube corresponds to the estimated length of the recovered core.

- Compare the measured length of the recovered core with the core penetration depth. If the recovered length of the sediment core is more than 60% of the penetration depth, keep the core for analysis. If an insufficient amount of material is recovered, set the core tube to the side and prepare to make an additional attempt (similar to procedures noted above for repeating coring procedure – maximum of three attempts for a given location).
  - If all three attempts to collect a core are unsuccessful based on recovery alone (i.e., less than 60% recovery), retain the longest core for analysis and indicate that the targeted recovery was not achieved.
- After core recovery, enter additional information into the field notebook.
  - date;
  - time of recovery;
  - sample position;

  - water depth (feet);
  - core collection method (hand-push or Vibracore) and tube material (Lexan® or aluminum);
  - core penetration depth (inch); and
  - other observations.

- Draw an arrow on the core tube with permanent marker to mark the top of the core. Label the core with permanent marker indicating station ID, date, and time.
- Store the core vertically while on the vessel and transport it to the processing area.

3.3 Core Processing Procedures

The general procedures to be utilized for the processing sediment cores and the extraction of samples for chemical analyses are outlined below. Core processing includes observational and photographic logging of the cores and collection of samples from the cores for chemical analyses.

- Maintain the core vertically in the core rack and dry the surface of the core tube with clean paper towels.
- While the core tube is vertical in the core rack, remove the top cap from the core and inspect the sediments within the core to determine if they are comprised of loose, watery sediments (that would slump if placed horizontally) or cohesive sediments. Remove any loose sediment with a stainless steel utensil while maintaining the core tube in a vertical position.
- Place the core horizontally on the core processing table and cut the core tube open lengthwise. Split the core in half.
- Mark the sample interval ranges on the outside of the core tube.
- Describe the core while the core is split open on the core processing table. As cores are processed, qualified personnel will describe each sediment sample interval. Additional information regarding procedures to identify soil types may be found in ASTM Standard D2488-00, entitled “Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).” Soil descriptions will be entered in the field notebook or on the Subsurface Log (Exhibit 3-1) for the following parameters.
  - soil type;
  - color;
  - percent recovery;
  - moisture content;
  - texture;
  - grain size and shape;
  - consistency;
  - blow counts, if collected; and

- miscellaneous observations.

A common soil sample description format should be utilized in the field notes, such as: Color; primary constituent (underlined or capitalized); secondary constituent(s) designated by “and” (if approximately 50 % of the sample, should only be utilized if a second primary constituent is identified), “some” (if approximately 30% to 50% of the sample), “little” (if approximately 10% to 30% of the sample), and/or “trace” (if less than 10% of the sample); description of consistency; moisture content; miscellaneous observations; and initial interpretations (capitalized in parentheses).

- Example 1: Brown fine SAND, some Silt, little medium-coarse Sand, trace concrete and brick debris, loose, wet, trace black staining.
- Example 2: Olive-gray SILT and CLAY, trace fine Gravel, angular dense, wet.

In addition, the boring logs must identify the specific depth of a landfill waste/native sediment interface (if present) and will provide a detailed description of any debris observed in the fill. Observations of staining, sheens, or other potential visual indicators of impacted soil should also be described in detail, including the starting and ending depths of such observations.

- Photograph the opened core. In the photograph, include a ruler or measuring tape for scale and mark the top and bottom ends of the core. Photograph any foreign objects or gaps. Record the photograph number and a description of each photograph in the field notebook.
- Prior to collecting sediment for chemical analysis, remove the smear zone (i.e., the portion of the sediment core that comes into contact with the core tube) over the interval to be sampled, to the extent practical.
- For each sample interval, remove sediment from the open core tube using a decontaminated stainless steel utensil and place sediment in a clean disposable aluminum pan and remove any debris (e.g., rocks, sticks) greater than ½-inch-diameter. Homogenize the sediment in the pan and place directly into clean, laboratory-supplied sample containers for analysis of polychlorinated biphenyls (PCBs).
- Sample containers will be labeled, stored on site, and transported to the appropriate testing laboratory. Label all sample containers with the following:
  - site;
  - project number;
  - boring number;
  - sample interval;
  - date;
  - time of sample collection; and
  - initials of sampling personnel.
- Handle, pack, and ship the samples in accordance with the procedures set forth in Attachment 1 to the FSP
- Record all appropriate information in the field notebook and on the proper forms.

4 DUPLICATE SAMPLE COLLECTION

Field duplicates will be prepared by homogenizing sediment collected at the same time and depth and then filling two sets of sample jars. The duplicate sample will be labeled in such a way that the sample designations will not indicate the duplicate nature of the samples. Information concerning the source of sample duplicates should be documented in the field notebook and on the version of the chain-of-custody form that is retained by the sampling team. This information should NOT be provided in the copy of the chain-of-custody form that is submitted to the laboratory.

5 SURVEY

A field survey control program will be conducted using standard instrument survey techniques to document the sediment sampling location and elevation of the water surface at that location. Generally, to accomplish this, a local control baseline will be set up. This local baseline control can then be tied into the appropriate vertical and horizontal datum for the site, as specified in the PDI Work Plan.

6 FIELD CLEANING PROCEDURES

Cleaning of sampling equipment is to follow the procedures specified in Attachment 8 to the FSP. If disposable / sample-specific equipment is not used, the sampling equipment is to be cleaned prior to the start of sampling activities, between samples, and following the completion of sampling activities. In addition, tools utilized in the handling and opening of sampling equipment, such as hacksaw for cutting Lexan® cores, are to be cleaned with a non-phosphate soap and water prior to the start of sampling activities, between samples, and following the completion of sampling activities, at a minimum.

7 DISPOSAL METHODS

Rinse water, PPE, and other residuals generated during the equipment cleaning procedures will be placed in appropriate containers. Containerized waste will be disposed of consistent with the disposal practices outlined in the FSP.

Date Start/Finish: / Drilling Company: Driller's Name: Drilling Method: Bit Size: Auger Size : Rig Type: Spoon Size:	Northing: Easting: Well Casing Elev.: ft. Corehole Depth: ft. Borehole Depth: ft. Ground Surface Elev.: ft. Descriptions by:	Well No. Client: Site:

DEPTH / ELEVATION	Sample Depth / Sample Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation ft.									GROUND SURFACE	
5										
10										
15										

Remarks:

Water Levels

Date / Time	Elevation	Depth

ATTACHMENT 4

Geotechnical Sampling Standard Operating Procedures

1 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the collection and field screening of soil samples using a hollow-stem auger, drive and wash, mud/water rotary, direct push macro-core, and/or rotosonic drilling methods. For the purposes of this SOP, “soil” is used throughout to represent soil or sediment.

This SOP should be followed whenever conducting soil boring activities. Note: If a boring is not completed as a well or piezometer, it will be grouted or abandoned in accordance with local borehole abandonment guidance.

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by the Project Manager.

2 PERSONNEL QUALIFICATIONS

Arcadis field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, and site-specific training, as needed. In addition, Arcadis field sampling personnel will be versed in the relevant SOPs and possess the skills and experience necessary to successfully complete the desired fieldwork. The project Health

and Safety Plan (HASP) and other documents will identify any other training requirements such as site-specific safety training or access control requirements.

3 EQUIPMENT LIST

The following equipment list identifies materials that may be needed in carrying out the procedures described in this SOP. Not all equipment listed below may be necessary for a specific activity. Additional equipment may be required, pending field conditions.

- personal protective equipment (PPE) and other safety equipment, as required in the project HASP
- project Quality Assurance Project Plan (QAPP)
- Work Plan or Field Sampling Plan (FSP) with figure showing proposed locations, table of target sampling location coordinates, and navigation and site maps
- barge and support vessel as needed for drilling over water equipped with all necessary health and safety equipment, that has been inspected, is capable of supporting the work to be performed, and accommodates all workers, equipment, and samples
- hand auger, pick, and shovel
- plastic sheeting
- logging table
- calibrated photoionization detector (PID) and calibration gas
- tape measure with accuracy of ± 0.01 foot

- automatically retracting safety knife
- stainless steel spatulas or large putty knife
- camera
- dry-erase board with marker
- waterproof permanent markers
- zip-top plastic bags
- packing tape and duct tape
- appropriate sample containers, labels, and forms
- decontamination supplies (see the SOP for Field Equipment Decontamination) including bucket, distilled or deionized water, cleansers appropriate for removing expected chemicals of concern, paper towels
- field logbook, logging tools, field logs, and black ball point pen and/or electronic data gathering environment (EDGE) tool
- sample packing and shipping materials (see the SOP for Chain-of-Custody, Handling, Packing, and Shipping)

4 CAUTIONS

Avoid using drilling fluids or materials that could impact groundwater or soil quality, or could be incompatible with the subsurface conditions. This includes adhesive tapes and lubricants on equipment that may come into contact with sample media.

Water used for drilling and sampling of soil or bedrock, decontamination of drilling/sampling equipment, or grouting boreholes upon completion will be of a quality acceptable for project objectives. Advance testing of the water supply should be considered.

Specifications of materials used for backfilling bore holes will be obtained, reviewed, and approved to meet project quality objectives.

On-water spills, observations of sheen, or other unexpected conditions will trigger implementation of the contingency plan, described in the FSP.

Field activities associated with vibracore sediment collection will be performed in accordance with a project-specific HASP, a copy of which will be present onsite during such activities. Vibracoring-related hazards, including subsurface utilities, are discussed in project-specific HASP and are not discussed herein. Use of hand-held manual and power tools can be dangerous. Refer to the project-specific HASP for guidance in situations requiring the use of power tools.

5 PROCEDURE

In accordance with procedures outlined below, the drill rig must be properly positioned and the position recorded before each activity can begin. In all instances where this SOP will be utilized, a hard copy or electronic version will be available at the point of use.

This section describes the step-by-step procedures for collection of subsurface soil samples. Observations will be recorded on the field forms, in the logbook, or electronically with the EDGE tool.

Upland Drilling

1. Maneuver the drill rig to the target sample location. Measure and record the sample location coordinates.
2. Mark out target drilling locations with white paint.
3. Conduct utility clearance prior to drilling, including contacting public utility notification center and any private utility locating identified in the FSP or HASP. If target location requires relocation due to underground utilities, adjust target locations within a 20 foot radius of the target location to avoid subsurface obstructions. If more than 20 foot offset from the target is required the United States Environmental Protection Agency (USEPA) will be contacted to discuss an alternate sample location.
4. Hand auger to a minimum depth of five feet below ground surface (bgs) to avoid damage to any unidentified subsurface utilities.
    a. Log soils recovered through hand augering in accordance with the SOP for Soil Logging.
    b. Contain hand auger cuttings on plastic sheeting and in a 5 gallon bucket.
    c. Handle hand auger cuttings as investigation derived waste (IDW) in accordance with Section VI of this SOP.
5. Specify sample collection intervals and planned total depth of boring to drillers prior to initiation of drilling. Monitor drilling progress, including beginning and end depths of each sample run, auger flight, rod run, etc.
6. Record boring log header information, including rig type, sampler, rod, auger, dimensions, driller name, other equipment information, etc.
7. Record sampler details in the field log book, including sampler type(s), sampler diameter(s) and length(s), sampler material(s).
8. Record drilling data as necessary to meet data objectives, including standard penetration test blow counts, unusual drill rig behavior, sampler type for each interval, etc.
9. Collect and log soil samples continuously, as specified in the FSP.
10. For each soil interval that will be analyzed for volatile compounds collect aliquots for volatile analysis immediately into the designated sample containers prior to screening or logging or sample.

11. Collect a small volume (approximately 1 ounce) of soil representative of each sample run, or representative of soil segments based on differences in evidence of impacts, and place into zipper-seal baggies. Perform PID headspace screening as follows:
    a. Allow to equilibrate to ambient temperature for approximately 15 minutes
    b. Insert “sniffer” of PID into each zip-top bag and read PID until value spikes and then stabilizes.
    c. Record the peak value displayed by the PID.
12. Describe sheen or NAPL impacts observed on the sample core and record in the field logbook or on the appropriate log form.
13. Photo-document the entire length of each sample run to provide reference for post-processing questions regarding descriptions of color/staining, general texture, recovery, etc. Photos of the core will include a view of a dry-erase board marked with the core ID, depth interval shown in the photo, date, and time. The photo will also include a view of a tape measure, for scale.
14. Log soil borings continuously according to the procedure described in the SOP for Soil Description.

Over-Water Drilling

1. Measure and record the surface water elevation at a surveyed reference location of known elevation where surface water conditions are equivalent to surface water at the sample location at 30-minute intervals throughout all on-water sampling activities.
2. Maneuver the drill rig to the target sample location and secure the vessel in place.
3. Measure and record water depth at the drilling location (i.e., the opening in the barge deck and hull providing access from the barge deck to the water below. Known as a “moon pool”) prior to setting drilling casing.
4. Set up casing through water column; confirm seal with sediment is established. The seal is well established when the head in the conductor casing can be elevated above the ambient head in the surrounding surface water.
5. Monitor surface water levels throughout drilling activities and account for any water level fluctuations in drill depth below sediment surface based on rod lengths if water levels change over the course of drilling. Follow steps 5 through 14 above.

6 WASTE MANAGEMENT

Solid IDWs such as excess soil generated through drilling activities will be collected into 55- gallon drums and stored onsite pending treatment and/or disposal.

Liquid IDWs such as decontamination liquids and purge water will be collected into 55 gallon drums and may be transferred or pumped directly into large-volume polyethylene tanks with secondary containment pending treatment and/or disposal.

Non-aqueous liquid wastes, if generated (i.e., hexane, non-aqueous phase liquid [NAPL], etc.), will be segregated and stored in appropriately sized buckets with secondary containment pending disposal.

PPE, soiled disposable items, and other trash will be stored in 55-gallon drums and stored onsite pending disposal.

IDW will be collected and stored onsite in United States Department of Transportation (DOT)- compliant 55 gallon drums and/or large-volume tanks with secondary containment. Fifty Five gallon drums and tanks will be labeled with DOT-compliant labels with the following information: drum contents, generator contact information, and date container was filled. IDWs known to be hazardous will be segregated and stored separately from non-hazardous IDWs. Solid IDW will be segregated and stored separately from liquid IDW.

IDW will be sampled as needed for disposal characterization. IDW will be stored onsite pending treatment and/or disposal. IDW may be managed in conjunction with remedial activities.

All IDW will be stored in a secure onsite location pending treatment and disposal and/or discharge.

7 DATA RECORDING AND MANAGEMENT

See the SOP for Field Documentation

8 QUALITY ASSURANCE

Sample quality will be achieved by complying with the procedures outlined in this SOP. Cross-contamination will be prevented by following the protocols described in the SOP for Field Equipment Decontamination. Field activities will be supervised by appropriate experienced field supervisors. Additional quality assurance information is presented in the project-specific QAPP.

1 SCOPE AND APPLICATION

This ARCADIS standard operating procedure (SOP) describes proper soil description procedures. This SOP should be followed for all unconsolidated material unless there is an established client-required specific SOP or regulatory-required specific SOP. In cases where there is a required specific SOP, it should be followed and should be referenced and/or provided as an appendix to reports that include soil classifications and/or boring logs. When following a required non-ARCADIS SOP, additional information required by this SOP should be included in field notes with client approval.

This SOP has been developed to emphasize field observation and documentation of details required to:

- make hydrostratigraphic interpretations guided by depositional environment/geologic settings;
- provide information needed to understand the distribution of constituents of concern; properly design wells, piezometers, and/or additional field investigations; and develop appropriate remedial strategies.

This SOP incorporates elements from various standard systems such as ASTM 02488-06, Unified Soil Classification System, Burmister and Wentworth. However, none of these standard systems focus specifically on contaminant hydrogeology and remedial design. Therefore, although each of these systems contain valuable guidance and information related to correct descriptions, strict application of these systems can omit information critical to our clients and the projects that we perform.

This SOP does not address details of health and safety; drilling method selection; boring log preparation; sample collection; or laboratory analysis. Refer to other ARCADIS SOPS, the project work plans including the quality assurance project plan, sampling plan, and health and safety plan (HASP), as appropriate.

2 PERSONNEL QUALIFICATIONS

Soil descriptions will be completed only by persons who have been trained in ARCADIS soil description procedures. Field personnel will complete training on the ARCADIS soil description SOP in the office and/or in the field under the guidance of an experienced field geologist. For sites where soil descriptions have not previously been well documented, soil descriptions should be performed only by trained persons with a degree in geology or a geology-related discipline.

3 EQUIPMENT LIST

The following equipment should be taken to the field to facilitate soil descriptions:

- field book, field forms or PDA to record soil descriptions;
- field book for supplemental notes;
- this SOP for Soil Descriptions and any project-specific SOP (if required);
- field card showing Wentworth scale;
- Munsell® soil color chart;

- tape measure divided into tenths of a foot;
- stainless steel knife or spatula;
- hand lens;
- water squirt bottle;
- jar with lid;
- personal protective equipment (PPE), as required by the HASP; and
- digital camera.

4 CAUTIONS

Drilling and drilling-related hazards including subsurface utilities are discussed in other SOPs and site-specific HASPs and are not discussed herein.

Soil samples may contain hazardous substances that can result in exposure to persons describing soils. Routes for exposure may include dermal contact, inhalation and ingestion. Refer to the project specific HASP for guidance in these situations.

5 HEALTH AND SAFETY CONSIDERATIONS

Field activities associated with soil sampling and description will be performed in accordance with a site-specific HASP, a copy of which will be present on site during such activities. Know what hazardous substances may be present in the soil and understand their hazards. Always avoid the temptation to touch soils with bare hands, detect odors by placing soils close to your nose, or tasting soils.

6 PROCEDURE

1. Select the appropriate sampling method to obtain representative samples in accordance with the selected sub-surface exploration method, e.g. split-spoon or Shelby sample for hollow-stem drilling, Lexan or acetate sleeves for dual- tube direct push, etc.
2. Proceed with field activities in required sequence. Although completion of soil descriptions is often not the first activity after opening sampler, identification of stratigraphic changes is often necessary to select appropriate intervals for field screening and/or selection of laboratory samples.
3. Examine all of each individual soil sample (this is different than examining each sample selected for laboratory analysis), and record the following for each stratum:
    - depth interval;
    - principal component with descriptors, as appropriate;
    - amount and identification of minor component(s) with descriptors as appropriate;
    - moisture;

- consistency/density;
- color; and
- additional description or comments (recorded as notes).

The above is described more fully below.

DEPTH

To measure and record the depth below ground level (bgl) of top and bottom of each stratum, the following information should be recorded.

1. Measured depth to the top and bottom of sampled interval. Use starting depth of sample based upon measured tool length information and the length of sample interval.
2. Length of sample recovered, not including slough (material that has fallen into hole from previous interval), expressed as fraction with length of recovered sample as numerator over length of sampled interval as denominator (e.g. 14/24 for 14 inches recovered from 24-inch sampling interval that had 2 inches of slough discarded).
3. Thickness of each stratum measured sequentially from the top of recovery to the bottom of recovery.
4. Any observations of sample condition or drilling activity that would help identify whether there was loss from the top of the sampling interval, loss from the bottom of the sampling interval, or compression of the sampling interval. Examples: 14/24, gravel in nose of spoon; or 10/18 bottom 6 inches of spoon empty.

DETERMINATION OF COMPONENTS

Obtain a representative sample of soil from a single stratum. If multiple strata are present in a single sample interval, each stratum should be described separately. More specifically, if the sample is from a 2-foot long split-spoon where strata of coarse sand, fine sand and clay are present, then the resultant description should be of the three individual strata unless a combined description can clearly describe the interbedded nature of the three strata. Example: Fine Sand with interbedded lenses of Silt and Clay, ranging between 1 and 3 inches thick.

Identify principal component and express volume estimates for minor components on logs using the following standard modifiers.

Modifier	Percent of total Sample (by volume
and	36 – 50
some	21- - 35
little	10 – 20
trace	<10

Determination of components is based on using the Udden-Wentworth particle size classification (see below) and measurement of the average grain size diameter. Each size grade or class differs from the next larger grade or class by a constant ratio of Y2. Due to visual limitations, the finer classifications of Wentworth's scale cannot be distinguished in the field and the subgroups are not included. Visual determinations in the field should be made carefully by comparing the sample to the field gauge card that shows Udden-Wentworth scale or by measuring with a ruler. Use of field sieves as recommended to assist in estimating percentage of coarse grain sizes. Settling test or wash method (Appendix X4 of ASTM 02488) is recommended for determining presence and estimating percentage of clay and silt.

Udden-Wenworth Scale Modified ARCADIS, 2008			
Size Class	Millimeters	Inches	Standard Sieve #
Boulder	256 – 4096	10.08+	
Large cobble	128 - 256	5.04 -10.08	
Small cobble	64 - 128	2.52 – 5.04	
Very large pebble	32 – 64	0.16 - 2.52	
Large pebble	16 – 32	0.63 – 1.26	
Medium pebble	8 – 16	0.31 – 0.63	
Small pebble	4 – 8	0.16 – 0.31	No. 5 +
Granule	2 – 4	0.08 – 0.16	No.5 – No.10
Very coarse sand	1 -2	0.04 – 0.08	No.10 – No.18
Coarse sand	½ - 1	0.02 – 0.04	No.18 - No.35
Medium sand	¼ - ½	0.01 – 0.02	No.35 - No.60
Fine sand	1/8 -¼	0.005 – 0.1	No.60 - No.120
Very fine sand	1/16 – 1/8	0.002 – 0.005	No. 120 – No. 230
Silt (subgroups not included)	1/256 – 1/16	0.0002 – 0.002	Not applicable (analyze by pipette or hydrometer)
Clay (subgroups not included	1/2048 – 1/256	.00002 – 0.0002	

Identify components as follows. Remove particles greater than very large pebbles (64- mm diameter) from the soil sample. Record the volume estimate of the greater than very large pebbles. Examine the sample fraction of very large pebbles and smaller particles and estimate the volume percentage of the pebbles, granules, sand, silt and clay. Use the jar method, visual method, and/or wash method (Appendix X4 of ASTM D2488) to estimate the volume percentages of each category.

Determination of actual dry weight of each Udden-Wentworth fraction requires laboratory grain-size analysis using sieve sizes corresponding to Udden-Wentworth fractions and is highly recommended to determine grain-size distributions for each hydrostratigraphic unit.

Lab or field sieve analysis is advisable to characterize the variability and facies trends within each hydrostratigraphic unit. Field sieve-analysis can be performed on selected samples to estimate dry weight fraction of each category using ASTM D2488 Standard Practice for Classification of Soils for Engineering Purposes as guidance, but replace required sieve sizes with the following Udden-Wentworth set: U.S. Standard sieve mesh sizes 6; 12; 20; 40; 70; 140; and 270 to retain pebbles; granules; very coarse sand; coarse sand; medium sand; fine sand; and very fine sand, respectively.

PRINCIPAL COMPONENT

The principal component is the size fraction or range of size fractions containing the majority of the volume. Examples: the principal component in a sample that contained 55% pebbles would be "Pebbles"; or the principal component in a sample that was 20% fine sand, 30% medium sand and 25% coarse sand would be "Fine to coarse Sand" or for a sample that was 40% silt and 45% clay the principal component would be "Clay and Silt'.

Include appropriate descriptors with the principal component. These descriptors vary for different particle sizes as follows.

Angularity- Describe the angularity for very coarse sand and larger particles in accordance with the table below (ASTM D-2488-06). Figures showing examples of angularity are available in ASTM D-2488-06 and the ARCADIS Soil Description Field Guide.

Description	Criteria
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded comers and edges.
Rounded	Particles have smoothly curved sides and no edges.

Plasticity- Describe the plasticity for silt and clay based on observations made during the following test method (ASTM D-2488-06).

- As in the dilatancy test below, select enough material to mold into a ball about Y:z inch (12 mm) in diameter. Mold the material, adding water if necessary, until it has a soft, but not sticky, consistency.
- Shape the test specimen into an elongated pat and roll by hand on a smooth surface or between the palms into a thread about 1/8 inch (3 mm) in diameter. (If the sample is too wet to roll easily, it should be spread into a thin layer and allowed to lose some water by evaporation.) Fold the sample threads and reroll repeatedly until the thread crumbles at a diameter of about 1/8 inch. The thread will crumble when the soil is near the plastic limit.

Description	Criteria
Nonplastic	A $^{1}/_{8}$ inch (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit

Dilatancy – Describe the dilatancy for silt and silt-sand mixtures using the following field test method (ASTM D-2488-06).

- From the specimen select enough material to mold into a ball about 'Y2 inch (12 mm) in diameter. Mold the material adding water if necessary, until it has a soft, but not sticky, consistency.
- Smooth the ball in the palm of one hand with a small spatula.
- Shake horizontally, striking the side of the hand vigorously with the other hand several times.
- Note the reaction of water appearing on the surface of the soil.

- Squeeze the sample by closing the hand or pinching the soil between the fingers, and not the reaction as none, slow, or rapid in accordance with the table below. The reaction is the speed with which water appears while shaking and disappears while squeezing.

Description	Criteria
None	No visible change in the specimen.
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

MINOR COMPONENT(S)

The minor component(s) are the size fraction(s) containing less than 50% volume. Example: the identified components are estimated to be 60% medium sand to granules, 25% silt and clay; 15% pebbles- there are two identified minor components: silt and clay; and pebbles.

Include a standard modifier to indicate percentage of minor components (see Table on Page 5) and the same descriptors that would be used for a principal component. Plasticity should be provided as a descriptor for the silt and clay. Dilatancy should be provided for silt and silt-sand mixtures. Angularity should be provided as a descriptor for pebbles and coarse sand. For the example above, the minor constituents with modifiers could be: some silt and clay, low plasticity; little medium to large pebbles, sub-round.

SORTING

Sorting is the opposite of grading, which is a commonly used term in the uses or ASTM methods to describe the uniformity of the particle size distribution in a sample. Well-sorted samples are poorly graded and poorly sorted samples are well graded. ARCADIS prefers the use of sorting for particle size distributions and grading to describe particle size distribution trends in the vertical profile of a sample or hydrostratigraphic unit because of the relationship between sorting and the energy of the depositional process. For soils with sand-sized or larger particles, sorting should be determined as follows:

- Well sorted- the range of particle sizes is limited (e.g. the sample is comprised of predominantly one or two grain sizes)
- Poorly sorted - a wide range of particle sizes are present

You can also use sieve analysis to estimate sorting from a sedimentological perspective; sorting is the statistical equivalent of standard deviation. Smaller standard deviations correspond to higher degree of sorting (see Remediation Hydraulics, 2008).

MOISTURE

Moisture content should be described for every sample since increases or decreases in water content is critical information. Moisture should be described in accordance with the table below (percentages should not be used unless determined in the laboratory).

Description	Criteria
Dry	Absence of moisture, dry to touch, dusty.
Moist	Damp but no visible water.
Wet (Saturated)	Visible free water, soil is usually below the water table.

CONSISTENCY or DENSITY

This can be determined by standard penetration test (SPT) blow counts (ASTM D-1586) or field tests in accordance with the tables below. For SPT blow counts the N-value is used. The N-value is the blows per foot for the 6" to 18" interval. Example: for 24-inch spoon, recorded blows per 6-inch interval are: 4/6/9/22. Since the second interval is 6" to12", the third interval is 12" to 18", the N value is 6+9, or 15. Fifty blow counts for less than 6 inches is considered refusal.

Fine-grained soil – Consistency

Description	Criteria
Very soft	N-value < 2 or easily penetrated several inches by thumb.
Soft	N-value 2-4 or easily penetrated one inch by thumb.
Medium stiff	N-value 9-15 or indented about ¼ inch by thumb with great effort.
Very stiff	N-value 16-30 or readily indented by thumb nail.
Hard	N-value > than 30 or indented by thumbnail with difficulty

Coarse-grained soil – Density

Description	Criteria
Very loose	N-value 1- 4
Loose	N-value 5-10
Medium dense	N-value 11-30
Dense	N-value 31- 50
Very dense	N-value >50

COLOR

Color should be described using simple basic terminology and modifiers based on the Munsell system. Munsell alpha-numeric codes are required for all samples. If the sample contains layers or patches of varying colors this should be noted and all representative colors should be described. The colors should be described for moist samples. If the sample is dry it should be wetted prior to comparing the sample to the Munsell chart.

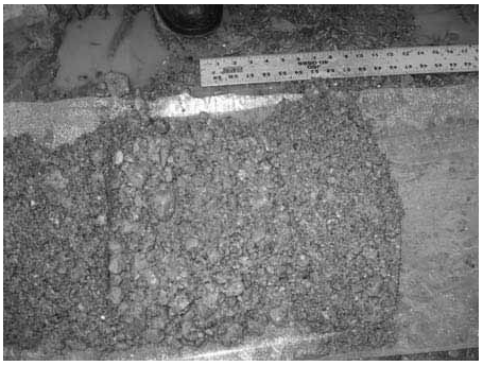
ADDITIONAL COMMENTS (NOTES)

Additional comments should be made where observed and should be presented as notes with reference to a specific depth interval(s) to which they apply. Some of the significant information that may be observed includes the following.

- **Odor**- You should not make an effort to smell samples by placing near your nose since this can result in unnecessary exposure to hazardous materials. However, odors should be noted if they are detected during the normal sampling procedures. Odors should be based upon descriptors such as those used in NIOSH "Pocket Guide to Chemical Hazards", e.g. "pungent" or "sweet' and should not indicate specific chemicals such as "phenol-like" odor or "BTEX" odor.
- Structure
- Bedding planes (laminated, banded, geologic contacts)
- Presence of roots, root holes, organic material, man-made materials, minerals, etc.
- Mineralogy
- Cementation
- NAPL presence/characteristics, including sheen (based on client-specific guidance)
- Reaction with HCl (typically used only for special soil conditions)
- Origin, if known (capital letters: LACUSTRINE; FILL; etc.)

EXAMPLE DESCRIPTIONS

51.4 to 54.0' Clay, some silt, medium to high plasticity, trace small to large pebbles, subround to subangular up to 2" diameter; moist; stiff; dark grayish brown (10YR 4/2) NOTE: Lacustrine ;laminated 0.01 to 0.02 feet thick, laminations brownish yellow (10 YR4/3).



32.5 to 38.0' Sand, medium to Pebbles, coarse; sub-round to sub-angular; trace silt; poor1y sorted; wet; grayish brown (10YR512). NOTE: sedimentary, igneous and metamorphic particles.

Unlike the first example where a density of cohesive soils could be estimated, this rotosonic sand and pebble sample was disturbed during drilling (due to vibrations in a loose Sand and Pebble matrix) so no density description could be provided. Neither sample had noticeable odor so odor comments were not included.

The standard generic description order is presented below.

- Depth
- Principal Components
    - Angularity for very coarse sand and larger particles

  - Plasticity for silt and clay
  - Dilatancy for silt and silt-sand mixtures
- Minor Components
- Sorting
- Moisture
- Consistency or Density
- Color
- Additional Comments

7 WASTE MANAGEMENT

Project-specific requirements should be identified and followed. The following procedures, or similar waste management procedures are generally required.

Water generated during cleaning procedures will be collected and contained onsite in appropriate containers for future analysis and appropriate disposal. PPE (such as gloves, disposable clothing, and other disposable equipment) resulting from personnel cleaning procedures and soil sampling/handling activities will be placed in plastic bags. These bags will be transferred into appropriately labeled 55-gallon drums or a covered roll-off box for appropriate disposal.

Soil materials will be placed in sealed 55-gallon steel drums or covered roll-off boxes and stored in a secured area. Once full, the material will be analyzed to determine the appropriate disposal method.

8 DATA RECORDING AND MANAGEMENT

Upon collection of soil samples, the soil sample should be logged on a standard boring log and/or in the field log book depending on Data Quality Objectives (DQOs) for the task/project. Two examples of standard boring logs are presented below.

The general scheme for soil logging entries is presented above; however, depending on task/project DQOs, specific logging entries that are not applicable to task/project goals may be omitted at the project manager's discretion. In any case use of a consistent logging procedure is required.

Completed logs and/or logbook will be maintained in the task/project field records file. Digital photographs of typical soil types observed at the site and any unusual features should be obtained whenever possible. All photographs should include a ruler or common object for scale. Photo location depth and orientation must be recorded in the daily log or log book and a label showing this information in the photo is useful.

ARCADIS Page ____ of ____

Sample Log

Well/Boring _____ Project Name and No. _____

Site Location _____ Drilling Started _____ Drilling Completed _____

Total Depth Drilled _____ feet Hole Diameter _____ inches Sampling Interval _____ feet

Length and Diameter of Sampling Device _____ Type of Sampling Device _____

Drilling Method _____ Drilling Fluid Used _____

Drilling Contractor _____ Driller _____ Helper _____

Prepared By _____ Hammer Weight _____ Hammer Drop _____ inches

Sample Depth (feet below land surface) From	To	Sample Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample Description	PID (ppm)

9 QUALITY ASSURANCE

Soil descriptions should be completed only by appropriately trained personnel. Descriptions should be reviewed by an experienced field geologist for content, format and consistency. Edited boring logs should be reviewed by the original author to assure that content has not changed.

10 REFERENCES

ARCADIS Soil Description Field Guide, 2008 (in progress)

Munsell® Color Chart-available from Forestry Suppliers, Inc.- Item 77341 "Munsell® Color Soil Color Charts

Field Gauge Card that Shows Udden-Wentworth scale-available from Forestry Suppliers, Inc. - Item 77332 "Sand Grain Sizing Folder"

ASTM D-1586, Test Method for Penetration Test and Split-Barrel Sampling of Soils

ASTM D-2488·00, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

United States Bureau of Reclamation Engineering Geology Field Manual. United States Department of Interior, Bureau of Reclamation. http://WWN.usbr.gov/pmts/geologylfieldmap.htrn

Petrology of Sedimentary Rocks, Robert L. Folk, 1980, p. 1-48

NIOSH Pocket Guide to Chemical Hazards

Remediation Hydraulics, Fred C. Payne, Joseph A Quinnan and Scott T. Potter, 2008, p 59-63

ATTACHMENT 5

Field Documentation Standard Operating Procedures

1 SCOPE AND APPLICATION

This standard operating procedure (SOP) covers the entries needed in a field book. This SOP does not address equipment decontamination, sample preservation, sample packaging, chain-of-custody, or laboratory analysis documentation. Refer to additional SOPs, as well as the project Pre-Design Investigation (PDI) Work Plan to which the Field Sampling Plan (FSP) (and this Attachment) is an Appendix, as appropriate.

2 EQUIPMENT

- Field Book;
- Indelible ink pen (if weather conditions prevent the use of such a pen, indicate so in the log and use an alternate writing instrument); and
- Re-sealable baggie or other weather-proof container to protect the field book from the elements.

3 PROCEDURES

- Print legibly. Do not use cursive writing;
- The name of the project, site location, project number, and date(s) of use should be written in indelible ink on the outside of the field book (additional books, as needed, will be labeled with their dates of application from start to finish [e.g., September 1, 2015 to May 5, 2016]);
- On the inside of the front cover, write “If Found, Please Return to ARCADIS,” and include the appropriate address and phone number, the name of the person to which the book is assigned, and the name of the Project Manager;
- Reserve the first page of the book for a Table of Contents;
- Reserve the last five pages of the book for important contacts, notes, reminders, etc.;
- Each day of field work, the following should be recorded in the field book as applicable:
    - Project name;
    - Date and time arrived;
    - Names of people on-site related to the project including employees, visitors, subcontractor employees, agency personnel, client representatives, etc.;
    - Briefly describe the work to be performed;
    - Indicate the health and safety level being used;
    - Record instrument calibrations and checks, if applicable;
    - Record time and general content of daily safety meeting, if applicable; and
    - Describe weather conditions, including temperature, precipitation, and wind speed and direction.

  - Minimize unused space on each page.

- If H&S monitoring is performed, record the time and results of initial/follow-up monitoring;
- Note factual observations including collection of samples, delays, damage noted, accidents, problems, and problem resolutions;
- Describe work performed and how documented such as photographs, sampling logs, etc.;
- Describe basis for field decisions including pertinent conversations with visitors, regulators, or project personnel;
- Note final instrument calibrations and checks, if applicable;
- Note the time off-site; and
- Sign the note book at the end of each day at a minimum. Draw a line to the end of the page to indicate no further entries on that page.
- If an entry to the field book is changed, strike out the deleted text or item with a single line such that the entry remains legible, and initial and date the change. Such changes should only be made by the same person that made the initial entry.
- Whenever possible, field book entries should be made in the field at the site, not at a later time at a different location. Supplemental entries to the field book may be made at a later date. The supplemental entry must be clearly identified as such and the entry must be signed and dated as described in this SOP.
- Problems noted in the field book must be brought to the attention of the Project Manager in a timely fashion. Problems may be reported in person, on the telephone, or via email.

4 DATA RECORDING AND MANAGEMENT

Each page of the field book should be scanned for electronic/digital archiving at periodic intervals. This will ensure that copies of the field notes are available in the event the field book is lost or damaged, and that field data can be easily disseminated to others without the risk of physically sending the field book. Field books that are full should be archived with the project files, and readily retrievable.

5 QUALITY ASSURANCE

Be mindful that the field book may appear in reports or other future uses. As discussed above, all entries should be legible. Entries should also be in English.

ATTACHMENT 6

Field Equipment Cleaning Standard Operating Procedures

1 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) outlines the cleaning procedures performed to ensure that sampling equipment that contacts a sample is free from analytes of interest and/or constituents that would interfere with laboratory analysis for analytes of interest. Non-disposable equipment will be cleaned after completing each sampling event, between sampling events, and prior to leaving the site.

Equipment that may require cleaning includes sampling devices and equipment. Cleaning procedures for sampling equipment will be monitored by collecting equipment blank samples as specified in the Quality Assurance Project Plan (QAPP; Appendix D to the Pre-Design Investigation [PDI] Work Plan). Dedicated and/or disposable (not to be re-used) sampling equipment will not require cleaning.

2 CLEANING OF RELATIVELY SMALL SAMPLING EQUIPMENT

This procedure applies to the cleaning of relatively small sampling equipment used for the collection of soil or sediment samples or for water testing or geophysical investigations. Such equipment may include soil core samplers, spatulas, etc. Such equipment will be cleaned in the field prior to and between sample collections (or other use) at a designated equipment cleaning area established within or adjacent to the specific work area.

2.1 Equipment

The following equipment/materials will be available as required during field cleaning activities:

- Health and safety equipment (as required in the Site Health and Safety Plan [HASP]);
- Distilled/deionized water;
- Non-phosphate detergent (e.g., Alconox);
- Clean tap water;
- Appropriate cleaning solvent (e.g., hexane, acetone);
- Rinse collection plastic containers;
- Brushes;
- Large heavy-duty garbage bags;
- Spray bottles;
- Re-sealable-type bags;
- Hand wipes or paper towels;
- Plastic sheeting; and

- Field book.

2.2 Procedures

- Don personal protective equipment (PPE) as required by HASP;
- If equipment is very dirty, on clean piece of plastic sheeting, in a clean wash bucket, pre-clean with a brush;
- Within the bucket, on top of the protective sheeting, use a non-phosphate detergent and water wash to removal all visible particulate matter and any residual oils or grease;
- Within the bucket, on top of the protective sheeting, use a tap water rinse to remove the detergent solution;
- Within the bucket, use a solvent rinse with hexane;
- Within the 5-gal bucket, use a distilled/deionized water rinse;
- Repeat solvent and water rinse two more times (i.e., triple rinse) and allow to air dry.

3 CLEANING OF HEAVY EQUIPMENT AND SUBSURFACE SOIL SAMPLING EQUIPMENT

This procedure applies to the cleaning of heavy equipment, such as drill rigs, auger flights, split spoons, etc. Such equipment will be cleaned within an appropriate location on the site.

If heavy equipment brought on site is suspected to contain contaminants from a prior job, it will be thoroughly cleaned according to the procedures described below. It will also be cleaned between drilling locations. Portions of the equipment that are in close proximity to materials being sampled, such as auger flights, drill rods, and drill bits, will be targeted for cleaning.

3.1 Safety Precautions

Before a piece of equipment can be cleaned, it must be disconnected and disabled in accordance with standard Energy Control and Power Lock-Out Procedures. All energy sources including stored energy must be removed prior to cleaning.

Do not attempt to clean equipment that is in service or still connected to power.

Protective clothing, in addition to that specified by the HASP (i.e., safety glasses, safety-toe shoes), may be required during some extensive cleaning. The cleaning contractor shall have a written HASP appropriate for the expected operations including measurements for determining the need for more stringent levels of protection. The additional protective clothing may include:

- plastic face shields;
- disposable Tyvek coveralls (Dupont/Saranex 23-P or equal);
- impervious rubber boots (neoprene, viton, or equal); and

- impervious gloves (neoprene, viton, or equal).

3.2 Equipment

The following equipment, as appropriate, shall be available during large equipment cleaning activities:

- Health and safety equipment (as required in the HASP);
- Utility pump;
- 6-mil polyethylene sheeting;
- Assorted scrub brushes;
- Waste disposal drums;
- Cleaning fluids such as Knights Super Kleen, Simple Green, Aquanex MC, Zep Formula 50, Zep Big Orange, or equal;
- Duct tape;
- Oil/water absorbent Speedi-Dry compounds; and
- Field book.

3.3 Procedures

- Don personal PPE as required by HASP;
- Set up the temporary area. This area should be larger than the intended items to be cleaned;
- Construct the area out of wood planks or similar (e.g., hay bales) to create a four-sided berm. Placed on top of the berm should be two layers of plastic sheeting. All solids and liquids produced during the procedure should pool in this area until disposed of appropriately;
- Place the item(s) to be cleaned on a surface (e.g., plastic/wood pallet) inside the temporary area;
- Pre-clean the entire piece of equipment to remove all loose dust, dirt, scale, etc. using a metal scraper and/or steel brush, by scraping, chipping, brushing and spot cleaning with solvent or detergent to remove encrusted materials;
- Apply the cleaning solution to each surface of the item via a mist, aerosol spray, or plastic brush soaked in the cleaning solution. Make sure that all surfaces are wetted. Use scrubbing brushes, if necessary, to loosen any visible dirt, stains, grease, etc. and then wipe down all surfaces with clean absorbent towels to remove any remaining particles. For larger items, it may be appropriate to clean the equipment in sections;
- Rinse the equipment with water supplied on-site or a potable water source;
- Repeat above two steps. The item should be clean and dry. The equipment is ready to be re-used on site. However, if the equipment is leaving the site to be used elsewhere, it must be wipe tested to demonstrate that it meets the applicable conditions for off-site re-use; and

- Use the designated utility pump to pump all liquids from the plastic sheeting to a 55-gallon drum, which will be staged prior to disposal.

4 DATA RECORDING AND MANAGEMENT

Equipment cleaning and decontamination will be noted in the field log book. Information will include the type of equipment cleaned, the decontamination location and any deviations from this SOP. Any unusual field conditions should be noted if there is potential to impact the efficiency of the decontamination or subsequent sample collection. Containers with decontamination fluids will be labeled.

5 DISPOSAL METHODS

Rinse water, PPE, and other residuals generated during the equipment cleaning procedures will be placed in appropriate containers. Containerized waste will be disposed of consistent with the disposal practices outlined in the FSP.

Arcadis of New York, Inc.

6723 Towpath Road

P.O. Box 66

Syracuse, New York 13214-0066

Tel 315 446 9120

Fax 315 449 0017

www.arcadis.com

APPENDIX B

Quality Assurance Plan

ARCADIS Design & Consultancy for natural and built assets

Respondents to Administrative Order on Consent for Remedial Design

UNIFORM FEDERAL POLICY – QUALITY ASSURANCE PROJECT PLAN

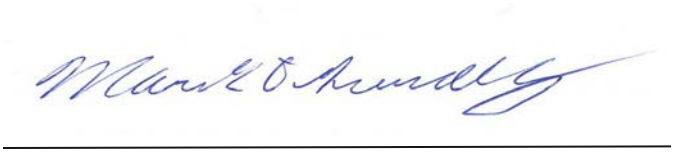
Lower Ley Creek Sub-site

Operable Unit 25 of the Onondaga Lake Superfund S

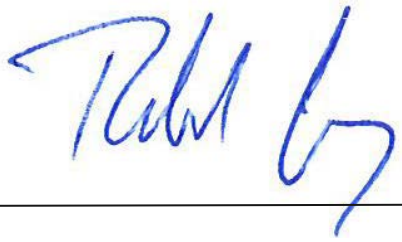
City of Syracuse/Town of Salina

Onondaga County, New York

December 2016



Mark O. Gravelding
Project Coordinator



Todd Cridge
Project Manager

Dennis Capria
Program QA/QC Coordinator

UNIFORM FEDERAL POLICY-QUALITY ASSURANCE PROJECT PLAN

Lower Ley Creek Sub-site

Operable Unit 25 of the Onondaga Lake Superfund Site

City of Syracuse/Town of Salina

Onondaga County, New York

Prepared for:

Respondents to Administrative Order on Consent for Remedial Design

Prepared by:

Arcadis of New York, Inc.
50 Fountain Plaza
Suite 600
Buffalo
New York 14202
Tel 716 667 0900
Fax 716 667 0279

Our Ref.:

B0035101.0001

Date:

December 2016

CONTENTS

APPENDIX

ACRONYMS AND ABBREVIATIONS

%R	percent recovery
ASP	Analytical Services Program
ASTM	American Society for Testing and Materials
CLP	Contract Laboratory Program
COC	chain-of-custody
CV	calibration verification
CVAA	cold vapor atomic absorption
DQI	data quality indicator
DQO	data quality objective
DUSR	Data Usability Summary Report
EDD	electronic data deliverable
Eurofins	Eurofins Lancaster Laboratories Environmental, LLC
FSP	Field Sampling Plan
GC/ECD	gas chromatography/electron capture detector
GC/MS	gas chromatography/mass spectrometry
GIS	geographic information system
GM	General Motors
HASP	Health and Safety Plan
ICP-AES	inductively coupled plasma-atomic emission spectrometry
ICV	initial calibration verification
ID	identification
LCS	laboratory control sample
MDL	method detection limit
mg/kg	milligrams per kilogram
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NS	no standard
NYSDEC	New York State Department of Environmental Conservation

OU	operable unit
PCB	polychlorinated biphenyl
PDI	pre-design investigation
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RL	reporting limit
ROD	Record of Decision
RPD	relative percent difference
RSD	relative standard deviation
SCO	Soil Cleanup Objective
SOP	standard operating procedure
SVOC	semi-volatile organic compound
TBD	to be determined
TCLP	toxicity characteristic leaching procedure
TSCA	Toxic Substances Control Act
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

INTRODUCTION

This Quality Assurance Project Plan (QAPP) details the planning processes for collecting data and describes the implementation of the quality assurance (QA) and quality control (QC) activities developed for the pre-design investigation (PDI) activities to be completed for the Lower Ley Creek Sub-site (the Sub-site) of the Onondaga Lake Superfund Site. The Sub-site (Superfund Site Identification Number: NYD986913580) is located in Onondaga County, New York, within the City of Syracuse and the Town of Salina. The objectives of this QAPP are to generate project data that are technically valid, legally defensible, and are useful in meeting the project goals, as well as integrate the technical and QC requirements of the Sub-site for future remedial design activities. This QAPP consists of four main components:

- Project Management
- Measurement and Data Acquisition
- Assessment and Oversight
- Data Validation and Usability

The above components will incorporate QA/QC requirements cited within the following documents:

- United States Environmental Protection Agency (USEPA) Requirements for Quality Assurance Project Plans, USEPA QA/R-5, March 2001
- USEPA Guidance for the Data Quality Objectives (DQOs) Process, QA/G-4, February 2006
- Uniform Federal Policy for Quality Assurance Project Plans, Final Version March 2005

PROJECT BACKGROUND AND HISTORY

Lower Ley Creek Sub-site is designated as Operable Unit (OU) 25 of the Onondaga Lake Superfund Site, which was listed on the National Priorities List on December 16, 1994. The Sub-site is located within the urbanized area of eastern Syracuse, New York and consists of the lower two miles of Lower Ley Creek between the Route 11 Bridge (i.e., Brewerton Road) and Onondaga Lake. The Sub-site also includes a 3.7-acre wetland situated on the southern bank of the Creek adjacent to the Cooper Crouse-Hinds North Landfill and the Old Ley Creek Channel, which was the original section of the Creek before Ley Creek was widened and reconfigured during a flood control project in the 1970s. In addition, the Sub-site includes several sections along the banks of the Creek where dredged contaminated sediments were placed during that flood control project.

Several properties are known to be either contributors or potential contributors of contaminants to Ley Creek, including: the General Motors (GM) Former Inland Fisher Guide Facility and Ley Creek Deferred Media Site; the GM Ley Creek Dredging Site; and the Town on Salina Landfill, which surrounds Lower Ley Creek just downstream of Route 11/Brewerton Road.

QAPP WORKSHEET #1 – TITLE AND APPROVAL PAGE

Site Name/Project Name:	Lower Ley Creek Sub-site, Operable Unit 25 of the Onondaga Lake Superfund Site
Site Location:	City of Syracuse/Town on Salina, Onondaga County, New York
Document Title:	Uniform Federal Policy – Quality Assurance Project Plan Lower Ley Creek Sub-site Operable Unit 25 of the Onondaga Lake Superfund Site
Lead Organization:	USEPA Region 2
Preparer's Name and Organizational Affiliation:	Jennifer Singer, Arcadis
Preparer's Contact Information:	50 Fountain Plaza, Suite 600, Buffalo, NY 14202, 716 667 6664, jennifer.singer@arcadis.com
Preparation Date:	August 2016
Arcadis Project Manager	
	Signature
Arcadis Program QA/QC Officer	
	Signature
USEPA Region 2 Remedial Project Manager	
	Signature
	Signature

QAPP WORKSHEET #2 – QAPP IDENTIFYING INFORMATION

Site Name/Project Name:	Lower Ley Creek Sub-site, Operable Unit 25 of the Onondaga Lake Superfund Site
Site Location:	City of Syracuse/Town on Salina, Onondaga County, New York
Site Number/Code:	USEPA ID # NYD986913580
Operable Unit:	OU25
Contractor Name:	Arcadis
Contract Number:	NA
Contract Title:	NA
Work Assignment Number:	NA
Identify guidance used to prepare Quality Assurance Project Plan (QAPP):	Uniform Federal Policy for Quality Assurance Project Plans, Manual V1 (2005)
Identify regulatory program:	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
Identify approval entity:	USEPA Region 2
Indicate whether the QAPP is a generic or a project-specific QAPP?	This is a project-specific QAPP, which addresses the requirements of the PDI. This QAPP may be amended, as required, for future work at the site.
List dates of scoping sessions that were held:	
List dates and titles of QAPP documents written for previous site work, if applicable:	Quality Assurance Project Plan, Lower Ley Creek Superfund Site; Prepared by: Lockheed Martin/Scientific Engineering Response & Analytical Services; approved November 2009, and all subsequent amendments
List organizational partners (stakeholders) and connection with lead organization:	The project organizational partners include representatives from USEPA Region 2, New York State Department of Environmental Conservation (NYSDEC), and Onondaga Nation
List data users:	USEPA Region 2, NYSDEC, and Arcadis

Required QAPP Element(s) and Corresponding QAPP Section(s) (per Uniform Federal Policy QAPP 2005)	Required Information	Crosswalk to Related Information and Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	Worksheet #1 – Title and Approval Page
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	The Table of Contents is provided following the QAPP cover page Worksheet #2 – QAPP Identifying Information
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	Worksheet #3 – Distribution List Worksheet #4-1 and #4-2 – Project Personnel Sign-Off
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	Worksheet #5 – Project Organization Chart Worksheet #6 – Communication Pathways Worksheet #7 – Personnel Responsibilities and Qualifications Worksheet #8 – Special Personnel Training Requirements
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History and Background	- Project Planning Session Documentation (including data needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History and Background - Site Maps (historical and present)	Worksheet #9 Project Team Planning Sessions Participants Sheet Worksheet #10 Problem Definition for Project Data Quality Objectives (DQOs)

Required QAPP Element(s) and Corresponding QAPP Section(s) (per Uniform Federal Policy QAPP 2005)	Required Information	Crosswalk to Related Information and Documents
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific Project Quality Objectives - Measurement Performance Criteria Table	Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements Worksheet #12A through #12E – Measurement Performance Criteria for project analytes.
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	Worksheet #13 – Secondary Data Criteria and Limitations
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	Worksheet #14 – Summary of Project Tasks Worksheet #15A and #15B – Reference Limits and Evaluation for specific monitoring activities Worksheet #16 – Project Schedule/Timeline
Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.4 Field Equipment Calibration, Maintenance, Testing and Inspection Procedures 3.1.2.5 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/Standard Operating Procedure (SOP) Requirements Table - Analytical Methods/SOP Requirements Table - Field Quality Control (QC) Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing and Inspection Table	Worksheet #17 – Sampling Design and Rationale Worksheet Worksheet #18 – Sampling Locations and Methods/SOP Requirements for the project Worksheet #19 – Analytical SOP Requirements (Sample Containers Preservation and Holding Times) Worksheet #20 – Sample Quantities and Control Frequencies Worksheet #21 – Field Sampling SOP References Worksheet #22 – Field Equipment Calibration, Maintenance, Testing and Inspection The field sampling SOPs can be found in the FSP

Required QAPP Element(s) and Corresponding QAPP Section(s) (per Uniform Federal Policy QAPP 2005)	Required Information	Crosswalk to Related Information and Documents
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing and Inspection Table	Worksheet #23 – Analytical SOP References Worksheet #24 – Analytical Instrument Calibration Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing and Inspection The analytical SOPs can be found in Appendix A
3.3 Sample Collection Documentation, Handling, Tracking and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example COC Form and Seal	Worksheet #26 – Sample Handling System Worksheet #27 – Sample Custody Requirements An example of the COC form can be found in SOP "Chain-of-custody, handling, packing, and shipping" included in the FSP
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples Table - Screening/Confirmatory Analysis Decision Tree	Worksheets #28A and #28E present QC sample information for project analytes
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management SOPs	Worksheet #29 – Project Documents and Records Worksheet #30 – Analytical Services

Required QAPP Element(s) and Corresponding QAPP Section(s) (per Uniform Federal Policy QAPP 2005)	Required Information	Crosswalk to Related Information and Documents
Assessment/Oversight		
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Assessments and Response Actions - Planned Project Assessments Table - Audit Checklists - Assessment Findings and Corrective Action Responses Table	Worksheet #31 – Planned Project Assessments Worksheet #32 – Assessment Findings and Corrective Action Responses
4.2 QA Management Reports	- QA Management Reports Table	Worksheet #33 – QA Management Reports
Data Review		
5.1 Overview		
5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table - Usability Assessment	Worksheet #34 – Verification (Step I) Process Worksheet #35 – Validation (Steps IIa and IIb) Process Worksheet #36 – Validation (Steps IIa and IIb) Summary Worksheet #37 – Usability Assessment
5.3 Streamlining Data Review 5.3.1 Data Review Steps to be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining	None	NA

QAPP WORKSHEET #3 – DISTRIBUTION LIST

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address
Pamela Tames	Remedial Project Manager	USEPA Region 2	(212) 637-4255	Tames.Pam@epa.gov
Mark Gravelding	Project Coordinator	Arcadis	(315) 671-9235	mark.gravelding@arcadis.com
Dennis Capria	Quality Manager	Arcadis	(315) 671-9299	dennis.capria@arcadis.com
Todd Cridge	Project Manager/QAPP Developer	Arcadis	(315) 671-9271	Todd.cridge@arcadis.com
Lyssa Longenecker	Project Manager	Eurofins Lancaster Laboratories Environmental, LLC (Eurofins)	(717) 656-2300	Lyssalongenecker@eurofinsUS.com

Note:

Copies of this QAPP will be distributed to the individuals listed above and will be made available to other key personnel who will be assigned to work on the project. Those named above will be responsible for distributing this QAPP and related documents to others in their organization. The copies will include this QAPP and any subsequent revisions and addenda.

QAPP WORKSHEET #4-1 – PROJECT PERSONNEL SIGN-OFF SHEET (ARCADIS)

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Mark Gravelding	Project Coordinator	(315) 671-9235		
Dennis Capria	Quality Manager	(315) 671-9299		
Todd Cridge	Project Manager/QAPP Developer	(315) 671-9271		

Project field team members, when assigned, will be required to sign that they have read applicable sections of this QAPP.	Field team members must read applicable sections of this QAPP and Standard Operating Procedures (SOPs) prior to participating in the project.

Note:

The project personnel sign-off table above documents key project personnel who have read the applicable sections of, and will perform required activities in accordance with this QAPP.

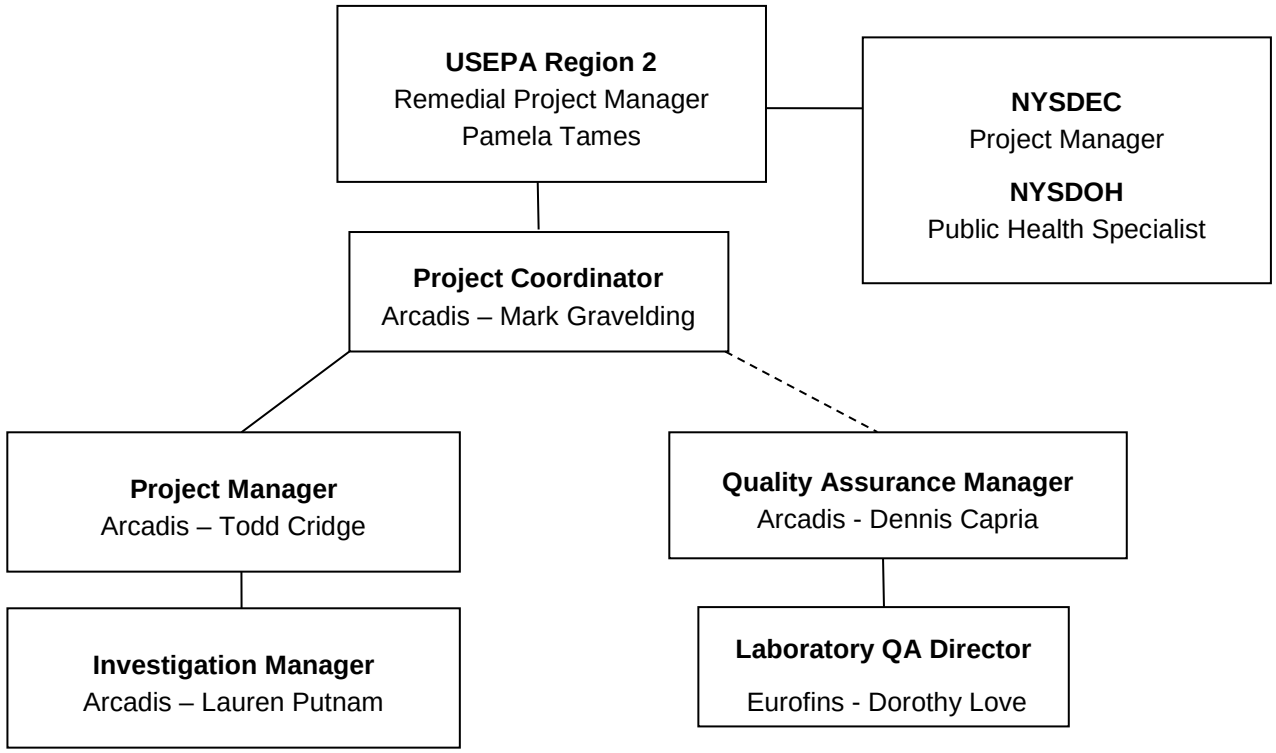
QAPP WORKSHEET #4-2 – PROJECT PERSONNEL SIGN-OFF SHEET (EUROFINS)

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Lyssa Longenecker	Laboratory Project Manager	(717) 656-2300		
Dorothy Love	Laboratory QA Director	(717) 656-2300		

Note:

The project personnel sign-off table above documents key project personnel who have read the applicable sections of, and will perform required activities in accordance with this QAPP.

QAPP WORKSHEET #5 – PROJECT ORGANIZATIONAL CHART



QAPP WORKSHEET #6 – COMMUNICATIONS PATHWAYS

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (e.g., Timing, Pathways)
Point of contact with USEPA Remedial Project Manager	Arcadis	Mark Gravelding	(315) 671-9235	Will provide documents to USEPA, NYSDEC, and Onondaga Nation representatives, and serve as the Arcadis liaison to Respondents
Coordinate field program, and manage all project phases	Arcadis	Todd Cridge	(315) 671-9271	To be notified by field personnel of field-related questions or problems by phone or email by close of business the next business day.
Stop work and initiation of corrective action[1]	Arcadis	Todd Cridge	(315) 671-9271	The Project Manager communicates within 24 hours of stop work to the project organization by phone, with confirmatory email.
Reporting of serious issues	Arcadis	Mark Gravelding	(315) 671-9271	Report any serious issues to Respondents, USEPA, and other concerned parties within 24 hours by telephone or email.
Approval of amendments to the QAPP	Arcadis	Dennis Capria	(315) 671-9299	Obtain initial approval from the Arcadis Project Manager and submit document amendments within 10 business days to USEPA for approval.
Real time modifications to QAPP	Arcadis	Dennis Capria	(315) 671-9299	To be notified by Arcadis Field Team Leader of any changes to QAPP made in the field and reasons by phone or email within two business days. Will promptly notify the Arcadis Project Manager of any such changes.
Reporting laboratory data quality issues	Eurofins	Laboratory QA Director	(717) 656-2300	Will report all QA/QC issues with project field samples to Project Manager and Program QA/QC Officer within two business days.
Corrective actions	Arcadis	Todd Cridge	(315) 671-9271	Will evaluate the need for corrective action for field and analytical issues in conjunction with the Project Manager, the Field Team Leader, or the Laboratory QA Manager, as appropriate.
Release of analytical data	Arcadis	Dennis Capria	(315) 671-9299	Will approve release of final analytical data following completion of validation.

Note: [1] Every Arcadis employee, subcontractor, and client representative at the site has the responsibility to stop the work of a co-worker or subcontractor if issues (e.g. change in working conditions, employee behaviour) arise.

QAPP WORKSHEET #7 – PERSONNEL RESPONSIBILITIES AND QUALIFICATIONS

Name	Title	Organizational Affiliation	Education and Experience Qualifications[1]
Mark Gravelding	Project Coordinator	Arcadis	MS Water Resource Engineering, 30 years experience
Todd Cridge	Project Manager	Arcadis	BS Civil Engineering, 14 years experience
TBD	Safety Officer	Arcadis	--
Todd Merrell	Field Team Leader	Arcadis	AAS Civil Engineering, 26 years experience
Dennis Capria	Arcadis Program QA/QC Officer	Arcadis	BS Biology, Minor Chemistry, 28 years experience
Lyssa Longenecker	Laboratory Project Manager	Eurofins	BS Biology, 5 years experience
Dorothy Love	Laboratory QA Director	Eurofins	BS Environmental Health, 35 years experience

Note:

[1] Resumes for key Arcadis personnel are available upon request.

The project management team will consist of representatives from USEPA, NYSDEC, the Lower Ley Creek PRP Group, and Arcadis. USEPA will provide technical oversight to the project. NYSDEC will provide State approval during the planning and investigation. Arcadis, as the primary contractor, will be responsible for developing and implementing the investigation plans and protocols and for developing the remedial design, and will provide project management for its subcontractors.

Descriptions of the Arcadis team member responsibilities are summarized below.

- **Project Coordinator** – The Arcadis Project Coordinator provides senior leadership in establishing project direction and plans. Works closely with the Project Manager to promote achievement of project goals and milestones.
  - Acting as primary liaison with the Lower Ley Creek PRP Group and USEPA and conducts regular active status meetings
  - Providing technical leadership and guidance to the project team, as well as senior review of project progress before further communication with the PRP Group and/or USEPA
- **Project Manager** – The Arcadis Project Manager may delegate authority to expedite and facilitate the implementation of the project plan. The Arcadis Project Manager is responsible for:
  - Ensuring that the contract is adhered to throughout project performance

- Ensuring that all activities are conducted in accordance with contractual specifications
- Ensuring compliance with project scope, schedule and budget
- Coordinating project team
- Managing subcontractors
- Managing all staff, materials, and equipment
- Ensuring that all personnel assigned the project, including subcontractors, review the technical plans before any task associated with the project is initiated and possess requisite training and certification
- Participating in the development of the field program, evaluation of data, reporting, and the development of conclusions and recommendations

- **Task Manager** – The Arcadis task manager reports directly to, and works with, the Arcadis project manager. The Arcadis task manager is responsible for assisting the Arcadis project manager as needed with project-related issues and responsibilities described above.
- **Program QA/QC Officer** – The Arcadis Program QA/QC Officer is responsible for independent reviews of project quality. The Arcadis Program QA/QC Officer provides an integral contribution to the success of the project by performing technical reviews throughout all project phases and offering technical guidance. Responsibilities and duties include:
  - Ensuring that the QA procedures and objectives in the project-specific work plans are met
  - Ensuring management and staff are aware of associated QA policies and procedures
  - Reviewing field and analytical data to ensure adherence to QA/QC procedures
  - Ensuring the quality of data before inclusion into associated reports
  - Assessing field and laboratory audits during the investigation
  - Providing technical guidance to direct the task leaders on a day-to-day or as-needed basis to ensure the application of QA/QC procedures
- **Project Safety Officer** – The Project Safety Officer is responsible for development and administration/implementation of Arcadis' health and safety program. Responsibilities and duties include:
  - Developing, implementing, and monitoring procedures for the Program Site Specific Health and Safety Plan (HASP)
  - Coordinating all health and safety training and medical monitoring
  - Ensuring field activities are in compliance with Arcadis' health and safety requirements
  - Stopping work due to health and safety concerns if necessary
  - Implementing corrective actions to ensure an accident free work environment

- **Field Team Leader** – The Field Team Leader will serve as the onsite contact persons for Arcadis. Responsibilities and duties include:
  - Supervising day-to-day, on-site operations
  - Providing field and QA/QC oversight during on-site activities
  - Updating project tracking system to ensure investigation schedule is met
  - Coordinating on-site subcontractor activities
  - Controlling on-site materials and ensuring that they are stored properly
  - Managing day-to-day activities of the on-site project staff
  - Designing field procedures and ensuring proper implementation of the field procedures by the project team
  - Maintaining consistent communication with the Project Manager regarding progress
  - Ensuring accurate field data produced by sampling personnel under their supervision
  - Ensuring that QC procedures are followed and documented
  - Coordinating field and laboratory schedules pertaining to relevant site activities
  - Reviewing field instrumentation, maintenance and calibration to meet quality objectives
  - Preparing reports pertaining to relevant field activities
  - Coordinating field activities with Arcadis field personnel
- **Field Personnel** – Responsibilities and duties include:
  - Performing field procedures associated with the investigations, as set forth in this QAPP
  - Performing field analyses and collect QA samples
  - Completing calibration, operation, and maintenance of field equipment
  - Reducing field data
  - Maintaining sample custody
  - Preparing field records and logs

Subcontracted Project Laboratory

- General responsibilities and duties of the analytical laboratories include:
  - Performing sample analyses and associated laboratory QA/QC procedures

- Suppling sampling containers and shipping cartons
- Maintaining laboratory custody of sample
- Adhering to all protocols in this QAPP

- **Laboratory Project Manager** – Responsibilities and duties include:
  - Serving as primary communication link between Arcadis and laboratory technical staff
  - Monitoring workloads and maintaining availability of resources
  - Overseeing preparation of analytical reports
  - Supervising in-house chain-of-custody (COC)
- **Laboratory QA Manager –** Responsibilities and duties include:
  - Monitoring the day-to-day quality of data produced by the laboratory for this project
  - Ensuring and documenting the reliability of the data
  - Maintaining and reviewing QC data
  - Conducting audits of all laboratory activities and data packages and deliverables

QAPP WORKSHEET #8 – SPECIAL PERSONNEL TRAINING REQUIREMENTS

Project Function	Specialized Training	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Field activities	Occupational Safety and Health Administration 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and medical monitoring, and any other project-specific training as specified in the APP	Arcadis or subcontracted organization	Training dates recorded in company/project training records	All field team members working on the site	All Arcadis and subcontractor personnel working on the site	Arcadis project files[1]
Analytical chemistry	Laboratory-specific training and proficiency testing	Project laboratory	Training dates kept in company training records	All personnel analyzing project samples	Laboratory personnel	Laboratory project files

Note:

[1] As applicable, training records for subcontractor personnel will be made available to Arcadis prior to commencement of field work.

QAPP WORKSHEET #9 – PROJECT TEAM PLANNING SESSIONS PARTICIPANTS SHEET

Project Name: Lower Ley Creek Sub-site, Operable Unit 25 of the Onondaga Lake Superfund Site

Site Location: City of Syracuse/Town of Salina, Onondaga County, New York

Projected Date(s) of Sampling: Spring 2017

Project Manager: Todd Cridge

Date of Session: June 29, 2015

Scoping Session Purpose: Project kick-off and introductory meeting. Reviewed preliminary pre-design scope and key components; introduction of potential for proposed sampling plan to include staged approach including collection of analytical and held samples, review of preliminary high-level project schedule

Name	Affiliation	E-mail Address
Mark Gravelding	Arcadis	Mark.gravedling@arcadis.com
Mike Erickson	Arcadis	Mike.erickson@arcadis.com
Peter Trimarchi	Nixon Peabody	ptrimarchi@nixonpeabody.com
Elaine Enfonde	Nixon Peabody	eenfonde@nixonpeabody.com
Laura Mona	Barclay Damon	lmona@barclaydamon.com
Jeffrey Davis	Barclay Damon	Jdavis@hblaw.com
John Wolski	UTC/Carrier	john.wolski@utc.com
Nelson Olavarria	Eaton/CCH	
Julia Ispentchian	National Grid	julia.ispentchian@nationalgrid.com
Pam Tames	USEPA	tames.pam@epa.gov
Joel Singerman	USEPA	Singerman.joel@epa.gov

QAPP WORKSHEET #9 – PROJECT TEAM PLANNING SESSIONS PARTICIPANTS SHEET

Project Name: Lower Ley Creek Sub-site, Operable Unit 25 of the Onondaga Lake Superfund Site

Site Location: City of Syracuse/Town of Salina, Onondaga County, New York

Projected Date(s) of Sampling: Spring 2017

Project Manager: Todd Cridge

Date of Session: July 22, 2015

Scoping Session Purpose: Review of pre-design Work Plan outline, introduction to PDI sample collection locations and selection process, discussion of sediment vs. soil limits/distinction, discussion of potential to remove ROD defined removal that fall within previously remediated areas or within current landfill limits

Name	Affiliation	E-mail Address
Mark Gravelding	Arcadis	Mark.gravedling@arcadis.com
Mike Erickson	Arcadis	Mike.erickson@arcadis.com
Nelson Olavarria	Eaton/CCH	
Elaine Enfonde	Nixon Peabody	eenfonde@nixonpeabody.com
Russell Nemecek	Onondaga County	Russ.nemecek@ongov.net
John Wolski	UTC/Carrier	john.wolski@utc.com
Julia Ispentchian	National Grid	julia.ispentchian@nationalgrid.com
Brian Stearns	National Grid	Brian.stearns@nationalgrid.com
Laura Mona	Barclay Damon	lmona@barclaydamon.com
Jeffrey Davis	Barclay Damon	Jdavis@hblaw.com
Chuck Guest	Arcadis	

QAPP WORKSHEET #9 – PROJECT TEAM PLANNING SESSIONS PARTICIPANTS SHEET

Project Name: Lower Ley Creek Sub-site, Operable Unit 25 of the Onondaga Lake Superfund Site

Site Location: City of Syracuse/Town of Salina, Onondaga County, New York

Projected Date(s) of Sampling: Spring 2017

Project Manager: Todd Cridge

Date of Session: August 5, 2015

Scoping Session Purpose: Review of Statement of Work updates and steps forward; establish pre-design objectives, group discussion related to deep excavation areas driven by PCBs that are covered with clean materials, discussion of potential need for capping/cover installation rather than excavation in the vicinity of structures or underground utilities, confirmation that removal extents/depths are driven by PCB as indicator compound, review of pre-design schedule. Meeting minutes distributed via email.

Name	Affiliation	E-mail Address
Mark Gravelding	Arcadis	Mark.gravedling@arcadis.com
Mike Erickson	Arcadis	Mike.erickson@arcadis.com
Rick Mustico	NYSDEC	richard.mustico@dec.ny.gov
Elaine Enfonde	Nixon Peabody	eenfonde@nixonpeabody.com
Russell Nemecek	Onondaga County	Russ.nemecek@ongov.net
John Wolski	UTC/Carrier	john.wolski@utc.com
Julia Ispentchian	National Grid	julia.ispentchian@nationalgrid.com
Pam Tames	USEPA	tames.pam@epa.gov
Chuck Guest	Arcadis	

QAPP WORKSHEET #9 – PROJECT TEAM PLANNING SESSIONS PARTICIPANTS SHEET

Project Name: Lower Ley Creek Sub-site, Operable Unit 25 of the Onondaga Lake Superfund Site

Site Location: City of Syracuse/Town of Salina, Onondaga County, New York

Projected Date(s) of Sampling: Spring 2017

Project Manager: Todd Cridge

Date of Session: February 10, 2016

Scoping Session Purpose: Presentation of non-sample collection pre-design activities, discussion related to staged approach to pre-design work and the need for contingency samples, discussion of the timing of Lower Ley Creek investigations relative to the completion of remediation in Upper Ley Creek, determination to focus upland sample collection on confirming ROD defined removals

Name	Affiliation	E-mail Address
Mark Gravelding	Arcadis	Mark.gravedling@arcadis.com
Mike Erickson	Arcadis	Mike.erickson@arcadis.com
Jim Campbell	Eaton/CCH	jrc@e-emi.com
Elaine Enfonde	Nixon Peabody	eenfonde@nixonpeabody.com
Peter Trimarchi	Nixon Peabody	ptrimarchi@nixonpeabody.com
Jean McCreary	Nixon Peabody	jmccreary@nixonpeabody.com
John Wolski	UTC/Carrier	john.wolski@utc.com
Julia Ispentchian	National Grid	julia.ispentchian@nationalgrid.com
Todd Cridge	Arcadis	Todd.cridge@arcadis.com
Laura Mona	Barclay Damon	lmona@barclaydamon.com
Jeff Davis	Barclay Damon	jdavis@barclaydamon.com

QAPP WORKSHEET #9 – PROJECT TEAM PLANNING SESSIONS PARTICIPANTS SHEET

Project Name: Lower Ley Creek Sub-site, Operable Unit 25 of the Onondaga Lake Superfund Site

Site Location: City of Syracuse/Town of Salina, Onondaga County, New York

Projected Date(s) of Sampling: Spring 2017

Project Manager: Todd Cridge

Date of Session: November 9, 2016

Scoping Session Purpose: Discussion of EPA comments on initial PDI Work Plan, description of additional soil sample collection needs and presentation of additional delineation locations

Name	Affiliation	E-mail Address
Mark Gravelding	Arcadis	Mark.gravedling@arcadis.com
Mike Erickson	Arcadis	Mike.erickson@arcadis.com
Jim Campbell	Eaton/CCH	jrc@e-emi.com
Elaine Enfonde	Nixon Peabody	eenfonde@nixonpeabody.com
Peter Trimarchi	Nixon Peabody	ptrimarchi@nixonpeabody.com
Jean McCreary	Nixon Peabody	jmccreary@nixonpeabody.com
John Wolski	UTC/Carrier	john.wolski@utc.com
Kathleen McFadden	UTC/Carrier	Kathleen.McFadden@UTC.COM
Julia Ispentchian	National Grid	julia.ispentchian@nationalgrid.com
Todd Cridge	Arcadis	Todd.cridge@arcadis.com
Laura Mona	Barclay Damon	lmona@barclaydamon.com
Kevin Murphy	Onondaga County	kmurphy@wladislawfirm.com
David Nunn	Eastman and Smith	dwnunn@eastmansmith.com
Mark Nicotra	Town of Salina	mnicotra@salina.ny.us

QAPP WORKSHEET #10 – PROBLEM DEFINITION

The DQO process is a tool that may be used to improve the quality of the data collection process by generating data that support defensible decisions. To determine the DQOs, a series of planning steps are used to identify the data needed to support project decisions and develop a data collection program. The process is intended to be iterative, optimizing data collection to meet the applicable decision criteria. The seven steps, as applied to the site, are detailed below.

Step 1 – State the Problem

Industrialization of the area began soon after the completion of the Erie Canal in 1857 and the development of railroads in eastern Syracuse. Several industries have been located near Ley Creek and its branches since the late 19th and early 20th centuries. The industrial nature of the area, as well as the infrastructure and other development, influenced this Sub-site and contributed to its current condition.

Assessments have been performed at many areas in the Onondaga Lake drainage basin to determine what sources have contributed to the contamination of Onondaga Lake. The Onondaga Lake Superfund site, which includes the Lake itself, six major and minor tributaries and various upland sources of contamination, was placed on the USEPA's National Priorities List on December 16, 1994. NYSDEC and USEPA have organized the work for the Onondaga Lake Superfund site into eleven sub-sites, which are considered by USEPA to be operable units of the site. The Lower Ley Creek Sub-site was declared a sub-site in mid-2009.

A number of upland sources have contributed contamination to Lew Creek. The most significant of these sources are the General Motors Inland Fisher Guide Facility/Ley Creek Deferred Media, Ley Creek polychlorinated biphenyl (PCB) dredgings, and Salina Landfill sub-sites.

Step 2 – Identify the Goals of the Study

The selected remedy for the Sub-site, as presented in USEPA ROD, is primarily based on the presence of PCBs in Ley Creek sediments and soils. The remedy involves excavating impacted sediment from Lower Ley Creek between the State Route 11 Bridge and Interstate 81 as well as from the Old Ley Creek Channel and soils associated with former dredge spoil deposits in the floodplains and the Old Ley Creek Channel area. The selected remedy includes the following components:

- Excavating an estimated 75,000 cubic yards (cy) of impacted soils located on the northern and southern banks of Lower Ley Creek;
- Excavating an estimated 12,000 cy of impacted sediment from the wetland area;
- Excavating an estimated 73,000 cy of impacted sediment from Lower Ley Creek;
- Capping soils that cannot be safely excavated due to existing oil and natural gas pipelines that run along the north bank of Lower Ley Creek;
- Capping sediments under the Route 11 bridge if necessary in order to protect the structural integrity of the bridge;
- Transporting excavated soils and sediments containing PCB concentrations greater than 50 milligrams per kilogram (mg/kg) to a Toxic Substances Control Act (TSCA) compliant facility;

- Transporting any excavated soils and sediments that fail toxicity characteristic leaching procedure (TCLP) testing, are determined to be characteristic hazardous waste, and are non-TSCA waste (i.e., PCB concentrations less than 50 mg/kg) to an off-site Resource Conservation and Recovery Act-(RCRA) compliant facility;
- Transporting excavated soils and sediments that are not TSCA-regulated (i.e., PCB concentrations less than 50 mg/kg) and are not characteristic hazardous waste to a local disposal facility, if available/feasible;
- Restoring excavated areas with clean substrate and vegetation consistent with an approved habitat restoration plan to be developed as part of the remedial design;
- Developing a Site Management Plan (SMP) that will provide for the proper management of all post-construction remedy components; and
- Implementing institutional controls in the form of an environmental easement/restrictive covenant to restrict intrusive activities in areas where contamination remains (including areas where municipal refuse was disposed of) unless the activities are in accordance with a USEPA-approved SMP.

Step 3 – Identify Information Inputs

The current scope of work focuses on the additional information and site-related data that will be collected as part of the remedy-specific PDI program required before the remedy described in the ROD can be implemented. PDI activities relevant to the scope of this QAPP include:

- Gathering additional characterization data for soil and sediment in areas identified for remediation in the ROD to determine the boundaries and depths for remediation.
- Gather additional data for the soil and sediment targeted for remediation to identify appropriate waste characterization and disposal requirements.
- Determine the geotechnical properties of the soil and sediment in areas identified for remediation in the ROD to support back and structural stability evaluation and excavated material dewatering/ stabilization design.

Step 4 – Define the Boundaries of the Study

The Lower Ley Creek Sub-site consists of the lower two miles of Ley Creek (including the Creek channel and adjacent floodplains) beginning at and including the State Route 11 Bridge and ending downstream at Onondaga Lake. The Sub-site also includes a 3.7-acre wetland situated on the southern bank of the Creek adjacent to the Cooper Crouse-Hinds North Landfill and the Old Ley Creek Channel, an original section of the Creek before Ley Creek was widened and reconfigured during a flood control project in the 1970s. In addition, the Sub-site includes several sections along the banks of the Creek where dredged contaminated sediments were placed during that flood control project.

Step 5 – Develop the Analytic Approach

Typically, the decision on whether data can be used will be based on the validation results. Following validation, the data will be flagged, as appropriate, and any use restrictions will be noted. A decision rule is adopted that 90 percent of the data points not be rejected or deemed unusable as a condition for use of the data set for decision-making purposes. The usable data will be evaluated versus the performance standard. The required reporting limits are documents in Worksheet #15 so that the lowest achievable detection limits will be reported by the laboratory.

Step 6 – Specify Performance or Acceptance Criteria

Specifications for this step call for giving forethought to corrective actions to improve data usability and understanding the representative nature of the sampling design. Corrective actions are described within this QAPP. The representative nature of the sampling design has been assured by discussions among professionals familiar with the site and the appropriate government agencies.

Step 7 – Develop the Plan for Obtaining Data

The overall QA objective is to develop and implement procedures for field sampling, including COC, laboratory analysis, and reporting, that will provide results to support the evaluation of site data against site-specific contract requirements. Specific procedures for sampling, COC, laboratory instrument calibration, laboratory analysis, data reporting, internal QC, audits, preventative maintenance of field equipment, and corrective action are described in other sections of this QAPP.

QAPP WORKSHEET #11 – PROJECT QUALITY OBJECTIVES/SYSTEMATIC PLANNING PROCESS STATEMENTS

Who will use the data?

USEPA Region 2, NYSDEC, and the Arcadis investigation/design team will use the data.

What will the data be used for?

The PDI data will be used to support the development of a detailed, comprehensive Remedial Design to implement the remedy selected in the ROD.

What types of data are needed?

- **Soil Sampling Program.** Additional pre-design investigation activites are required to better define the vertical and horizontal extent of PCB impacts and refine the limits of soil requiring remediation and the volume to be excavated. The soil sampling program will involve the collection of 106 soil samples for analysis of PCBs, with an additional 39 samples held for analysis contingent upon the analytical results associated with the original samples. A summary of the sample locations and depths are provided in the PDI Work Plan.
- **Sediment Sampling Program.** Additional pre-design investigation activities are proposed to refine the vertical and horizontal extent of sediment impacts and refine the limits of the sediment excavation and the associated sediment removal volume. The sediment sampling program will involve the collection of 206 sediment samples for analysis of PCBs and/or metals with an additional 275 samples held for analysis contingent upon the analytical results associated with the original samples. A summary of the sample locations and depths are provided in the PDI Work Plan.
- **Waste Characterization Sampling.** Waste characterization sampling will be performed to provide information required to determine the characteristics of the soil and sediment to be removed during implementation of the selected remedy and support the selection of appropriate disposal facilties. The waste characterization soil and sediment samples will be collected in conjunction with the soil and sediment sampling program described above. Thirty waste characterization samples will be submitted for laboratory analysis for the following parameters: TCLP volatile organic compounds (VOCs), TCLP semivolatile organic compounds (SVOCs), TCLP metals, ignitability, and corrosivity. In addition, PCB data collected from the soil and sediment sampling locations described above will be used to determine appropriate waste characterization requirements. A summary of the proposed waste characterization sampling locations is provided in the PDI Work Plan.
- **Geotechnical Sampling.** In-water and upland geotechnical borings will be installed in areas of anticipated excavation/dredging, specifically in deeper areas, adjacent to installed construction, and in areas of potential shoreline stability evaluations during dredging. Samples will be submitted for laboratory analysis for the following tests: grain size, moisture contect, Atterberg limits, specific gravity, unconsolidated-undrained triaxial compression with pore pressure, consolidated-undrained triaxial compression with pore pressure, and one-dimensional consolidation properties. The number of samples to be submitted will be determined by the project geotechnical engineer upon completion of the drilling program. A summary of the boring locations is provided in the PDI Work Plan.

How "good" do the data need to be in order to support the environmental decision?

The data must be technically defensible and of sufficient quality to support the DQOs of the PDI, which is intended to support the remedial design of the soil and sediment remediation planned for implementation in the Lower Ley Creek. Data collected will support determination of vertical and horizontal limits of the excavation/dredging, determination of waste disposal quantities and appropriate disposal facilities, and considerations for bank stability and shoring design associated with the excavation/dredging. Analytical reporting limits for all parameters should be sufficiently low to achieve screening criteria as presented in Worksheet #15.

How much data are needed?

The number of samples and analyses are summarized in Worksheets #18 and #20.

Where, when, and how should the data be collected/generated?

Sampling will be conducted in the Lower Ley Creek project area in accordance with the requirements of the approved Field Sampling Plan. Sampling is anticipated to begin in October 2016. Sampling methods and protocols will be in accordance with Standard Operating Procedures. Soil borings will be installed by hand or with a tractor or ATV mounted boring rig, with samples collected from respective borings in one foot increments. Sediment samples will be collected from the water surface with a barge mounted drill rig, with borings installed to location specific depths generally based on the area specific removal depth set forth in the ROD.

Who will collect and generate the data?

Arcadis and its subcontractors will collect the soil, sdiment, and geotechnical samples. The samples will be shipped to a subcontracted laboratory for analysis.

How will the data be reported?

Data will be reported by the subcontracted laboratory to Arcadis according to the requirements outlined in Worksheet #29. An electronic data deliverable (EDD) will be provided by the laboratory in a format compatible with the Arcadis database requirements. A full data package, including the raw data, will also be provided by the laboratory in electronic PDF format. Following validation of the the laboratory report, data will be reported in a Data Usability Summary Report (DUSR).

The overall findings of the PDI and evaluation activites will be presented in the Sediment Pre-Design Results Report, which will be submitted to USEPA for review and comment within 90 days of completing the field activities and receiving final laboratory reports and DUSRs.

How will the data be archived?

Electronic data will be archived in the project database to be maintained by Arcadis. Electronic copies of laboratory reports will be archived by Arcadis. All hard copy data for the project will be archived by Arcadis in its Syracuse, New York office.

QAPP WORKSHEET #12 – MEASUREMENT PERFORMANCE CRITERIA TABLE

To measure and control the quality of analyses, certain QA parameters, discussed below, are defined and utilized in data analysis activities.

Precision

Precision, which measures the reproducibility of data or measurements under specific conditions, is a quantitative measure of the variability of a group of data compared to their average value. Duplicate precision is stated in terms of relative percent difference (RPD). Measurement of precision is dependent upon sampling technique and analytical method.

For a pair of measurements, RPD will be calculated to assess precision, as presented below:

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

where: D_1 and D_2 = the two replicate values

For laboratory duplicate analyses and matrix spike (MS)/matrix spike duplicate (MSD) analyses, RPD will meet the laboratory-specific limit. For field duplicate analyses, an RPD criteria of ≤50% for soil and sediment samples will be utilized.

Accuracy/Bias

Accuracy measures the bias in a measurement system. Sources of error include the sampling process, field contamination, preservation, handling, shipping, sample matrix, sample preparation, and analysis technique. Analytical accuracy will be assessed through surrogate spiking, MS and MSD samples, and laboratory control samples (LCS), where applicable. In general, accuracy is measured in terms of percent recovery (%R):

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

where: SSR = spike sample result

SR = sample result

SA = spike added to spiking matrix

Refer to Worksheets #12 and #28 for the laboratory analytical method accuracy requirements.

Representativeness

Representativeness expresses the degree to which data accurately and precisely reflects a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the proper design and implementation of the sampling program and proper laboratory protocol. The sampling design created for this project was designed to provide data representative of the Sub-site conditions at the time of sample collection. During development of the sampling design, consideration is given to the history of contamination within the Sub-site, existing analytical data, physical setting, and processes. Representativeness will be satisfied by determining that the field collection procedures in Field Sampling Plan (FSP) and the field sampling SOPs are followed; proper sampling techniques, preservation, and handling procedures are used; proper analytical procedures are followed; and holding times for the samples are not exceeded in the laboratory.

Completeness

Completeness is a measure of the amount of usable data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is expected that the laboratories used for this project will provide data that meet the QC acceptance criteria for 90 percent, or more, of all samples analyzed. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{COMPLETENESS } (\%) = \frac{\text{number of usable data}}{\text{number of samples collected for each parameter analyzed}} \times 100$$

The data validation process will be used to determine the quality and quantity of usable analytical data generated.

The completeness acceptance criterion for samples collected in the field will be 90 percent of the quantity of samples planned for collection. Corrective action may be implemented to re-collect samples where necessary and possible (e.g., modifying a planned sample location, addressing sample jars broken during shipment). Laboratory notification of sample receipt and conditions will be used to determine, as soon as possible, whether any problems during sample shipment would necessitate recollection of samples.

Comparability

Comparability expresses the confidence with which one data set can be compared to another. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are expected to provide comparable data to existing datasets for the Sub-site. The procedures proposed for sample collection are similar to those previously conducted by the USEPA. The procedures used will be USEPA-promulgated methodologies or American Society for Testing and Materials (ASTM) Standard Test Methods, which are well recognized and commonly used for environmental and geotechnical investigations.

Desired Method Sensitivity

Depending upon the use of the data and the type of test parameter, specific reporting limits (RLs) will be required. Worksheet #15 lists the required RLs, as specified for the definitive chemical parameters required for this project.

QAPP Worksheet #12A – Measurement Performance Criteria Table (PCBs in Soil and Sediment)

Matrix	Soil and Sediment
Analytical Group	PCB Aroclors
Concentration Level	Low – High

Sampling Procedure	Analytical Method/SOP	Data Quality Indicator (DQIs)	Measurement Performance Criteria[1]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A), or Both (S&A)
See Sampling SOPs in the FSP	SW-846 8082A Per laboratory SOP #9015110	Precision	RPD < 50%	Field duplicate	S&A
		Accuracy	%R: Laboratory-specific limits	Surrogates	A
		Sensitivity/Accuracy	Less than the RL	Blanks (e.g., method blank, field blank, equipment blank)	A
		Accuracy	%R: Laboratory-specific limits	LCS	A
		Accuracy/ Precision	%R: Laboratory-specific limits RPD: Laboratory-specific limits	MS/MSD	A
		Accuracy	RPD < 40%	Confirmatory column	A
		Sensitivity	Low enough to support the RLs	Method detection limit	A
		Completeness	>90% sample collection, >90% laboratory analysis	Data completeness	S&A

Note:

[1] The assigned laboratory must perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in the applicable SW846 method and the laboratory SOP.

QAPP Worksheet #12B – Measurement Performance Criteria Table (Metals and Mercury in Sediment and TCLP Leachate)

Matrix	Sediment and TCLP Leachate
Analytical Group	Metals and Mercury
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicator (DQIs)	Measurement Performance Criteria[1]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A), or Both (S&A)
See Sampling SOPs in the FSP	SW-846 6010C/7470A Per laboratory SOPs #9015067 and #9018442	Precision	RPD < 50%	Field duplicate[2]	S&A
		Sensitivity/Accuracy	Less than the RL	Blanks (e.g., method blank, field blank, equipment blank)	A
		Accuracy	%R: 80-120%	LCS	A
		Accuracy/ Precision	%R: 75-125% RPD: ≤ 20%	MS/MSD	A
		Sensitivity	Low enough to support the RL	Method detection limit	A
		Completeness	>90% sample collection, >90% laboratory analysis	Data completeness	S&A

Note:

[1] The assigned laboratory must perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in the applicable USEPA method and the laboratory SOP.

[2] Field duplicate samples are not required in association with waste characterization sampling.

QAPP Worksheet #12C – Measurement Performance Criteria Table (VOCs in TCLP Leachate)

Matrix	TCLP Leachate
Analytical Group	VOCs
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicator (DQIs)	Measurement Performance Criteria[1]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A), or Both (S&A)
See Sampling SOPs in the FSP	SW-846 8260C Per laboratory SOP #9013078	Accuracy	%R: Laboratory-specific limits	Surrogates	A
		Sensitivity/Accuracy	Less than the RL	Blanks (e.g., method blank, field blank, equipment blank)	A
		Accuracy	%R: Laboratory-specific limits	LCS	A
		Accuracy/ Precision	%R: Laboratory-specific limits RPD: Laboratory-specific limits	MS/MSD	A
		Sensitivity	Low enough to support the RLs	Method detection limit	A
		Completeness	>90% sample collection, >90% laboratory analysis	Data completeness	S&A

Note:

[1] The assigned laboratory must perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in the applicable SW846 method and the laboratory SOP.

QAPP Worksheet #12D – Measurement Performance Criteria Table (SVOCs in TCLP Leachate)

Matrix	TCLP Leachate
Analytical Group	SVOCs
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicator (DQIs)	Measurement Performance Criteria[1]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A), or Both (S&A)
See Sampling SOPs in the FSP	SW-846 8270D Per laboratory SOP #9015100	Accuracy	%R: Laboratory-specific limits	Surrogates	A
		Sensitivity/Accuracy	Less than the RL	Blanks (e.g., method blank, field blank, equipment blank)	A
		Accuracy	%R: Laboratory-specific limits	LCS	A
		Accuracy/ Precision	%R: Laboratory-specific limits RPD: Laboratory-specific limits	MS/MSD	A
		Sensitivity	Low enough to support the RLs	Method detection limit	A
		Completeness	>90% sample collection, >90% laboratory analysis	Data completeness	S&A

Note:

[1] The assigned laboratory must perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in the applicable SW846 method and the laboratory SOP.

QAPP Worksheet #12E – Measurement Performance Criteria Table (Waste Characterization Parameters in Soil and Sediment)

Matrix	Soil and Sediment
Analytical Group	Ignitability and Corrosivity
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicator (DQIs)	Measurement Performance Criteria[1]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A), or Both (S&A)
See Sampling SOPs in the FSP	Ignitability: 40 CFR, Part 261.21 Corrosivity: SW-846 9045D Per laboratory SOPs #9011685 and #9012741	Sensitivity/Accuracy	Less than the RL	Blanks (e.g., method blank, field blank, equipment blank)	A
		Precision	RPD: Laboratory-specific limits	Laboratory duplicate	A
		Sensitivity	Low enough to support the RLs	Method detection limit	A
		Completeness	>90% sample collection, >90% laboratory analysis	Data completeness	S&A

Note:

[1] The assigned laboratory must perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in the applicable SW846 method and the laboratory SOP.

QAPP WORKSHEET #13 – SECONDARY DATA CRITERIA AND LIMITATIONS TABLE

Secondary Data	Data Source	Data Originator	How Data Will be Used	Limitation on Data Use
Historical Data	Record of Decision, Lower Ley Creek Sub-site of the Onondaga Lake Superfund Site, City of Syracuse/Town of Salina, Onondaga County, New York, September 2014	USEPA Region 2	Assist during remedial design activities. Supplement reaching performance objectives.	The historical data are considered to be valid data and have been accepted by the USEPA.
Historical Data	Final Remedial Investigation Report, Lower Ley Creek Sub-site of the Onondaga Lake Superfund Site, Syracuse, New York, June 2013	HydroGeologic, Inc.	Assist during remedial design activities. Supplement reaching performance objectives.	The historical data are considered to be valid data and have been accepted by the USEPA.
Historical Data	Final Feasibility Study Report, Lower Ley Creek Sub-site of the Onondaga Lake Superfund Site, Syracuse, New York, March 2014	HydroGeologic, Inc.	Assist during remedial design activities. Supplement reaching performance objectives.	The historical data are considered to be valid data and have been accepted by the USEPA.

QAPP WORKSHEET #14 – SUMMARY OF PROJECT TASKS

Sampling Tasks

- Soil and sediment characterization activities in the Sub-site will focus on horizontal and vertical delineation in areas identified for remediation in the ROD to determine the boundaries and depths for remediation.
- Soil and sediment waste characterization sampling activities will be used to estimate the portion of materials to be removed that may be considered TSCA-regulated and/or characteristic hazardous for disposal purposes to identify appropriate waste disposal requirements.
- Soil and sediment geotechnical assessments will be made in areas identified for remediation in the ROD to support bank and structural stability evaluation and excavated material dewatering/stabilization design.

Analysis Tasks

- Sediment samples will be processed, prepared, and analyzed by a subcontract laboratory for PCBs by SW-846 8082A and/or metals by SW-846 6010C/7471B.
- Soil samples will be processed, prepared, and analyzed by a subcontract laboratory for PCBs SW-846 8082A.
- Waste characterization samples will be processed, prepared, and analyzed by a subcontract laboratory for TCLP VOCs by SW-846 1311/8260B, TCLP SVOCs by SW-846 1311/8270D, TCLP metals by SW-846 1311/6010C/7470A, ignitability by 40 CFR, Part 261.21, and corrosivity by SW-846 9045D.
- Soil and sediment geotechnical analysis samples will be processed, prepared, and analyzed by a subcontract laboratory grain size by ASTM D422, moisture content by ASTM D2216, Atterberg limits by ASTM D4318, specific gravity by ASTM D584, unconsolidated-undrained triaxial compression with pore pressure by ASTM D2850, consolidated-undrained triaxial compression with pore pressure by ASTM D4767, and on-dimensional consolidation properties by ASTM D2435/D2535M.

Quality Assurance Tasks

The samples will be collected and processed as documented in the FSP. The QA samples are described in Worksheet #20.

Secondary Data Tasks

See Worksheet #13 for the Secondary Data Criteria and Limitations table.

Data Management Tasks

The purpose of data management is to confirm that the necessary data are accurate and readily accessible to meet the analytical and reporting objectives of the project. The field investigations will include a significant number of samples that require a structured, comprehensive, and efficient program for management of data.

The data management program established for the project includes field documentation and sample QA/QC procedures, methods for tracking and managing the data, and a system for filing all site-related information. More specifically, data management procedures will be employed to efficiently process the information collected, such that the data are readily accessible and accurate. The data management plan has five elements: 1) sample designation system, 2) field activities, 3) sample tracking and management, 4) data management system, and 5) document control and inventory.

- **Sample Designation System.** A concise and easily understandable sample designation system is an important part of project sampling activities. It provides a unique sample number that will facilitate both sample tracking and easy resampling of select locations to evaluate data gaps, if necessary. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events or conditions. A combination of letters and numbers will be used to yield a unique sample number for each field sampled collected.

  Each sample will be identified by a unique sample identification number in the logbook, sampling log, and COC record using an alphanumeric code. Field samples will be linked to geographic location via location codes. All field samples will be identified using the following scheme:

  XXXX-YY-(TD-BD)

  Where **XXXX** represents the media sampled:

  SED = sediment

  SOIL = soil

  Where **YY** represents the location identifier corresponding to the soil or sediment investigation area

  Where **TD** corresponds to the top depth of the sample in feet.

  Where **BD** corresponds to the bottom depth of the sample in feet.

  Blind duplicate samples will be labeled sequentially starting at “-001” followed by the date in “mmddyy” format (e.g. DUP-001-081916).

- **Field Activities.** Field activities require consistent documentation and accurate record keeping. During site activities, standardized procedures will be used for documentation of field activities, data security, and QA. These procedures are described in further detail in the following subsections.

Complete and accurate record keeping is a critical component of the field investigation activities. When interpreting analytical results, and identifying data trends, investigators realize that field notes are an important part of the review and validation process. To confirm that the field investigation is thoroughly documented, several different information records, each with its own specific reporting requirements, will be maintained, including:

- **Field Logs.** Personnel performing the field activities will keep field logs that detail observations and measurements made during the site work. Data will be recorded directly into site-dedicated, bound notebooks, with each entry dated and signed. To determine, at a future date, that notebook pages are not missing, each page will be sequentially numbered. Erroneous entries will be corrected by crossing out the original entry, initialing it and then documenting the proper information. In addition, certain media sample locations will be surveyed to accurately record their locations. The survey crew will use its own field logs and will supply the sampling location coordinates to the Database Administrator.
- **Chain-of-Custody Forms.** COC forms are used to document and track sample possession from time of collection to the time of disposal. A COC form will accompany each field sample collected, and one copy of the form will be filed in the field office. Field personnel will be briefed on the proper use of the COC procedure. A sample COC form is included in SOP “Chain-of-custody, handling, packing, and shipping” included in the FSP.
- **Instrument Calibration Records.** As part of data QA procedures, field monitoring and detection equipment will be routinely calibrated. Instrument calibration confirms that equipment used is of the proper type, range, accuracy, and precision to provide data compatible with the specified requirements and desired results. Calibration procedures for the various types of field instrumentation are described in Worksheet #22. To demonstrate that established calibration procedures have been followed, calibration records will be prepared. The calibration record will serve as a written account of monitoring or detection equipment QA. Erratic behavior or failures of field equipment will be subsequently recorded in the calibration log. Calibration records will include, as appropriate, the following:
  - Calibration date and time
  - Type and identification number of equipment
  - Calibration frequency and acceptable tolerances
  - Identification of individual(s) performing calibration
  - Reference standards used
  - Calibration data
  - Information on calibration success or failure
- **Data Security.** Measures will be taken during the field investigation to confirm that samples and records are not lost, damaged, or altered. When not in use, field notebooks will be stored at the field office or locked in the field vehicle. Access to these files will be limited to the field personnel who use them.

- **Sample Tracking and Management.** A record of all field documentation will be maintained to confirm the validity of data used in the site analysis. To effectively execute such documentation, specific sample tracking and data management procedures will be used throughout the sampling program. Sample tracking will begin with the completion of COC forms. The completed COC forms associated with samples collected will be emailed to the Task Manager. Copies of all completed COC forms will be maintained in the project file. The laboratory will verify receipt of the samples electronically (via e-mail) upon receipt. When analytical data are received from the laboratory, the analytical data packages will be compared against the information on the COCs to confirm that the correct analyses were performed for each sample and that results for all samples submitted for analysis were received. Any discrepancies noted will be promptly followed up by the Program QA/QC Officer (or designee).

- **Data Management System.** In addition to the sample tracking system, a data management system will be implemented. The central focus of the data management system will be the development of a personal computer-based project database. The project database, to be maintained by the Project Database Manager, will combine pertinent geographical, field and analytical data. Information that will be used to populate the database will be derived from three primary sources: surveying of sampling locations, field observations and analytical results.

  The data will be warehoused in a CORE database system that uses a Microsoft Access platform. Geographic information system (GIS) applications will be developed in ESRI ArcGIS, with additional customization performed with Visual Basic. Tables and other database reports will be generated in Microsoft Excel and/or Microsoft Word format.

  - **Survey Information.** In general, each location sampled will be surveyed to confirm accurate documentation of sample locations for mapping and GIS purposes (if appropriate), to facilitate resampling of select sample locations during future monitoring programs, if needed, and for any potential remediation activities. The surveying activities that will occur in the field will consist of collection of information that will be used to compute a northing and easting in North American Datum of 1983 coordinate system for New York in US Survey for each sample location and collection of information to compute elevations relative to the National Geodetic Vertical Datum of 1988 for select sample locations, as appropriate. Field books associated with the surveying activities will be stored as a record of the project activities.

  - **Field Observations.** An important part of the information that will ultimately reside in the data management system for use during the project will originate in the observations that are recorded in the field. During the field activities, field notes will be maintained by the field personnel who perform the activities to provide a record of the sampling event. Field notes will include the locations sampled, the sampling methodologies used, QA/QC procedures, blind duplicate and MS/MSD sample identification numbers, equipment decontamination procedures, personnel involved in the activity, and any other noteworthy events that occurred.

  - **Analytical Results.** Analytical results will be provided by the laboratory in both a digital and a hard copy format. The data packages will be examined to confirm that the correct analyses were performed for each sample submitted and that all of the analyses requested on the COC form were performed. If discrepancies are noted, the Program QA/QC Officer will be notified and will promptly follow up with the laboratory to resolve any issues. Each data package will be validated in accordance with procedures outlined in Worksheet #37. Data that do not meet the specified standards will be flagged pending resolution of the issue. The flag will not be removed from the data until the issue associated with the sample results is resolved. Although flags may remain for certain data, the use of the data may not necessarily be restricted. Following completion of the data validation, the digital files will be used to populate the appropriate database tables. This format specifies one data record for each constituent for each sample analyzed. Specific fields include but are not limited to:

    - Sample identification number

- Date sampled
- Date analyzed
- Parameter name
- Analytical result
- Units
- Detection limit
- Qualifier(s)

The individual EDDs, supplied by the laboratory in a defined format value in a Microsoft Excel file, will be loaded into the appropriate database. Any analytical data that cannot be provided by the laboratory in electronic format will be entered manually. After entry into the database, the EDD data will be compared to the field information previously entered into the database to confirm that all requested analytical data have been received. The EDD field definitions are summarized in the following table:

Field Name [1]	Data Type [2]	Notes
Sample Name	Text-50	Sample ID as it appears on Laboratory Form 1 for analysis (e.g., MW-1 reported as MW-1RE for re-analysis).
COC Sample Name	Text-50	Sample ID as it appears on the chain of custody.
SDG	Text-50	Sample Delivery Group
Lab Sample ID	Text-50	
Matrix	Text-25	e.g., Soil, Water, Sediment
Sample Type	Text-10	e.g., FB, RB, FD, FS, TB, MS, MSD -- for Field Blank, Rinse Blank, Field Duplicate, Field Sample, Trip Blank, Matrix spike, Matrix Spike Duplicate respectively. MS and MSD sample results are optional.
Date Collected	Date/Time	
Time Collected	Date/Time	
Depth Start	Number	
Depth End	Number	
Depth Units	Text-25	
Method	Text-50	Analytical method used by laboratory. Include "-TCLP" or "-Filtered" as appropriate (e.g., Soil-1 reported as Soil-1-TCLP for TCLP samples).
CAS Number	Text-25	Chemical Abstracts Service Registry Number
Analyte	Text-100	
Result Value	Number	For non-detected results a “U" must be present in Lab Qualifiers field.

Lab Qualifiers	Text-10	"U" for not detected, others as defined by the lab.
Reporting Limit	Number	PQL
Result Units	Text-25	
Dilution Factor	Number	
Reportable Result	Yes/No	If the field is not included, default on import will be "Yes". If the field is included it must be populated. Used where re-analyses or dilutions are present to determine proper result to report.
Filtered	Yes/No	
MDL	Number	Method Detection Limit
Date Analyzed	Date/Time	
Time Analyzed	Date/Time	
Date Received	Date/Time	Date Received by Lab
Laboratory	Text-50	
Lab Certification Number	Text-50	
Result Type	Text-10	e.g., IS, SC, SUR, TIC or TRG -- for Internal Standard, Spiked Compound, Surrogate, Tentatively Identified Compound, Target (regular) result, respectively. IS, SC and SUR results are optional.
TIC Retention Time	Text-10	Required if Result Type = TIC
Basis	Text-10	e.g., Wet, Dry or NA -- for wet weight, dry weight, not applicable, respectively.
Test Type	Text-10	e.g., Initial, DL, DL1…DLn, RE, RE1…Ren, REX, REX1…REXn; where Initial = Initial Analysis, DL = Dilution, RE = Re-analysis, REX = Re-extraction, n = the nth analysis of the test type.
Time Received	Date/Time	Time Received by Lab

Notes:
1. Number after "Text-" indicates the maximum number of characters allowed.
2. If lab is providing Matrix or Sample Types, they can use codes different from the examples above but will need to provide definitions for them.
3. Depth related fields can be left blank for samples where they are not applicable.

- **Data Analysis and Reporting.** The database management system will have several functions to facilitate the review and analysis of project data. Data entry screens will be developed to assist in the keypunching of field observations. Routines will also be developed to permit the user to scan analytical data from a given site for a given medium. Several output functions that have been developed by Arcadis will be appropriately modified for use in the data management system.

  A valuable function of the data management system will be the generation of tables of analytical results from the project database. The capability of the data management system to directly produce tables reduces the redundant manual entry of analytical results during report preparation and precludes transcription errors that may occur otherwise. This data management system function creates as the ability to process the data and generate tables of rows and columns. Tables of analytical data will be produced as part of data interpretation tasks, the reporting of data and generation of the Sediment Pre-Design Results Report.

Another function of the data management system will be to create digital files of analytical results and qualifiers suitable for transfer to mapping/ presentation software. A function has been created by Arcadis that creates a digital file consisting of sample location number, state plane coordinates, sampling date and detected constituents, and associated concentrations and analytical qualifiers. The file is then transferred to an AutoCAD work station, where another program has been developed to plot a location's analytical data in a "box" format at the sample location (represented by the state plane coordinates). This routine greatly reduces the redundant keypunching of analytical results and facilitates the efficient production of interpretative and presentation graphics.

The data management system also has the capability of producing a digital file of select parameters that exists in one or more of the databases. This type of custom function is accomplished on an interactive basis and is best used for transferring select information into a number of analysis tools, such as statistical or graphing programs.

Documentation and Records

- Field Documentation. Field personnel will provide comprehensive documentation covering all aspects of field sampling, field analysis, and sample COC. This documentation constitutes a record that allows reconstruction of all field events to aid in the data review and interpretation process. All documents, records, and information relating to the performance of the field work will be retained in the project file. The various forms of documentation to be maintained throughout the action include:
  - **Daily Production Documentation.** A field notebook consisting of a waterproof, bound notebook that will contain a record of all activities performed at the site.
  - **Sampling Information.** Detailed notes will be made as to the exact sampling location, physical observations, and weather conditions (as appropriate).
  - **Sample COC.** COC forms will provide the record of responsibility for sample collection, transport, and submittal to the laboratory. COC forms will be filled out at each sampling site, at a group of sampling sites, or at the end of each day of sampling by Arcadis' field personnel designated to be responsible for sample custody. If the samples are relinquished by the designated sampling person to other sampling or field personnel, the COC form will be signed and dated by the appropriate personnel to document the sample transfer. The original COC form will accompany the samples to the laboratory, and copies will be forwarded to the project files. A sample COC form is included in the SOP "Chain of Custody, Handling, Packing, and Shipping" included in the FSP.

    Persons will have custody of samples when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.
  - **Field Equipment, Calibration and Maintenance Logs.** To document the calibration and maintenance of field instrumentation, calibration and maintenance logs will be maintained for each piece of field equipment that is not factory-calibrated.
- **Laboratory Project Files.** The laboratory will establish a file for pertinent data. The file will include correspondence, faxed information, phone logs and COC forms. The laboratory will retain project files and data packages for a period not less than five years.

- **Laboratory Logbooks.** Workbooks, bench sheets, instrument logbooks, and instrument printouts will be used to trace the history of samples through the analytical process and to document important aspects of the work, including the associated QCs. As such, logbooks, bench sheets, instrument logs and instrument printouts will be part of the permanent record of the laboratory. Each page or entry will be dated and initialed by the analyst at the time of entry. Errors in entry will be crossed out in indelible ink with one stroke, corrected without the use of white-out or by obliterating or writing directly over the erroneous entry, and initialed and dated by the individual making the correction. Pages of logbooks that are not used will be completed by lining out unused portions. Information regarding the sample, analytical procedures performed, and results of the testing will be recorded on laboratory forms or personal notebook pages by the analyst. These notes will be dated and will also identify the analyst, instrument used, and instrument conditions. Laboratory notebooks will be periodically reviewed by the laboratory group leaders for accuracy, completeness, and compliance with this QAPP. All entries and calculations will be verified by the laboratory group leader. If all entries on the pages are correct, the laboratory group leader will initial and date the pages. Corrective action will be taken for incorrect entries before the laboratory group leader signs.
- **Computer and Hard Copy Storage.** All electronic files and deliverables will be retained by the laboratory for not less than five years; hard copy data packages (or electronic copies) will also be retained for not less than five years.
- **Field Data Reporting.** Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks or data sheets and/or on forms. Such data will be reviewed by the appropriate Field Team Leader for adherence to the FSP and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and (as necessary) incorporated into the data evaluation process. If applicable, field data forms and calculations will be processed and included in appendices to the appropriate reports (when generated). The original field logs documents and data reductions will be kept in the project file at the Arcadis office in Syracuse, New York.
- **Laboratory Data Reporting.** Data reports for all parameters will include, at a minimum, the following items:
  - **Narrative.** Summary of activities that took place during sample analysis, including the following information:
    - Laboratory name and address
    - Date of sample receipt
    - Cross reference of laboratory identification number to contractor sample identification
    - Analytical methods used
    - Deviations from specified protocol
    - Corrective actions taken

  Included with the narrative will be any sample handling documents, including field and internal COC forms, air bills, and shipping tags.

  - **Analytical Results.** These will be reported according to analysis type and include the following information, as applicable:
    - Sample identification (ID)

- Laboratory ID
- Date of collection
- Date of receipt
- Date of extraction
- Date of analysis
- Method detection and reporting limits

Sample results on the report forms will be corrected for dilutions. Soil and sediment data will be reported on a dry weight basis. All results will be reported uncorrected for blank contamination.

For this project, three levels of data reporting have been defined, as follows:

- Level 1 — Minimal Reporting: Minimal or "results only" reporting is used for analyses that, due either to their nature (i.e., field monitoring) or the intended data use (i.e., preliminary screening), do not generate or require extensive supporting documentation.
- Level 2 — Modified Reporting: Modified reporting is used for analyses that are performed following standard USEPA-approved methods and QA/QC protocols. Based on the intended data use, modified reporting may require some supporting documentation, but not full Contract Laboratory Program (CLP) -type reporting.
- Level 3 — Full Reporting: Full CLP-type reporting is used for those analyses that, based on the intended data use, require full documentation.

The soil and sediment analytical results will be reported using Level 3 deliverables (equivalent to the NYSDEC Analytical Services Program [ASP] Category B data package). This deliverable will include, but not be limited to, raw data required to recalculate any result, including instrument printouts and quantitation reports. The report also will include standards used in calibration and calculation of analytical results; sample extraction, digestion, and other preparation logs; standard preparation logs; instrument run logs; and moisture content calculations.

The waste characterization analytical results will be reported using Level 2 deliverables (equivalent to the NYSDEC ASP Category A data package). The full documentation required for the Category B data package is not required due to the intended data use (i.e., waste characterization).

Assessment/Audit Tasks

Performance and systems audits will be completed in the field and laboratory during the site investigations, as described below and in Worksheets #31 and #32.

- **Field Audits.** The Field Team Leader will monitor field performance. Field performance audit summaries will contain an evaluation of field activities to verify that the activities are performed according to established procedures as described in FSP. Field performance audits may be

performed by the Arcadis Project Manager (or his designee). The number and frequency of field performance audits conducted will be determined independently by the Arcadis Project Manager. The Arcadis Project Manager (or his designee) will administer field performance audits at a frequency of approximately once per mobilization. The observations made during field performance audits and any recommended changes/deviations to the field procedures will be recorded and documented. In addition, the Program QA/QC Officer (or his designee) will review the rinse and trip blank data to identify potential deficiencies in field sampling and cleaning procedures. In addition, systems audits comparing scheduled QA/QC activities from this QAPP with actual QA/QC activities completed will be performed. The Project Manager and Program QA/QC Officer will periodically confirm that work is being performed consistent with this QAPP and the FSP.

- **Laboratory Audits.** Internal laboratory audits are conducted periodically by the Laboratory QA Manager. As part of the audit, the overall performance of the laboratory staff is evaluated and compared to the performance criteria outlined in the laboratory QA manual and SOPs. Results of the audits are summarized and issued to each department supervisor, Laboratory Manager, and Laboratory Director. A systems audit of each laboratory is also performed by the Program QA/QC Officer to determine whether the procedures implemented by each laboratory comply with this QAPP and SOPs. As a participant in state and federal certification programs, the laboratory is audited by representatives of the regulatory agency issuing certification, in addition to the laboratory's internal audits. Audits are usually conducted annually and focus on laboratory conformance to the specific program protocols for which the laboratory is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action, if necessary.

  Arcadis reserves the right to conduct an on-site audit of the laboratory prior to the start of analyses for the project. Additional audits may be performed during the project, as deemed necessary.

- **Corrective Action.** Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP. Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for the actions are described below.

  - **Field Procedures.** If, during field work, a condition is noted by the field crew that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action implemented by the Field Team Leader or a designee will be documented on a Corrective Action Form and reported to the Program QA/QC Officer and Project Manager. Project personnel will continuously monitor ongoing work performance as part of daily responsibilities.

    Examples of situations that would require corrective actions are provided below:

    - Protocols as defined by this QAPP and/or FSP have not been followed
    - Equipment is not in proper working order or is not properly calibrated
    - QC requirements have not been met

- Issues resulting from performance or systems audits have not been resolved

- **Laboratory Procedures.** In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause and corrective action taken will be documented and reported to the Project Manager and Program QA/QC Officer. Corrective action may be initiated, at a minimum, under the following conditions:

  - Protocols as defined by this QAPP have not been followed
  - Predetermined data acceptance standards are not obtained
  - Equipment is not in proper working order or calibrated
  - Sample and test results are not completely traceable
  - QC requirements have not been met
  - Issues resulting from performance or systems audits have not been resolved

  Laboratory personnel will continuously monitor ongoing work performance as part of daily responsibilities. Corrective action will be initiated at the point where the problem has been identified. At whatever level this occurs (analyst, supervisor, data review, or QC), it will be brought to the attention of the Laboratory QA Manager and, ultimately, the Laboratory Director. Final approval of any action deemed necessary is subject to the approval of the Laboratory Director.

  Any corrective action deemed necessary based on system or performance audits, the analytical results of split samples, or the results of data review will be implemented. The corrective action may include sample re-extraction, re-preparation, re-analysis, cleanup, dilution, matrix modification or other activities.

Data Review Tasks

Verification of sampling and laboratory data will be conducted. All chemical data generated for the Sub-site will be validated by an Arcadis data validator in accordance with the criteria in the USEPA National Functional Guidelines and applicable USEPA Region 2 SOPs. Samples collected for waste characterization and geotechnical analyses will not be validated.

QAPP WORKSHEET #15A – REFERENCE LIMITS AND EVALUATION (SOIL AND SEDIMENT)

Analyte	CAS Number	Soil Remediation Standard (mg/kg) [1]	Sediment Remediation Standards (mg/kg)	Laboratory Achievable Detection Limits [2,3]	
				Method Detection Limit (MDL) (mg/kg)	RL (mg/kg)
PCB Aroclors (SW-846 8082A)					
Aroclor 1016	12674-11-2	NS		0.0036	0.017
Aroclor 1221	11104-28-2	NS		0.0046	0.017
Aroclor 1232	11141-16-5	NS		0.0080	0.017
Aroclor 1242	53469-21-9	NS		0.0033	0.017
Aroclor 1248	12672-29-6	NS		0.0033	0.017
Aroclor 1254	11097-69-1	NS		0.0033	0.017
Aroclor 1260	11096-82-5	NS		0.0049	0.017
Total PCBs (sum of all Aroclors)	1336-36-3			--	--
Total PCBs (sum of all Aroclors)	1336-36-3	50 (TSCA)		--	--
Metals (SW-846 6010C, 7471B)					
Arsenic	7440-38-2			0.970	4
Barium	7440-39-3			0.0330	1
Cadmium	7440-43-9			0.0490	1
Chromium	7440-47-3			0.140	3
Lead	7439-92-1			0.550	3
Mercury	7439-97-6			0.0100	0.1
Selenium	7782-49-2			0.900	4
Silver	7440-22-4			0.150	1

Notes:

1. The remediation standard of 1 mg/kg total PCBs is a site-specific limit. NS indicates that there is no standard listed for the analyte.
2. Concentrations detected less than the quantitation limit but greater than the method detection limit must be reported with the appropriate qualifier.
3. The target reporting limits are based on wet weight. The actual reporting limits will vary based on sample weight and moisture content.

QAPP WORKSHEET #15B – REFERENCE LIMITS AND EVALUATION (WASTE CHARACTERIZATION)

Analyte	CAS Number	Regulatory Level (mg/L) [1]	Laboratory Achievable Detection Limits [2]	
			MDL (mg/L)	RL (mg/L)
Metals (SW-846 1311/6010C/7470A)				
Arsenic	7440-38-2	5	0.0070	0.04
Barium	7440-39-3	100	0.00030	0.01
Cadmium	7440-43-9	1	0.00030	0.01
Chromium	7440-47-3	5	0.0015	0.03
Lead	7439-92-1	5	0.0051	0.03
Mercury	7439-97-6	0.2	0.00005	0.0002
Selenium	7782-49-2	1	0.0082	0.04
Silver	7440-22-4	5	0.0014	0.01
VOCs (SW-846 1311/8260C)				
Benzene	71-43-2	0.5	0.01	0.02
Carbon tetrachloride	56-23-5	0.5	0.01	0.02
Chlorobenzene	108-90-7	100	0.01	0.02
Chloroform	67-66-3	6	0.01	0.02
1,2-Dichloroethane	107-06-2	0.5	0.01	0.02
1,1-Dichloroethene	75-35-4	0.7	0.01	0.02
2-Butanone (MEK)	78-93-3	200	0.06	0.2
Tetrachloroethene	127-18-4	0.7	0.01	0.02
Trichloroethene	79-01-6	0.5	0.01	0.02
Vinyl chloride	75-01-4	0.2	0.01	0.02
SVOCs (SW-846 1311/8270D)				
1,4-Dichlorobenzene	106-46-7	7.5	0.0025	0.005
2-Methylphenol	95-48-7	200 [3]	0.0025	0.005
4-Methylphenol	106-44-5	200 [3]	0.0025	0.005
2,4-Ditrotoluene	121-14-2	0.13	0.005	0.025
Hexachlorobenzene	118-74-1	0.13	0.0005	0.0025
Hexachlorobutadiene	87-68-3	0.5	0.0025	0.005
Hexachloroethane	67-72-1	3	0.005	0.025
Nitrobenzene	98-95-3	2	0.0025	0.005
Pentachlorophenol	87-86-5	100	0.005	0.025
Pyridine	110-86-1	5	0.01	0.025
2,4,5-Trichlorophenol	95-95-4	400	0.0025	0.005
2,4,6-Trichlorophenol	88-06-2	2	0.0025	0.005
Waste Characterization Parameters				
Ignitability (40 CFR, Part 261.21; Degrees C)	NA	NS	--	--
pH (SW-846 9045D; SU)	NA	2-12.5	--	--

Notes:

1. Refer to USEPA SW-846 Chapter 7, Table 7-1. NS indicates that there is no standard listed for the analyte. Note that regulatory levels are applicable to TCLP analyses only.
2. Concentrations detected less than the quantitation limit but greater than the method detection limit must be reported with the appropriate qualifier.
3. The regulatory levels for total cresol is 200mg/L.

QAPP WORKSHEET #16 – PROJECT SCHEDULE TIMELINE TABLE

Activities	Organization	Anticipated Date(s) of Initiation	Anticipated Date of Completion	Deliverable	Estimated Deliverable Due Date
Development of Project Planning Documents	Arcadis	August 2016	August 2016	Work Plan, QAPP, FSP, and HASP	August 2016
Laboratory Analysis	Assigned subcontract laboratory	October 2016	November 2016	Chemical data	December 2016
Laboratory Analysis	Assigned subcontract laboratory	October 2016	November 2016	Geotechnical data	December 2016
Data Validation	Arcadis	After data packages are received	1 month after data package is received from the subcontract laboratory	DUSR	1 month after data package is received
Data Evaluation	Arcadis	January 2017	March 2017	Sediment Pre-Design Results Report	March 2017

Note:

Dates provided in this worksheet are approximate and subject to revision. The detailed project schedule is maintained by Arcadis, and is updated as needed. An up-to-date copy of the project schedule will be available to the project team members.

QAPP WORKSHEET #17 – SAMPLING DESIGN RATIONALE

The PDI is intended to support the remedial design of the soil and sediment cleanup project planned for implementation at the Lower Ley Creek Sub-site. The proposed sampling locations (Figures 3-2 of the PDI Work Plan) were selected based on areas identified for remediation in the ROD.

The FSP and PDI Work Plan includes the data collection activities and sampling approaches summarized below:

- **Soil Sampling Program.** As fully described in the PDI Work Plan, soil samples will be collected from around the perimeter of and within all soil removal areas to refine the depths of removal based on presence of PCBs and confirm the final extent of removal limits first established in the ROD. The specific sampling depth(s) and rationale for the selection of sample locations for each area is included in Worksheet #18, as well as in the PDI Work Plan. Specifically, soil samples will be collected from the following soil removal areas:
    - Soil borings will be installed from soil removal areas Soil-I1, Soil-L3, Soil-L4, Soil-L5, Soil-L6, Soil-L7, Soil-L8, and Soil-L9 from various one-foot depth increments to a depth of two feet beyond the ROD defined removal limit and analyzed for PCBs to delineate the removal depths identified in the ROD associated.
    - Soil borings will be installed around the perimeter of all soil removal areas to confirm ROD defined removal extents. Soil sample locations were selected to include a minimum of 3 samples around previously identified soil exceedances, with removal area perimeter delineation locations spaced at a maximum of approximately 100 to 150 feet.
    - After a pipeline and utility location survey, soil borings along the National Grid and Buckeye pipelines will be installed by hand to a depth of 2 feet at an approximate 100-foot interval on either side of the pipeline in soil removal areas Soil-B, -C, and –D. Samples will be collected from the 0- to 2-foot interval and analyzed for PCBs. Analytical results associated with these samples will be used to determine if soil removal in the vicinity of the pipeline is required, confirm the removal in these areas described in the ROD, and characterize materials in the top two feet that may be left in place as a soil cover if it is determined that removal of deeper materials in this area is impractical, or cannot be completed in a safe manner or without jeopardy to the integrity of the pipeline.
- **Sediment Sampling Program.** With the exception of sediment removal area SED-A, sediment samples will be collected from the entire length of the Ley Creek within the Sub-site for chemical characterization to refine the vertical and horizontal extent of sediment impacts to confirm the sediment removal extents and depths detailed in the ROD. Specific details of the proposed sediment sampling program are as follows:
    - In sediment removal areas with removal depths of two feet, single borings will be installed at the approximate mid-channel location over the length of the removal areas in areas where there is no existing data. Samples will be collected at the 2-3 foot increment for analysis of PCBs to confirm the two-foot removal depth. Additional samples will be collected from the 3-4 foot and 4-5 foot increments and held for analysis contingent upon the analytical results from the shallower samples.

  - In deeper removal areas (i.e., 5 feet or greater), sediment borings will be installed at three locations across the channel (i.e., mid channel, and the left and right approximate toe of the slope) to document sediment channel characterization across the channel and establish sediment removal depths in the near shore areas that may influence bank stability. Samples in these locations will be collected to confirm removal depths defined in the ROD with additional samples held for analysis based on the results of the shallower samples.
  - Additional borings will be installed in areas of Ley Creek that have not been designated for removal in which there is limited data. These borings will be installed at the approximate mid-channel location with samples collected in one-foot increments starting at the surface and proceeding to the approximate removal depth of the adjacent ROD defined removal areas.

- **Waste Characterization Sampling.** Waste characterization sampling will be performed to provide information required to determine the characteristics of the soil and sediment to be removed during implementation of the selected remedy and support the selection of appropriate disposal facilities. Thirty composite samples will be collected from the remediation areas identified in the ROD; each composite sample will be composed of a minimum of three aliquots collected from soil and sediment borings spatially distributed within each targeted area. The waste characterization soil and sediment samples will be collected in conjunction with the soil and sediment sampling activities described above.
- **Geotechnical Sampling.** In-water and upland geotechnical borings will be installed in areas of anticipated excavation/dredging, specifically in deeper areas, adjacent to installed construction, and in areas of potential shoreline stability evaluations during dredging. The areas of deeper dredging require additional considerations to bank stability and potential excavation shoring design and analysis. Geotechnical borings located neat bridge abutments of Route 11/Brewerton Road and 7th North Street will be used to evaluate the stability of the bridge foundations during dredging operations. Temporary conditions need to be evaluated and analyzed for any additional design considerations in these critical areas. Geotechnical soil investigations to support the design will be conducted as part of the PDI, including:
  - Installation of six geotechnical borings in-water and thirteen geotechnical borings upland. The borings will be advanced to three times the anticipated excavation/dredge depth, with a minimum boring depth of 15 feet. The borings will range from 15-25 feet in-water and 15-45 feet upland, or until refusal.
  - Standard penetration testing and geotechnical soil sampling (i.e., split spoons and Shelby tubes). Standard penetration testing will be performed continuously throughout the soil column to boring termination, in accordance with ASTM D1586. Approximately nine Shelby tubes will be collected at an approximate frequency of one tube every three borings if fine grained soils are encountered, in accordance with ADTM D1587, and will generally be performed between sample intervals.
  - Geotechnical laboratory analysis will be performed for grain size, moisture content, Atterberg limits, specific gravity, unconsolidated-undrained triaxial compression with pore pressure, consolidated-undrained triaxial compression with pore pressure, and one-dimensional consolidation properties. The number of samples to be submitted to testing will be determined by the project geotechnical engineer upon completion of the drilling program.

QAPP WORKSHEET #18 – SAMPLING LOCATIONS AND METHODS/SOP REQUIREMENTS TABLE

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SOIL-B SOIL-B-001 SOIL-B-002 SOIL-B-003 SOIL-B-004 SOIL-B-005 SOIL-B-006 SOIL-B-007	Soil	7 borings installed with samples collected from the 0-1', 1'-2', 2'-3', and 3'-4' depth increments	PCBs	Low to High	14 samples + 14 samples held	• Determine if removal in the vicinity of the pilelines is required, confirm the removal in the area described in the ROD, and characterize materials in the top two feet that may be left in place as a soil cover if it is determined that removal in this area is impractical • Delineate existing SCO exceedances to confirm ROD defined removal extents

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SOIL-C SOIL-C-001 SOIL-C-002 SOIL-C-003 SOIL-C-004 SOIL-C-005 SOIL-C-006 SOIL-C-007 SOIL-C-008 SOIL-C-009 SOIL-C-010 SOIL-C-011 SOIL-C-012 SOIL-C-013 SOIL-C-014 SOIL-C-015 SOIL-C-016 SOIL-C-017 SOIL-C-018 SOIL-C-019 SOIL-C-020 SOIL-C-021 SOIL-C-022 SOIL-C-023 SOIL-C-024	Soil	24 borings installed with samples collected from the 0-1', 1'-2', 2'-3', and 3'-4' depth increments	PCBs	Low to High	48 samples + 48 samples held	• Determine if removal in the vicinity of the pilelines is required, confirm the removal in the area described in the ROD, and characterize materials in the top two feet that may be left in place as a soil cover if it is determined that removal in this area is impractical • Delineate existing SCO exceedances to confirm ROD defined removal extents

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SOIL-D SOIL-D-001 SOIL-D-002 SOIL-D-003 SOIL-D-004 SOIL-D-005 SOIL-D-006 SOIL-D-007 SOIL-D-008 SOIL-D-009 SOIL-D-010 SOIL-D-011 SOIL-D-012 SOIL-D-013	Soil	13 borings installed with samples collected from the 0-1', 1'-2', 2'-3', and 3'-4' depth increments	PCBs	Low to High	26 samples + 26 samples held	• Delineate the 2' removal depth identified in the ROD
SOIL-E SOIL-E-001 SOIL-E-002 SOIL-E-003 SOIL-E-004 SOIL-E-005 SOIL-E-006	Soil	6 borings installed with samples collected from the 0-1', 1'-2', 2'-3', and 3'-4' depth increments	PCBs	Low to High	12 samples + 12 samples held	• Delineate the 2' removal depth identified in the ROD
SOIL-H SOIL-H-001 SOIL-H-002 SOIL-H-003 SOIL-H-004	Soil	4 borings installed with samples collected from the 0-1', 1'-2', 2'-3', and 3'-4' depth increments	PCBs	Low to High	8 samples + 8 samples held	• Delineate the 2' removal depth identified in the ROD

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SOIL-I SOIL-I-001 SOIL-I-002 SOIL-I-003 SOIL-I-004 SOIL-I-005 SOIL-I-006 SOIL-I-007 SOIL-I-008 SOIL-I-009 SOIL-I-010 SOIL-I-011	Soil	11 borings installed with samples collected from the 0-1', 1'-2', 2'-3', and 3'-4' depth increments	PCBs	Low to High	22 samples + 22 samples held	• Delineate the 2' removal depth identified in the ROD
SOIL-I1 SOIL-I1-001 SOIL-I1-002 SOIL-I1-003	Soil	3 borings installed with samples collected from the 2'-3', 3'-4', 4'-5', 5'-6', and 6'-7' depth increments	PCBs	Low to High	9 samples + 6 samples held	• Delineate the 5' removal depth identified in the ROD
SOIL-L SOIL-L-001 SOIL-L-002	Soil	2 borings installed with samples collected from the 0-1', 1'-2', 2'-3', and 3'-4' depth increments	PCBs	Low to High	4 samples + 4 samples held	• Delineate the 2' removal depth identified in the ROD

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SOIL-L3 SOIL-L3-001	Soil	1 boring installed with samples collected from the 2'-3', 3'-4', 4'-5', 5'-6', 6'-7', 7'-8', 8'-9', and 9'-10' depth increments	PCBs	Low to High	6 samples + 2 samples held	• Delineate the 8' removal depth identified in the ROD
SOIL-L4 SOIL-L4-001 **SOIL-L7** SOIL-L7-001	Soil	One borings installed in each area with samples collected from the 2'-3', 3'-4', 4'-5', 5'-6', 6'-7', 7'-8', 8'-9', 9'-10', 10'-11', 11'-12', 12'-13',13'-14', 14'-15', and 15'-16' depth increments	PCBs (Soil-L7 only: (held for metals in the event that there are no apparent PCB impacts)	Low to High	24 samples + 4 samples held	• Delineate the 14' removal depth identified in the ROD
SOIL-L5 SOIL-L5-001 SOIL-L5-002 **SOIL-L6** SOIL-L6-001 SOIL-L6-002 **SOIL-L8** SOIL-L8-001 SOIL-L8-002	Soil	2 borings installed in each area with samples collected from the 2'-3' depth increment; additional samples collected from the 3'-4', 4'-5', 5'-6', 6'-7', 7'-8', 8'-9', and 9'-10' depth increments held for analysis based on results of 2'-3' depth increment	PCBs	Low to High	6 samples + 42 samples held	• Delineate the 8' removal depth identified in the ROD

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SOIL-L9 SOIL-L9-001	Soil	1 borings installed with samples collected from the 2'-3' depth increment; additional samples collected from the 3'-4', 4'-5', 5'-6', 6'-7', 7'-8', 8'-9', 9'-10', 10'-11', 11'-12', 12'-13', 13'-14', 14'-15', and 15'-16' depth increments held for analysis based on results of 2'-3' depth increment	PCBs	Low to High	1 samples + 13 samples held	• Delineate the 14' removal depth identified in the ROD
SOIL-M SOIL-M-001 SOIL-M-002 SOIL-M-003 SOIL-M-004	Soil	4 borings installed with samples collected from the 0-1', 1'-2', 2'-3', and 3'-4' depth increments	PCBs	Low to High	8 samples + 8 samples held	• Delineate the 2' removal depth identified in the ROD

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SED-AB SED-AB-001 **SED-KL** SED-KL-001 SED-KL-002	Sediment	3 borings installed with samples collected from the 0'-1' and 1'-2' depth increments; additional samples collected from the 2'-3' and 3'-4' depth increments held for analysis based on results of shallower depth increments	PCBs and/or Metals	Low to High	6 + 6 samples held	Gap area
SED-AB SED-AB-002 SED-AB-003	Sediment	2 borings installed with samples collected from the 0'-1', 1'-2', 2'-3', and 3'-4' depth increments; additional samples collected from the 4'-5' and 5'-6' depth increments held for analysis based on results of shallower depth increments	PCBs and/or Metals	Low to High	8 + 4 samples held	Gap area

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SED-EF SED-EF-001	Sediment	1 boring installed with samples collected from the 0'-1', 1'-2', 2'-3', 3'-4', and 4'-5' depth increments; additional samples collected from the 5'-6' and 6'-7' depth increments held for analysis based on results of shallower depth increments	PCBs and/or Metals	Low to High	5 + 2 samples held	Gap area
SED-EF SED-EF-002	Sediment	1 boring installed with samples collected from the 0'-1', 1'-2', 2'-3', and 3'-4' depth increments; additional samples collected from the 4'-5' and 5'-6' depth increments held for analysis based on results of shallower depth increments	PCBs and/or Metals	Low to High	4 + 2 samples held	Gap area

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SED-HI SED-HI-001 SED-HI-002	Sediment	2 boring installed with samples collected from the 0'-1', 1'-2', and 2'-3' depth increments; additional samples collected from the 3'-4' and 4'-5' depth increments held for analysis based on results of shallower depth increments	PCBs and/or Metals	Low to High	6 + 4 samples held	Gap area

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SED-B SED-B-001 SED-B-002 **SED-D** SED-D-002 **SED-E** SED-E-001L SED-E-001C SED-E-001R SED-E-004L SED-E-004R **SED-H** SED-H-001 SED-H-002 SED-H-003 SED-H-004 **SED-I** SED-I-001 SED-I-002 **SED-L** SED-L-001 SED-L-002 SED-L-003 SED-L-004	Sediment	18 borings installed with samples collected from the 2'-3' depth increment; additional samples collected from the 3'-4' and 4'-5' depth increments held for analysis based on results of 2'-3' depth increment	PCBs and/or Metals	Low to High	18 + 36 samples held	Delineate the 2' removal depth identified in the ROD

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SED-B SED-B-003 **SED-D** SED-D-001	Sediment	2 borings installed with samples collected from the 2'-3' and 3'-4' depth increments; additional samples collected from the 4'-5' and 5'-6' depth increments held for analysis based on results of shallower depth increments	PCBs and/or Metals	Low to High	4 + 4 samples held	Delineate the 2' removal depth identified in the ROD
SED-K SED-K-001 SED-K-002	Sediment	2 borings installed with samples collected from the 1'-2' depth increment; additional samples collected from the 2'-3' and 3'-4' depth increments held for analysis based on results of the 1'-2' depth increment	PCBs and/or Metals	Low to High	2 + 4 samples held	Delineate the 2' removal depth identified in the ROD

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SED-F SED-F-001L SED-F-001C SED-F-001R SED-F-002L SED-F-002C SED-F-002R SED-F-003L SED-F-003C SED-F-003R SED-F-004 SED-F-005	Sediment	11 borings installed with samples collected from the 2'-3', 3'-4', and 4'-5' depth increments; additional samples collected from the 5'-6' and 6'-7' depth increments held for analysis based on results of shallower depth increments (SED-F-005: additional 7'-8', 8'-9', and 9'-10' increments held for analysis)	PCBs and/or Metals	Low to High	33 + 25 samples held	Delineate the 4' removal depth identified in the ROD
SED-E SED-E-002L SED-E-002C SED-E-002R SED-E-003L SED-E-003C SED-E-003R	Sediment	6 borings installed with samples collected from the 2'-3', 3'-4', and 4'-5' depth increments; additional samples collected from the 5'-6' and 6'-7' depth increments held for analysis based on results of shallower depth increments	PCBs and/or Metals	Low to High	18 + 12 samples held	Delineate the 5' removal depth identified in the ROD

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SED-G SED-G-001L SED-G-001C SED-G-001R SED-G-002L SED-G-002C SED-G-002R SED-G-005L SED-G-005C SED-G-005R SED-G-006L SED-G-006C SED-G-006R **SED-J** SED-J-001L SED-J-001C SED-J-001R SED-J-004L SED-J-004C SED-J-004R SED-J-005L SED-J-005C SED-J-005R SED-J-006L SED-J-006C SED-J-006R	Sediment	24 borings installed with samples collected from the 2'-3' depth increment; additional samples collected from the 3'-4', 4'-5', 5'-6', 6'-7', 7'-8', 8'-9', and 9'-10' depth increments held for analysis based on results of 2'-3' depth increment	PCBs and/or Metals	Low to High	24 + 168 samples held	Delineate the 8' removal depth identified in the ROD

Sampling Location/ID Number	Matrix	Sample Type and Number	Analytical Group	Concentration Level	Number of Samples	Rationale for Sampling Location
SED-G SED-G-003L SED-G-003C SED-G-003R SED-G-004L SED-G-004C SED-G-004R **SED-J** SED-J-002L SED-J-002C SED-J-002R SED-J-003L SED-J-003C SED-J-003R	Sediment	12 boring installed with samples collected from the 2'-3', 3'-4', 4'-5', 5'-6', 6'-7', 7'-8', and 8'-9' depth increments; additional samples collected from the 9'-10' and 10'-11' depth increments held for analysis based on results of shallower depth increments	PCBs and/or Metals	Low to High	84 + 24 samples held	Delineate the 8' removal depth identified in the ROD

QAPP WORKSHEET #19 – ANALYTICAL SOP REQUIREMENTS TABLE

Analytical Group	Analytical and Preparation Method/SOP Reference	Containers (number, size, and type)[1]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)[2]
Soil				
PCBs	SW-846 8082A Lab SOP #9015110	1x4 oz. glass jar	Cool to <6^{0}C	1 year to extraction, 40 days to analysis
Sediment				
PCBs	SW-846 8082A Lab SOP #9015110	1x4 oz. glass jar	Cool to <6^{0}C	1 year to extraction, 40 days to analysis
Metals	SW-846 6010C Lab SOP #9015159	1x4 oz. glass jar	None	180 days to analysis
Mercury	SW-846 7471B Lab SOP #9015067	1x4 oz. glass jar	Cool to <6^{0}C	28 days to analysis
Waste Characterization				
TCLP Metals	SW-846 1311/6010C/7470A Lab SOPs #9015086/9015159/9015067	1x4 oz.glass jar	Cool to <6^{0}C	180 days to analysis (Metals) 28 days to analysis (Mercury)
TCLP VOCs	SW-846 1311/8260C Lab SOPs #9015085/9013078	2x2 oz. glass jars	Cool to <6^{0}C	14 days to preparation, 14 days to analysis
TCLP SVOCs	SW-846 1311/8270D Lab SOPs #9015086/9015100	1x4 oz.glass jar	Cool to <6^{0}C	14 days to extraction, 40 days to analysis
Corrosivity	SW-846 9045D Lab SOP #9011685	1x2 oz. glass jar	Cool to <6^{0}C	None
Ignitability	40 CFR, Part 261.21 Lab SOP #9012741	1x4-oz. glass jar	Cool to <6^{0}C	None

Analytical Group	Analytical and Preparation Method/SOP Reference	Containers (number, size, and type)[1]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)[2]
Soil – Geotechnical Analyses				
Moisture Content	ASTM D2216	Shelby Tube	None specified	Test as soon as practical
Grain Size	ASTM D422	Shelby Tube	None specified	None specified
Atterberg Limits	ASTM D4318	Shelby Tube	None specified	None specified
Specific Gravity	ASTM D854	Shelby Tube	None specified	None specified
Unconsolidated-Undrained Triaxial Compression with Pore Pressure	ASTM D2850	Shelby Tube	None specified	None specified
Consolidated-Undrained Triaxial Compression with Pore Pressure	ASTM D4767	Shleby Tube	None specified	None specified
One-Dimensional Consolidation	ASTM D2435/D2535M	Shelby Tube	None specified	None specified

Notes:

[1] The laboratory should be consulted prior to sample collection, as it may be possible to combine sample volume for multiple analyses in one sample container.

[2] It is imperative that all samples are submitted to the laboratory with ample time for the analysis to be completed within the holding time. Missing a holding time is unacceptable and may result in unusable data if the holding time is missed.

QAPP WORKSHEET #20 – FIELD QUALITY CONTROL SAMPLE SUMMARY TABLE

QAPP Worksheet #20 - Sample Quantities and Control Frequencies

Matrix/Analysis	Analytical and Preparation SOP[1]	Estimated Environ. Sample Quantity[2]	Archived Samples for Future Potential Analysis[2,3]	Field QC Analyses						Laboratory QC Sample						Total[5]
				Trip Blank		Rinse Blank[4]		Field Duplicate		Matrix Spike		Matrix Spike Duplicate		Lab Duplicate		
				Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	
Sediment																
PCB Aroclors (SW846 8082A)	9015110	206	275	NA	--	1/day	TBD	1/10	21	1/20	11	1/20	11	NA	--	524
Metals (SW846 6010C, 7471B)	9015067/9018442	206	275	NA	--	1/day	TBD	1/10	21	1/20	11	1/20	11	NA	--	524
Soil																
PCB Aroclors (SW846 8082A)	9015110	188	201	NA	--	1/day	TBD	1/10	19	1/20	10	1/20	10	NA	--	428
Waste Characterization																
TCLP VOCs (SW-846 1311/8260)	9015085/9013078	30	0	1/cooler	1	1/day	TBD	NA	--	NA	--	NA	--	NA	--	31
TCLP SVOCs (SW-846 1311/8270)	9015086/9015100	30	0	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	30
TCLP Metals (SW-846 1311/6010/7470)	9015086/9015067/9018442	30	0	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	30
Ignitability	9012741	30	0	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	30
Corrosivity	9011685	30	0	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	30
Geotechnical Analyses																
Moisture Content	ASTM D2216	25	0	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	25
Grain Size	ASTM D422	20	0	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	20
Atterberg Limits	ASTM D4318	12	0	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	12
Specific Gravity	ASTM D584	4	4	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	8
Unconsolidated-Undrained Triaxial Compression with Pore Pressure	ASTM D2850	1	0	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	1
Consolidated-Undrained Triaxial Compression with Pore Pressure	ASTM D4767	1	0	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	1
One-Dimensional Consolidation	ASTM D2435/D2535M	2	0	NA	--	1/day	TBD	NA	--	NA	--	NA	--	NA	--	2

Abbreviations:
Freq. = frequency
NA = not applicable
No. = number of samples

Notes:
1. See Worksheet #23 for SOP title, revision number, date details.
2. Samples quantities are an approximation.
3. Archive samples will be analyzed as necessary based on the results of the initial samples.
4. Rinse blanks collected at a frequency of 1 per day or 1 per 20 samples, whichever is more frequent. Rinse blanks not required when dedicated sampling equipment is used.
5. Total number of samples includes all archive samples.

QAPP WORKSHEET #21 – PROJECT SAMPLING SOP REFERENCES TABLE

Standard Operating Procedure (SOP) Reference Number[1]	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work?
Attachment 1	Chain of Custody, Handling, Packing, and Shipping, Revision 0, August 22, 2016	Arcadis	See SOP for materials and supplies necessary for sample handling, packing, and shipping	No
Attachment 2	Soil Borings and Soil Sampling, Revision 0, August 22, 2016	Arcadis	See SOP for material and supplies that should be available during soil sampling	No
Attachment 3	Sediment Probing and Sampling, Revision 0, August 22, 2016	Arcadis	See SOP for material and supplies that should be available during sediment sampling	No
Attachment 4A	Geotechnical – Soil Drilling and Screening, Revision 0, August 22, 2016	Arcadis	See SOP for material and supplies that should be available to carry out procedures described in the SOP	No
Attachment 4B	Geotechnical – Soil Description, Revision 0, August 22, 2016	Arcadis	See SOP for equipment that should be available to facilitate soil descriptions	No
Attachment 5	Field Documentation, Revision 0, August 22, 2016	Arcadis	Field book, indelible ink pen, and weather-proof container	No
Attachment 6	Field Equipment, Revision 0, August 22, 2016	Arcadis	See SOP for equipment and materials that should be available during field cleaning activities	No

[1] The SOP reference number refers to the FSP Attachment. Copies of the Sampling SOPs are included in the FSP and are not included in the QAPP.

QAPP WORKSHEET #22 – FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION TABLE

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person
Global Positioning System Unit	At least daily when used	As required by manufacturer specification	Locating samples	Check battery charge and accuracy	Daily	Manufacturers specifications	Re-calibrate, troubleshoot according to manufacturer specifications, and replace instrument if necessary	Field personnel/ operator
Photoionization Detector	At least daily when used	As required by manufacturer specification	Locating samples	Check battery charge and accuracy	Daily	Manufacturers specifications	Re-calibrate, troubleshoot according to manufacturer specifications, and replace instrument if necessary	Field personnel/ operator

QAPP WORKSHEET #23 – ANALYTICAL SOP REFERENCE TABLE

SOP Reference Number	Title, Revision Date and/or Number[1,2]	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work (Yes or No)
9015110	Polychlorinated Biphenyls in Solid Samples by 8082A using GC-ECD, Revision 7, 7/21/2015	Definitive	PCBs	Gas Chromatography/ Electron Capture Detector (GC/ECD)	Eurofins	No
9015109	Analysis of Polychlorinated Biphenyls by 8082A in Aqueous Samples using GC-ECD, Revision 5, 11/4/2015	Definitive	PCBs	GC/ECD	Eurofins	No
9018442	Metals by ICP for Methods SW-846 6010B/C (Aqueous, Solid, Tissue) and EPA 200.7 (Aqueous), Revision 9, 11/20/2015	Definitive	Metals, TCLP Metals	Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES)	Eurofins	No
9015067	Mercury in Aqueous, Solid and Tissue Samples by Cold Vapor AA, Revision 16, 11/27/2015	Definitive	Mercury, TCLP Mercury	Cold Vapor Atomic Absorption (CVAA)	Eurofins	No
9013078	Determination of Volatile Target Compounds and Gasoline Range Organics by Capillary Column Gas Chromatography/Mass Spectrometry in Waters and Wastewaters by Method SW8260C, Revision 4, 1/22/2016	Definitive	TCLP VOCs	Gas Chromatography/ Mass Spectrometry (GC/MS)	Eurofins	No

SOP Reference Number	Title, Revision Date and/or Number[1,2]	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work (Yes or No)
9015100	Semivolatile Organic Compounds by Method 8270D in Aqueous and Non-Aqueous Matricces using GC-MS, Revision 6, 3/23/2016	Definitive	TCLP SVOCs	GC/MS	Eurofins	No
9012741	Ignitability of Solis by 40 CFR, Part 261.21, Revision 8, 11/9/2015	Definitive	Ignitability	Pensky-Martens Closed Flash Point Tester	Eurofins	No
9011685	pH (SW) (Electrometric), Revision 10, 8/8/2014	Definitive	pH	pH Electrode	Eurofins	No
9015159	Sample Preparation of Wastewater and Leachates for Analysis of Total Metals by Inductively Coupled Plasma Atomic Emission Spectrometry, Revision 12, 1/19/2015	Definitive	Metals Preparation for Water	NA – Preparation Method	Eurofins	No
9015133	Sample Preparation of Waters for Analysis of Total Recoverable Metals by Inductively Coupled Plasma Optical Emission Spectrometry, Revision 16, 12/3/2014	Definitive	Metals Preparation for Water	NA – Preparation Method	Eurofins	No
9015160	Sample Prep of Sediments, Sludges, Soils, and Tissues for Analysis of Metals by ICP and ICP-MS, Revision 22, 8/21/2014	Definitive	Metals Preparation for Soil	NA – Preparation Method	Eurofins	No

SOP Reference Number	Title, Revision Date and/or Number[1,2]	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work (Yes or No)
9015082	Digestion of Aqueous Samples by SW-846 Method 7470A, EPA 254.1, Revision 18, 4/29/2015	Definitive	Mercury Preparation for Water	NA – Preparation Method	Eurofins	No
9015161	Sample Preparation of Soil, Sediment, Sludge, Oils, and Tissues for Total Mercury Analysis by Atomic Absorption Cold Vapor Technique, Revision 18, 8/28/2014	Definitive	Mercury Preparation for Soil	NA – Preparation Method	Eurofins	No
9015149	Separatory Funnel Extraction (Method 3510C) or Waste Dilution (Method 3580A) of Base Neutrals and Acid Extractables in Leachates, Revision 12, 4/26/2016	Definitive	SVOC Extraction for Water	NA – Preparation Method	Eurofins	No
9015079	Separatory Funnel Extraction by Method 3510C, 608, or 622 for Pesticides and PCBs in a Wastewater, Revision 18, 4/13/2016	Definitive	PCBs Extraction for Water	NA – Preparation Method	Eurofins	No
9015104	Microwave Extraction Method 3546 for PCBs in a Solid Matrix, Revision 7, 12/3/2015	Definitive	PCBs Extraction for Soil	NA – Preparation Method	Eurofins	No
9015086	Toxicity Characteristic Leaching Procedure Non-volatile Leachates, Revision 11, 2/1/2016	Definitive	SVOCs, Mercury, and Metals TCLP Extraction	NA – Preparation Method	Eurofins	No

SOP Reference Number	Title, Revision Date and/or Number[1,2]	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work (Yes or No)
9015085	Toxicity Characteristic Leaching Procedure Zero Headspace Leachates, Method 1311, Revision 11, 3/29/2012	Definitive	VOCs TCLP Extraction	NA – Preparation Method	Eurofins	No
ASTM D2216	Standard Test Method for Laboratory Determination of Water Content of Soil	Definitive	Moisture Content	Gravimetric	TBD	No
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils	Definitive	Atterberg	Geotechnical test apparatus	TBD	No
ASTM D422	Standard Test Method for Particle Size of Soils	Definitive	Grain Size/Sieve Analysis	Sieves	TBD	No
ASTM D854	Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer	Definitive	Specific Gravity	Pycnometer	TBD	No
ASTM D2850	Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils	Definitive	Unconsolidated-Undrained Triaxial Compression with Pore Pressure	Geotechnical test apparatus	TBD	No
ASTM D4767	Standard Test Method for Consolidated-Undrained Triaxial Compression Test for Cohesive Soils	Definitive	Consolidated-Undrained Triaxial Compression with Pore Pressure	Geotechnical test apparatus	TBD	No
ASTM D2435/D2435M	Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading	Definitive	One-Dimensional Consolidation	Geotechnical test apparatus	TBD	No

SOP Reference Number	Title, Revision Date and/or Number[1,2]	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work (Yes or No)

Notes:

[1] SOPs are reviewed/revised by the laboratories on an annual basis. The SOPs included in this QAPP are current as of the date of the submittal. The current version of the laboratory SOP will be followed at the time of sample receipt.

[2] Copies of the laboratory SOPs are included in Appendix A. Copies of the ASTM methods are not included in an appendix since the documents are copyrighted materials.

QAPP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC/ECD (PCBs)	Initial Calibration – 5 point	Initial calibration prior to sample analysis	% relative standard deviation (%RSD) <20% for all compounds	Correct problem, re-calibrate and re-analyze any affected samples	Assigned Laboratory Personnel	SW-846 8082A Lab SOP #9015110
	Initial Calibration Verification (ICV)	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected	Rerun ICV one time, second failure requires recalibration		
	Calibration Verification (CV)	Daily, before sample analysis, every 12 hours of analysis time, and at the end of the analysis sequence	± 20% difference for all analytes	Re-inject CV; if passes rerun previous 10 samples and continue run; if 2nd CV fails, recalibrate		
GC-MS (VOCs)	Initial Calibration – 5 point	Initial calibration prior to sample analysis	%RSD <20% for all compounds, relative response factor meet method criteria	Correct problem, re-calibrate and re-analyze any affected samples	Assigned Laboratory Personnel	SW-846 8260C Lab SOP #9013078
	ICV	Once after each initial calibration	Value of second source for all analytes within ± 30% of expected	Rerun ICV one time, second failure requires recalibration		

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
	CV	Daily, before sample analysis, and every 12 hours of analysis time	± 20% difference for all analytes	Re-inject CV; if passes rerun previous 10 samples and continue run; if 2nd CV fails, recalibrate		
	Tune check	Prior to initial calibration and prior to each 12-hour period of sample analyis	Specific ion abundance criteria of bromofluorobenzene from method SW-846 8260C	Retune instrument and verify		
GC/MS (SVOCs)	Initial Calibration – 5 point	Initial calibration prior to sample analysis	%RSD <20% for all compounds, relative response factor meet method criteria	Correct problem, re-calibrate and re-analyze any affected samples	Assigned Laboratory Personnel	SW-846 8270D Lab SOP #9015100
	ICV	Once after each initial calibration	Value of second source for all analytes within ± 30% of expected	Rerun ICV one time, second failure requires recalibration		
	CV	Daily, before sample analysis, and every 12 hours of analysis time	± 20% difference for all analytes	Re-inject CV; if passes rerun previous 10 samples and continue run; if 2nd CV fails, recalibrate		

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
	Tune check	Prior to initial calibration and prior to each 12-hour period of sample analyis	Specific ion abundance criteria of decafluorotriphenylphosphate from method SW-846 8270D	Retune instrument and verify		
ICP-AES (Metals)	Initial Calibration	Daily prior to sample analysis	$r^2 \geq 0.998$	Recalibrate	Assigned Laboratory Personnel	SW-846 6010C Lab SOP #9018442
	ICV	Once after each initial calibration, prior to sample analysis	Value of second source for all analytes within ± 10% of expected value	Recalibrate		
	CV	After every 10 samples and at the end of the analysis sequence	All analytes within ± 10% of expected value	Recalibrate, rerun 10 samples previous to failed CV		
	Low-level Calibration Check Standard	Daily	All analytes within ± 20% of expected value	Correct problem then repeat initial calibration		
	Interference Check Solution	After initial calibration and prior to sample analysis	ICS-A: Absolute value of concentration for all non-spiked project analytes < RL ICS-AB: within ± 20% of expected value	Terminate analysis, locate and correct problem, reanalyze interference check solution and all samples		

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
CVAA (Mercury)	Initial Calibration	Daily prior to sample analysis	$r^2 \geq 0.995$	Recalibrate	Assigned Laboratory Personnel	SW-846 7470A/7471B Lab SOP #9015067
	ICV	Once after each initial calibration, prior to sample analysis	Value of second source for all analytes within ± 10% of expected value	Recalibrate		
	CV	After every 10 samples and at the end of the analysis sequence	All analytes within ± 20% of expected value	Recalibrate, rerun 10 samples previous to failed CV		

QAPP WORKSHEET #25 – ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION TABLE

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
GC/ECD	Change septa weekly or as needed Change gas line dryers as needed Replace injection port liner weekly or as needed Replace GC column and detector as needed Check that gas supply is sufficient and delivery pressure is adequate	PCBs	Check connections, bake out instrument, leak test	See Lab SOP #9015110	See Lab SOP #9015110	Inspect system, correct problem, rerun calibration and affected samples	Analyst	Lab SOP #9015110

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
GC/MS	Replace pump oil as needed Change gas line dryers as needed Perform ion source cleaning and filament replacement Replace injection port liner weekly or as needed Clip column Replace gas chromatography (GC) column as needed Manual tuning Replace electron multiplier Check that gas supply is sufficient and delivery pressure is adequate Bake out lines and column	VOCs and SVOCs	Check connections, bake out instrument, leak test	See Lab SOPs #9013078 and #9015100	See Lab SOPs #9013078 and #9015100	Inspect system, correct problem, rerun calibration and affected samples	Analyst	Lab SOPs #9013078 and #9015100

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
ICP-AES	Change capillary and pump tubing Check liquid argon tank Replace and realign plasma torch Clean nebulizer and spray chamber	All metals except mercury	Check connections, replace worn equipment	See Lab SOP #9018442	See Lab SOP #9018442	Inspect system, correct problem, rerun calibration and affected samples	Analyst	Lab SOP #9018442
CVAA	Clean tubing and quartz cell as needed Clean aspirator as necessary Check level of mercury scrubber solution Replace lamps Check that gas supply is sufficient and delivery pressures are adequate	Mercury	Check connections, replace worn equipment	See Lab SOP #9015067	See Lab SOP #9015067	Inspect system, correct problem, rerun calibration and affected samples	Analyst	Lab SOP #9015067

Note:

[1] SOP reference numbers correspond to analytical SOPs in Worksheet #23.

QAPP WORKSHEET #26 – SAMPLE HANDLING SYSTEM

Sample Collection, Packaging, and Shipment
Sample Collection (Personnel/Organization): Arcadis Field Team supervised by the Field Services Lead will collect the samples
Sample Packaging (Personnel/Organization): Arcadis Field Team
Coordination of Shipment (Personnel/Organization): Arcadis Field Team
Type of Shipment/Carrier: FedEx or UPS for overnight delivery, drop-off at laboratory location, or courier to the laboratory
Sample Receipt and Analysis
Sample Receipt (Personnel/Organization): Assigned subcontract laboratory personnel
Sample Custody and Storage (Personnel/Organization): Assigned subcontract laboratory personnel
Sample Preparation (Personnel/Organization): Assigned subcontract laboratory personnel
Sample Determinative Analysis (Personnel/Organization): Assigned subcontract laboratory personnel
Sample Archiving
Field Sample Storage (No. of days from sample collection): Chemistry samples will not be stored in the field, but will be shipped within 24 hours of collection. If, due to an emergency, they are stored in the field, they will be kept in a cooler or transferred to a refrigerator at 4ºC.
Sample Extract/Digestate Storage (No. of days from extraction/digestion): Sample extraction and digestion will be conducted according to the USEPA method and the requirements given in Worksheet #19
Biological Sample Storage (No. of days from sample collection): Not applicable, no biological samples will be collected
Sample Disposal
Personnel/Organization: Assigned subcontract lab sample custodian
Number of Days from Analysis: Aliquots, portions, or residual quantities of the original sample: At least 60 days after delivery of final report

QAPP WORKSHEET #27 – SAMPLE CUSTODY REQUIREMENTS

Sample Handling and Custody Requirements

At all times, field and laboratory personnel will be aware of the need to maintain all samples, whether in the field or in the laboratory, under strict chain-of-custody, and in a manner to retain physical properties and chemical composition. This Worksheet details sample handling and custody requirements from collection to ultimate disposal.

Sample Handling (Sample Packaging, Shipping Containers, Sample Shipment, and Sample Custody)

Sample packaging and shipment procedures are designed so that samples will arrive at the laboratory, with the COC intact. Samples will be packaged for shipment as outlined below:

- Securely affix the sample label to the container with clear packing tape.
- Check the cap on the sample container to confirm that it is properly sealed.
- Wrap the sample container cap with clear packing tape to prevent the label from becoming loose.
- Complete the COC form with the required sampling information and confirm that the recorded information matches the sample labels. Note: If the designated sampler relinquishes the samples to other sampling or field personnel for packing or other purposes, the sampler will complete the COC form prior to this transfer. The appropriate personnel will sign and date the COC form to document the sample custody transfer.
- Using duct tape, secure the outside drain plug at the bottom of the cooler.
- Wrap sample containers in bubble wrap or other cushioning material.
- Place 1 to 2 inches of cushioning material at the bottom of the cooler.
- Place the sealed sample containers into the cooler.
- Place ice in plastic bags and seal. Place loosely in the cooler.
- Fill the remaining space in the cooler with cushioning material.
- Place COC forms in a plastic bag and seal. Tape the forms to the inside of the cooler lid.
- Close the lid of the cooler, lock and secure with duct tape.
- Wrap strapping tape around both ends of the cooler at least twice.
- Mark the cooler on the outside with the shipping address and return address, affix “Fragile” labels and draw (or affix) arrows indicating “this side up.” Cover the labels with clear plastic tape.
- Place a signed custody seal over the sample cooler lid.

Samples will be packaged by field personnel and transported as low-concentration environmental samples. Samples will be hand delivered to the laboratory by a courier or member of the Field Team or delivered to the laboratory by an express carrier (e.g., FedEx, UPS) within 48 hours of the time of collection. Shipments will be accompanied by the COC form identifying the contents.

The original form will accompany the shipment; copies will be retained by the sampler for the sampling office records. If the samples are sent by common carrier, a bill of lading will be used. Receipts or bills of lading will be retained as part of the permanent project documentation. Commercial carriers are not required to sign off on the COC form as long as the forms are sealed inside the sample cooler and the custody seals remain intact.

Sample custody seals and packing materials for filled sample containers will be provided by the analytical laboratory. The filled, labeled, and sealed containers will be placed in a cooler on ice and carefully packed to eliminate the possibility of container breakage.

Field Sample Custody Procedures

The objective of field sample custody is to protect samples from tampering from the time of sample collection through time of transport to the analytical laboratory. Persons will have custody of samples when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

Field custody documentation consists of both field logbooks and field COC forms.

- **Field Logbooks.** Field logbooks will provide the means of recording the data collecting activities that are performed. As such, entries will be described in as much detail as possible so that persons going to the site could reconstruct a particular situation without reliance on memory.

  Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in a secure location when not in use. Each logbook will be identified by the project specific document number. The title page of each logbook will contain the following:

  - Person to whom the logbook is assigned
  - Logbook number
  - Project name
  - Project start date
  - End date

  Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather conditions, names of all sampling team members present, level of personal protection being used and signature of the person making the entry will be provided. The names of visitors to the site and field sampling or investigation team personnel, as well as the purpose of their visit, will also be recorded in the field logbook.

  Measurements made and samples collected will be recorded. Entries will be made in ink, with no erasures. If an incorrect entry is made, the information will be crossed out with one strike mark. Whenever a sample is collected or a measurement is made, a detailed description of the

location of the station will be recorded. The number of the photographs taken, if any, will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected following the sampling procedures documented in the FSA. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume, and number of containers. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description.

- **Chain of Custody Record.** Completed COC forms will be required for all samples to be analyzed. COC forms will be initiated by the sampling crew in the field. The COC forms will contain the unique sample identification number, sample date and time, sample description, sample type, preservation (if any), and analyses required. The original COC form will accompany the samples to the laboratory. Copies of the COC forms will be made prior to shipment (or multiple copy forms will be used) for field documentation. The COC forms will remain with the samples at all times. The samples and signed COC forms will remain in the possession of the sampling crew until the samples are delivered to the express carrier (e.g., FedEx, UPS), hand delivered to the laboratory, or placed in secure storage.

  Whenever samples are split with a government agency or other party, a separate COC form will be prepared for those samples and marked to identify the party with whom the samples are being split. The person relinquishing the samples to the facility or agency should request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, note this in the "Received By" space.

Laboratory Sample Custody Procedures

Upon sample receipt, laboratory personnel will be responsible for sample custody. The original field COC form will accompany all samples requiring laboratory analysis. The laboratory will use COC guidelines described in the USEPA guidance documents. Samples will be kept secured in the laboratory until all stages of analysis are complete. All laboratory personnel having samples in their custody will be responsible for documenting and maintaining sample integrity.

Immediately upon sample receipt, the laboratory sample custodian will verify the integrity of the cooler seal, open the cooler, and compare the contents against the field COC. If a sample container is missing, a sample container is received broken, the sample is in an inappropriate container, or the sample has not been preserved by appropriate means, Arcadis will be notified. The laboratory sample custodian will be responsible for logging the samples in, assigning a unique laboratory identification number to each sample, labelling the sample bottle with the laboratory identification number, and moving the sample to an appropriate storage location to await analysis. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in the laboratory tracking system. Relevant custody documentation will be placed in the project file.

QAPP WORKSHEET #28A – QC SAMPLES TABLE (PCBS IN SOIL AND SEDIMENT)

Matrix	Soil and Sediment
Analytical Group	PCB Aroclors
Analytical Method/SOP Reference	SW-846 8082A Lab SOP #9015110

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
Second Column Confirmation of Positive Results	All positive results must be confirmed	Per laboratory SOP #9015110	NA; report the higher result if RPD ≤ 40%; report the lower result if RPD > 40%	Laboratory analyst	Precision	RPD of results between two columns ≤ 40%
MS/MSD	One per preparatory batch	Per laboratory SOP #9015110	Identify problem, then reanalyze MS/MSD and all associated batch samples	Laboratory analyst	Precision/Accuracy	Within laboratory in-house limits
Method Blank	One per preparatory batch	Per laboratory SOP #9015110	Correct problem, then reanalyze method blank and all samples processed with the contaminated blank	Laboratory analyst	Sensitivity	No target analytes detected greater than one-half RL and 1/10 the amount measured in any sample or 1/10 regulatory limit (whichever is greater)

Matrix	Soil and Sediment
Analytical Group	PCB Aroclors
Analytical Method/SOP Reference	SW-846 8082A Lab SOP #9015110

QC Sample	Frequency/Number		Method/SOP QC Acceptance Limits	Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	One per preparatory batch		Per laboratory SOP #9015110	Identify problem, then reanalyze LCS and all associated batch samples	Laboratory analyst	Accuracy	Within laboratory in-house limits
Surrogate Standards	Added to all samples, blanks, LCS, and MS		Per laboratory SOP #9015110	Correct problem, then reanalyze affected samples	Laboratory analyst	Accuracy	Within laboratory in-house limits
Continuing Calibration Verification	Every 12 hour period		Per laboratory SOP #9015110	Recalibrate and reanalyze all associated samples	Laboratory analyst	Accuracy	± 15% deviation from predicted response
Field Duplicates	One per 10 field sampling	RPD < 50%	Qualify data outside criteria	Data validator	Precision	RPD < 50%	
Equipment blanks (if collected)	One per day when non-dedicated equipment is used	No target analytes ≥ RL	Qualify data for blank contamination	Data validator	Sensitivity	No target analytes ≥ RL	

QAPP WORKSHEET #28B – QC SAMPLES TABLE (METALS AND MERCURY IN SEDIMENT AND TCLP LEACHATE)

Matrix	Sediment and TCLP Leachate
Analytical Group	Metals and Mercury
Analytical Method/SOP Reference	SW-846 6010C/7470A Lab SOP #9015067/9018442

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS/MSD	One per preparatory batch	Per laboratory SOPs #9015067 and #9018442	Identify problem, then reanalyze MS/MSD and all associated batch samples	Laboratory analyst	Precision/Accuracy	Within laboratory in-house limits
Method Blank	One per preparatory batch	Per laboratory SOPs #9015067 and #9018442	Correct problem, then reanalyze method blank and all samples processed with the contaminated blank	Laboratory analyst	Sensitivity	No target analytes detected greater than one-half RL and 1/10 the amount measured in any sample or 1/10 regulatory limit (whichever is greater)
LCS	One per preparatory batch	Per laboratory SOPs #9015067 and #9018442	Identify problem, then reanalyze LCS and all associated batch samples	Laboratory analyst	Accuracy	Within laboratory in-house limits

Matrix	Sediment and TCLP Leachate
Analytical Group	Metals and Mercury
Analytical Method/SOP Reference	SW-846 6010C/7470A Lab SOP #9015067/9018442

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
Continuing Calibration Verification	Prior to analysis, 1 per 10 samples, and at the end of the sequence	Per laboratory SOPs #9015067 and #9018442	Recalibrate and reanalyze all associated samples	Laboratory analyst	Accuracy	Recovery ± 10%
Interference Check Samples (SW-846 6010C only)	After calibration	Per laboratory SOPs #9015067 and #9018442	Correct problem, the recalibrate and reanalyze all associated samples	Laboratory analyst	Accuracy	Recovery 80-120%
Serial dilution (SW-846 6010C only)	One per preparatory batch	Per laboratory SOPs #9015067 and #9018442	Perform post-digestion spike if serial dilution does not meet criteria	Laboratory analyst	Accuracy	1:5 dilution must agree within ± 10% of original detemination
Post-digestion spike (SW-846 6010C only)	When serial dilution	Per laboratory SOPs #9015067 and #9018442	Reanalyze post-digestion spike	Laboratory analyst	Accuracy	Recovery within 80-120%
Field Duplicates (required for sediment samples only)	One per 10 field sampling	RPD < 50%	Qualify data outside criteria	Data validator	Precision	RPD < 50%

Matrix	Sediment and TCLP Leachate
Analytical Group	Metals and Mercury
Analytical Method/SOP Reference	SW-846 6010C/7470A Lab SOP #9015067/9018442

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
Equipment blanks (if collected)	One per day when non-dedicated equipment is used	No target analytes ≥ RL	Qualify data for blank contamination	Data validator	Sensitivity	No target analytes ≥ RL	

QAPP WORKSHEET #28C – QC SAMPLES TABLE (VOCS IN TCLP LEACHATE)

Matrix	TCLP Leachate
Analytical Group	VOCs
Analytical Method/SOP Reference	SW-846 8260B Lab SOP #9013078

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
Internal Standards	Added to all samples, blanks, LCS, and MS	Per laboratory SOP #9013078	Correct problem, then reanalyze affected samples	Laboratory analyst	Accuracy	RT within ± 30 seconds from RT of initial calibration midpoint standard; area counts within -50% to +100% of initial calibration midpoint standard
MS/MSD	One per preparatory batch	Per laboratory SOP #9013078	Identify problem, then reanalyze MS/MSD and all associated batch samples	Laboratory analyst	Precision/Accuracy	Within laboratory in-house limits
Method Blank	One per preparatory batch	Per laboratory SOP #9013078	Correct problem, then reanalyze method blank and all samples processed with the contaminated blank	Laboratory analyst	Sensitivity	No target analytes detected greater than one-half RL and 1/10 the amount measured in any sample or 1/10 regulatory limit (whichever is greater)
LCS	One per preparatory batch	Per laboratory SOP #9013078	Identify problem, then reanalyze LCS and all associated batch samples	Laboratory analyst	Accuracy	Within laboratory in-house limits

Matrix	TCLP Leachate
Analytical Group	VOCs
Analytical Method/SOP Reference	SW-846 8260B Lab SOP #9013078

QC Sample	Frequency/Number		Method/SOP QC Acceptance Limits	Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
Surrogate Standards	Added to all samples, blanks, LCS, and MS		Per laboratory SOP #9013078	Correct problem, then reanalyze affected samples	Laboratory analyst	Accuracy	Within laboratory in-house limits
Continuing Calibration Verification	Every 12 hour period		Per laboratory SOP #9013078	Recalibrate and reanalyze all associated samples	Laboratory analyst	Accuracy	± 20% deviation from predicted response
Equipment blanks (if collected)	One per day when non-dedicated equipment is used	No target analytes ≥ RL	Qualify data for blank contamination	Data validator	Sensitivity	No target analytes ≥ RL	
Trip blanks	One per cooler	No target analytes ≥ RL	Qualify data for blank contamination	Data validator	Sensitivity	No target analytes ≥ RL	

QAPP WORKSHEET #28D – QC SAMPLES TABLE (SVOCS IN TCLP LEACHATE)

Matrix	TCLP Leachate
Analytical Group	SVOCs
Analytical Method/SOP Reference	SW-846 8270D Lab SOP #9015100

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
Internal Standards	Added to all samples, blanks, LCS, and MS	Per laboratory SOP #9015100	Correct problem, then reanalyze affected samples	Laboratory analyst	Accuracy	RT within ± 30 seconds from RT of initial calibration midpoint standard; area counts within -50% to +100% of initial calibration midpoint standard
MS/MSD	One per preparatory batch	Per laboratory SOP #9015100	Identify problem, then reanalyze MS/MSD and all associated batch samples	Laboratory analyst	Precision/Accuracy	Within laboratory in-house limits
Method Blank	One per preparatory batch	Per laboratory SOP #9015100	Correct problem, then reanalyze method blank and all samples processed with the contaminated blank	Laboratory analyst	Sensitivity	No target analytes detected greater than one-half RL and 1/10 the amount measured in any sample or 1/10 regulatory limit (whichever is greater)
LCS	One per preparatory batch	Per laboratory SOP #9015100	Identify problem, then reanalyze LCS and all associated batch samples	Laboratory analyst	Accuracy	Within laboratory in-house limits

Matrix	TCLP Leachate
Analytical Group	SVOCs
Analytical Method/SOP Reference	SW-846 8270D Lab SOP #9015100

QC Sample	Frequency/Number		Method/SOP QC Acceptance Limits	Corrective Action	Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
Surrogate Standards	Added to all samples, blanks, LCS, and MS		Per laboratory SOP #9015100	Correct problem, then reanalyze affected samples	Laboratory analyst	Accuracy	Within laboratory in-house limits
Continuing Calibration Verification	Every 12 hour period		Per laboratory SOP #9015100	Recalibrate and reanalyze all associated samples	Laboratory analyst	Accuracy	± 20% deviation from predicted response
Equipment blanks (if collected)	One per day when non-dedicated equipment is used	No target analytes ≥ RL	Qualify data for blank contamination	Data validator	Sensitivity	No target analytes ≥ RL	

QAPP WORKSHEET #28E – QC SAMPLES TABLE (WASTE CHARACTERIZATION PARAMTERS IN SOIL AND SEDIMENT)

Matrix	Soil and Sediment
Analytical Group	Ignitability and Corrosivity
Analytical Method/SOP Reference	Ignitability: 40 CFR Part 261.21 Corrosivity: SW-846 9045D Lab SOP #9011685/9012741

QC Sample		Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action		Person Responsible for Corrective Action	DQI	Measurement Performance Criteria
Laboratory Duplicate		One per preparatory batch	Per laboratory SOPs #9011685 and #9012741	Correct problem, then reanalyze all samples processed with the duplicate		Laboratory analyst	Precision	Within laboratory in-house limits
Equipment blanks (if collected)	One per day when non-dedicated equipment is used	No target analytes ≥ RL	Qualify data for blank contamination	Data validator	Sensitivity	No target analytes ≥ RL		

QAPP WORKSHEET #29 – PROJECT DOCUMENTS AND RECORDS TABLE

Sample Collection Documents and Records	On-Site Analysis Documents and Records	Off-Site Analysis Documents and Records	Data Assessment Documents and Records	Other
• Field Notes • Boring Logs • Digital Photographs • Chain-of-Custody Records • Air Bills • Communications Logs (recorded electronically) • Copies of Pertinent e-mails • Field Instrument Records • Daily Health and Safety Briefing Sheets • Subcontractor Sign-In Sheets	• Record of Field Instrument Measurements • Corrective Action Reports	• Copies of all Analytical Data Deliverables; hard copies of raw data are archived; the EDDs are uploaded to the project database. The raw data files from the laboratory include Analytical Instrument Calibration Records, COC Records, and Sample Preparation and Analysis Files • Sample Receipt Records	• Technical System Field Audit Reports • QC Review of Field Data • DUSR	• Staff Health and Safety Reords • FSP • HASP

QAPP WORKSHEET #30 – ANALYTICAL SERVICES TABLE

Matrix	Analytical Group	Conc. Level	Sample Location/ ID Numbers	Analytical SOP[1]	Data Package Turnaround Time	Laboratory/Organization[2]
Soil and Sediment	TCLP VOC	Low	See Worksheet #18	SW-846 1311/8260C Lab SOPs #9015085/9013078	7 days	Eurofins 2425 New Holland Pike Lancaster, PA 17605 (717) 656-2300
	TCLP SVOC	Low		SW-846 1311/8270D Lab SOPs #9015086/9015100		
	TCLP Metals	Low		SW-846 1311/6010C/7470A Lab SOPs #9015086/9015067/9018442		
	Ignitability	Low		40 CFR, Part 261.21 Lab SOP #9012741		
	Corrosivity	Low		SW-846 9045D Lab SOP #9011685		
Soil	PCBs	All	See Worksheet #18	SW-846 3550C/8082A Lab SOP #9015110	3 days or 7 days	Eurofins 2425 New Holland Pike Lancaster, PA 17605 (717) 656-2300
Sediment	PCBs	All	See Worksheet #18	SW-846 3550C/8082A Lab SOP #9015110	3 days or 7 days	Eurofins 2425 New Holland Pike Lancaster, PA 17605 (717) 656-2300
	Metals	Low		SW-846 6010C/7471B Lab SOP #9015067/9018442		
Soil	Moisture Content	NA	See Worksheet #18	ASTM D2216	7 days	TBD
	Atterberg Limits			ASTM D4318		
	Grain Size			ASTM D422		
	Specific Gravity			ASTM D854		

Matrix	Analytical Group	Conc. Level	Sample Location/ ID Numbers	Analytical SOP[1]	Data Package Turnaround Time	Laboratory/Organization[2]
	Unconsolidated-Undrained Triaxial Compression with Pore Pressure			ASTM D2850		
	Consolidated-Undrained Triaxial Compression with Pore Pressure			ASTM D4767		
	One-Dimensional Consolidation			ASTM D2435/D2435M		

Notes:
[1] Copies of laboratory SOPs are included in Appendix A.
[2] A copy of the Eurofins New York Department of Health Certificate of Approval for Laboratory Service is included in Appendix A. The certification is valid through April 1, 2017.

QAPP WORKSHEET #31 – PLANNED PROJECT ASSESSMENTS TABLE

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Action	Person(s) Responsible for Monitoring Effectiveness of Corrective Action
QC reports of any non-conformance	Daily as required	Internal	Arcadis	Field Team members	Todd Cridge	Mark Gravelding	Todd Cridge
Field audit	One time field event	Internal	Arcadis	Arcadis Field Team Leader	Todd Cridge	Mark Gravelding	Todd Cridge
Laboratory audit	Per laboratory QA program	Internal	Eurofins	Laboratory QA Manager	Dorothy Love, Laboratory QA Director	Lyssa Longenecker, Laboratory Project Manager	Dennis Capria
Field inspections	Intermittent	Internal	Arcadis	Arcadis Field Team Leader	Todd Cridge	Mark Gravelding	Todd Cridge
Safety audits	Intermittent	Internal	Arcadis	Arcadis Field Team Leader	Todd Cridge	Mark Gravelding	Todd Cridge

QAPP WORKSHEET #32 – ASSESSMENT FINDINGS AND CORRECTIVE ACTION RESPONSES

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
Field sampling technical systems audit	Written audit report	Mark Gravelding	72 hours after audit	Memorandum	Todd Cridge	48 hours after notification
Contract laboratory technical audit	Written audit report	Mark Gravelding Dennis Capria	1 week after audit	Memorandum	Dennis Capria	48 hours after notification
Field inspection	Memorandum	Arcadis Project Manager	2 days	Memorandum	Todd Cridge	48 hours after notification

QAPP WORKSHEET #33 – QA MANAGEMENT REPORTS TABLE

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipient(s)
Field sampling technical systems audit report	As necessary during project	NA	Todd Cridge	Mark Gravelding
Contract laboratory technical audit report	As necessary during project	NA	Dennis Capria	Mark Gravelding
DUSR	All laboratory data packages will be validated	As generated throughout the project	Dennis Capria	Mark Gravelding

QAPP WORKSHEET #34 – VERIFICATION (STEP I) PROCESS TABLE

Verification Input	Description	Internal/External	Responsible for Verification
COC and shipping forms	COC forms and shipping documentation will be reviewed by the laboratory upon receipt of samples for verification against the sample coolers they represent. COC forms will be signed by all parties that had custody of samples, with the exception of commercial carriers.	External	Lyssa Longenecker, Laboratory Project Manager
Field notes and sampling logs	All field noted and sampling logs will be reviewed internally and placed in the project file.	Internal	Todd Cridge
Laboratory data	All laboratory data packaged will be verified internally by the laboratory perfoming the work for completeness and technical accuracy prior to submittal to Arcadis.	External	Lyssa Longenecker, Laboratory QA Manager
Laboratory data	All final data packages will be verified for content upon receipt.	Internal	Dennis Capria

Data Verification/Validation

Data quality and data usability for any type of data collection are highly dependent on three major processes: 1) planning prior to data collection, 2) verification/validation of the collected data, and 3) suitability of the data for their intended use. USEPA guidance on developing QAPPs identifies data verification/validation and usability as key elements of the data quality process. These elements are outlined in the following Worksheets #34 through #37.

Data verification is a systematic process in which the accuracy and defensibility of the collected data are evaluated by reviewing the data for completeness, correctness, and conformance/compliance. A specific dataset is compared against data quality criteria established for the field and/or laboratory methods and procedures performed. A data validation process is carried out to verify that the data are of required and defensible quality as documented by the data validation report. The final data may or may not be suitable to meet the project DQOs relative to the critical decisions required. The objective of data validation is to identify any questionable or invalid analytical measurements.

Data validation entails a review of the QC data and the raw data to verify that the laboratory was operating within required limits; the analytical results were correctly transcribed from the instrument read-outs; and which, if any, environmental samples were related to out-of-control QC samples. Subsequent to the data validation process, any qualification of the data is documented to inform all data users of the data usability.

The data validator verifies that laboratory corrections (also referred to as reduction of laboratory measurements) and laboratory reporting of analytical parameters are in accordance with the procedures specified for each analytical method and/or as specified in this QAPP. Upon receipt of laboratory data, the data validator will complete the following tasks:

- Evaluate completeness of data package.
- Verify that field COC forms are complete and that samples were handled properly.
- Verify that holding times were not exceeded for each parameter. If holding time exceedances occurred, verify that they were documented. Data for all samples exceeding holding time requirements are flagged accordingly. Verify that parameters were analyzed according to the methods specified.
- Review QA/QC data (i.e., confirm that duplicates, blanks, and spikes were analyzed on the required number of samples as specified in the relevant method, and verify that duplicate and MS recoveries are acceptable).
- Investigate anomalies identified during review. When anomalies are identified, they are discussed with the Arcadis Program QA/QC Officer, Project Manager and/or Laboratory Projet Manager, as appropriate.
- If data appear suspect, investigate the specific data of concern. Calculations are traced back to raw data. This process involves reviewing all raw data available from the laboratory (those items included in the data package) – including sample preparation/analysis process documentation, chromatograms, data results, other relevant reporting/documentation forms – in an effort to recreate the work in the laboratory as closely as possible. If calculations do not agree, the causes are determined and corrected. (Note: Corrections to data or changes to data qualifiers are also updated in the project database without comprising the original reported data. Only the validated data are accessible to the end user.)

Deficiencies discovered as a result of the data review, as well as the corrective actions implemented in response, are documented in a written report. The purpose of the documentation is to address the following topics, as applicable to each method:

- Assessment of the data package
- Description of any protocol deviations
- Failures to reconcile reported and/or raw data
- Assessment of any compromised data
- Overall appraisal of the analytical data
- Table of site name, sample quantities, matrix, and fractions analyzed

Tiered Approach to Data Verification/Validation

A tiered approach to data verification/validation will be used to assess the data quality to verify that the data meet the DQOs established for the sampling event.

The approach used to verify/validate data is selected based on a number of factors that are typically site- or project-specific and include consideration of the established DQOs associated with type of sampling event. All laboratory data will be verified/validated using a tiered approach. Following a Tier 1 validation of all available data, Arcadis will complete a Tier III validation on 10% of the analytical results and a Tier II validation on 90% of the analytical results. Arcadis does not anticipate validation of waste characterization samples. Geotechnical sample results will be reviewed by a qualified individual, but the tiered approach defined here is not applicable to these analyses. The data validation process tiers are defined as follows:

- Tier I (data verification): The data package is checked for completeness. The case narrative is reviewed, field duplicate results associated with the dataset are reviewed, and the result sheet is evaluated to assess potential usability issues.
- Tier II (limited verification/validation): In addition to the elements of a Tier I review, Tier II includes a review of DQIs such as holding times, blanks, calibration, MS, laboratory duplicates, LCS, and surrogate recoveries. The results of the review of the DQIs are assessed, and appropriate data qualifiers are applied to the dataset as appropriate. (Note: This is described as a “limited” review because the process does not include the full, detailed validation procedure described under Tier III.)
- Tier III (verification/validation): In addition to the Tier I/II elements, Tier III includes a detailed review of instrument calibration and laboratory raw data to check for errors in calculation, compound identification, and transcription.

QAPP WORKSHEET #35 – VALIDATION (STEPS IIA AND IIB) PROCESS TABLE

Step IIa/IIb	Validation Input	Description	Responsible for Validation
Step IIa	Sampling methods and procedures	Establish that required sampling methods were used and that any deviations were noted. Provide that the sampling procedures and field measurements met performance criteria and that any deviations are documented.	Todd Cridge
Step IIa	Analytical method and procedures	Establish that required analytical methods were used and that any deviations were noted. The laboratory will provide that QC samples met performance criteria and that any deviations were documented in the report narrative.	Dennis Capria
Step IIa modified	Analytical method and procedures	Review associated blanks for potential contamination and verify that all preparations and analyses have been performed within applicable holding times.	Dennis Capria
Step IIb	Documentation of QAPP QC sample results	Establish that all QAPP-required QC samples were collected and analyzed.	Dennis Capria
Step IIb	Project quantitation limits	Determine that the project quantitation limits were achieved as outlined in this QAPP	Dennis Capria
Step IIb	Performance criteria	Evaluate QC data associated with the samples designated for intended uses stated in Worksheet #36 against project-specific performance criteria in the QAPP, laboratory QA Manual, and laboratory control criteria.	Dennis Capria
Step IIb	DUSR	Summarize data verification and validation components included in the performance review. Include qualified data and explanation of all qualifiers.	Dennis Capria

QAPP WORKSHEET #36 – VALIDATION (STEPS IIA AND IIB) SUMMARY TABLE

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria[1]	Data Validator
IIa/IIb	Soil	PCBs	All	USEPA Validation Criteria including USEPA's National Functional Guidelines, and applicable Region 2 guidelines.	Dennis Capria
IIa/IIb	Sediment	PCBs and Metals	All	USEPA Validation Criteria including USEPA's National Functional Guidelines, and applicable Region 2 guidelines.	Dennis Capria

Note:

[1] 100% of all available data will be validated except those collected to determine disposal options (e.g., TCLP, RCRA characteristics) and geotechnical samples

Commercial Subcontractor Laboratory Data

All chemical data generated by a commercial subcontractor laboratory will be validated by Arcadis. Parameters will be validated in accordance with the QC requirements of this QAPP, using the USEPA's National Functional Guidelines, and applicable Region 2 guidelines as guidance. Data validation will be performed manually; it is not anticipated that automated data validation will be performed for this project.

Following a Tier 1 validation of all available data, and a Tier II validation on a minimum of 90% of the analytical results. Finally, the validator will conduct a full, Tier III validation of 10% of the sample results. This means that the validator will review the raw data and logbook sheets, and will recalculate at least 10% of the sample and QC sample results.

Once data validation is completed, a DUSR will be generated. The report will contain information regarding the parameters that are qualified, the reason for the qualification, and the direction of the bias (only for parameters qualified as estimated), when possible. Based upon the QA review of the analytical data, specific codes (data qualifiers or 'flags') will be placed next to results to provide an indication of the quantitative and qualitative reliability of the results. The data qualifier codes in the National Function Guidelines will be used for this project. Qualifiers assigned by laboratories will be defined by each laboratory in their data package and will be superseded by the data validator's qualifiers.

Validation protocols used as guidance for the chemical data include the following:

- USEPA Contract Laboratory Program National Functional Guidelines For Organic Data Review, OSWER 9240.1-05A-P, October 1999.

- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, OSWER 9240.1-45, October 2004.
- USEPA Region 2 Validating PCB Compounds: PCBs by Gas Chromatography SW-846 Method 8082A, SOP HW-45, Revision 1, October 2006.
- USEPA Region 2 ICP-AES Data Validation, SOP HW-2a, Revision 15, December 2012.
- USEPA Region 2 Mercury and Cyanide Data Validation, SOP HW-2c, Revision 15, December 2012.

The October 1999 Organics National Functional Guidelines and October 2004 Inorganics National Functional Guidelines, will be used to validate the data since the Organic Low- Medium (OLM) and Inorganic Low-Medium (ILM) analytical methods referenced in these documents most closely parallel the data quality indicator requirements of the SW846 organic and inorganic methods. There are many differences in the Inorganic Superfund Methods (ISM) and Superfund Organic Methods (SOM) analytical methods referenced in the newer National Functional Guidelines which are not applicable to the SW846 methods.

Field Data Evaluation

Procedures to evaluate field data for this program include reviewing 100% of all data entries in field application books to verify that errors have not been made. The field data documented includes data generated during measurement of field parameters, observations, results of any QC sample analyses, and field instrument calibrations. This task will be the responsibility of an Arcadis Data Reviewer with oversight by the Program QA/QC Officer or designee.

QAPP WORKSHEET #37 – USABILITY ASSESSMENT

The Data Usability Assessment will be performed by Arcadis. Documentation generated during the Data Usability Assessment will consist of data validation checklists with a brief summary of overall data usability.

The Data Usability Assessment process involves data verification and validation. Data verification is the process by which laboratory results are checked to provide that the proper QC steps were performed and key items have met QC objectives (both analytical and contractual). Key steps of an Arcadis data verification include:

- Identifying sample collection, handling and analysis procedures;
- Documenting handling and analysis activities (e.g., QC checklist);
- Verifying (internally, at the data generator level) all sampling, handling, on-site analytical laboratory data;
- Verifying laboratory data (e.g., laboratory-qualified data);
- Verifying data package deliverable completeness;
- Reviewing the case narrative;
- Presenting all analytical results;
- Summarizing QC sample data; and
- Evaluating applicable raw data

All required data deliverables must be present in the data package in order to proceed to the next step of data validation.

Data validation entails a review of the sample collection, handling, QC data, and the raw data to verify that the laboratory was operating within required limits, analytical results were correctly transcribed from the instrument read-outs and which (if any) environmental samples were related to out-of-control QC samples. The objective of data validation is to identify any questionable or invalid laboratory measurements.

DQIs are used to evaluate conformance with the project DQOs. DQIs are generally defined in terms of six parameters (further defined in Worksheet #12):

- Representativeness
- Comparability
- Completeness
- Precision
- Accuracy
- Sensitivity

Data Validation and Usability

Arcadis will validate data generated using the USEPA's National Functional Guidelines (Organics October 1999 and Inorganics October 2004) and USEPA Region 2 SOPs, where appropriate. These procedures and criteria may be modified, as necessary, to address project-specific and method-specific criteria, control limits, and procedures. Data validation will consist of data screening, checking, reviewing, editing, and interpretation to document analytical data quality and to determine whether the quality is sufficient to meet the DQOs.

The data validator will verify that reduction of laboratory measurements and laboratory reporting of analytical parameters is in accordance with the procedures specified for each analytical method and/or as specified in this QAPP. Any deviations from the analytical method or any special reporting requirements apart from those specified in this QAPP will be detailed on COC forms.

Upon receipt of laboratory data, the following procedures will be executed by the data validator:

- Evaluate completeness of data package.
- Verify that field COC forms were completed and that samples were handled properly.
- Verify that holding times were met for each parameter. Holding time exceedances, should they occur, will be documented. Data for all samples exceeding holding time requirements will be flagged as either estimated or rejected. The decision as to which qualifier is more appropriate will be made on a case-by-case basis.
- Verify that parameters were analyzed according to the methods specified.
- Review QA/QC data (i.e., confirm that duplicates, blanks and spikes were analyzed on the required number of samples, as specified in the method and verify that duplicate and MS recoveries are acceptable).
- Investigate anomalies identified during review. When anomalies are identified, they will be discussed with the Laboratory Project Manager and/or Arcadis Program QA/QC Officer, as appropriate.
- If data appear suspect, investigate the specific data of concern. Calculations will be traced back to raw data. If calculations do not agree, the cause will be determined and corrected.

Deficiencies discovered as a result of the data review, as well as the corrective actions implemented in response, will be documented and submitted in the form of a written report addressing the following topics, as applicable to each method:

- Assessment of the data package;
- Description of any protocol deviations;
- Failures to reconcile reported and/or raw data;
- Assessment of any compromised data;
- Overall appraisal of the analytical data; and
- Table of site name, sample quantities, matrix and fractions analyzed.

It should be noted that qualified results do not necessarily invalidate data. The goal to produce the best possible data does not necessarily mean that data must be produced without QC qualifiers. Qualified data can provide useful information.

During the review process, laboratory qualified and unqualified data are verified against the supporting documentation. Based on this evaluation, qualifier codes may be added, deleted or modified by the data reviewer. Results will be qualified with the following codes in accordance with the USEPA National Functional Guidelines:

Qualifier	Definition
Concentration (C) Qualifiers	
U	The analyte/compound was analyzed for but not detected. The associated value is the compound reporting limit.
B	The analyte/compound has been found in the sample as well as its associated blank, its presence in the sample may be suspect.

Qualifier	Definition
J	The analyte/compound was positively identified; however, the associated numerical value is an estimated concentration only.
Quantitation (Q) Qualifiers	
E	The compound was quantitated above the calibration range.
D	Concentration is based on a diluted sample analysis.
P	The lower of the two values is reported when the percent difference between the results of two GC columns is greater than 40 percent.
Validation Qualifiers	
UJ	The analyte/compound was not detected above the reported sample quantitation limit; however, the reported limit is approximate and may or may not represent the actual reporting limit.
UB	The analyte/compound is considered non-detect at the listed value due to associated blank contamination.
J	The analyte/compound was positively identified; however, the associated numerical value is an estimated concentration.
R	The sample results are rejected.

Two facts will be noted to all data users. First, the "R" flag means that the associated value is unusable. In other words, due to significant QC problems, the analysis is invalid and provides no information as to whether the compound is present or not. Analytes with "R" values should not appear on data tables because they cannot be relied upon for any reason. The second fact is that no compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data, but any value potentially contains error.

Resolution of any issues regarding laboratory performance or deliverables will be handled between the laboratory and the data validator. Suggestions for reanalysis may be made by the Program QA/QC Officer at this point.

Validation Reports

The data validation reports will identify all deficiencies and the potential impact on the results. The Arcadis Data Validator will amend qualifiers generated during the validation process to the database. The validation checklists and the database will be the primary location of all applicable data qualifiers. Qualifiers will not be applied to the hard copy analytical reports.

Reconciliation with Data Usability Requirements

Data results will be examined to determine the performance that was achieved for each data usability criterion. The performance will then be compared with the project objectives and DQOs. Deviations from objectives will be noted. Data that have been rejected will not be used. Data that have been qualified but not rejected will be considered useable (i.e., qualified as estimated) and definitive data. If there is an instance where further limitations must be placed on qualified data, the data will be additionally qualified with “X.” This would indicate that the associated data are non-definitive data and should be used for screening purposes only.

Additional action may be warranted when performance does not meet performance objectives for critical data. Options for corrective action relating to incomplete information, questionable results or inconsistent data may include any or all of the following:

- Retrieval of missing information;
- Request for additional explanation or clarification;

- Reanalysis of sample from extract (when appropriate); and
- Recalculation or reinterpretation of results by the laboratory.

These actions may improve the data quality, reduce uncertainty, and eliminate the need to qualify or reject data. If these actions do not improve the data quality to an acceptable level, the following additional actions may be taken:

- Extrapolation of missing data from existing data points;
- Use of historical data; and
- Evaluation of the critical/noncritical nature of the sample

If the data gap cannot be resolved by these actions, the data bias and potential for false negatives and positives can be evaluated. If the resultant uncertainty level is unacceptable, the following action must be taken:

- Additional sample collection and analysis.

APPENDIX A

ANALYTICAL LABORATORY STANDARD OPERATING PROCEDURES

(Provided on CD)

APPENDIX A

ANALYTICAL LABORATORY STANDARD OPERATING PROCEDURES

Eurofins Document Reference	1-P-QM-WI -9015110	**Revision**	7
Effective Date	Jul 21, 2015	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 10592, 10885, 12718, 13099, 13219, 13713		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Jessica Miller
Reviewed and Approved by	Susan Goshert;Review;Monday, July 13, 2015 11:43:44 AM EDT Kathryn Brungard;Approval;Monday, July 13, 2015 3:09:06 PM EDT

Revision Log:

Revision: 7		**Effective Date:** This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Historical/Local Document Number	Current relevant LIMS analysis scan for procedure	Added analysis scan 13713
Scope	Reflects current analysis scans and reporting limits	Updated LOQ for Tissue to 34 ug/kg and added tissue microwave scan 13713
Calibration	Enhancement	Added information on analyzing the DDT/endrin breakdown for retention time information.

Revision: 6		**Effective Date:** May 27, 2015
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Historical/Local Document Number	Current relevant LIMS analysis scan for procedure	Added analysis scan 13219
Scope	Relevant LIMS analysis scan for procedure Reflects current LOQs Clarification	Added analysis scan 13219 Updated the LOQ for wipes Changed descriptions in the analysis and extraction table
Reagents and Standards	Enhancement	Added standards used to prepare ICV
Gas Chromatographic Conditions	Reflects current GC conditions	Updated GC conditions
Calibration	Reflects current information for sequence	Added the 1016 standard to the sequence and added information on why this standard is analyzed with the calibration. Item 8.e changed wording from must to should per method wording. Item 10. changed the window from 0.03 to 0.02
Statistical Information/Method Performance	Enhancement	Added information on the MDL study and the analysis of the DDT/DDE/DDD standard.
Appendix I	Clarification	Removed standard table and added wording on using the standard database. Updated GC conditions. Changes the order in the sequence for the MD16 and MDPCTX standards.

Reference:

1. *Test Methods for Evaluating Solid Waste*, SW-846, Method 8082A, February 2007.

2. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
Analysis #0819, 11128, 11132, 11135	Sonic Probe Extraction Procedure for the Determination of Polychlorinated Biphenyls (PCBs) in a Solid Matrix
Analysis #10497, 11140	Microwave Extraction Method 3546 for PCBs in a Solid Matrix
1-P-QM-PRO-9015477	Cleanup Procedures for the Extraction of Pesticides and Polychlorinated Biphenyls (PCBs)
1-P-QM-PRO-9015493	QC Data Acceptability and Corrective Action
1-P-QM-PRO-9015494	Interpretation of Chromatographic Data
1-P-QM-PRO-9015495	Preventative and Corrective GC Maintenance
1-P-QM-PRO-9015496	Monitoring QC Data Acceptance Limits
1-P-QM-PRO-9015498	Setting Up Single Component Initial Calibrations
1-P-QM-PRO-9015499	Using "Datalog" Software for Data Acquisition of Multicomponent Pesticides/PCBs
1-P-QM-PRO-9015501	Common Equations Used During Chromatographic Analyses
1-P-QM-QMA-9015390	Demonstrations of Capability
1-P-QM-QMA-9017309	Determining Method Detection Limits and Limits of Quantitation

Scope:

This method is used for identifying and quantitating the following PCBs in solid samples and wipes using SW846 8082A:

Compound	Soil LOQ (µg/kg)	Wipes LOQ (µg)	Tissue LOQ (µg/kg)
Aroclor 1016	17	0.5	34
Aroclor 1221	17	0.5	34
Aroclor 1232	17	0.5	34
Aroclor 1242	17	0.5	34
Aroclor 1248	17	0.5	34
Aroclor 1254	17	0.5	34
Aroclor 1260	17	0.5	34

The following aroclors can also be analyzed for upon request by the client, usually on a project basis. Since aroclors 1262 and 1268 contain peaks that elute much later than 1260, the GC run time may need to be extended to ensure the entire pattern has eluted.

Compound	Soil LOQ (µg/kg)	Wipes LOQ (µg)	Tissue LOQ(µg/kg)
Aroclor 1262	17	0.5	34
Aroclor 1268	17	0.5	34

Aroclors 5422, 5432, and 5460 can be analyzed upon request of the client. See Appendix I for GC operating conditions and calibration information.

Compound	Soil LOQ (µg/kg)
Aroclor 5422	33
Aroclor 5432	33
Aroclor 5460	33

Limits of Quantitiation (LOQs) are based on statistical evaluation of laboratory data and are subject to change. The current Method Detection Limits (MDLs) and LOQs are maintained in the LIMS.

Analysis LIMS scan	Extraction LIMS scan	Description (targets)
10592	11132 sonication	Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260 Aroclor 1262, 1268
10885	10497 microwave	Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260 Aroclor 1262, 1268
13099	13100 microwave	Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260 Aroclor 5432, 5442, 5460
12718 wipes	10497 microwave	Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260 Aroclor 1262,1268
13219 tissue	11128 sonication	Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260 Aroclor 1262,1268
13713 tissue	10497 microwave	Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260 Aroclor 1262,1268

Basic Principles:

A solid sample or entire wipe is extracted using sonic probe with 1:1 methylene chloride:acetone, or microwave extraction with hexane. The extract is dried, concentrated, and exchanged to hexane. A florisil and sulfuric acid cleanup is utilized to reduce any matrix interferences. The PCBs are then identified and quantitated using gas chromatography (GC) with electron capture detector (ECD). Copper cleanup may also be employed to reduce elemental sulfur or other matrix interferences which introduce large, unresolvable peaks into the chromatogram. Refer to 1-P-QM-PRO-9015477 (SOP-OE-004) for details on each cleanup procedure.

Solid matrices other than soil can also be analyzed as long as the sample can be handled through the extraction technique. Typically solids are reduced to small pieces for extracting (concrete, wood, other plant material etc). Tissue samples are ground and homogenized prior to extracting. Tissue samples may be whole fish, filets, or other miscellaneous species (usually aquatic but not necessarily). Wipe samples are analyzed by taking the entire wipe sample and any solvent in the sample container.

Reference Modifications:

Gas Chromatography conditions are different than those listed in Method 8082 however, all QC criteria are met.

Definitions:

1. Analytical Batch – A group of field and Quality Control (QC) samples of the same matrix, extracted together under the same conditions and period of time, using the same lot(s) of chemicals.

2. Continuing calibration verification (CCV) – A mid-level standard used to verify that the analytical response is reliable, and has not changed significantly from the current Initial Calibration curve (ICAL). The verification of the ICAL that is required during the course of analyses at periodic intervals.

3. Initial Calibration Verification (ICV) - Second source calibration verification. A standard obtained or prepared from a source independent of the source of standards for the ICAL. Used to verify the integrity of the standards used for initial calibration.

4. Laboratory Control Sample/ Laboratory Control Sample Duplicate (LCS/LCSD) – A sample of known composition analyzed with each batch of samples to demonstrate laboratory accuracy. The samples either naturally contain the analytes of interest or are clean samples fortified with known concentrations. Used to demonstrate laboratory accuracy. A duplicate is a second aliquot of a sample that is treated identically to the original to determine precision of the test.

5. Matrix spike/matrix spike duplicate (MS/MSD) – A sample created by fortifying a second aliquot of a water or soil sample with some or all of the analytes of interest. The concentration added is known and compared to the amount recovered to determine percent recovery. Matrix spike recoveries provide information about the accuracy of the method in light of the matrix analyzed. A duplicate is a second aliquot of a sample that is treated identically to the original to determine precision of the test.

6. Method blanks – A designated sample designed to monitor for sample contamination during the analysis process. A volume of deionized laboratory water is typically used to monitor water sample analysis, while solids blanks consist of a purified solid matrix or just the reagents used in the test. The blank demonstrates that no artifacts were introduced during the analysis process.

7. Surrogates – Organic compounds which are similar to the analytes of interest but are not naturally occurring in environmental samples. Surrogates are spiked into all standards and every field and QC sample prior to extraction and analysis to provide information regarding the effects of the sample matrix.

Interferences:

Avoid contact with any plastic material during the extraction and analysis procedures to minimize interferences from phthalate esters.

Scrupulously clean all glassware to minimize interferences caused by laboratory contaminants.

An electron capture detector (ECD) is very sensitive to compounds that contain halogens and will also respond to many other compounds and materials including oxygenated organics, unsaturated organics, and elemental sulfur.

Extracts may require further cleanup by sulfuric acid, florisil, or copper if interferents such as oxygenated organics, unsaturated organics, and elemental sulfur are present. Refer to 1-P-QM-PRO-9015477 (SOP-OE-004) for details on each cleanup procedure.

Safety Precautions and Waste Handling:

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

Gloves, lab coats, and safety glasses must be worn when preparing standards. Safety glasses must be worn around the GC where solvents and sample extracts are handled.

GC vials are disposed of in the designated lab container and subsequently lab packed for final disposal. All solvent waste is placed in designated containers in the laboratory then taken to the lab-wide facility by personnel trained in hazardous waste disposal.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC) which is maintained in the analyst's training records.

Initially, each analyst performing instrumental analysis must work with an experienced analyst for a period of time until they can independently calibrate the instrument, use the chromatography data system to set up sequences, perform the calculations, interpret chromatograms, perform instrument maintenance, and enter data into the LIMS. Proficiency is measured through documented audits of the tasks listed and over checking of data as well as an Initial Demonstration of Capability (IDOC).

The IDOC consists of four laboratory control samples that are carried through all steps of the analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Various options are available for a DOC and can include four laboratory control samples, one blind sample, or one ICAL with ICVs and/or CCVs. Refer to 1-P-QM-QMA-9015390 (LOM-SOP-ES-238) for more guidance on these options.

Sample Collection, Preservation, and Handling:

Samples are collected in wide-mouth glass containers with Teflon™-lined caps and kept cool at 0° to 6°C, not frozen. Sample extraction must be performed within 14 days of collection, and sample analysis must be performed with 40 days of extraction.

Apparatus and Equipment:

1. HP 5890 gas chromatograph equipped with an electron capture detector or equivalent

2. Columns:

    a. Phenomonex MultiRes I – 30 m × 0.32 mm × 0.5 µm or equivalent

    b. Phenomonex MultiRes II – 30 m × 0.32 mm × .25 µm or equivalent

    c. Alternatively, Restek columns can be used.

3. Integrating system such as Chrom Perfect® by Justice Laboratory Software, or equivalent. Chrom Perfect® is a data system capable of storing and reintegrating chromatographic data and determining peak areas using a forced baseline, area summation, baseline projection, and performing baseline compensation as required.

4. Various sizes of Class A volumetric flasks, pipettes, and syringes

Reagents and Standards:

A. Reagents

1. Hexane for autosampler rinse vials. Stored at room temperature.

2. UPC (Ultra pure carrier) helium for carrier gas

3. UPC nitrogen for detector make-up gas

4. UPC hydrogen for carrier, either bottled or from a generator

B. Standards

1. All standards are prepared using Class A volumetric pipettes, syringes, and flasks.

2. An analytical balance is used to measure all weights.

3. Unopened ampules are stored according to the manufacturer's instructions and are stable until the expiration date provided by the manufacturer.

4. All prepared standard solutions are stored at -10° to -15°C in labeled containers or vessels.

5. Aroclor 1016 & 1260 stock – Restek #32039 at 1,000,000 ppb in isooctane or equivalent.

    a. At least two different lots of this material are kept in supply; one for working calibration standards and one for matrix spike.

    b. Prepare a ten-fold dilution for an intermediate.

6. Aroclor 1016 ICV Stock – Accustandard Cat# C-2165-H-10X at 1,000,000 ppb in Hexane.

7. Aroclor 1260 ICV Stock - Accustandard Cat# C-2605-H-10X at 1,000,000 ppb in Hexane.

8. Aroclor 1221 stock – Restek #32007 at 100,000 ppb in isooctane or equivalent. Two lots are kept on hand to provide a second source.

9. Aroclor 1232 stock – Restek #32008 at 100,000 ppb in isooctane or equivalent. Two lots are kept on hand to provide a second source.

10. Aroclor 1242 stock – Restek #32009 at 100,000 ppb in isooctane or equivalent. Two lots are kept on hand to provide a second source.

11. Aroclor 1248 stock – Restek #362010 at 1,000,000 ppb in isooctane or equivalent. Two lots are kept on hand to provide a second source

    Prepare an intermediate by diluting 1 mL to 10 mL of hexane. .

12. Aroclor 1254 stock – Restek #32011 at 1,000,000 ppb in isooctane or equivalent. Two lots are kept on hand to provide a second source.

    Prepare an intermediate by diluting 1 mL to 10 mL of hexane.

13. Surrogate stock (SS) – Supelco #861284 containing DCB/TCX at 200,000 ppb in acetone or equivalent.

    Prepare an intermediate by diluting 1.0 mL to 25 mL of hexane for AR1016/1260, AR1254, AR1248.

14. 1016/1260 Matrix spike (MS) stock – Restek #32039 at 1,000,000 ppb in hexane or equivalent.

15. Aroclor 1262 stock – Restek #32409 at 1,000,000 ppb in hexane or equivalent.

    Prepare an intermediate by diluting 1 mL to 10 mL of hexane.

16. Aroclor 1268 stock – Restek #32410 at 1,000,000 ppb in hexane or equivalent.

    Prepare an intermediate by diluting 1 mL to 10 mL of hexane.

17. Instrument Blank (IBLK) – Surrogate Stock (SS) – Supelco #861284 containing Decachlorobiphenyl (DCB) and Tetrachlorometaxylene (TCX) at 2000,000 ppb in acetone or equivalent.

18. Prepare working standards using the electronic standard database as a guide.

    a. In the database, choose the category (i.e. working spike, surrogate, intermediate, etc) and the required standard.

b. The database contains the following information: solution description (ex. AR161), parent solution name, aliquot used, final volume, solvent used, concentration of each compound in the solution, and expiration date. The working standards have an expiration date of 6 months.

c. The calibration scheme begins at or near the reporting limit through a 20 fold of the initial calibration level.

d. The scheme for preparing the matrix and surrogate spiking solutions used in the extraction process are listed below.

Standard Name	Parent Solution	Aliquot (mL)	Final Volume (mL)	Solvent	Description
PCB Spike	1016/1260 MS Stock	1.25	250	Acetone or methanol	Water Spike
SS	SS Stock	1.5	1000	Acetone or methanol	SW-846 Water surrogate – identical to that prepared for Pest/PCB analyses

19. An initial calibration verification standard must also be prepared at a concentration at the mid-point of the calibration for 1016, 1260, 1248 and1254 using a stock solution purchased from a different source other than that used for the calibration standards.

20. Additional standards and preparations are listed in Appendix I for Aroclor 5442, 5432, and 5460 (PCT analysis).

Extraction:

See Organic Extraction Analysis #0819, 11128, 11132, 11135 or Analysis #10497, 11140

Gas Chromatographic Conditions:

The conditions listed are usually the optimum operating conditions but can vary to improve the sensitivity, linearity, and overall chromatography or shorten run times on each GC system.

Detector	ECD
Detector Temperature	330°C
Oven Temperature	110°C 40°C/min to 250°C 20°C/min to 280°C 30°C/min. to 330°C Hold until DCB elutes ~ 2 min.
Carrier	Hydrogen at 12 psi, 5ml/min constant flow (Can be substituted with Helium)
Makeup gas	N2 at 30 mL/min. for Varian GCs N2 at 55 mL/min. for HP GCs
Injection size	1 µL, direct injection
Injection Temperature	225°C

A Merlin microseal may be used in place of a traditional septum.

Calibration:

1. Prior to starting a new calibration, an analyst must change the septum on the GC and allow the system to stabilize (the septum change depends on the number of injections that have been made).

2. Fill the autosampler rinse vials with clean solvent or replace vials which appear dirty.

3. Prepare a sequence using the following suggested order of injections:

1. Conditioner
2. IBLK
3. AR161
4. AR162
5. AR163
6. AR164
7. AR165
8. AR481
9. AR482
10. AR483
11. AR484
12. AR485
13. AR541
14. AR542
15. AR543
16. AR544
17. AR545
18. AR213
19. AR32x
20. AR423
21. AR623
22. AR683
23 AR16xx
24. MD16 (MDL)
25. IC16x (ICV)
26. IC48x (ICV)
27. IC54x (ICV)
28. Blank
29. LCS
30. 1234567
31. 1234567ms
32. 1234567msd

33 – 43. Continue running samples

44. AR163 (CCV)
45. IBLK

a. For routine PCBs:

(1) The AR21 and AR42 are level 3's in the cal and are entered at AR213 and AR423 in the cal.

(2) AR32X is the only one that is an x and it runs at a level 3 concentration.

(3) AR62 and AR68 are both level 3s and are listed as AR623 and AR683 in the sequences.

(4) A single point of Aroclor 1016 is analyzed with the calibration to aid in better pattern recognition in the samples. Aroclor 1016 and 1242 have similar patterns with the exception of the smaller trailing peaks at the end of the Aroclor 1242 pattern. This is identified in the sequence as AR16xx.

(5) A DDT/Endrin breakdown standard is run with each ICAL in order to provide the retention times for p,p-DDE, p,p-DDD, and p,p-DDT which may interfere with the pattern for aroclor 1254 and 1260.

b. See Appendix I for a sequence example when the analysis of PCTs (Aroclors 5442, 5432, and 5460) is requested.

4. Inject conditioner to prime the system.

   a. The conditioner injection is usually a standard or sample which has already been injected.

   b. It is used to prime the system and is best utilized when the GC has not been running and there is a gap in time prior to starting a set of injections.

   c. Hexane blanks may also be run to allow the GC to go through some temperature programs and/or to check the cleanliness of the system.

5. An instrument blank (IBLK) is always run prior to a new calibration to confirm that the instrument is free of background noise or contamination.

   IBLK may also be run with the continuing check standards - this is optional but frequently requested for projects.

6. Initial Calibration (ICAL)

   a. Calibrate for the aroclors using the five levels of 1016, 1260, 1248, and 1254 (calibration range of 50 µg/L through 1000 µg/L) and using the single point for 1221, 1232, 1242, and 1262 and 1268 when needed (200 µg/L standard used).

   b. As an option, 1248 and 1254 may use a single point calibration.

   c. An external standard calibration based on the average calibration factor (AVG CF) is used for quantitation where the %RSD is ≤20%.

   d. The surrogate standards are calibrated using the AR16 levels and the calibration is also performed using AVG CF unless the %RSD is >20%.

   e. When the % RSD criteria is not met (i.e. >20%), a linear calibration curve is used.

      (1) The curve must meet a correlation coefficient of 0.99 to be a valid fit.

      (2) Extrapolate or force to zero is not allowed. Set the zero to ignore.

      (3) See 1-P-QM-PRO-9015498 (SOP-PP-031) for more details.

   f. If the %RSD criteria or 0.99 curve coefficient cannot be met:

      (1) Inspect the data points to see if one or more calibration levels may have concentrated due to solvent evaporation or degraded over time.

      (2) Reinject or remake the standard if this is the cause.

      (3) Perform instrument maintenance as needed.

(4) See 1-P-QM-PRO-9015495 (SOP-PP-013) for troubleshooting linearity problems.

A quadratic fit may not be used for South Carolina samples.

g. Set up the aroclor calibration data in a custom program under Datalog.

(1) The retention times of the peaks to use for identifying and quantifying the aroclors are entered into the calibration file along with the corresponding peak heights and concentrations (in µg/L).

(2) See 1-P-QM-PRO-9015499 (SOP-PP-032) for details.

h. Ensure the surrogate peaks in the standards are labeled properly.

i. Set the scaling of chromatograms so that the size of the peaks of interest for each aroclor are approximately 2 to 3 mm in height at the concentration of the method detection limit (MDL).

(1) Ensure all peaks in the MDL standard are integrated.

(2) By running the1016/1260 MDL standard, the majority of peaks for all aroclors should be represented.

7. Initial Calibration Verification (ICV)

a. Verify the calibration curves using the ICV mixtures injected directly after the full ICAL.

b. The % difference of the concentrations for these must be within 20% difference of the nominal concentration.

8. Continuing Calibration Verification (CCV)

    a. Calibration verification is performed after each set of twenty injections (samples, QC, blanks, etc.) or 12 hours, whichever comes first.

    b. Use AR16 to evaluate the calibration of the aroclors (or other aroclors as requested for particular clients or projects).

    c. The concentration quantitated for the continuing calibration verification standards must be within 20% difference (%D) of the nominal concentration for each compound.

    d. Samples must be bracketed by compliant standards.

        (1) Exception: If standard following a sample is outside the ±20% but exhibits increasing response, the samples before it do not have to be reinjected if the target analytes are not detected.

        (2) If CCVs continue to fail, corrective action must be taken, which can include performing injection port maintenance.

    e. If confirmation of target analytes is needed, then the second column should meet the 20% continuing calibration criteria, as well as all initial calibration criteria.

9. The instrument blank (IBLK) is injected after each set of continuing calibration verification when requested.

    a. It must be evaluated as a water matrix against the water MDL/LOQs.

    b. The IBLK must not have any target compounds above the reporting limits.

        (1) If a target analyte is detected in the IBLK, any associated samples with a detection for that same target must be evaluated.

(2) Unless the concentration in the sample is more than 10x the IBLK value, the sample must be injected after another compliant IBLK.

(3) Instrument maintenance, like baking the system or injection port maintenance is usually necessary to clean up the instrument.

10. Retention time (RT) windows

a. Established as 3× the standard deviation determined over 72 hours, or at no less than ±0.02 min, applied to the midpoint initial calibration standard.

b. If the RTs for a continuing calibration verification standard fall outside the RT window, update the midpoint RT using that standard.

(1) Save this under the appropriate name to indicate an update has occurred.

(2) RTs cannot be updated more than once per day. All subsequent standards run within a 24-hour period must be within this window.

(3) If RTs are not consistent, the cause must be investigated and corrective action taken.

Procedure:

1. Prepare a sequence of injections as suggested in the Calibration Section, along with the appropriate check standards.

2. Retention times of peaks in the samples are compared to the standard RT windows

a. Peaks present on both columns that are also in the correct ratios to represent an aroclor are quantitated, and the high value is reported unless chromatographic anomalies are observed. See 1-P-QM-PRO-9015494 (SOP-PP-011).

b. Use a minimum of three to six peaks for quantitation, with the exception of certain mixes where it may be more accurate to use less peaks to avoid excessive overlap of patterns.

3. Continue running groups of samples/injections followed by check standards every 12 hours or 20 injections, whichever comes first.

   a. For projects where a known aroclor is present and at the request of clients, other aroclors can be run for the continuing check standard. For instance, a set of continuing standards may be AR483, AR163, IBLK.

   b. + Aroclor 1262 and 1268 can be analyzed when requested. A full five point curve can also be run, depending on the project requirements.

4. If significant interference is present, schedule florisil and/or sulfuric acid cleanup. If elemental sulfur is present, TBA or copper the extract or have it put through GPC cleanup. If these techniques do not reduce the matrix problems, dilute the extract and adjust LOQs accordingly.

5. Report the results for the least dilute sample where the concentration measured is within the acceptable calibration range.

Calculations:

1. The peak heights generated by the integration system are used to calculate the calibration factors (CF) for peaks of interest for each aroclor.

   Usually, the six major peaks that are unique to each aroclor are chosen for quantitation, with the exception of 1221 where only three peaks are available.

2. Sample concentrations are calculated per peak using average calibration factor (AVG CF) from the initial calibration.

$$\frac{Sample\ Height}{AVG\ CF\ (CF)} \times \frac{FV}{IW} \times DF = \mu g/kg\ as\ received\ per\ peak$$

Where:

FV = Final volume (mL)

IW = Initial weight (g)

DF = Dilution factor, as needed

The final result that is reported is determined as the average of the result for each peak chosen for quantitation:

$$(Result\ 1 + Result\ 2 + \ldots + Result\ n)/n = Average\ Result$$

3. The surrogate results are determined using either AVGRF or linear curve:

Using AVGCF from the initial calibration:

$$\frac{Sample\ Height}{AVG\ CF\ (CF)} \times \frac{FV}{IW} \times DF = \mu g/kg\ as\ received$$

b. Using linear curve from the initial calibration:

$$[(Sample\ Height - Y\ -\ intercept) / Slope] x \frac{FV}{IW} x\ DF = \mu g/kg\ as\ received$$

Where:

FV = Final volume

IW = Initial weight

DF = Dilution factor, as needed

4. See 1-P-QM-PRO-9015501 (SOP-PP-040) for all other equations related to the analysis.

Statistical Information/Method Performance:

Generate reporting limits including method detection limits (MDLs) and limits of quantitation (LOQs) according to 1-P-QM-QMA-9017309 (LOM-SOP-ES-203). Initially, perform an MDL study on each instrument used for the analysis. Determine the MDL by taking seven spiked replicates through the entire extraction and analysis procedure. The results are tabulated using an Excel spreadsheet. Compare and pool results to determine the final reporting MDL. An MDL study or verification of the MDL is required each year. NELAC allows for an annual verification of the MDL in lieu of a full MDL study. The department supervisor maintains annual study data. Updates to the LIMS are made as need by the QA Department and only as directed by the manager. Update the department database via a download from the LIMS.

Common single component pesicides such as DDT, DDD, and DDE may cause interference with the aroclor pattern. To ensure that the analyst is aware of this, a standard containing DDE/DDD/DDT will be run with each initial calibration. QC Acceptance limits are established as statistical limits. See 1-P-QM-PRO-9015496 (SOP-PP-025) for further information on monitoring and establishing limits.

Quality Assurance/Quality Control:

A sodium sulfate blank and a sodium sulfate spike (LCS) are analyzed with every group of samples up to a maximum of 20. An MS/MSD is performed per batch. For wipes and when an MS/MSD cannot be performed, an LCSD will be extracted.

Aroclor 1016 and 1260 are routinely spiked; however, other aroclors can be spiked as requested by clients.

DCB and TCX are added as surrogates to each sample and QC to monitor the efficiency of the extraction, the operation of the autosampler, and to monitor retention times throughout the GC run.

If any client, agency, or state has more stringent QC or batch requirements, these must be followed.

See 1-P-QM-PRO-9015493 (SOP-PP-002) for details on QC acceptance criteria and corrective action.

Appendix I

PCT Analysis (Aroclor 5422, 5432, and 5460)

A. Standards:

1. PCT-Stocks- Aroclor 5432, 5442, and 5460 purchased as individually ampulated solutions from Accustandard at 35,000ug/L.

2. Surrogate Stock- Ultra ISM-320 containing TCX/DCB at 200,000ppb in acetone. Prepare an intermediate by diluting 0.25mL to 25mL of hexane.

3. MS stock of Aroclor 5442 - Absolute cat# 71791, 1000ug/L in Methanol.

4. Prepare working standards using the electronic standard database as a guide.

    a. In the database, choose the category (i.e. working spike, surrogate, intermediate, etc) and the required standard.

    b. The database contains the following information: solution description (ex. AR161), parent solution name, aliquot used, final volume, solvent used, concentration of each compound in the solution, and expiration date. The working standards have an expiration date of 6 months.

    c. The calibration scheme begins at or near the reporting limit through a 20 fold of the initial calibration level.

    d. The scheme for preparing the matrix and surrogate spiking solutions used in the extraction process are listed below.

Standard Name	Parent Solution	Aliquot (mL)	Final Volume (mL)	Solvent	Description
MS	5422 MS Stock	1.25	250	Acetone or methanol	PCT Water Spike
SS	SS Stock	1.5	1000	Acetone or methanol	PCB surrogate

B. GC Chromatographic Analysis

The conditions listed serve as a guideline only and are typically the optimum operating conditions. The analyst may make any changes to the chromatographic conditions to improve the speed of analysis, linearity, sensitivity, and/or improve separation if initial and continuing calibration criteria and quality assurance criteria listed within this analysis document are met.

Detector: ECD

Detector temp: 330°C
Oven Temp: 110°C to 250° at 40°C/min, to 280°C at 20°C/min, to 330°C at 30°C/min, hold 9 min.

Carrier: Hydrogen at 3.6 mL/min

Makeup gas: N_2 at 60mL/min or equivalent

Injection size: 1-uL, direct injection

Injection temp: 225°C

C. Example of a Sequence:

1. Conditioner
2. IBLK
3. AR161
4. AR162
5. AR163
6. AR164
7. AR165
8. AR481
9. AR482
10. AR483
11. AR484
12. AR485
13. AR541
14. AR542
15. AR543
16. AR544
17. AR545
18. PCT1
19. PCT2
20. PCT3
21. PCT4
22. PCT5
23. A4421
24. A4422
25. A4423
26. A4424
27. A4425
28. AR213
29. AR32x
30. AR423
31. AR623
32. AR683
33. AR16xx
34. MDPCTX
35. MD16
36. IC16
37. IC48
38. IC54
39. Blank
40. LCS
41. 1234567
42. 1234567MS
43. 1234567MSD

44-58. Continue running samples

59. AR163
60. PCT3
61. A4423
62. IBLK

Eurofins Document Reference	1-P-QM-WI -9015109	**Revision**	5
Effective Date	Nov 4, 2015	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 10591, 13092		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Jessica Miller
Reviewed and Approved by	Susan Goshert;Review;Wednesday, October 21, 2015 1:31:12 PM EDT Kathryn Brungard;Approval;Wednesday, October 21, 2015 1:35:48 PM EDT

Revision Log:

Revision: 5	**Effective Date:** This version	
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Historical/ Local Document Number	LIMS scan relevant to this procedure	Add 13092 for PCTs
Sample Collection, Preservation, and Handling	Reflects current industry standard for refrigeration storage.	Changed to 0° to 6° C, not frozen.
Apparatus and Equipment	Reflects current instrumentation	Updated 7890 GC
Calibration	Reflects method criteria Enhancement Reflects current procedure	Changed wording to second column should meet 20% continuing calibration criteria. Added information on analyzing an EVAL to aid in identifying possible DDD, DDE, and DDT in the aroclor pattern. Added information on analyzing a single PCB 1016 standard to help with pattern recognition. Changed the RT window from 0.03 to 0.02 min.
Gas Chromatographic Conditions	Reflects current operating conditions	Updated GC conditions.
Calculation	Clarification	Added information on not using individual peaks where the value is <MDL in calculating the PCB concentration.
Appendix I	Clarification for PCTs	Removed table for calibration standard preparation and added information referencing the standard database. Updated GC conditions for analyzing PCTs.

Revision: 4	**Effective Date:** Jan 10, 2013	
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout Document	Reflect re-identification of documents in EtQ	Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Cross Reference	Referenced in SOP	Added Demonstrations of Capability reference 1-P-QM-QMA-9015390
Scope	Clarification	Added PCT's (Aroclor 5422, 5432, and 5460).
Basic Principles	Unnecessary information	Removed 1L sample size.
Definitions	Enhancement	Added full definitions vs. acronyms.
Personnel Training and Qualification	Clarification	Added information on IDOC and DOCs.
Apparatus and Equipment	Enhancement	Added information on the data systems capability.
Reagents and Standards	Reflects current practices	Added reference to PCT's and to the standard database.
Extraction	Reflects current extractions	Deleted all unnecessary extractions scans.
Calibration	Enhancement	Reformatted section
Appendix I	Reflects current procedure	Added calibration information and sequence information.

Reference:

1. *Test Methods for Evaluating Solid Waste*, SW-846, Method 8082A, February 2007.

2. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
Analysis #6654, 10241, 11112, 11113, 11114, 11116, 11117, 11118, 11119, 11120, 11121, 11123, 11126, 11960, 12026, 12822, 13086, 13093, 13183, 13187	Separatory Funnel Extraction by Method 3510C, 608 or 622 for Pesticides and PCBs in a Wastewater
1-P-QM-PRO-9015477	Cleanup Procedures for the Extraction of Pesticides and Polychlorinated Biphenyls (PCBs)
1-P-QM-PRO-9015493	QC Data Acceptability and Corrective Action
1-P-QM-PRO-9015494	Interpretation of Chromatographic Data
1-P-QM-PRO-9015495	Preventative and Corrective GC Maintenance
1-P-QM-PRO-9015496	Monitoring QC Data Acceptance Limits
1-P-QM-PRO-9015498	Setting Up Single Component Initial Calibrations
1-P-QM-PRO-9015499	Using "Datalog" Software for Data Acquisition of Multicomponent Pesticides/PCBs
1-P-QM-PRO-9015501	Common Equations Used During Chromatographic Analyses
1-P-QM-QMA-9015390	Demonstrations of Capability
1-P-QM-QMA-9017309	Determining Method Detection Limits and Limits of Quantitation

Scope:

This method is useful for identifying and quantitating the following polychlorinated biphenyls (PCBs) as Aroclors in aqueous matrices:

Compound	LOQ (µg/L)
Aroclor 1016	0.5
Aroclor 1221	0.5
Aroclor 1232	0.5
Aroclor 1242	0.5
Aroclor 1248	0.5
Aroclor 1254	0.5
Aroclor 1260	0.5

The following aroclors can also be analyzed for upon request by the client, usually on a project basis. Since aroclors 1262 and 1268 contain peaks that elute much later than 1260, the GC run time needs to be extended to ensure the entire pattern has eluted.

Compound	LOQ (µg/L)
Aroclor 1262	0.5
Aroclor 1268	0.5
Aroclor 5422	0.5
Aroclor 5432	0.5
Aroclor 5460	0.5

See Appendix I for GC operating conditions and calibration information when analyzing for Aroclor 5422, 5432, and/or 5460.

Limits of Quantitiation (LOQs) are based on annual statistical evaluation of laboratory data and are subject to change. The current Method Detection Limits (MDLs) and LOQs are maintained in the LIMS.

Basic Principles:

A portion of an aqueous sample is extracted serially with methylene chloride. The volume of sample extracted can be adjusted depending on the physical appearance of the sample and the amount sent for analysis. The extract is dried, concentrated, and exchanged into hexane. The PCBs are then identified and quantitated using gas chromatography (GC) with an electron capture detector (ECD). The extract may require further cleanup (by florisil, sulfuric acid, or copper) to reduce matrix interferences that introduce large, unresolvable peaks in the chromatogram (due to interferents such as phthalates, oxygenated organics, unsaturated organics, or elemental sulfur).

Reference Modifications:

Gas Chromatography conditions are different than those listed in Method 8082A however, all QC criteria are met.

Definitions:

1. Analytical Batch – A group of field and Quality Control (QC) samples of the same matrix, extracted together under the same conditions and period of time, using the same lot(s) of chemicals.

2. Continuing Calibration Verification (CCV) – A mid-level standard used to verify that the analytical response is reliable, and has not changed significantly from the current Initial Calibration curve (ICAL). The verification of the ICAL that is required during the course of analyses at periodic intervals.

3. Initial Calibration Verification (ICV) – Second source calibration verification. A standard obtained or prepared from a source independent of the source of standards for the ICAL. Used to verify the integrity of the standards used for initial calibration.

4. Laboratory Control Sample/ Laboratory Control Sample Duplicate (LCS/LCSD) – A sample of known composition analyzed with each batch of samples to demonstrate laboratory accuracy. The samples either naturally contain the analytes of interest or are clean samples fortified with known concentrations. Used to demonstrate laboratory accuracy. A duplicate is a second aliquot of a sample that is treated identically to the original to determine precision of the test.

5. Matrix Spike/Matrix Spike Duplicate (MS/MSD) – A sample created by fortifying a second aliquot of a water or soil sample with some or all of the analytes of interest. The concentration added is known and compared to the amount recovered to determine percent recovery. Matrix spike recoveries provide information about the accuracy of the method in light of the matrix analyzed. A duplicate is a second aliquot of a sample that is treated identically to the original to determine precision of the test.

6. Method Blanks – A designated sample designed to monitor for sample contamination during the analysis process. A volume of deionized laboratory water is typically used to monitor water sample analysis, while solids blanks consist of a purified solid matrix or just the reagents used in the test. The blank demonstrates that no artifacts were introduced during the analysis process.

7. Surrogates – Organic compounds which are similar to the analytes of interest but are not naturally occurring in environmental samples. Surrogates are spiked into all standards and every field and QC sample prior to extraction and analysis to provide information regarding the effects of the sample matrix.

Interferences:

A. Avoid contact with any plastic material during the extraction and analysis procedures to minimize interferences from phthalate esters.

B. Scrupulously clean all glassware to minimize interferences caused by laboratory contaminants.

C. An electron capture detector (ECD) is very sensitive to compounds that contain halogens and will also respond to many other compounds and materials including oxygenated organics, unsaturated organics, and elemental sulfur.

D. Extracts may require further cleanup if interferents are present. Refer to 1-P-QM-PRO-9015477 (SOP-OE-004) for details on each cleanup procedure. Interfering materials can introduce large, unresolvable peaks into the chromatogram.

1. Use Florisil cleanup to reduce organics that can interfere (polar compounds).

2. Use GPC to remove sulfur and higher molecular weight organics.

3. Use copper or TBA cleanup to remove elemental sulfur.

Safety Precautions and Waste Handling:

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

Gloves, lab coats, and safety glasses must be worn when preparing standards. Safety glasses must be worn around the GC where solvents and sample extracts are handled.

GC vials are disposed of in the designated lab container and subsequently lab packed for final disposal. All solvent waste is placed in designated containers in the laboratory then taken to the lab-wide facility by personnel trained in hazardous waste disposal.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC) which is maintained in the analyst's training records.

Initially, each analyst performing instrumental analysis must work with an experienced analyst for a period of time until they can independently calibrate the instrument, use the chromatography data system to set up sequences, perform the calculations, interpret chromatograms, perform instrument maintenance, and enter data into the LIMS. Proficiency is measured through documented audits of the tasks listed and over checking of data as well as an Initial Demonstration of Capability (IDOC).

The IDOC consists of four laboratory control samples that are carried through all steps of the analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Various options are available for a DOC and can include four laboratory control samples, one blind sample, or one ICAL with ICVs and/or CCVs. Refer to 1-P-QM-QMA-9015390 (LOM-SOP-ES-238) for more guidance on these options.

Sample Collection, Preservation, and Handling:

Samples are collected in amber glass containers with Teflon-lined caps, preserved with 0.008% sodium thiosulfate in case residual chlorine is present, and kept cool at 0° to 6°C, not frozen. Sample extraction must be performed within 7 days of collection, and sample analysis must be performed with 40 days of extraction.

Apparatus and Equipment:

1. HP 7890 gas chromatograph equipped with an electron capture detector, or equivalent

2. Phenomonex MultiRes I – 30 m × 0.32 mm × 0.5 µm, or equivalent

3. Phenomonex MultiRes II – 30 m × 0.32 mm × 0.25 µm, or equivalent

4. Integrating system such as Chrom Perfect® by Justice Laboratory Software, or equivalent. Chrom Perfect® is a data system capable of storing and reintegrating chromatographic data and determining peak areas using a forced baseline, area summation, baseline projection, and performing baseline compensation as required.

5. Various sizes of Class A volumetric flasks, pipettes, and syringes

Reagents and Standards:

A. Reagents

1. Follow manufacturer's guidelines for storage conditions.

2. Hexane for autosampler rinse vials. Stored at room temperature.

3. UPC (Ultra Pure Carrier) helium for carrier gas.

4. UPC nitrogen for detector make-up gas.

5. UPC hydrogen carrier gas, either bottled or from a generator.

B. Standards

1. All standards are prepared using Class A volumetric pipettes, syringes, and flasks.

2. All weights are made on an analytical balance.

3. Unopened ampules are stored according to the manufacturer's instructions and are stable until the expiration date provided by the manufacturer.

4. All prepared standard solutions are stored at -10° to -15°C.

5. Aroclor 1016 stock – Restek 32006 at 1,000,000 ppb in hexane. Prepare an intermediate by diluting 1 to 10 mL of hexane.

6. Aroclor 1260 stock – Restek 32012 at 1,000,000 ppb in hexane. Prepare an intermediate by diluting 1 to 10 mL of hexane.

7. Aroclor 1221 stock – Restek 32007 at 100,000 ppb in hexane. Two separate lots are kept on hand to provide a second source.

8. Aroclor 1232 stock – Restek 32008 at 100,000 ppb in hexane. Two separate lots are kept on hand to provide a second source.

9. Aroclor 1242 stock – Restek 32009 at 100,000 ppb in hexane. Two separate lots are kept on hand to provide a second source.

10. Aroclor 1248 stock – Restek 32010 at 1,000,000 ppb in hexane. Prepare an intermediate by diluting 1 to 10 mL of hexane. Two separate lots are kept on hand to provide a second source.

11. Aroclor 1254 stock – Restek 32011 at 1,000,000 ppb in hexane. Prepare an intermediate by diluting 1 to 10 mL of hexane. Two separate lots are kept on hand to provide a second source.

12. Surrogate stock (SS) – Supelco 861284 containing DCB/TCX at 200,000 ppb in acetone. Prepare an intermediate by diluting 0.25 to 25 mL of hexane.

13. 1016/1260 Matrix spike (MS) stock: Restek 32039. Each at 1,000,000 ppb in hexane. Also used as a second source stock. Prepare an intermediate by diluting 1 mL to 10 mL of hexane.

14. Aroclor 1262 stock – Restek #32409 at 1,000,000 ppb in hexane. Prepare an intermediate by diluting 1 mL to 10 mL of hexane.

15. Aroclor 1268 stock – Restek #32410 at 1,000,000 ppb in hexane. Prepare an intermediate by diluting 1 mL to 10 mL of hexane.

16. Instrument Blank (IBLK) – Surrogate Stock (SS) – Supelco #861284 containing Decachlorobiphenyl (DCB) and Tetrachlorometaxylene (TCX) at 200,000 ppb each in acetone.

17. Prepare working standards using the electronic standard database as a guide.

    a. In the database, choose the category (i.e. working spike, surrogate, intermediate, etc) and the required standard.

    b. The database contains the following information: solution description (ex. AR161), parent solution name, aliquot used, final volume, solvent used, concentration of each compound in the solution, and expiration date. The working standards have an expiration date of 6 months.

    c. The calibration scheme begins at or near the reporting limit through a 20 fold of the initial calibration level.

d. For Bottle Code 43's

Standard Name	Parent Solution	Aliquot (mL)	Final Volume (mL)	Solvent	Description
PCB Spike	1016/1260 MS Stock	1.25	250	Acetone or methanol	Water Spike
SS	SS Stock	1.5	1000	Acetone or methanol	SW-846 Water surrogate – identical to that prepared for Pest/PCB analyses

e. For Bottle Code 153's

Standard Name	Parent Solution	Aliquot (mL)	Final Volume (mL)	Solvent	Description
Mini Sep. PCB Spike	PCB Spike	12.5	50	Acetone or methanol	Water Spike
SS	SS Stock	0.375	1000	Acetone or methanol	SW-846 Water surrogate – identical to that prepared for Pest/PCB analyses

18. An initial calibration verification standard must also be prepared at a concentration at the mid-point of the calibration for 1016, 1260, 1248, 1254 using a stock solution purchased from a different vendor or different lot than that used for the calibration standards.

19. Additional standards and preparations are listed in Appendix I for Aroclor 5442, 5432, and 5460 (PCT analysis).

Extraction

See organic extraction Analysis # 6654, 10241, 11112, 11113, 11114, 11116, 11117, 11118, 11119, 11120, 11121, 11123, 11126, 11960, 12026, 12822, 13086, 13093, 13183, 13187

Gas Chromatographic Conditions

The conditions listed are usually the optimum operating conditions but can vary to improve the sensitivity, linearity, and overall chromatography or shorten run times on each GC system.

Detector	ECD
Detector Temperature	330°C
Oven Temperature	110°C 40°C/min. to 250°C 20°C/min. to 280°C 30°C/min to 330°C Hold until DCB elutes ~ 2 min.
Column A	MR I
Column B	MR II
Carrier	Hydrogen at 12 psi, 5ml/min constant flow. (Can be substituted with Helium)
Makeup gas	N_2 at 80 mL/min. for Agilent GCs
Injection size	1 µL, direct injection
Injection Temperature	225°C

A Merlin microseal can be used in place of traditional septum.

Calibration:

A. Prior to starting a new calibration, an analyst must change the septum on the GC and allow the system to stabilize (the septum change depends on the number of injections that have been made).

B. Fill the autosampler rinse vials with clean solvent or replace vials that appear dirty.

C. Prepare a sequence using the following order of injections:

1. Conditioner
2. IBLK
3. EVAL
4. AR161
5. AR162
6. AR163
7. AR164
8. AR165
9. AR481
10. AR482
11. AR483
12. AR484
13. AR485
14. AR541
15. AR542
16. AR543
17. AR544
18. AR545
19. AR213
20. AR32x
21. AR423
22. AR623
23. AR683
24. MD16 (MDL)
25. IC16X (ICV)
26. IC48X (ICV)
27. IC54X (ICV)
28. Blank
29. LCS
30. 1234567
31. 1234567ms
32. 1234567msd
33.- 43. Continue running samples
44. AR163 (CCV)
45. IBLK

1. Note for our routine PCBs: The AR21 and AR42 are level 3's in the ICAL and are entered as AR213 and AR423 in the ICAL. AR32X is the only one that is an x and it runs at a level 3 concentration. Also the AR62 and AR68 are both level 3s and are listed as AR623 and AR683 in the sequences.

2. A single point of Aroclor 1016 is analyzed with the calibration to aid in better pattern recognition in the samples. Aroclor 1016 and 1242 have similar patterns with the exception of the smaller trailing peaks at the end of the Aroclor 1242 pattern. This is identified in the sequence as AR16xx.

3. A DDT/Endrin breakdown standard is run with each ICAL in order to provide the retention times of p,p-DDE, p,p-DDD, and p,p-DDT which may interfere with the pattern for aroclor 1254 and 1260.

4. See Appendix I for a sequence example when the analysis of PCTs (Aroclors 5442, 5432, and 5460) is requested.

D. Continue running groups of samples/injections. Each bracket must contain no more than 20 samples/injections and last no more than 12 hours for Method 8082A. Each bracket is followed by the continuing calibration check standard and an instrument blank (IBLK).

E. The conditioner injection is usually a standard or sample that has already been injected.

1. The conditioner is used to prime the system.

2. It is best utilized when the GC has not been running and there is a gap in time prior to starting a set of injections.

F. Hexane blanks can also be run to allow the GC to go through some temperature programs and/or to check the cleanliness of the system.

G. Instrument blanks (IBLK) may also be run with the continuing calibration standards. This is optional but frequently requested for projects.

1. The instrument blank (IBLK) is injected after the conditioners but before the initial calibration.

2. It is used to determine that the instrument is free of background noise or contamination.

H. For projects where a known aroclor is present and at the request of clients other aroclors can be run for the continuing check standard. For instance, a set of continuing standards can be AR483, AR163, and IBLK.

I. Aroclor 1262 and 1268 can be analyzed when requested. A full five point curve can also be run, depending on the project requirements.

J. Initial Calibration (ICAL)

1. Calibrate for the aroclors using the five levels of 1016, 1260, 1248, and 1254. Use the single point for 1221, 1232, 1242, 1262, and 1268 when needed. As an option, 1248 and 1254 can use a single point calibration.

2 An external standard calibration based on the average calibration factor (AVG CF) for all analytes is used for quantitation where the %RSD is ≤20%.

3. The surrogate standards are calibrated using the AR16 levels using AVGCF unless the %RSD is >20%.

4. For the surrogates only: If the RSD is > 20%, use a calibration curve.

   a. Use a linear fit.

   b. The correlation coefficient must be >0.99 to be a valid fit.

   c. Extrapolate or force to zero is not allowed. Set the zero to ignore. See 1-P-QM-PRO-9015498 (SOP-PP-031) for more details.

5. If the 0.99 curve coefficient cannot be met, or the 20% RSD for the aroclors:

   a. Inspect the data points to see if one or more calibration level became concentrated due to solvent evaporation or degraded over time.

   b. Reinject or remake the standard if a specific calibration level has concentrated due to solvent evaporation, or degraded over time..

c. Perform instrument maintenance as needed. See 1-P-QM-PRO-9015495 (SOP-PP-013) for troubleshooting linearity problems.

6. The calibration range for the aroclors is 50ug/L to 1000 µg/L. Level 1 is equivalent to the Limit of Quantitation.

7 Set up the aroclor calibration data in a custom program under Datalog.

The retention times of the peaks to use for identifying and quantifying the aroclors are entered into the calibration file along with the corresponding peak heights and concentrations. See 1-P-QM-PRO-9015499 (SOP-PP-032) for details.

8. Ensure the peaks in the standards are labeled properly, including the surrogates in all injections that contain them.

9. Set the scaling of chromatograms and peak integration parameters so that the size of the peaks for each compound of interest are approximately 2 to 3 mm in height at the concentration of the method detection limit (MDL).

a. Ensure all peaks in the MDL standard are integrated.

b. By running the 1016/1260 MDL standard, the majority of peaks of all aroclors are represented.

K. Initial Calibration Verification (ICV)

1. Verify the calibration curves using the ICV mixtures injected directly after the full ICAL.

2. The % difference of the concentrations for these must be within 20% difference of the nominal concentration.

a. If this criteria is not met, reinject the ICV.

b. If the criteria is not met again, then prepare a new standard.

L. Continuing Calibration Verification (CCV)

1. Calibration verification is performed after each set of twenty injections (samples, QC, blanks, etc.) or 12 hours, whichever comes first.

2. Use AR16 to evaluate the calibration of the aroclors (or other aroclors as requested for particular clients or projects).

3. Other aroclors can also be used along with AR16. This must be done if a site has prior history of containing a specific aroclor, or as requested for client projects or to meet other regulatory requirements.

4. The concentration quantitated for the continuing calibration check standards must be within 20% difference (%D) of the nominal concentration for each compound.

5. Samples must be bracketed with compliant standards.

   a. Exception: If the standard following a sample is outside the ±20% but exhibits increasing response, the samples before it do not have to be reinjected if the target analytes are not detected.

   b. If continuing calibration checks continue to fail, corrective action must be taken, which can include performing injection port maintenance.

   c. If confirmation of target analytes is needed, the second column should meet the 20% continuing calibration criteria as well as all initial calibration criteria.

6. The instrument blank (IBLK) is injected after each set of continuing calibration verifications when requested.

   a. It must be evaluated as a water matrix against the water MDL/LOQs.

b. The IBLK must not have any target compounds above the reporting limits.

(1) If a target analyte is detected in the IBLK, any associated samples with a detection for that same target must be evaluated.

(2) Unless the concentration in the sample is more than 10x the IBLK value, the sample must be reinjected after another compliant IBLK.

(3) Instrument maintenance, like baking the system or injection port maintenance is usually necessary to clean up instrument.

7. Retention time (RT) windows

a. Established as 3× the standard deviation determined over 72 hours or at no less than ±0.02 min, applied to the mid-point initial calibration standard.

b. If the RTs for a CCV fall outside the RT window, update the mid-point RT using that standard.

(1) Save this under the appropriate name to indicate an update has occurred.

(2) RTs cannot be updated more than once per day. All subsequent standards run within a 24-hour period must be within this window.

(3) If RTs are not consistent, the cause must be investigated and corrective action taken.

Procedure:

1. Make injections via an auto sampler.

2. Samples are analyzed according to the sequence in the calibration section above, along with the appropriate check standards.

3. Retention times of peaks in the samples are compared to the standard RT windows.

   Peaks present on both columns that are also in the correct ratios to represent an aroclor are quantitated and the high value is reported unless chromatographic anomalies are observed. See 1-P-QM-PRO-9015494 (SOP-PP-011).

4. Use a minimum of three to six peaks for quantitation, with the exception of certain mixes where it can be more accurate to use less peaks to avoid excessive overlap of patterns.

5. If significant interference is present, schedule florisil and/or sulfuric acid cleanup. If elemental sulfur is present, copper treat the extract or have it put through GPC cleanup. If these techniques do not reduce the matrix problems, dilute the extract and adjust LOQs accordingly.

6. Report the results for the least dilute sample where the concentration measured is within the acceptable calibration range.

Calculations:

A. See 1-P-QM-PRO-9015501 (SOP-PP-040) for details on all calculations/equations used to evaluate the initial and continuing calibration.

B. Calculation of results is performed according to the following procedures:

1. The peak heights generated by the integration system are used to calculate the calibration factors (CF) for peaks of interest for each aroclor. Usually, the six major peaks that are unique to each aroclor are chosen for quantitation with the exception of 1221 where only three peaks are available.

2. Sample concentrations are calculated per peak using average calibration factor (AVG CF) from the initial calibration for 1016, 1260, 1248, and 1254 where a multi-point calibration is run, single point CF for 1221, 1232, 1242, (a multi-point calibration can also be run for these as requested or necessary to meet client or regulatory agency requirements). Do not use individual peaks that have values <MDL in quantitation.

3. $$\frac{Sample\ Height}{AVG\ CF\ (CF)} \times \frac{FV}{IV} \times DF = \mu g/L\ as\ received$$

Where:

FV = Final volume – 10 mL

IV = Initial volume – 1000 mL

DF = Dilution factor, as needed

The final result that is reported is determined as the average of the result for each peak chosen for quantitation:

4. The surrogate results are determined using either AVGRF or linear curve:

$$(Result\ 1 + Result\ 2 + \ldots + Result\ n) / n = Average\ Result$$

a. Using AVGCF from the initial calibration:

$$\frac{Sample\ Height}{AVG\ CF\ (CF)} \times \frac{FV}{IV} \times DF = \mu g/L\ as\ received$$

b. Using linear curve from the initial calibration:

$$[(Sample\ Height - Y - intercept)/Slope] \times \frac{FV}{IV} \times DF = \mu g/L\ as\ received$$

Where:

FV = Final volume – 10 mL

IV = Initial volume – 1000 mL

DF = Dilution factor, as needed

Statistical Information/Method Performance:

Generate method detection limits (MDLs) and limits of quantitation (LOQs) according to (1-P-QM-QMA-9017309) LOM-SOP-ES-203. Perform an MDL study on each instrument used for the analysis. Determine the MDL by taking seven spiked replicates through the entire extraction and analysis procedure. Compare and pool results to determine the final reporting MDL. (NELAC allows for an annual verification of the MDL in lieu of an annual EPA MDL study).The department management maintains annual study data. The department manager requests that the QA Department update to the LIMS as needed. Update the department database via a download from the LIMS.

QC Acceptance limits are established as statistical limits. See 1-P-QM-PRO-9015496 (SOP-PP-025) for further information on monitoring and establishing limits.

Quality Assurance/Quality Control:

A reagent water blank and a reagent water spike (LCS) are analyzed each day with every batch of samples (batch size is 20). An MS/MSD is performed per batch as long as there is ample volume of a sample in the batch. If an MS/MSD cannot be performed, an LCSD must be extracted.

Aroclor 1016 and 1260 are routinely spiked, however, other aroclors can be spiked as requested by clients.

DCB and TCX are added as surrogates to each sample and QC to monitor the efficiency of the extraction, the operation of the autosampler, and to monitor retention times throughout the GC run.

If any client, agency, or state has more stringent QC or batch requirements, these must be followed.

See 1-P-QM-PRO-9015493 (SOP-PP-002) for details on QC acceptance criteria and corrective action.

Appendix I

PCT Analysis (Aroclor 5442, 5432, and 5460)

A. Standards:

PCT-Stocks - Aroclor 5432, 5442, and 5460 purchased as individually ampulated solutions from Accustandard at 35,000ug/L.

Surrogate Stock - Ultra ISM-320 containing TCX/DCB at 200,000ppb in acetone. Prepare an intermediate by diluting 0.25mL to 25mL of hexane.

MS stock of Aroclor 5442 - Absolute Cat. #71791. 1000ug/L in Methanol.

Prepare working standards using the electronic standard database as a guide.

1. In the database, choose the category (i.e. working spike, surrogate, intermediate, etc) and the required standard.

2. The database contains the following information: solution description (ex. AR161), parent solution name, aliquot used, final volume, solvent used, concentration of each compound in the solution, and expiration date. The working standards have an expiration date of 6 months.

3. The calibration scheme begins at or near the reporting limit through a 20 fold of the initial calibration level.

4. The scheme for preparing the matrix and surrogate spiking solutions used in the extraction process are listed below.

Standard Name	Parent Solution	Aliquot (mL)	Final Volume (mL)	Solvent	Description
MS	5422 MS Stock	1.25	250	Acetone or methanol	PCT Water Spike
SS	SS Stock	1.5	1000	Acetone or methanol	PCB surrogate

B. GC Chromatographic Conditions

Detector: ECD
Detector temp: 300°C
Oven Temp: 110°C to 250° at 40°C/min, 280 to 330°C at 30°C/min, hold 9 min.
Carrier: Hydrogen at 5.0 mL/min
Makeup gas: N_2 at 80mL/min or equivalent
Injection size: 1-uL, direct injection
Injection temp: 225°C

The conditions listed serve as a guideline only and are typically the optimum operating conditions. The analyst may make any changes to the chromatographic conditions to improve the speed of analysis, linearity, sensitivity, and/or improve separation if initial and continuing calibration criteria and quality assurance criteria listed within this analysis document are met.

C. Sequence

1. Conditioner
2. IBLK
3. EVAL
4. AR161
5. AR162
6. AR163
7. AR164
8. AR165
9. AR481
10. AR482
11. AR483
12. AR484
13. AR485
14. AR541
15. AR542
16. AR543
17. AR544
18. AR545
19. PCT1
20. PCT2
21. PCT3
22. PCT4
23. PCT5
24. A4421
25. A4422
26. A4423
27. A4424

28. A4425
29. AR213
30. AR32x
31. AR423
32. AR623
33. AR683
34. MD16
35. MDPCTX
36. IC16
37. IC48
38. IC54
39. Blank
40. LCS
41. 1234567
42. 1234567MS
43. 1234567MSD

44-58. Continue running samples

59. AR163
60. PCT3
61. A4423
62. IBLK

Eurofins Document Reference	1-P-QM-WI -9018442	**Revision**	9
Effective Date	Nov 20, 2015	**Status**	Effective
Historical/Local Document Number	Analysis 6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Nina Haller
Reviewed and Approved by	Robert Strocko;Review;Thursday, November 5, 2015 8:29:09 AM EST Kathryn Brungard;Approval;Friday, November 6, 2015 5:50:18 AM EST

Table of Contents

Revision Log:

Revision: 9	**Effective Date:**	This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Document Title	Enhancement	Added the acronym ICP
Throughout Document	Reflects change in naming convention	Changed Parallax to LIMS.
Definitions	Enhancement	Included Linear Range criteria and frequency, and IECs.
Personnel Training and Qualifications	Enhancement	Added additional information for DOCs.
Sample Collection, Preservation and Handling	Clarification Correction	Clarified that the holding time of 180 days includes the analysis. Changed from pH >2 to pH ≥2
Statistical Information/ Method Performance	Information is already discussed in an earlier section	Removed all information concerning IDOCs and training documents
Instrument Operations A.5.	Addition	Added IEC requirements specific to WI.
Table I and Table II	Correction	Updated Linear Range criteria and frequency.
Table II	Clarification	Noted that the LCS is spiked at or below the MCL for all primary drinking water metals. Added new EW rule for the PB and LCS if they are out of specification data cannot be accepted for any reason. Clarified PB requirements.

Revision: 8	**Effective Date:**	Jan 28, 2015
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout Document	Reflects re-identification of documents in EtQ	Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Routine Methods	Correction	Removed highlight from Te, Th, W wavelengths
Quality Assurance/ Quality Control D.2.	Correction	Removed reference to table III

Reference:

1. *Test Methods for Evaluating Solid Wastes*, SW-846 Method 6010B, December 1996

2. *Test Methods for Evaluating Solid Wastes*, SW-846 Method 6010C, February 2007

3. Method 200.7 (rev. 4.4), Determination of Metals and Trace Metals in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry, USEPA 600/R-94/111 May 1994.

4. ICAP™ 6000 Series ICP-OES Spectrometer Operator Manual, 2005/2006.

5. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
1-P-QM-FOR-9008385	ICP LOQs (mg/L)
1-P-QM-FOR-9008807	MSA Prep for Samples with MS/MSD <50%
1-P-QM-FOR-9008905	MSA Prep for Samples within TCLP Limits
1-P-QM-FOR-9009067	Working Instructions for Preparation of ICP Solutions and Standards
1-P-QM-FOR-9009182	Working Instructions for Prep Solutions and Standards
1-P-QM-PRO-9015403	Fixed-Volume Hand-Held Pipettes
1-P-QM-PRO-9015511	Liquid Sample Preservation
1-P-QM-QMA-9015390	Demonstrations of Capability
1-P-QM-QMA-9017309	Determining Method Detection Limits and Limits of Quantitation
1-P-QM-QMA-9017313	Establishing Control Limits
1-P-QM-QMA-9017325	Instrument and Equipment Maintenance and Calibration

Purpose:

The purpose of this SOP is to describe the proper analysis of aqueous and solid samples for metals by ICP. This SOP also outlines the proper operation and maintenance of the ICP instrumentation and provides consistent guidelines for the evaluation of ICP data.

Scope:

This procedure applies to analyses performed in Environmental Sciences using Inductively Coupled Plasma (ICP) Atomic Emissions Spectroscopy for identification and quantitation of metallic constituents by Methods 6010B/C (aqueous, solid, tissue) and EPA 200.7 (aqueous).

LOQs are based on annual statistical evaluation of laboratory data and are subject to change without notification. The current MDLs and LOQs are maintained in the LIMS.

Routine Methods:

Elements routinely analyzed on the Thermo Scientific iCAP 6000 Series Analyzer include Eurofins Lancaster Laboratories Environmental, LLC (ELLE) analyses:

Element	Waters Analysis #	Solids Analysis #	Wavelength (nm)
Ag	7066	6966	328.06
Al	1743	1643	308.21
As	7035	6935	189.04
Au	11762	11761	242.80
B	8014	7914	249.67
Ba	7046	6946	455.40
Be	7047	6947	313.04
Ca	1750	1650	317.93
Cd	7049	6949	226.50
Co	7052	6952	228.62
Cr	7051	6951	267.72
Cu	7053	6953	327.40
Fe	1754	1654	261.19
K	1762	1662	766.49
Li	1756	1656	670.78
Mg	1757	1657	285.21
Mn	7058	6958	257.61
Mo	7060	6960	202.03
Na	1767	1667	589.59
Ni	7061	6961	231.60
P	10143	10145	177.49
Pb	7055	6955	220.35
S	12004	12003	182.03
Sb	7044	6944	206.83
Se	7036	6936	196.09
Si	1765	12763	251.60
Sn	7069	6969	189.99
Sr	8068	7968	421.55

Element	Waters Analysis #	Solids Analysis #	Wavelength (nm)
Te	13494	13498	214.281
Th	13495	13499	401.913
Ti	7070	6970	334.94
Tl	7022	6925	190.86
V	7071	6971	292.40
W	13496	13500	207.911
Zn	7072	6972	213.86
Zr	10144	10146	339.19

Basic Principles:

An instrument run sheet is prepared using the information provided on the sample batch sheet received from the prep area. Appropriate standards, check standards and interference check standards are added. Standards and samples are poured as needed to be analyzed on the instrument.

Samples are received from the prep area in Nalgene containers. The samples are analyzed directly on the instrument, with the exception of the spiked sample and a serial dilution of the same background sample. The spiked and serial dilution sample is prepared in a volumetric flask or directly into the graduated plastic digestion tube that is placed on the autosampler for instrument analysis. Any sample that requires a dilution is prepared in the same fashion. Standards and samples are entered in to a sequence file on the instrument in the same order as on the ICP run sheet.

Water and soil samples are treated with acids and heated to solubilize the metals present. These digestates are then analyzed for trace metals by an atomic emission spectroscopic technique. Samples are transported to a nebulizer via an autosampler and peristaltic pump. The nebulizer introduces an aerosol into a spray chamber; the resulting mist is then transported to an argon plasma torch where excitation of atoms occurs. Characteristic atomic-line emission spectra are produced by a radio-frequency (R.F.) inductively coupled plasma. The spectra are dispersed by a diffraction grating and the intensities of the light at each wavelength are monitored by a photosensitive device. The signals from the photosensitive device are processed by a computer. A background correction technique is required to compensate for variable background contribution to the spectra of trace elements.

Definitions:

1. Analytical Batch – A group of field samples that are digested and analyzed together. A batch consists of no more than 10 samples for EPA 600 methods or no more than 20 samples for other methods.

2. Analytical Samples – Analytical sample is defined as any solution introduced into an instrument on which an analysis is performed, excluding instrument calibration, ICV, ICB, CCV, and CCB. Analytical samples include undiluted and diluted samples, matrix spike samples, duplicate samples, serial dilution samples, analytical spike samples, post-digestion spike samples, ICSs, LLCs, PBs, LCSs, and PEs.

3. Background Sample (U) – The original sample from which the batch QC is derived. The background sample is either site specific or randomly selected.

4. Continuing Calibration Blank (CCB) – A reagent blank run immediately after every CCV. This is used to monitor the stability of the low end of the calibration.

5. Continuing Calibration Verification (CCV) – A mid-range standard run at a frequency of 10% (every ten samples) throughout the run. This is used to monitor instrument drift.

6. Duplicate Sample (D) – A replicate of the original sample, processed in parallel. This sample is used to provide a measure of the in-lab repeatability (precision) of the analytical process. The duplicate sample is either site specific or randomly selected.

7. Initial Calibration Verification (ICV) – This is a standard near the middle of the calibration range, prepared from a different source than the calibration standards. It is used to prove that the instrument is calibrated correctly at the start of the run.

8. Initial Calibration Blank (ICB) – This is a standard reagent blank, used to prove that the low end of the calibration is acceptable. It must be run immediately after the ICV.

9. Inter-Element Correction (IEC) - A correction performed on the instrument to account for known overlaps and remove interferences to give more accurate results.

10. Interelement Correction Standard-A (ICSA) – A standard containing high concentrations of commonly interfering elements. It is used to assess the spectral interferences due to matrix elements that are normally expected to be found in a sample.

11. Interelement Correction Standard-AB (ICSAB) – A standard containing both interfering elements and target analytes, run immediately after the ICSA. It is used to demonstrate the effectiveness of the interelement correction factors in use.

12. Instrument detection limit (IDL)

    EPA SW846 and EPA 600 Analyses – A value determined for the purpose of evaluating the ICB/CCBs for data package samples. It is determined by calculating the standard deviation on 7 standard solutions at a concentration 3× to 5× the anticipated IDL. This standard deviation is then multiplied by the student's t value to obtain the MDL. This value is obtained quarterly on each instrument used for an analyte.

13. Laboratory Control Sample (LCS) – A spiked reagent blank of known composition carried through the digestion process. It is used to judge efficiency of the digestion procedure, as measured by the % recovery of the analytes.

14. Laboratory Control Sample Duplicate (LCSD) – This is a duplicate of the LCS. It is used to judge efficiency of the digestion procedure, as measured by the % recovery of the analytes. It is also used as a measure of the precision of the analytical process.

15. Limit of Quantitation (LOQ) – The level above which quantitative results are obtained with a specified degree of confidence. It is based on a value 3× to 5× the MDL.

16. Low Level Check Standard (LLC) – A low-level standard used to monitor the performance of the instrument near the detection limit.

17. Matrix Spike Sample (R) – A replicate of the original sample spiked with a known amount of analyte. This sample is used to determine if there are any matrix effects that could influence analyte recovery during the digestion procedure. The matrix spike sample is either site specific or randomly selected.

18. Matrix Spike Duplicate (M) – A duplicate of the Matrix Spike Sample (R) which is a replicate of the original sample spiked with a known amount of analyte. This sample is used to determine if there are any matrix effects that could influence analyte recovery during the digestion procedure. It is also used as a measure of the precision of the analytical process. The matrix spike duplicate sample is either site specific or randomly selected.

19. Method Detection Limit (MDL) – The minimum concentration of a substance reportable with 99% confidence that the analyte concentration is greater than 0. It is determined by calculating the standard deviation on 7 digested standards at an estimated concentration 2.5× to 5× the signal/noise ratio. This standard deviation is then multiplied by the student's t value to obtain the MDL. MDLs are performed on all instruments used to determine each analyte. MDLs are not listed in this SOP. They can be found in the LIMS system due to the fact that they change on a regular basis.

20. Post Digestion Spike (PDS) – This sample is a spike of the Background Sample prepared after digestion, at the time of analysis. It is used to determine if out-of-specification spike recoveries are due to problems in the digestion or are matrix related.

21. Preparation Blank (PB) – This is a reagent blank carried through the entire digestion procedure. It is used to determine if contamination has occurred during the digestion procedure.

22. Serial Dilution (SD) – This sample is a 1:4 (5×) dilution of the background sample, prepared after the digestion. It is used to indicate the presence of any matrix effects that could cause a nonlinear response at the instrument.

23. Linear Range (LR) – This is the highest sample concentration that can be analyzed by the method with criteria of ±10% of the true value. Sample results must be < 90% of the true value of the linear range. Linear Ranges are analyzed quarterly.

24. Analytical Value – Analytical reading obtained by the average of three instruments replicates.

Interferences:

Spectral interferences are caused by background emission, stray light from high concentration elements or overlap from a spectral line from another element. Spectral interferences are compensated for by the use of background points, alternate wavelengths and interelement corrections.

Physical interferences caused by the change in sample matrix affecting sample transport and/or nebulization must be compensated for by using internal standardization.

Memory interference, or carryover, is the contribution of analyte signal from a previous sample onto the next sample analysis. Adequate rinse time of the autosampler tubing overcomes any memory interference.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

Preparing samples for inorganic analysis involves working with concentrated acids and other chemicals which are dangerous if not handled carefully:

Nitric acid (HNO_3) – This acid can cause skin burns. Add nitric acid to samples in a hood to avoid exposure to toxic fumes.

Hydrochloric acid (HCl) – This acid can cause skin burns. Never mix HCl with concentrated H2SO4 to avoid a violent reaction. Always use in a fume hood.

Hydrogen Peroxide 30% (H_2O_2) - This oxidizer can cause skin burns. Always use in a fume hood.

When diluting strong acids, never add water to acid; always add acid to water.

Store concentrated acids in the prep room acid lockers. Only acids are to be stored in these lockers. (Store solvents in the flammable liquid storage cabinet.) Some concentrated acids are kept in the acid reagent bottles on prep room counters. Fill reagent bottles in an operating fume hood using caution to avoid spills.

Use spill pillows to absorb large acid spills (small spills are cleaned with wet paper towels.) Use SPILL-X-A powder or equivalent to neutralize any remaining acid and then rinse the area thoroughly with water. Spill pillows and SPILL-X-A are stored on the prep room shelf.

Dispose of acid waste properly. Collect all acid digestions, waste solutions, and expired reagent solutions in waste containers. When the acid waste containers are full, a designated acid waste handler transfers the waste to the acid neutralization tank.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC) which is maintained in the analyst's training records.

Initially, each analyst performing the instrumental analysis must work with an experienced analyst for a period of time until they can independently calibrate the instrument, use the sequence editor to set up the run, perform calculations, interpret raw data, and enter data into the LIMS. Proficiency is measured through documented audits of the tasks listed and over checking of data as well as an IDOC (Initial Demonstration of Capability).

The IDOC consists of four laboratory control samples that are carried through all steps of the analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Various options are available for a DOC and can include four laboratory control samples or one blind sample. Refer to 1-P-QM-QMA-9015390 (Demonstrations of Capability) for more guidance on these options.

Sample Collection, Preservation, and Handling:

A. Aqueous samples

1. Samples are collected in plastic or glass containers.

2. Samples are preserved with nitric acid and stored at 0°to 6°C, not frozen.

3. Samples must be digested and analyzed within 180 days of collection for all methods.

B. Solid samples

1. Samples are collected in glass containers and stored at 0° to 6°C, not frozen.

2. Samples must be digested and analyzed within 180 days of collection.

3. Solid samples require no chemical preservation.

C. pH Adjustment

1. Upon receipt at the laboratory, Sample Storage personnel check the pH of water samples (following the protocol outlined in 1-P-QM-PRO-9015511). If the pH is ≥2, the pH of the sample is adjusted to a pH less than 2 with nitric acid. The date and tiem that the additional preservation was added is recorded. After a minimum of 24 hours, prior to digestion, the Metals department checks the pH of the sample to confirm that the pH is less than 2.

2. Drinking water samples require pH check immediately before digestion. If the pH is ≥2, the client service representative (CSR) is notified. The CSR must notify the client for direction on how to proceed with the sample (i.e. proceed as is or add more acid.)

3. Dissolved Metals

   a. Samples to be analyzed for metals requiring filtration at the lab must be submitted unpreserved.

   b. The sample is run through a 0.45 micron filter within 5 days of receipt.

   c. Samples are filtered into containers and preserved to a pH of <2 with HNO_3.

D. Storage - Store sample digestates in plastic bottles at room temperature. Store standards and digestates separately.

E. Sample Discard - The general practice in the metals group is to discard the digestions after all the required metals from a batch of samples have been analyzed and verified in the LIMS. Samples which require the digestate to be held for long term storage are periodically evaluated for discard.

Apparatus and Equipment:

The following is a list of the hardware and apparatus necessary for ICP analysis. More detailed hardware information is located in the *Operator's Manuals*.

1. Test tube racks
2. 15-mL graduated polypropylene screw cap tubes (certified ±1%)
3. 16-mL polystyrene tubes
4. Filter paper – Whatman No. 540, 90-mm ashless
5. FilterMate filtration device with 0.45-µm PTFE fiber filter and insertion tool
6. 1 × 100 10-mL sterile disposable syringes
7. 25-mm syringe filters, PTFE, 0.45-µm
8. 30-mL polypropylene medicine cups
9. Adjustable electronic and fixed volume hand-held pipettes and tips (10 – 5000 µL) - FisherBrand or equivalent.

   NOTE: For routine operation, calibration, and maintenance of FisherBrand (or equivalent) electronic or fixed volume hand-held pipettes, see 1-P-QM-PRO-9015403.

10. Spectrometer

    The Thermo Scientific iCAP™ 6000 series Trace Analyzer utilizes a high performance solid state Charge Injection Device (CID) camera system to deliver high contrast/low noise imaging and quantification of all wavelengths in the analytical range. With the entire spectrometer and foreoptics purged with either Argon or Nitrogen, it features a 52.91 grooves/mm grating and dual-view detector.

11. Auto-sampler – The ESI SC-14 auto-sampler and integrated “FAST” system offer increased capacity and reduce sample introduction times. The parameters for each automated run are entered into the auto-sampler table in the iTEVA™ software as described in Instrument Operation, Section A of this SOP.

12. Peristaltic pump – The peristaltic pump regulates the flow of the following: sample, internal standard, instrument rinse and spray chamber waste. Special care must be taken to ensure that all pump tubing is connected properly. The Teflon concentric and glass V-groove nebulizers have a natural uptake, but a peristaltic pump is used to compensate for differences in sample viscosity. After traveling through the peristaltic pump, the sample and internal standard tubing are combined by a “Y” connector, and then allowed to mix in a mixing coil before entering the nebulizer.

13. R.F. generator –The iCAP™ 6000 series Trace Analyzer utilizes an internal solid state RF Generator at 27.12MHz with a power efficiency greater than 78%.

14. Coolflow –The ThermoFlex™ 900 cooling device for the iCAP™ 6000 series Trace Analyzer operates at 17°C.

15. Personal computer – The iCAP™ 6000 series Trace Analyzer is controlled by PCs.

Reagents and Standards:

Reagent and standard information and the preparation of the following standard and solution sections are located in 1-P-QM-FOR-9009067.

A. ICP Standards

B. ICP Initial and Continuing Calibration

C. ICP LOQ Check Standard Solutions (LLC)

D. Interference Check Solutions

E. Rinse/Carrier and Profile Solutions

F. Internal Standard Solution

G. IDL and MDL Solutions

H. Matrix Matched Standards Table

Calibration:

A. Initial Calibration.

1. For the preparation and concentrations of calibration blanks and calibration standards see 1-P-QM-FOR-9009067.

2. For the frequency, acceptance criteria and corrective action see Tables I and II.

B. Initial Calibration Verification (ICV).

1. For the preparation and concentrations of ICV standard see 1-P-QM-FOR-9009067.

2. For the frequency, acceptance criteria and corrective action see Tables I and II.

C. Continuing Calibration Verification (CCV).

1. For the preparation and concentrations of CCV standard see 1-P-QM-FOR-9009067.

2. For the frequency, acceptance criteria and corrective action see Tables I and II.

D. Low Level Check Standard (LLC)

1. For the preparation and concentrations of the LLC standard see 1-P-QM-FOR-9009067.

2. For the frequency, acceptance criteria and corrective action see Tables I and II.

E. ICSA/ICSAB

1. For the preparation and concentrations of ICSA/ICSAB standards see 1-P-QM-FOR-9009067.

2. For the frequency, acceptance criteria and corrective action see Tables I and II.

Procedure:

A. Setting up an ICP run

1. Determine the batches to be analyzed and determine any special requirements by viewing lab notes and/or project notes that are with the batch paperwork delivered from the metals prep area.

2. Assign an ICP metals storage location and document the location on the batch sheet(s) and on the sample lid for the Prep Blank of each batch.

3. Log in to LIMS and select Sequence Editor from the IDAT menu. In the Sequence Editor window, select the appropriate batch digest type (EPA or SW-846).

4. Choose the appropriate digest from the list, and click on “Get Batches”

5. Select a batch from the list to display the incomplete samples in that batch.

6. Select the appropriate template (pre-designed with the correct QC standards and auto-sampler locations) from the template list; a blank form is opened. If that batch has been previously documented, the existing sequence file is also loaded.

7. Add all required samples into the form, either by choosing “Add batch” for all samples, or by “dragging” individual samples into the field.

    a. Sample names include:

        (1) PBW – Prep blank (water)

        (2) LCSW – Laboratory control sample (water)

        (3) LCSDW – Laboratory control sample duplicate (water)

        (4) PBS – Prep blank (solid)

        (5) LCSS – Laboratory control sample (solid)

        (6) LCSDS – Laboratory control sample duplicate (solid)

        (7) ELLEs’ sample number

(8) CCV – Continuing calibration verification

(9) CCB – Continuing calibration blank

(10) LLC – Low level check

(11) ICSA – Interelement correction standard – A

(12) ICSAB – Interelement correction standard - AB

b. Batches with only field blanks or equipment blanks do not need a post-digest spike or a serial dilution.

c. “As Received” samples must be run with a blank and LCS, LCSD (prepared and documented in LLENS by the analyst).

8. Edit dilution factors (DF), protocols, and auto-sampler locations as needed. Consult the Incomplete List sheet to determine the analysis requirements for each sample.

9. Remove all unnecessary QC standards by clicking on the “QC” button. Unnecessary lines are removed by selecting individual lines and clicking on the red “X” button.

10. Save the sequence file. Click “OK” to acknowledge that the file has been saved and the cover sheet document has been created. The document opens automatically.

11. Edit the cover sheet document as needed, including batch location information and any additional comments or instructions.

12. When setting up a run, Batch QC must be placed in the same block of ten or fewer samples. If there are two LCSs, they must be placed one after the other. [The order of the batch QC is typically PB, LCS, (LCSD), Bkg, PDS, DUP, MS, (MSD) and SD.]

a. ICV/ICB must be analyzed immediately after the calibration curve.

b. CCV/CCB must be analyzed after every ten analytical samples.

c. LLC, ICSA, ICSAB, CCV, CCB must immediately follow the ICV/ICB and must conclude each run.

NOTE: As of 10/11/2012 for all DOD protocols, it is not necessary to analyze the ending ICSA/ICSAB and LLC check samples. This is for DOD only!

d. Any deviations from protocol must be noted in the Comments Section of the cover page.

e. Any unused portion of the run sheet must be "Z'd" out with initial and date.

B. Pouring an ICP run

It is important to minimize any chance of contamination, both of yourself and the samples. Keep your hands and the work area clean at all times. Do not re-use any pipette tips.

NOTE: Run QC standards are prepared separately, and kept in separate auto-sampler racks to be obtained at the time of analysis.

1. Use the batch location information on the selected run sheet to locate the corresponding batch(es). In the "Poured by:" section of the header, record: initials, employee number, and the date.

2. Carefully examine the batch to ensure there are no discrepancies between the Batch Preparation Sheet, run cover sheet, and the physical placement of samples in the batch.

NOTE: In most instances, samples are analyzed in their digestion vessels, in a foam storage rack.

3. Obtain and label all required test tubes, and place them in test tube racks. Any poured sample that does not require a graduated test tube is to be poured into a polystyrene tube.

4. Prepare and label the PDS required for each new batch (sample volume permitting).

    a. A PDS is prepared using 0.2 mL of a custom-ordered PDS solution into 9.8 mL of background sample.

    b. Equivalent amounts of the custom PDS must be used if decreasing sample volume.

    c. Record preparation details in the comments column of the ICP run sheet.

5. Prepare a serial dilution by diluting the background sample by 5×.

    a. If the background sample chosen for serial dilution has been diluted due to matrix interference or to bring the concentration into the linear range of the instrument, the serial dilution must also be diluted by 5 times the dilution factor of the background (i.e., if Bkg = DF5, S.D. must = DF25).

    b. Document preparation details in the comment section.

6. Using Whitman No. 540 filter paper or the Filter Mate filtration device, filter those samples that are cloudy or contain particulate.

    a. If the filtrate remains cloudy, filter again.

    b. Samples with limited sample volume must be filtered using a 10-mL sterile disposable syringe fitted with a 0.45 µm PTFE syringe filter.

c. If any samples are filtered, the prep blank must also be filtered.

d. Document all filtrations on the run cover sheet and mark each sample lid with an “F” to indicate that it was filtered.

7. For TCLP samples that requires method of standard additions, refer to 1-P-QM-FOR-9008905 or 1-P-QM-FOR-9008807 for instructions.

8. Perform any additional spiking or dilutions and document preparation details in the comment section.

9. Cover the samples with lids or with plastic wrap to prevent contamination.

10. Place the poured batch on the bench top to await analysis, or return samples to their ICP sample storage location.

NOTE: A post-digest spike and a serial dilution must be performed on one sample in each digestion batch. Typically, the background sample is chosen. If the batch QC is split between two samples, the post-digest spike is performed on the background sample accompanied by a matrix spike; the serial dilution is performed on the background sample accompanied by a matrix duplicate. If sample volume is limited, it is acceptable to use the duplicate for the PDS and SD.

NOTE: Analysis information, including standard lot numbers, run number, rinse time, method, analyst and date of analysis, are documented on the cover sheet at the time of analysis.

NOTE: Documentation is of utmost importance. Double check all entries.

NOTE: Dilute samples when necessary to yield a response that falls within the calibration range. Report the results for the least dilute sample where the concentration measured is within the acceptable calibration range.

NOTE: If a batch requires re-analysis, it is acceptable to re-use dilutions and/or spiked samples that were prepared for the previous analysis. A "P" in the comments section is used to indicate that a previously poured test tube is being re-used.

Instrument Operations:

A. iTEVA™ software: The Thermo Scientific iCAP™ 6000 series instrument is operated through iTEVA™ software. From the Start menu, select "iTEVA™ Control Center" to start the software.

1. Plasma ignition of the iCAP™ 6000

   a. Open the plasma status window by clicking on the icon at the bottom of the screen.

   b. Verify that all parameters are within acceptable range for ignition as indicated by a green light.

   c. Ensure that the drain tubing for the spray chamber is properly connected to the peristaltic pump and positioned to drain into a waste carboy.

   d. Select "Ignite plasma". After the plasma has ignited, the instrument automatically performs optimization of the nebulizer gas pressure, and then starts the on-board peristaltic pump.

   e. If the plasma does not light, repeat steps b-d.

   f. Once the plasma operating parameters have engaged, exit the Plasma status window by clicking on Close.

   g. If the plasma has been off for more than 15 minutes let the instrument warm up for 30 minutes. If the plasma has been off less than 15 minutes, let the instrument warm up 5 to 10 minutes.

2. Automated analysis using the iTEVA™ software

   a. Open the Analyst window from the Control Center by clicking on the Analyst icon. When prompted, select the appropriate method.

   b. In the Analyst window, click on the Sequence tab at the bottom of the screen.

   c. From the Auto-session menu, select Open new session.

   d. The “New auto-session” window opens. Choose the appropriate autosampler configuration set.

   e. Click on “New” to add a sequence and the “Add sequence” window appears.

   f. Click on the “Import comma delimited text file” option and choose an appropriate template or previously prepared run sequence from the drop-down menu for the run to be entered. Click OK to close this window and continue.

   g. Change the sequence name to reflect the run number, but do not change the method revision number.

   h. Click OK at the bottom of the “New auto-session” window to continue.

   i. The sequence template is loaded. When prompted, click OK to choose the “Use positions” option, then Yes to accept duplicate positions.

   j. Edit the table as needed to include sample number, class, dilution factor, batch number and protocol for each sample.

k. Additional samples and QC are added using the “Add sample” and “Add QC” icons, respectively, at the top of the screen. Unused rows are removed by selecting the entire row(s) and using the “remove sample” icon at the top of the screen.

l. Right-click on the calibration standards list and select “Auto-locate” to have autosampler positions automatically assigned.

m. Verify that the sample list begins and ends at the correct tube numbers, and check all entries for errors.

n. Click on the “Initialize Autosampler” icon to initialize the autosampler for the current configuration.

o. Click on the printer icon and choose to print page 1 only. This printout is kept with the run cover sheet.

p. Carefully examine the batch to ensure there are no discrepancies between the run cover sheet, auto-sampler sequence table and the physical placement of samples in the batch.

q. Click on the “Start automated run” icon to start the run sequence. If a run sequence is to be started at a sample or standard other than the initial calibration, right-click on the appropriate sample and choose “Start Auto-Session Run at this Sample” and elect not to run the “start actions.”

3. Running an AutoPeak in iTEVA™

a. In an open autosampler session (autosampler must be initialized), right-click on the location of the AutoPeak solution, and choose “Go to...”

b. Click on the Analysis tab to open the Analysis window.

c. From the Instrument menu, select Perform AutoPeak.

d. Click on All elements, then OK.

e. When prompted to aspirate the high standard, click OK. The AutoPeak is now performed.

f. When the AutoPeak has finished, click on Done.

4. Manual analysis in iTEVA™

a. In an open autosampler session (autosampler must be initialized), add sample(s) to be analyzed to a new or existing sequence as detailed in section A.2 of this SOP.

b. To start analysis, right-click on the appropriate sample and choose “Start Auto-Session Run at this Sample” and elect not to run the “start actions.”

c. When analysis is complete, results can be printed from the Analysis tab by right-clicking on the sample name and selecting “Print Sample…”

5. Performing an interelement correction (IEC) in iTEVA™

a. Prepare a solution of the interfering element at the linear range of the instrument. Perform manual analysis according to section A.4 of this SOP.

b. Note results of elements with a known interference that are greater than the limit of quantitation.

c. Divide the result of each interfered element by that of the interfering element. These values represent the amount the current IECs need to be adjusted.

d. In the Method window, click on Elements to expand the list of elements in the method.

e. Click on the targeted element to view the settings for that element.

f. Click on the IECs tab to view the current IECs for that element.

g. Add each calculated result to the correction factors currently in the first column corresponding to each pair of elements.

h. Enter the new correction factors in the table.

i. Repeat steps d-f as needed.

j. Click on the Save method icon to save the method.

k. For Wisconsin samples analyzed by EPA 200.7 run the following IEC check.

(1) For interferences from iron and aluminum, only correction factors (positive or negative), when multiplied by 100, that exceed ± LOQ need be tested on a daily basis.

(2) For the all other interfering elements, only those correction factors (positive or negative), when multiplied by 10, that exceed the ± LOQ need be tested on a daily basis.

(3) If the correction routine is operating properly, all interferences should fall within ± LOQ.

NOTE: When making an update to an IEC, the interference should be analyzed a second time to confirm that the IEC is correct.

(4) If the correction factors tested on a daily basis are found to be within ± LOQ for five consecutive days, the verification frequency may be extended to weekly.

NOTE: If the samples do not contain concentrations of the interfering elements greater than 10 ppm, daily verification is not required.

B. Import and QC review of run data

Importing run data

a. Open the iCAP Data Reprocessor.

b. Ensure the correct database is listed.

c. Click on “Get run name list”.

d. Select the appropriate run.

e. Click on “Reprocess”.

f. Start the LIMS software and log in.

g. Select Import from the IDAT menu.

h. Open the appropriate run file.

i. If prompted, enter the storage location of batch(es) requested.

j. Verify that the following information is accurate: sample number, standard name, class, batch number, matrix, protocol, method reference, LCS ID, initial volume, final volume and dilution factor. Make corrections as needed.

k. Enter the correct rinse time.

l. Enter the appropriate analyst number.

m. Click on Check/Save.

n. When the confirmation screen appears, verify that the file name and run number are the same. Choose to either Exit or Import another run and the run is imported and printed.

Routine Maintenance for the ICAP™ 6000 Duo Analyzer:

A. Sample introduction system removal and cleaning: Remove and clean the sample introduction system when instrument performance declines (See **Figure 1**). Any adjustment to an instrument (replacement of parts, etc.) must be documented in the appropriate instrument logbook.

1. Remove spray chamber and nebulizer.

a. Unclamp spray chamber from spray chamber adapter by gently squeezing clamp with one hand while supporting the spray chamber with the other hand.

b. Gently remove the nebulizer from the spray chamber by pulling it out.

c. Disconnect the argon and sample tubing from the nebulizer by pinching the Luer lock and pulling the tubing off the nebulizer.

d. Clean the spray chamber if residue is observed coating the sides. If cleaning is necessary, remove the drain tubing from the spray chamber.

2. Remove and disassemble the torch

a. Gently pull the spray chamber adapter out of the torch assembly.

b. Unlock the torch assembly by turning it clockwise and remove it from the instrument.

c. Turn the injector tip assembly clockwise to separate it from the torch housing.

d. Gently pull the center tube out of housing to clean.

3. Prepare ultrasonic bath. Make sure the bath is at least ½ full with clean reagent water.

4. Clean torch, injector tip, and nebulizer.

a. Invert the torch in a 250-mL vacuum flask of 50% HCl and place in the sonicator for 10 minutes. After sonication, rinse the torch with reagent water. (Be careful not to get a lot of water down into the base of the torch.) Carefully dry the torch with a paper towel.

b. Place the injector tip in 50% HCl for 10 minutes. Rinse the injector tip with reagent water and carefully dry with a paper towel.

c. For a glass nebulizer, place the nebulizer in 50% HCl for 10 minutes. (Do not place nebulizer in the sonicator.) If there is a visible clog, carefully insert 0.13 diameter fishing line through the tip of the nebulizer to assist in removing the clog. Force the 50% HCl solution through the argon and sample inlets in the nebulizer and rinse with reagent water when finished. (Make sure all of the water is out of the argon cavity of nebulizer.) For a plastic nebulizer, use a syringe to force the 50% HCl solution through the nebulizer to clean and/or remove any clogs.

d. If the spray chamber needs to be cleaned, place it in the sonicator for approximately 5 minutes, and then rinse it out with matrix B rinse, followed by reagent water.

B. Reassemble the sample introduction system: (See **Figure 1**)

1. Reassemble the torch.

a. The o-rings on the metal torch mount must be inspected and replaced if any wear or damage is visible.

b. The quartz torch is pushed fully into the metal torch mount with a gently twisting pressure.

c. The circular “target” design on the torch **MUST** align with the circular notch on the torch mount.

d. Insert the injector tip fully into the center tube holder.

e. Insert the center tube assembly into the torch mount and rotate it counter-clockwise to lock it in position.

f. Mount the torch assembly back into the instrument by inserting it straight through the torch hole and coil, being careful not to disturb the quartz bonnet above the radial view lens.

g. Turn the assembly counter-clockwise to lock it into position.

h. Gently push the spray chamber adapter into the back of the center tube assembly.

2. Reassemble the spray chamber and nebulizer.

a. If removed for spray chamber cleaning, reattach the drain tube to the spray chamber.

b. With a twisting motion, insert the nebulizer into the spray chamber so that the collar is a tight fit.

c. Attach the sample and nebulizer gas tubing to the nebulizer.

d. Clamp the spray chamber to the spray chamber adapter.

3. Ignite the plasma.

C. Changing the pump tubing: Change pump tubing on the peristaltic pump when the tubing shows wear. Inspect all tubing to insure that it is secure and in good condition.

D. Documentation for instrument/analysis tag out and return to service.

NOTE: The following information is taken from 1-P-QM-QMA-9017325: In the event of an equipment failure, the following must be performed:

1. Document the nature of the failure in the maintenance logbook

2. Document how and when the defect was discovered

3. Notification of supervisor or responsible person who can decide on appropriate action to take

4. The instrument must be clearly tagged as *Out of Service*. The tag must contain the following information:

    a. Date taken out of service

    b. Employee who took the instrument out of service

    c. Reason for tagout

    Form 1-P-QM-FOR-9007909 is used for “tagging out”.

5. The date taken out of service and the date returned to service must be documented in the logbook.

6. Document any corrective action that was taken to bring the equipment back into service.

7. Results of the corrective action (i.e., system calibration within specifications, etc.)

8. Supervisory personnel must perform a documented evaluation and review of instrumentation/equipment where a major or uncommon failure has occurred to assess the potential impact the failure could have on the calibration and/or qualification of the instrument. This is done on a case-by-case basis.

9. After repair, document whether the function has been fixed. Then determine if calibration or verification activities need to be performed before the instrumentation is put back into service.

Calculations:

1. Final result

   a. Water sample

$$\frac{\textit{Instrument Reading}}{} \times \frac{\textit{Dilution Volume}}{\textit{Aliquot Volume}} \times \frac{\textit{Final Volume}}{\textit{Sample Volume}}$$

   b. Solid sample (mg/kg)

$$\frac{\textit{Instrument Reading}}{} \times \frac{\textit{Dilution Volume}}{\textit{Aliquot Volume}} \times \frac{\textit{Final Volume}}{\textit{Sample Weight (grams)}}$$

   All dilution factors must be recorded and used in the calculation. [To enter dilution data into the LIMS when multiple dilutions are used, a factor must be formed (Ex. 1), which contains no more than three figures for the volume or the aliquot (Ex. 2).]

   Ex. 1. $50/0.5 \times 10/1 = 500/0.5$

   Ex. 2. $50/0.5 \times 25/0.5 = 1250/0.25 = 125/0.025$

   NOTE: The default units are µg/L

2. Relative percent different (RPD)

$$RPD = \frac{S - D}{(S + D)/2} \times 100$$

Where:

S = first sample value

D = duplicate sample value

3. Spike recovery

$$\%\,Recovery = \frac{SSR - SR}{SA} \times 100$$

Where:

SSR = spiked sample result

SR = sample result

SA = spike added

4. Correlation Coefficient

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{N})(\sum Y^2 - \frac{(\sum Y)^2}{N})}}$$

Where :

X = the known concentration

Y = the instrument response

N = the total number of data points

5. Serial Dilution

$$\%\ Difference = \frac{(5 \times SDR) - SR}{SR} \times 100$$

Where:

SDR = serial dilution result

SR = sample result

6. Methods of standard additions (MSA)

Take either 4 identical aliquots (for 3 point MSA) or 2 identical aliquots (for one point MSA) of the same sample. Leave one unspiked. Spike the other 3 aliquots with different levels of a standard solution (for 3 point MSA) and spike the other aliquot at approximately the indigenous concentration of the sample (for one point MSA). Add blank solution to sample aliquots so that the final volume is the same for all. Use small volumes of spiking solution to avoid diluting the sample more than 10%. Analyze the 4 aliquots or 2 aliquots and record the instrument readings in absorbance. Use the readings and spike values to find the slope and x- and y- intercepts. The x- intercept is the result.

$$\text{Slope = m = } \frac{\sum x_i y_i - (\sum x_i \sum y_i)/n}{\sum x_i^{\,2} - (\sum x_i)^2/n}$$

$$\text{Y-Intercept = b = } \overline{y} - m\overline{x}$$

$$\text{Result = } -\frac{b}{m}$$

$$\text{Correlation Coefficient = r = } \frac{\sum\{(x_i - \overline{x})(y_i - \overline{y})\}}{\sqrt{\left[\sum (x_i - \overline{x})^2\right]\left[\sum (y_i - \overline{y})^2\right]}}$$

The correlation coefficient (r) for the least squares fit must be ≥0.995. If the r value is <0.995, the MSA must be repeated at the same dilution. If the r value is again low, the result with the higher r value is verified and both are flagged with a "+" in the data package. If the r value is <0.990, the sample is run at an interference dilution to overcome matrix effects. This usually requires a raised limit of quantitation. If a client requests a particular limit of quantitation that prohibits further dilution, then the sample is repeated at the same dilution and the best of the two results is verified.

Statistical Information/Method Performance:

Generate MDLs and LOQs according to 1-P-QM-QMA-9017309. Perform an MDL study on each instrument used for the analysis. Determine the MDL by taking seven spiked replicates through the entire digestion and analysis procedure. Compare and pool results to determine the final reporting MDL. The department supervisor maintains annual study data. The department supervisor requests that a Quality Assurance Specialist update to the LIMS as needed. Update the department database via a download from the LIMS.

QC acceptance limits (MS, MSD, LCS and LCSD) are established as statistical limits. Limits are evaluated every 6 months by the department and updated in LIMS by QA as directed by the department supervisor.

Quality Assurance/Quality Control:

A. For 6010B, and 6010C, each digestion batch (up to 20 samples) must contain a method blank, LCS, and either an U, D, MS, MSD or an LCS/LCSD.

B. For 200.7, each digestion batch (up to 10 samples) must contain a method blank, LCS, and either an U, D, MS or an LCS/LCSD.

C. QC limits for MS/MSD, and LCS/LCSD are established through statistical analysis of historical data.

1. The limits are maintained in the LIMS for the metals analysis numbers.

2. The limits are evaluated every 6 months and updated as needed.

3. The limits are subject to change without notification.

D. Batch Quality Control

1. For the preparation and concentrations of Batch Quality Control see 1-P-QM-FOR-9009067

2. For the frequency, acceptance criteria and corrective action see tables I and II.

E. Raw data quality checks

1. Confirm that the batch and cover sheets are correctly labeled, dated, and signed where necessary. Review the batch sheet, project notes and lab notes with the incomplete list for special comments and due dates. Check that the run protocol has been selected correctly.

2. Check to see that the autosampler table printout is with the run and has a review signature from the analyst and run importer.

3. Refer to the calculation section of this SOP for calculations used for ICP analysis.

4. Refer to Tables I, and II for run and batch calibration and QC frequency, acceptance criteria and corrective action. For information on statistical limits refer to 1-P-QM-QMA-9017313.

5. Each analytical run must have a QC review attached. All samples on the run must be listed on the QC review with notation as to whether the sample was verified or needed to be redigested/reanalyzed. The verifier must document on the QC review if any sample(s) were selected/deselected.

6. For spike levels of run QC see 1-P-QM-FOR-9009067

7. Spike levels of batch QC are available in the LIMS and on 1-P-QM-FOR-9009182.

8. LOQs are available in the LIMS and on 1-P-QM-FOR-9008385.

9. Check to make sure that all results are below 90% of the linear range. If a sample reading is above 90% of the linear range, then reread the sample at an appropriate dilution. Verifiers footnote the coversheet indicating that all dilutions were performed correctly by comparing to the previous undiluted sample data.

10. Check that the **absolute** value of all nondetected analytes is less than the LOQ. A technical decision must be made as to whether a reread is warranted for readings <(-LOQ). Comments are added during verification to any non-detect sample readings that were diluted due to <(-LOQ).

11. For SPLP and TCLP samples, an MSA (method of standard additions) is required if:

    a. The sample concentration falls between 80% to 100% of the regulatory limits.

    b. If the SPLP or TCLP Matrix Spike (QA) recovers < 20%, all samples in the leachate batch must be reanalyzed using the method of standard additions for that analyte.

12. For all EW samples (samples from public drinking water sources); check the results against the MCL (maximum contaminant level). If an analyte **exceeds** the MCL, notify a verifier at once. An automated email is sent to the Client Service Representative and the state for the analytes listed below with the exception of lead and copper which follow the 90th percentile rule (the CSR tracks the lead and copper and notifies the supplier when necessary). Suppliers must be notified within 24 hours.

Analyte	MCL (mg/L)
Sb	0.006
As	0.01
Ba	2 (1)**
Be	0.004
Cd	0.005
Cr	0.1 (0.05)**
Se	0.05 (0.01)**
Tl	0.002
Al*	0.2
Cu	1.0
Fe*	0.3
Mn*	0.05
Ag*	0.1 (0.05)**
Zn*	5.0

*****Secondary regulated contaminants

******The federal MCLs for these analytes are greater than Pennsylvania MCLs. The numbers in parentheses are the MCLs effective in Pennsylvania.

13. Check the internal standard (Yttrium) level for the entire run. If the Yttrium reading for any sample is < 50% or >130% of the reading for S0, then reread the sample at a dilution.

    NOTE: The internal standard is added in equal concentration to all of the samples and standards via a dedicated line on the peristaltic pump. The analytical lines referenced to an internal standard report a corrected concentration value based on the ratio of analyte to internal standard intensities. All of the calculations for determining concentration are based off of Intensity Ratio (IR). The IR is defined as the background corrected intensity signal of the analyte line (Ia) divided by the internal standard value (Iis). IR = Ia/Iis

14. For EPA600 series samples, an ICV2 is analyzed immediately after the initial ICV. The average of the six total replicates is used with a requirement of ±5% accuracy and an RSD of <3%.

15. Check for high concentrations of interfering elements. Analytes must be flagged for possible interference if any interfering element concentration is greater than the level used for semi-annual IECs. Comments must be added during verification to any samples reading under the reporting limit that were diluted due to possible interference(s). For the iCAP 6000 series instrument (T70, #11016; T71, #16315; T72, #16417, T73, #18255) Si is monitored due to an interference on Pb. Pb data must be reread if Si is not within ±10% in CCVs.

NOTE: All samples requiring postspikes must be postspiked at 2 times the CRQL or approximately 2 times the indigenous level of the sample.

F. When raw data checks are complete, check the following:

1. All samples requiring reread/redigestion are listed on the reread/redigestion schedule forms. Any dilutions required have been calculated correctly and added to the reread/redigestion form. Specific instrument has been noted for client requirements if necessary.

2. Data for samples following Good Laboratory Practices (GLP) must be retained as permanent storage.

3. The data are uploaded to the LIMS via IDAT by the reviewer and are verified from the LIMS by the verifier.

G. Instrument detection limits are performed on a quarterly basis and method detection limits are performed on a yearly basis for each analytical instrument.

H. Verification process

1. Confirm that all required pieces of QC have been uploaded to the LIMS and are within specification. If there is partial QC on the current run and the samples have been analyzed more than once, check to see if there are associated runs in the hold bin waiting on additional QC to be verified.

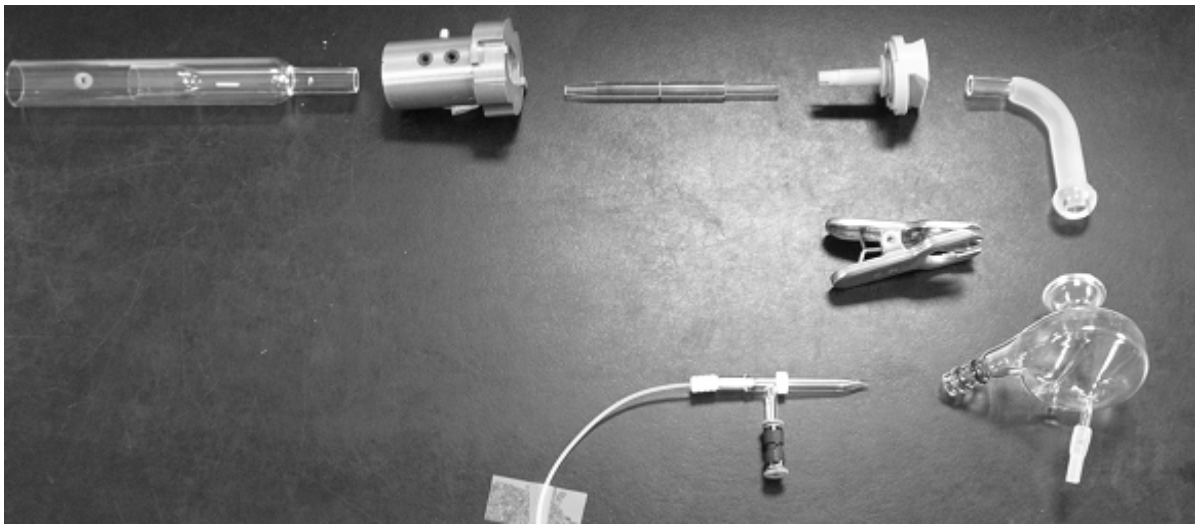
2. In the LIMS, choose method of verification. (Metals verification by run, or verify by individual element.)

3. Ensure that all lab notes and project notes were followed.

4. Non-compliant data can be reported only after all required corrective actions have been taken. Document the nonconformance using Form 1-P-QM-FOR-9007858.

5. When all of the elements are verified for a digest, verify the digest number. Associated tracking numbers and suite numbers are routinely auto-verified within hours of verifying all of the elements and digests on each sample.

Figure 1



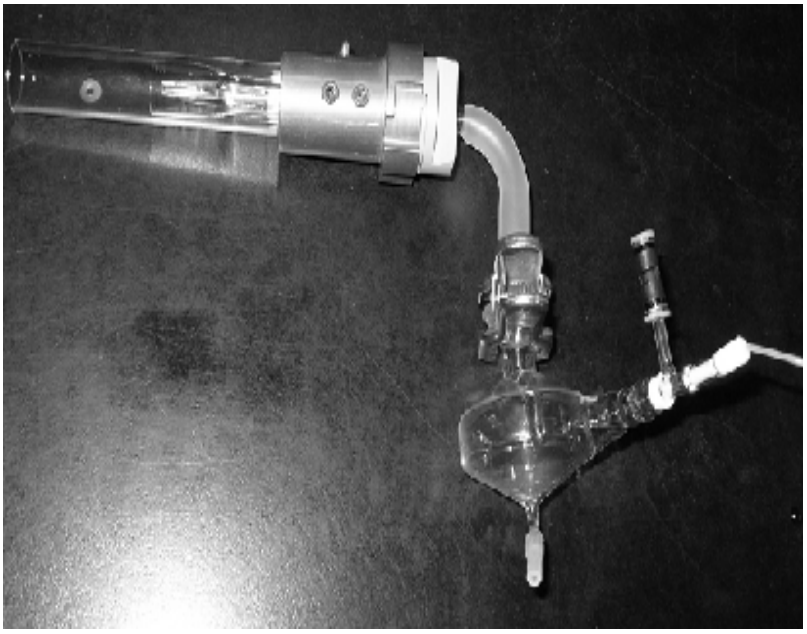


Table I
QC requirements for SW-846 6010B and 6010C (ICP Metals)

	Frequency	Acceptance	Corrective Action
Calibration	The calibration contains a blank and 1 standard.		
Initial Calibration Verification (ICV)	Must be analyzed immediately following Calibration Standards.	±10% of the true value. RSD must be <5% (6010B, 6010C).	If the ICV is out of specification high for an analyte and the result is not < - LOQ, accept results that report as non-detect for affected analyte. Results for the affected analyte(s) > or = to the reporting limit must not be reported from the run (reanalyze).
Initial Calibration Blank (ICB)	Must be analyzed immediately following the ICV.	|ICB| must be <3× IDL (6010B, 6010C) If ICB is Out of Specification positive (+), accept results that are > 10X the ICB, or < reporting limit. If ICB is Out of Specification negative (-), only accept results that are > 10X ICB. (6010B, 6010C).	Data for that analyte cannot be reported from the run for the affected samples (reanalyze the affected samples for that analyte) (6010B, 6010C).
Low Level Check (LLC)	Must be analyzed at the beginning and end of each run and before the ICSA and ICSAB.	6010B: ±50% of True Value. Not applicable if sample concentrations are >10× the true value of the LLC. For LLC results >the high limit, samples <reporting limit can be accepted. 6010C:+/-30% of True Value. Not applicable if sample concentrations are < LOQ, or if sample concentrations are greater than the CCV (CCV must be within specification).	Data for that analyte cannot be reported from the run for the affected samples.
Interference Check Standard A and AB (ICSA/ICSAB)	The ICSA must be analyzed at the beginning and end of each run immediately following the LLC. The ICSAB must be analyzed at the beginning and end of each run immediately following the ICSA.	±20% of the true value for analytes that are spiked. |ICS| or |ICSAB| must be <2× LOQ for analytes that are not spiked.	Data for that analyte cannot be reported from the run (reanalyze all samples requiring that element).

Table I (Continued)

	Frequency	Acceptance	Corrective Action
Continuing Calibration Verification (CCV)	Must be analyzed immediately following the ICSAB and at a frequency of every 10 samples.	±10% of the true value. RSD must be <5% (6010B, 6010C)	If the CCV is out of specification high for an analyte and the result is not < - LOQ, accept results that report as non-detect for affected analyte. Results for the affected analyte(s) > or = to the reporting limit must not be reported from the run (reanalyze).
Continuing Calibration Blank (CCB)	Must be analyzed immediately following CCV's at a frequency of every 10 samples	|CCB| must be <3× IDL (6010B, 6010C) If CCB is Out of Specification positive (+), accept results that are > 10X the CCB, or < reporting limit. If CCB is Out of Specification negative (-), only accept results that are > 10X CCB. (6010B, 6010C).	Data bracketing the CCB for that analyte cannot be reported for the affected samples (reanalyze the affected samples in the bracketing blocks for that analyte) (6010B, 6010C).
Preparation Blank (PB)	Must be prepped at a frequency of 1 per analytical batch of 20 samples or less.	|PB| must be <1/2 LOQ. For 6010B: Not applicable if analyte reading in the sample is > 20× the PB reading or <LOQ. For 6010C: Not applicable if analyte reading in the sample is > 10× the PB reading or <LOQ.	Redigest all associated samples.
Laboratory Control Standard (LCS)	Must be prepped at a frequency of 1 per analytical batch of 20 samples or less.	Use statistical limits or the method limit of ±20%, as indicated by the client requirement. If the LCS is out of specification high and the sample result is less than the LOQ the data can be taken.	Redigest all associated samples if the LCS is out of specification low. If the LCS is out of specification high redigest samples that are greater than the LOQ.

Table I (Continued)

	Frequency	Acceptance	Corrective Action
Laboratory Control Standard Duplicate (LCSD)	If insufficient sample volume is submitted to perform batch QC then a LCSD is prepped at a frequency of 1 per analytical batch of 20 samples or less.	Use statistical limits or the method limit of ±20%, as indicated by the client requirement If the LCS is out of specification high and the sample result is less than the LOQ the data can be taken. RPD must be < 20%.	Redigest all associated samples if the LCS is out of specification low. If the LCS is out of specification high redigest samples that are greater than the LOQ. Redigest samples if RPD is out of specification
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	Must be prepped at a frequency of 1 per analytical batch of 20 samples or less.	Use statistical limits or the method limit of ±25% (6010B, 6010C), as indicated by the client requirement. RPD must be <20%.	Data is flagged in the QC Summary and/or in the data package. If sample concentration <4× the spike added a PDS must be performed. Flagged in the Data Package and in the QC summary.
Duplicate (D)	Must be prepped at a frequency of 1 per analytical batch of 20 samples or less.	If the samples are >5× the LOQ the RPD must be <20%. If either the sample or duplicate is <5× the LOQ the difference between the two values must be <LOQ. Not applicable if both samples are <LOQ.	Data is flagged in the QC Summary and/or in the data package.
Post Digestion Spike (PDS)	Must be prepared with each background sample. Evaluated when matrix spike(s) are not within specification.	±25% of the true value.	The data is reported in the data package.
Serial Dilution	Must be prepared with each background sample. Evaluated only when analyte concentrations are >50× the MDL.	The percent difference must be <10%.	The data is flagged in the data package.

Table I (Continued)

	Frequency	Acceptance	Corrective Action
Samples		Results must be < 90% of the linear dynamic range, >-LOQ. RSD must be <20% for results >2x LOQ. Elements reported as non-detect are accepted if the ICV/CCV is out of specification high, and the sample is not < - LOQ.	Sample is diluted and reanalyzed. Sample is reanalyzed. Reanalyze for elements that do not meet this criteria.
Linear Range (LR)	Analyzed quarterly.	±10% of the true value	Samples reading greater than 90% of the calibration range must be reanalyzed.
Internal Standard	Added to samples in line by use of a mixing T.	Must be 50% -130% of the calibration blank.	Reanalyze at a dilution.

Table II
QC requirements EPA-600/R-94/111 (PW, EW, WW) ICP Metals

	Frequency	Acceptance	Corrective Action
Calibration	The calibration contains a blank and 1 standard.		
Initial Calibration Verification (ICV) ICV2	Must be analyzed immediately following calibration. ICV2 must be analyzed immediately after the ICV to attain the average of six replicates.	Avg of ICV and ICV2 must be ±5% of the true value. RSD for 6 replicates must be <3%.	If the ICV is out of specification high for an analyte and the result is not < - LOQ, accept results that report as non-detect for affected analyte. Results for the affected analyte(s) > or = to the reporting limit must not be reported from the run (reanalyze).
Initial Calibration Blank (ICB)	Must be analyzed immediately following the ICV.	|ICB| must be < 3x IDL If ICB is Out of Specification positive (+), accept results that are > 10X the ICB, or < reporting limit. If ICB is Out of Specification negative (-), only accept results that are > 10X ICB.	Data for that analyte cannot be reported from the run (reanalyze all samples requiring that analyte).
Low Level Check (LLC)	Must be analyzed at the beginning and end of each run and before the ICSA and ICSAB.	Use statistical limits. Not applicable if sample concentrations are >10× the true value of the LLC. For LLC results >the high limit, samples <reporting limit can be accepted.	Data for that analyte cannot be reported from the sample.
Interference Check Standard A and AB (ICSA/ICSAB)	The ICSA must be analyzed at the beginning and end of each run immediately following the LLC. The ICSAB must be analyzed at the beginning and end of each run immediately following the ICSA.	± 20% of the true value for analytes that are spiked. |ICSA| or |ICSAB| must be <2× LOQ for analytes that are not spiked.	Data for that analyte cannot be reported from the run (reanalyze all samples requiring that element).
Continuing Calibration Verification (CCV)	Must be analyzed immediately following the ICSAB and at a frequency of every 10 samples.	±10% of the true value.	If the CCV is out of specification high for an analyte and the result is not < - LOQ, accept results that report as non-detect for affected analyte. Results for the affected analyte(s) > or = to the reporting limit must not be reported from the run (reanalyze).

Table II (Continued)

	Frequency	Acceptance	Corrective Action
Continuing Calibration Blank (CCB)	Must be analyzed immediately following CCV's at a frequency of every 10 samples.	|CCB| must be <3x IDL If CCB is Out of Specification positive (+), accept results that are > 10X the CCB, or < reporting limit. If CCB is Out of Specification negative (-), only accept results that are > 10X CCB.	Data bracketing the CCB for the affected analyte cannot be reported (reanalyze all samples in the bracketing blocks for that element).
Preparation Blank (PB)	Must be prepped at a frequency of 1 per analytical batch of 10 samples or less.	|PB| must be <1/2 LOQ or 2.2x MDL whichever is greater. Not applicable if analyte reading in the sample is >10× the PB reading or <LOQ. EW samples are not accepted for any reason if the PB is out of specification.	Redigest all associated samples. EW samples must be redigested.
Laboratory Control Standard (LCS)	Must be prepped at a frequency of 1 per analytical batch of 10 samples or less. *Note: The LCS is spiked at or below the MCL for all primary drinking water metals. See QA/QC section E.12. for MCL levels.	Use statistical limits or the method limit of ±15% (PW, EW)/ 20%(WW) ,as indicated by the client requirement. If the LCS is out of specification high and the sample result is less than the LOQ the data can be taken. EW samples are not accepted if the LCS is out of specification.	Redigest all associated samples if the LCS is out of specification low. If the LCS is out of specification high redigest samples that are greater than the LOQ. EW samples must be redigested.
Laboratory Control Standard Duplicate (LCSD)	If insufficient sample volume is submitted to perform batch QC then a LCSD is prepped at a frequency of 1 per analytical batch of 10 samples or less. *Note: The LCS is spiked at or below the MCL for all primary drinking water metals. See QA/QC section E.12. for MCL levels.	Use statistical limits or the method limit of ±15%(PW, EW)/ 20%(WW) ,as indicated by the client requirement. If the LCS is out of specification high and the sample result is less than the LOQ the data can be taken. EW samples are not accepted if the LCS is out of specification. RPD must be < 20%.	Redigest all associated samples if the LCS is out of specification low. If the LCS is out of specification high, redigest samples that are greater than the LOQ. EW samples must be redigested. Redigest samples if RPD is out of specification

Table II (Continued)

	Frequency	Acceptance	Corrective Action
Matrix Spike (MS)	Must be prepped at a frequency of 1 per analytical batch of 10 samples or less.	Use statistical limits or the method limit of ±30%, as indicated by the client requirement.	Data is flagged in the QC Summary and/or in the data package. If sample concentration <4× the spike added a PDS must be performed.
Duplicate (D)	Must be prepped at a frequency of 1 per analytical batch of 10 samples or less.	If the samples are >5× the LOQ the RPD must be <20%. If either the sample or duplicate is <5× the LOQ the difference between the two values must be <LOQ. Not applicable if both samples are <LOQ.	Data is flagged in the QC Summary and/or in the data package.
Post Digestion Spike (PDS)	Must be prepared with each background sample. Evaluated when matrix spike is not within specification.	±15% of the true value.	Data is reported in the data package.
Serial Dilution	Must be prepared with each background sample. Evaluated only when analyte concentrations are >50× IDL.	The percent difference must be <10%.	Data is flagged in the data package.
Samples		Results must be < 90% of the linear dynamic range, >-LOQ. RSD must be <20% for results > 2xLOQ. Elements reported as non-detect are accepted if the ICV/CCV is out of specification high and the sample is not < - LOQ.	Sample is diluted and reanalyzed. Sample is reanalyzed. Reanalyze for elements that do not meet this criteria.
Linear Range (LR)	Analyzed quarterly.	±10% of the true value	Samples reading greater than 90% of the calibration range must be reanalyzed.
Internal Standard	Added to samples in line by use of a mixing T.	Must be 50% -130% of the calibration blank.	Reanalyze at a dilution.

Appendix I

Definitions and explanations of the codes and symbols used on the raw data

A. Sample table information

1. The run number.
2. The page number.
3. The tube number.
4. The sample number.
5. The first and second of four asterisks denote whether the sample is a background (U*), duplicate (D*), spike (R*), MSD (M*), post-digestion spike (UP), serial dilution (UL), or not a QC sample (**).
6. The weight to volume or volume to volume digestion ratio, consisting of the initial quantity of sample used and the final digest volume.
7. The dilution factor – Indicating if the digest solution was diluted prior to analysis. An undiluted sample is labeled DF1.
8. Digestion batch number – Assigned when designated samples are scheduled for preparation, this number is used to track samples and QC prepared together.
9. The protocol by which the data is reviewed (SW-846, EPA-600).
10. Date and time of the sample injection into the instrument.
11. The ICAP identification number.

Appendix I (Continued)

B. The ICP scans all of the method elements simultaneously during the analysis. The QC review lists all the samples on the run. The QC review lists elements verified, good phantom, and elements/phantom that are bad (need to be reread for run or batch QC). The reviewer or verifier documents on the QC review if any element(s)/sample(s) were selected/deselected.

C. The following are error codes in the iTEVA™ software .

1. S = Saturation – The concentration of the element is more than the detector can quantify.

2. K = The Elements Affected by a Saturated Element – The concentration listed is not accurate, and a more accurate result can be obtained by running the sample at a dilution.

D. Along with the average concentration (in ppm), the average intensity, %RSD and all three replicates are shown for each analyte. Internal standard values are intensities (cts/s).

Eurofins Document Reference	1-P-QM-WI -9015067	**Revision**	16
Effective Date	Nov 27, 2015	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 0259, 0159		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Nina Haller
Reviewed and Approved by	Robert Strocko;Review;Thursday, November 12, 2015 10:35:17 AM EST Kathryn Brungard;Approval;Friday, November 13, 2015 4:30:05 PM EST

Table of Contents

Revision Log:

Revision: 16		**Effective Date:** This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Personnel Training and Qualifications	Enhancement	Added information on IDOC and DOC options.
Table 1	Clarification for compliance	Added a note that the LCS is spiked at or below the MCL for drinking water.
Table 1	Clarification for compliance	Added new EW rule for the PB and LCS if they are out of specification data cannot be accepted for any reason.
Table 1 and 2	Clarification for compliance	PB requirements acceptance criteria updated.

Revision: 15		**Effective Date:** Jun 16, 2015
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout Document	No longer applicable Clarification	Removed CLP references. Added eLIMS-EP for Parallax.
Table I and II	Clarification	Clarified the acceptance criteria for LCS/LCSD.

Reference:

1. Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

2. Test Methods for Evaluating Solid Wastes, SW-846 Method 7471B, February 2007.

3. Test Methods for Evaluating Solid Wastes, SW-846 Method 7471A, September 1994

4 Method 245.1 (rev. 3), Determination of Mercury in Water by Cold Vapor Atomic Absorption Spectroscopy, USEPA 600/R-94/111 May 1994.

5. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
Analysis #5711, 10638	Sample Preparation of Soil, Sediment, Sludge, Oils, and Tissues for Total Mercury Analysis by Atomic Absorption Cold Vapor Technique
Analysis #5713, 5714	Digestion of Aqueous Samples by SW-846 Method 7470A, EPA 254.1.
1-P-QM-FOR-9007858	Nonconformance Form
1-P-QM-FOR-9008921	Working Instructions for Preparation of Mercury Solutions and Standards
1-P-QM-QMA-9015390	Demonstrations of Capability
1-P-QM-QMA-9017325	Instrument and Equipment Maintenance and Calibration

Purpose:

The purpose of this SOP is to describe the proper analysis of aqueous, solid and tissue samples for Mercury by Cold Vapor Atomic Absorption.

Scope:

This method is used for determination of mercury in aqueous and solid samples. The optimum concentration range for this method is 0.2 to 5.0 ppb.

Matrices - EPA 7470A is applicable to water analysis. EPA 7471A and EPA 7471B are applicable to soil and tissue analysis. EPA 245.1 is applicable to water analysis.

LOQs are based on annual statistical evaluation of laboratory data and are subject to change. The current MDLs and LOQs are maintained in the LIMS.

Limits of Quantitation are subject to change without notification.

Background Information:

Not applicable

Basic Principles:

The Leeman Labs Mercury Analyzer utilizes continuous flow technology with drying of the sample vapor for the analysis of mercury by automated vapor generation. The reaction for the mercury analysis is a simple reduction reaction. The mercury is reduced with stannous chloride to liberate mercury metal and Tin (IV) chloride. An inert gas is used to sweep the volatile mercury into the absorption cell in the optical path of the atomic absorption spectrophotometer. The dry vapor enters one path of the optical cell, which has been optimized for fast response (small diameter), and sensitivity (long length).

Mercury is measured using a solid state detector with a wide dynamic range and a mercury source that delivers a stable source of emission at 254 nm. The signal is referenced to the simultaneous absorbance of the pure carrier gas flowing through the second optical path under identical conditions.

Reference Modifications:

SW-846 Methods 7470A, 7471A, 7471B and EPA 245.1 are manual procedures. This SOP is written for an automated determination. The chemistry used to perform the mercury determination is the same. This modification does not impact the quality of the data generated.

Definitions:

1. 0.15% HNO_3 – 0.15% Nitric Acid Solution
2. ACS – American Chemical Society
3. Calibration Blanks – includes ICBs and CCBs
4. CCB – Continuing Calibration Blank
5. CCV – Continuing Calibration Verification
6. CRA – Low Level Check Standard
7. D – Sample Duplicate
8. DOC – Demonstration of Capability
9. ICB – Initial Calibration Blank
10. ICV – Initial Calibration Verification
11. IDOC – Initial Demonstration of Capability

12. LCS/LCSD – Laboratory Control Sample/ Laboratory Control Sample Duplicate

13. LCSW/LCSS – Laboratory Control Sample Water/Laboratory Control Sample Solid

14. LIMS – Laboratory Information Management Systems

15. LLI Sample ID – unique 7-digit number assigned to a client sample.

16. LOQ – Limit of Quantitation

17. M – Sample spike duplicate

18. MDL – Method Detection Limit

19. MS/MSD – Matrix spike/matrix spike duplicate

20. PB/PBW/ PBS –Preparation Blank/ Preparation Blank Water/Preparation Blank Solid.

21. QC – Quality Control

22. R – sample spike

23. RPD – Relative Percent Difference

24. Leeman Labs Envoy software – a windows based program to help navigate the software.

25. Method Blank - equivalent to a Preparation Blank. A designated sample designed to monitor for sample contamination during the analysis process. A volume of reagent laboratory water is typically used to monitor water sample analysis, while solids blanks consist of a purified solid matrix or just the reagents used in the test. The blank demonstrates that no artifacts were introduced during the analysis process.

26. MSA – Method of Standard Additions

27. eLIMS-EP (Parallax) – The computer system that is used for Environmental work to track client samples and report results for those samples, unless spreadsheets or certificates of analysis reports are attached by the technical department. Also referred to as the LIMS.

28. SOP- Standard Operating Procedure

29. SPLP - Synthetic Precipitation Leaching Procedure

30. TCLP – Toxicity Characteristic Leaching Procedure

31. U or US – unspiked background sample

Interferences:

Potassium permanganate is added to samples to eliminate possible interference from sulfide. Concentrations as high as 20 mg/L of sulfide as sodium sulfide do not interfere with the recovery of added inorganic mercury from reagent water.

Samples high in chlorides require additional permanganate (as much as 25 mL) because, during the oxidation step, chlorides are converted to free chlorine, which also absorbs radiation of 253.7 nm. Take care to ensure that free chlorine is absent before the mercury is reduced and swept into the cell by using an excess of hydroxylamine sulfate (or chloride) reagent.

Copper has been reported to interfere; however, copper concentrations as high as 10 mg/kg had no effect on recovery of mercury from spiked samples.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

Preparing samples for inorganic analysis involves working with concentrated acids and other chemicals which are dangerous if not handled carefully:

Nitric acid (HNO3) – This acid can cause skin burns. Add nitric acid to samples in a hood to avoid exposure to toxic fumes.

Sulfuric acid (H2SO4) – This acid is a strong oxidizing agent and can cause severe burns. Sulfuric acid spills are extremely slippery, adding to the danger. Always use in a fume hood. Never mix with concentrated HCl or concentrated KMNO4 to avoid a violent reaction (explosive splattering and extreme heat).

Hydrochloric acid (HCl) – This acid can cause skin burns. Never mix HCl with concentrated H2SO4 to avoid a violent reaction. Always use in a fume hood.

When diluting strong acids, never add water to acid; always add acid to water.

Store concentrated acids in the prep room acid lockers. Only acids are to be stored in these lockers. (Store solvents in the flammable liquid storage cabinet.) Some concentrated acids are kept in the acid reagent bottles on prep room counters. Fill reagent bottles in an operating fume hood using caution to avoid spills.

Perform acid digestions in hoods that are turned on and have active alarms. Notify a supervisor immediately if the hood is malfunctioning or the alarm sounds. Samples that contain dust may be hazardous. Open in a fume hood.

Samples that may contain cyanide require special precautions to avoid exposure to hydrogen cyanide gas. Contact your supervisor prior to adding acid. Always open these samples and add the acid in a hood.

Use spill pillows to absorb large acid spills (small spills are cleaned with wet paper towels.) Use SPILL-X-A powder or equivalent to neutralize any remaining acid and then rinse the area thoroughly with water. Spill pillows and SPILL-X-A are stored on the prep room shelf.

Dispose of acid waste properly. Collect all acid digestions, waste solutions, and expired reagent solutions in waste containers. When the acid waste containers are full, a designated acid waste handler transfers the waste to the acid neutralization tank.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC) which is maintained in the analyst's training records.

Initially, each analyst performing the instrumental analysis must work with an experienced analyst for a period of time until they can independently calibrate the instrument, use the system to set up sequences, perform the calculations, interpret raw data, and enter data into the LIMS. Proficiency is measured through documented audits of the tasks listed and over checking of data as well as an Initial Demonstration of Capability (IDOC).

The IDOC consists of four laboratory control samples that are carried through all steps of the analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Various options are available for a DOC and can include four laboratory control samples or one blind sample. Refer to 1-P-QM-QMA-9015390 (DOC) for more guidance on these options.

Sample Collection, Preservation, and Handling:

Aqueous samples are collected in plastic or glass containers, preserved to a pH of <2 with nitric acid and stored at 0° to 6°C not frozen. Samples must be digested within 28 days of collection for SW-846 Methods 7470A, 7471A, 7471B.

Drinking Water samples are collected in 1-L plastic or glass containers, preserved to a pH of <2 with nitric acid and stored at 0° to 6°C not frozen. Samples must be digested and analyzed within 28 days of collection for EPA 245.1

Solid samples are collected in glass containers and stored at 0° to 6°C not frozen. Samples must be digested and analyzed within 28 days of collection.

Dissolved Mercury: Samples to be analyzed for soluble mercury requiring filtration at the lab must be submitted unpreserved. The sample is run through a 0.45 micron filter within 5 days of receipt and then for aqueous samples**,** samples are collected in plastic containers and preserved to a pH of <2 with HNO_3.

Store sample digestates in plastic bottles at room temperature. Store standards and digestates separately.

Apparatus and Equipment:

Hydra II Mercury Analyzer with Envoy instrument software.

Reagents and Standards:

A. Store all standards and reagents in polyethylene or glass containers at room temperature. Label the container with the solution name, lot number, date prepared, the expiration date, the initials of the person preparing the solution, and the storage conditions.

   NOTE: Standard/ spiking concentration and reagent vendors are subject to change without notification.

B. Reagents use the following or equivalent:

1. Nitric acid, 70.0% to 71.0% HNO_3, Fisher Trace Metal Grade reagent, 1.428 g/mL; Store in glass container at room temperature. Follow manufacturer's expiration date.

2. Sodium chloride, NaCl, J.T. Baker, Certified ACS. Store in plastic container at room temperature. Follow manufacturer's expiration date.

3. Hydroxylamine hydrochloride, $NH_2OH{\bullet}HCl$, J.T. Baker, Certified ACS. Store in plastic container at room temperature. Follow manufacturer's expiration date.

4. Reagent Water

5. Stannous chloride solution, 10% SnCl, Baker Analyzed reagent, ACS. Store in plastic container at room temperature. Follow manufacturer's expiration date.

6. Hydrochloric acid, HCl, 36.5% to 38.0%, Fisher Trace Metal Grade reagent, 1.194 g/mL or equivalent. Store in glass container at room temperature. Follow manufacturer's expiration date.

C. For the preparation of calibration blanks, ICBs, CCBs, calibration standards, ICVs, CCVs, CRAs, Method Blanks, LCSs and Matrix Spikes solutions, see Form 1-P-QM-FOR-9008921.

D. General solutions - See Form 1-P-QM-FOR-9008921.

Calibration:

A. Leeman Labs Hydra II Mercury Analyzer

1. The software program has been developed to check the correlation coefficient of the curve, run appropriate ICV and CCVs at proper intervals, and check the percent recoveries of the ICV and CCVs.

2. A recalibration and reread of any associated samples is required for any checks that fall outside the windows.

B. Initial Calibration.

1. For the preparation of calibration blanks and calibration standards see Form 1-P-QM-FOR-9008921.

2. For the frequency, acceptance criteria and corrective action see tables I and II.

NOTE: The low standard must be at or below the LOQ.

C. Initial Calibration Verification (ICV).

1. For the preparation of ICV standard see Form 1-P-QM-FOR-9008921.

2. For the frequency, acceptance criteria and corrective action see tables I and II.

D. Continuing Calibration Verification (CCV).

1. For the preparation of CCV standard see Form 1-P-QM-FOR-9008921.

2. For the frequency, acceptance criteria and corrective action see tables I and II.

E. Low Level Check Standard (CRA)

1. For the preparation and concentrations of CRA standard see Form 1-P-QM-FOR-9008921.

2. For the frequency, acceptance criteria and corrective action see tables I and II.

Procedure:

A. Sample preparation

1. Aqueous samples are digested according to Analysis #5713, 5714.

2. Solid samples are digested according to Analysis #5711, 10638.

B. Leeman Labs Hydra II Mercury Analyzer

1. Instrument Setup

a. Turn ON the power to the instrument (switch in the back) and computer.

b. Ensure that Argon supply is set to 15 psi.

c. Double click the Envoy icon on the desktop to initialize the instrument software.

d. Loosen all the peristaltic pump cassettes.

e. Place levers in the 1 o-clock position to avoid stalling the pump.

f. Check that the rinse bottle is full and Luer connections are tight. Only a 'light' finger tightening is required. Refill the rinse tank with a 2.0% Hydrochloric Acid (HCl) solution. For preparation of 2.0% HCl solution, see Form1-P-QM-FOR-9008921.

g. Check that the 10% stannous chloride bottle is full and Luer connections are tight. Only a 'light' finger tightening is required. For preparation of 10% stannous chloride, see Form 1-P-QM-FOR-9008921.

h. Click the start icon on the Tool Bar to turn on the peristaltic pump and set the gas flow to method programmed conditions.

I. Check to see that the lamp, pump and gas turn on. If necessary, open the Method/Instrument Control Panel and turn them on and set appropriate parameters.

j. When the pump is turning, tighten the cassettes by lowering the levers to a horizontal position. Allow 10 minutes for lamp and pump equilibration.

k. Inspect all system connections for leaks.

l. The system is now ready to be optimized for automated analysis.

2. Autosampler and Run Setup

a. Click on the Sequence Tab to display the automated sequence page.

b. Click the Sequence menu item on the Menu bar and select "Create" from the displayed options to display a spreadsheet of empty locations consisting of 3 racks with sample locations equal to the rack capacity (24, 60 or 90).

(1) Each row represents a cup location on one of the racks and its graphical representation updates in the lower "Rack" graphic whenever the Update button is clicked.

(2) Enter only laboratory sample numbers into the sample list table. The standards and Quality Control samples are automatically populated.

(3) Click the "Update" button to when all samples are entered to populate the navigation tree to the left with the proposed run sequence.

Sample Analysis:

A. Leeman Labs Hydra II Mercury Analyzer

1. Analysis of samples with Leeman Labs Hydra II Mercury Analyzer

a. **Prior to analysis:**

(1) For soils remove cover, add 6 mL of sodium chloride/hydroxylamine hydrochloride solution to reduce excess permanganate. Adjust volume to the 100 mL mark with reagent water, and mix.

(2) For waters remove cover, add 2.4 mL of sodium chloride/hydroxylamine hydrochloride solution to reduce excess permanganate. Adjust volume to the 40 mL mark with reagent water, and mix.

b. Click the "Run Sequence" icon to start the run. If a dialog appears after the Run Sequence icon is clicked, follow the instructions of those prompts to resolve issues before running the sequence.

c. The system adds Stannous chloride to the samples via a "Y" connection in the pump tubing. The peristaltic pump then carries the sample/stannous mix to the liquid gas separator. Argon gas is bubbled through the liquid and used to transport the volatile mercury into the detector. The mercury is reduced with stannous chloride to liberate mercury metal and Tin (IV) chloride.

NOTE: Detailed instructions for the complete instrument setup are found in the *Leeman Labs Hydra II Automated Mercury Analyzer Manual*.

2. Dilutions

    a. Dilute samples when necessary to yield a response that falls within the calibration range.

    b. Report the results for the least dilute sample where the concentration measured is within the acceptable calibration range.

3. Instrument shutdown and cleanup

    a. Overnight Shutdown

        (1) Click on the “sleep” icon to stop argon flow and pump.

        (2) In sleep mode the pump is cycled on periodically to relieve pressure points where the rollers contact the tubing.

        (3) Never leave bottle of reductant and rinse connected to the instrument if the pump clamps are released because siphoning can occur and cause damage to the instrument.

    b. Long-term shutdown (more than 3 days of no operation).

        (1) Place reductant tubing and rinse tubing into a beaker of reagent water.

        (2) Run pump until system is flushed of reagents. Send autosampler tip to air.

        (3) Remove reductant and rinse tubing from beaker to allow the aspirating of air. Run pump until system is flushed of liquid. Some liquid does remain in the liquid/gas separator.

        (4) Turn OFF the pump.

(5) Close Envoy program and power down the instrument.

(6) Shut OFF the power to the computer and monitor.

(7) Shut down argon gas flow.

4. Maintenance

a. Replace the pump tubing as needed under normal daily usage.

b. On an as needed basis, check the optical cell and windows, and if needed, clean the optical cell.

(1) Wipe the optical cell with a soapy solution (one drop of liquid Ivory soap to 500 mL reagent water) and warm tap water.

(2) Rinse with reagent water and dry. To speed the drying of the optical cell, connect the heater plug to the optical cell with the windows off for several minutes.

(3) Clean the quartz windows with methanol and a piece of lens paper.

(4) Document any maintenance in the Mercury maintenance logbook located next to the instrument.

NOTE: Detailed instructions for the maintenance and troubleshooting of the Leeman Labs Mercury Analyzer can be found in the *Leeman Labs Hydra II Mercury Analyzer Manual.*

Calculations:

1. Final result

   a. Water sample

$$\frac{Instrument}{Reading} \times \frac{Dilution\ Volume}{Aliquot\ Volume} \times \frac{Final\ Volume}{Sample\ Volume}$$

   b. Solid sample (mg/kg)

$$\frac{Instrument}{Reading} \times \frac{Dilution\ Volume}{Aliquot\ Volume} \times \frac{Final\ Volume}{Sample\ Weight\ (grams)}$$

   All dilution factors must be recorded and used in the calculation. [To enter dilution data into the LIMS when multiple dilutions are used, a factor must be formed (Ex. 1), which contains no more than three figures for the volume or the aliquot (Ex. 2).]

   Ex. 1. 50/.5 × 10/1 = 500/.5

   Ex. 2. 50/.5 × 25/.5 = 1250/.25 = 125/.025

   NOTE: The default units are µg/L

2. Relative percent different (RPD)

$$RPD = \frac{S - D}{(S + D)/2} \times 100$$

Where:

S = first sample value

D = duplicate sample value

3. Spike recovery

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

Where:

SSR = spiked sample result

SR = sample result

SA = spike added

4. Correlation Coefficient

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{N})(\sum Y^2 - \frac{(\sum Y)^2}{N})}}$$

Where :

X = the known concentration

Y = the instrument response

N = the total number of data points

5. Serial Dilution

$$\%\ Difference = \frac{(5 \times SDR) - SR}{SR} \times 100$$

Where:

SDR = serial dilution result

SR = sample result

6. Methods of standard additions (MSA)

Take 4 identical aliquots of the same sample. Leave one unspiked. Spike the other 3 aliquots with different levels of a standard solution. Add blank solution to sample aliquots so that the final volume is the same for all. Use small volumes of spiking solution to avoid diluting the sample more than 10%. Analyze the 4 aliquots and record the instrument readings in absorbance. Use the readings and spike values to find the slope and x- and y- intercepts. The x- intercept is the result.

$$\text{Slope} = m = \frac{\sum x_i y_i - (\sum x_i \sum y_i)/n}{\sum x_i^2 - (\sum x_i)^2/n}$$

$$\text{Y-Intercept} = b = \bar{y} - m\bar{x}$$

$$\text{Result} = -\frac{b}{m}$$

$$\text{Correlation Coefficient} = r = \frac{\sum\{(x_i - \bar{x})(y_i - \bar{y})\}}{\sqrt{\left[\sum (x_i - \bar{x})^2\right]\left[\sum (y_i - \bar{y})^2\right]}}$$

The correlation coefficient (r) for the least squares fit must be ≥0.995. If the r value is <0.995, the MSA must be repeated at the same dilution. If the r value is again low, the result with the higher r value is verified and both are flagged with a "+" in the data package. If the r value is <0.990, the sample is run at an interference dilution to overcome matrix effects. This usually requires a raised limit of quantitation. If a client requests a particular limit of quantitation that prohibits further dilution, then the sample is repeated at the same dilution and the best of the two results is verified.

Statistical Information/Method Performance:

Generate MDLs and LOQs according to 1-P-QM-QMA-9017309. Perform an MDL study on each instrument used for the analysis. Determine the MDL by taking seven spiked replicates through the entire digestion and analysis procedure. Compare and pool results to determine the final reporting MDL. The department supervisor maintains annual study data. The department supervisor requests that a Quality Assurance Specialist update to the LIMS as needed. Update the department database via a download from the LIMS.

Quality Assurance/Quality Control:

A. For 7470A, 7471A, and 7471B, each digestion batch (up to 20 samples) must contain a method blank, LCS, and either an US, D, MS, MSD or an LCS/LCSD.

B. For 245.1, each digestion batch (up to 10 samples) must contain a method blank, LCS, and either an US, D, MS or an LCS/LCSD.

C. QC limits for MS/MSD, and LCS/LCSD are established through statistical analysis of historical data.

   1. The limits are maintained in the LIMS for the relevant analysis numbers.

   2. The limits are evaluated every 6 months and updated as needed.

   3. The limits are subject to change without notification.

D. Batch Quality Control

   1. For the preparation and concentrations of Batch Quality Control see Form 1-P-QM-FOR-9008921.

   2. For the frequency, acceptance criteria and corrective action see tables I and II.

E. Raw data quality checks

   1. Confirm that the batch and cover sheets are correctly labeled, dated, and signed where necessary. Review the batch sheet, project notes and lab notes with the incomplete list for special comments and due dates. Check that the run protocol has been selected correctly.

   2. Refer to the calculation section of this SOP for calculations used for Hg analysis.

3. Refer to Tables I and II for run and batch calibration and QC frequency, acceptance criteria and corrective action. For information on statistical limits see 1-P-QM-QMA-9017313.

4. Each analytical run must have a QC review attached. All samples on the run must be listed on the QC review with notation as to whether the sample was verified or needed to be redigested/reanalyzed. The verifier must document on the QC review if any sample(s) were selected/deselected.

5. For spike levels of run and batch QC, see Form 1-P-QM-FOR-9008921.

6. LOQs are available to analysts in the LIMS.

7. Check to make sure that all results are within the calibrations range. If a sample reading is above the calibration range, then reread the sample at an appropriate dilution.

8. Check that the **absolute** value of all nondetected analytes is less than the LOQ. A technical decision must be made as to whether a reread is warranted for readings ≤LOQ.

9. For TCLP and SPLP samples, an MSA (method of standard additions) is required if:

    a. The sample concentration falls between 80% to 100% of the regulatory limits.

    b. If the TCLP and SPLP matrix spike (QA) recovers <20%, all samples in the leachate batch must be reanalyzed using the method of standard additions for that analyte.

10. For all EW samples (samples from public drinking water sources); check the results against the MCL (maximum contaminant level). If an analyte **exceeds** the MCL, notify a verifier at once so that the supplier can be notified. The verifier must contact the Client Service Representative, who must then notify the Supplier. Suppliers must be notified within 24 hours.

Analyte	MCL (mg/L)
Hg	0.002

F. When raw data checks are complete, check the following:

1. All samples requiring redigestion are listed on the redigestion schedule.

2. Redigest request forms are clipped to the front of the run.

3. The data are uploaded to eLIMS-EP via IDAT by reviewer then verified from eLIMS-EP by a verifier.

5. The data packet is placed in the verification bin.

G. Instrument detection limits are performed on a quarterly basis and method detection limits are performed on a yearly basis for each analytical instrument.

H. Taking an instrument/analysis out of service/returning an instrument/analysis to service.

NOTE: The following information is taken from 1-P-QM-QMA-9017325. In the event of an equipment failure, perform the following steps:

1. Document the nature of the failure in the maintenance logbook.

2. Document how and when the defect was discovered.

3. Notify a supervisor or experienced analyst to determine a person who can decide on appropriate action to take.

4. The instrument must be clearly tagged as *Out of Service*. The tag must contain the following information:

   a. Date taken out of service.

b. Employee who took the instrument out of service.

c. Reason for tagout.

5. The date taken out of service and the date returned to service must be documented in the logbook.

6. Document any corrective action that was taken and the result of that corrective action (i.e., system calibration within specifications, etc.) to bring the equipment back into service.

7. Supervisory personnel must perform a documented evaluation and review of instrumentation/equipment where a major or uncommon failure has occurred to assess the potential impact the failure could have on the calibration and/or qualification of the instrument.

8. After a repair, document whether the function has been fixed. Calibration or verification activities are to be performed before the instrumentation is put back into service.

I. Verification process

1. Confirm that all required pieces of QC have been uploaded to eLIMS-EP and are within specification. If there is partial QC on the current run and the samples have been analyzed more than once, check to see if there are associated runs in the hold bin waiting on additional QC to be verified.

2. In eLIMS-EP, choose method of verification. (Metals verification by run or verify by individual element).

3. Ensure that all lab notes and project notes were followed.

4. Non-compliant data can be reported only after all required corrective actions have been taken. Document the nonconformance using Form 1-P-QM-FOR-9007858.

5. Once all of the elements are verified for a digest, verify the digest number. Associated tracking numbers or suite numbers will be auto-verified after all of the metals are verified.

Table I
QC Requirements for EPA600 245.1 (Mercury) for (PW, EW) and (WW)

	Frequency	Acceptance	Corrective Action
Calibration	The calibration contains a blank and 5 standards. Due to the instrument software limitations, the calibration blank must be included in the correlation coefficient calculation.	Correlation coefficient >0.995	If the correlation coefficient is not met, confirm instrument conditions (i.e. check pump tubing and gas liquid separator). Reanalyze the curve, if the correlation coefficient is acceptable, proceed with sample analysis. If the correlation coefficient is not met after reanalysis, redigest and reanalyze the curve and all associated samples.
Initial Calibration Verification (ICV)	Must be analyzed immediately following the calibration.	±5% of True Value	If the ICV is out of specification high report the elements that are < LOQ. For elements > LOQ, data cannot be reported. Confirm instrument conditions (i.e. check pump tubing and gas liquid separator). Reanalyze the ICV, if the recovery is acceptable, proceed with sample analysis. If the acceptance criteria are not met after reanalysis, redigest and reanalyze the curve and all associated samples.
Initial Calibration Blank (ICB)	Must be analyzed immediately following the ICV	Must be <lLOQl	Data cannot be reported from the run (reanalyze).
Contract Required Detection Limit (CRA)	Must be analyzed immediately after the ICB	±50% of the true value	Data cannot be reported from the run (reanalyze).
Continuing Calibration Verification (CCV)	Must be analyzed immediately following the CRA and at the frequency of every 10 samples.	±10% of the true value	If the CCV is out of specification high and the sample is not < - LOQ, accept samples that report as non-detect. Data bracketing the CCV cannot be reported from other samples on the run (reanalyze). If the CCV is out of specification, it is read in duplicate. If both CCVs are within specification, the data from the last good CCV is reanalyzed. If one or both CCVs are still out of specification, then the run is terminated and the samples after the last good CCV must be analyzed on a new run.
Continuing Calibration Blank (CCB)	Must be analyzed immediately following CCVs at a frequency of every 10 samples.	Must be <lLOQl	Data bracketing the CCB cannot be reported from the run (reanalyze) If the CCB is out of specification, it can be read in duplicate. If both CCBs are within specification, the data from the last good CCB is reanalyzed. If one or both CCBs are still out of specification, then the run is terminated and the samples after the last good CCB must be reanalyzed on a new run.

Table I (Continued)

	Frequency	Acceptance	Corrective Action
Preparation Blank (PB)	Must be prepped at a frequency of 1 per analytical batch of 10 samples or less.	IPBl must be < ½ LOQ or 2.2x MDL whichever is greater. Not applicable if analyte reading in the sample is >10× the PB reading or < LOQ. EW samples are not accepted for any reason if the PB is out of specification.	Redigest all associated samples. EW samples must be redigested.
Laboratory Control Standard (LCS)	Must be prepped at a frequency if 1 per analytical batch of 10 samples or less. *Note: The LCS is spiked at or below the MCL for drinking water. See QA/QC section E.10. for MCL level.	Use statistical limits, or the method limit of ±15%, as indicated by the client requirement. If the LCS is out of specification high and the sample result is less than the LOQ the data can be taken. EW samples are not accepted if the LCS is out of specification.	Redigest all associated samples if the LCS is out of specification low. If the LCS is out of specification high, redigest samples that are greater than the LOQ. EW samples must be redigested.
Laboratory Control Standard Duplicate (LCSD)	If insufficient sample volume is submitted to perform batch QC then a LCSD is prepped at a frequency of 1 per analytical batch of 10 samples or less. *Note: The LCS is spiked at or below the MCL for drinking water. See QA/QC section E.10. for MCL level.	Use statistical limits, or the method limit of ±15% As indicated by the client requirement. If the LCSD is out of specification high and the sample result is less than the LOQ the data can be taken. EW samples are not accepted if the LCS is out of specification. RPD must be <20%.	Redigest all associated samples if the LCSD is out of specification low. If the LCSD is out of specification high, redigest samples that are greater than the LOQ. EW samples must be redigested. Redigest if RPD is out of specification
Matrix Spike (MS)	Must be prepped at a frequency of 1 per analytical batch of 10 samples or less.	Use statistical limits or the method limit of ±30% whichever is tighter. (PW,EW) Use statistical limits or the method limit of ±20% whichever is tighter (WW)	The data is flagged in the QC Summary and/or in the data package.
Duplicate (D)	Must be prepped at a frequency of 1 per analytical batch of 10 samples or less.	If the samples are >5× the LOQ the RPD must be <20%. If either the sample or duplicate is <5× the LOQ the difference between the two values must be <LOQ.	The data is flagged in the QC Summary and/or in the data package.

Table II
QC Requirement for EPA SW846 7470A, 7471A and 7471B (Mercury)

	Frequency	Acceptance	Corrective Action
Calibration	The calibration contains a blank and 5 standards. Due to the instrument software limitations, the calibration blank must be included in the correlation coefficient calculation.	Correlation coefficient >0.995	If the correlation coefficient is not met, confirm instrument conditions (i.e. check pump tubing and gas liquid separator). Reanalyze the curve, if the correlation coefficient is acceptable, proceed with sample analysis. If the correlation coefficient is not met after reanalysis, redigest and reanalyze the curve and all associated samples.
Initial Calibration Verification (ICV)	Must be analyzed immediately following the calibration.	±10% of True Value	If the ICV is out of specification high report the elements that are < LOQ. For elements > LOQ, data cannot be reported. Confirm instrument conditions (i.e. check pump tubing and gas liquid separator). Reanalyze the ICV, if the recovery is acceptable, proceed with sample analysis. If the acceptance criteria are not met after reanalysis, redigest and reanalyze the curve and all associated samples.
Initial Calibration Blank (ICB)	Must be analyzed immediately following the ICV	Must be <lLOQl	Data cannot be reported from the run (reanalyze).
Contract Required Detection Limit (CRA) Limit of Quantitation Check Standard	Must be analyzed immediately after the ICB	For 7470A and 7471A: ±50% of the true value For 7471B: 30% of the True Value	Data cannot be reported from the run (reanalyze).
Continuing Calibration Verification (CCV)	Must be analyzed immediately following the CRA and at the frequency of every 10 samples.	±20% of the true value	If the CCV is out of specification high and the sample is not < - LOQ accept elements that report as non-detect. Data bracketing the CCV cannot be reported from other samples on the run (reanalyze) If the CCV is out of specification, it is read in duplicate. If both CCVs are within specification, the data from the last good CCV is reanalyzed. If one or both CCVs are still out of specification, then the run is terminated and the samples after the last good CCV must be reanalyzed on a new run or redigested if there is not enough CCV (or any other run standard) to reanalyze with a new calibration.
Continuing Calibration Blank (CCB)	Must be analyzed immediately following CCVs at a frequency of every 10 samples.	Must be <lLOQl	Data bracketing the CCB cannot be reported from the run (reanalyze) If the CCB is out of specification, it is read in duplicate. If both CCBs are within specification, the data from the last good CCB is reanalyzed. If one or both CCBs are still out of specification, then the run is terminated and the samples after the last good CCB must be reanalyzed on a new run or redigested if there is not enough CCB (or any other run standard) to reanalyze with a new calibration

Table II (Continued)

	Frequency	Acceptance	Corrective Action
Preparation Blank (PB)	Must be prepped at a frequency of 1 per analytical batch of 20 samples or less.	IPBl must be < ½ LOQ . For 7470A and 7471A: Not applicable if analyte reading in the sample is >20× the PB reading or <LOQ. For 7470B and 7471B: Not applicable if analyte reading in the sample is >10× the PB reading or <LOQ.	Redigest all associated samples.
Laboratory Control Standard (LCS)	Must be prepped at a frequency if 1 per analytical batch of 20 samples or less.	Use statistical limits or the method limit of ±20%, as indicated by the client requirement. If the LCS is out of specification high and the sample result is less than the LOQ the data can be taken.	Redigest all associated samples if the LCS is out of specification low. If the LCS is out of specification high, redigest samples that are greater than the LOQ.
Laboratory Control Standard Duplicate (LCSD)	If insufficient sample volume is submitted to perform batch QC then a LCSD is prepped at a frequency of 1 per analytical batch of 20 samples or less.	Use statistical limits or the method limit of ±20%, as indicated by the client requirement. If the LCSD is out of specification high and the sample result is less than the LOQ the data can be taken. RPD must be <20%.	Redigest all associated samples if the LCSD is out of specification low. If the LCSD is out of specification high, redigest samples that are greater than the LOQ. Redigest if RPD is out of specification
Matrix Spike (MS)	Must be prepped at a frequency of 1 per analytical batch of 20 samples or less.	Use statistical limits or the method limit of ±20% whichever is tighter.	The data is flagged in the QC Summary and/or in the data package.
Duplicate (D)	Must be prepped at a frequency of 1 per analytical batch of 20 samples or less.	If the samples are >5× the LOQ the RPD must be <20%. If either the sample or duplicate is <5× the LOQ the difference between the two values must be <LOQ.	The data is flagged in the QC Summary and/or in the data package.

Eurofins Document Reference	1-P-QM-WI -9013078	**Revision**	4
Effective Date	Jan 22, 2016	**Status**	Effective
Historical/Local Document Number	Analysis 11996, 11997, 13130		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Marla Brewer
Reviewed and Approved by	Kenneth Boley;Review;Monday, January 4, 2016 10:24:47 PM EST Christiane Sweigart;Approval;Friday, January 8, 2016 2:42:09 PM EST

Revision Log:

Revision: 4		**Effective Date:**	This version
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Scope	Clarification		Included disclaimer concerning TSC sheets
Personnel Training and Qualifications	Duplicate information		Removed the statement regarding the SOP and DOC at the beginning of the section.
Calibration C.2	Continuity		Moved (2) below calibration table
Calibration E.	Correction		Changed check standard concentration for 25ml purge analysis
Calibration F.	Enhancement		Added MDL sensitivity check requirement
Appendix	Updated with most current version		Replaced Figures 1-5

Revision: 3		**Effective Date:**	Nov 25, 2013
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Reference	Required reference		Added 5030C
Sample Collection, Preservation and Handling	Current requirement		Updated temperature range to 0° to 6°C, not frozen
Reagents and Standards A.2	Current practice		Added “or equivalent” to methanol description

Reference:

1. Volatile Organic Compounds by Gas Chromatography/ Mass Spectrometry (GC/MS), SW-846 Method 8260C, August 2006.

2. Determinative Chromatographic Separations, SW-846 Method 8000B, December 1996.

3. Purge and Trap for Aqueous Samples, SW-846 Method 5030B, December 1996.

4. Purge and Trap for Aqueous Samples. SW-846 Method 5030C, Rev 3, May 2003.

5. *Total Petroleum Hydrocarbons Analysis-Gasoline Method*, California Department of Health Services, LUFT Task Force.

6. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
1-P-QM-PRO-9015465	Glassware Cleaning
1-P-QM-PRO-9015467	GC and GC/MS Instrumentation Maintenance
1-P-QM-PRO-9015469	GC/MS Volatile Standards Traceability
1-P-QM-PRO-9015470	Preparation and Analysis of Cleaning Blanks for GC and GC/MS Volatiles
1-P-QM-PRO-9015471	GC/MS Volatiles Audit Process
1-P-QM-PRO-9017810	Level II Review of GS/MS Volatiles
1-P-QM-QMA-9015390	Demonstrations of Capability
1-P-QM-QMA-9017309	Determining Method Detection Limits and Limits of Quantitation

Scope:

This method is suitable for the determination of the target compounds listed and maintained in the LIMS (Laboratory Information Management System) for aqueous matrices. Non-target volatile compounds in the sample can be tentatively identified (TIC) using a mass spectral reference library comparison. This analysis must be performed by or under the direct supervision of an operator experienced in the analysis of volatile organics by purge and trap GC/MS methodologies and skilled in mass spectral interpretation. Using this method, the TICs are quantitated with an estimated concentration. Compounds other than those listed in the LIMS for this group of master scans are analyzed using USEPA SW-846 Method 8260C. Theoretical Standard Calibration (TSC) Sheets are included in the Appendix (Figures1-6). These TSC sheets are to serve as examples only and may not reflect most current version in use. Attachment I describes the proper analysis procedure for Gasoline Range Organics in Water. Due to poor purging efficiency or poor gas chromatographic performance, some analytes require calibration at higher levels and higher practical quantitation limits (PQLs). Any additional compounds must be added to the theoretical standard concentrations (TSC) sheet. Standards containing additional analytes must be prepared as described in the Standards section of this document. Both secondary stock solutions and matrix spike solutions must be prepared for use in analyzing additional compounds.

Basic Principles:

A 5-mL or 25-mL sample or a dilution of a sample is placed in a specially designed purge vessel. The sample is purged with an inert gas and the effluent gas passed through a sorbent tube where the volatile organics are trapped. After purging, the sorbent trap is rapidly heated and backflushed on to the head of a gas chromatographic (GC) capillary column. The GC column is temperature programmed to separate the volatile compounds, which are subsequently detected and identified using mass spectrometric techniques.

When a compound reaches the Mass Spectrometer, it is bombarded by high-energy electrons (70 eV). This causes the compound to fragment and form ions. The positive ions are focused into a quadrupole mass analyzer, where the ions are separated according to their mass/charge ratios during rapid repetitive scans. These ions are then amplified and detected with an electron multiplier.

The resulting time/intensity/mass spectra data are stored and processed by a computer. Target compounds are identified on the basis of relative retention times and mass spectral matches to standards, which are injected every 12 hours on the same system. The internal standard method is used for quantitation.

Interferences:

Contaminant sources are volatile compounds in the laboratory environment, impurities in the inert purging gas, carryover from samples containing high concentrations of volatile organic compounds and dirty glassware. The analyst must demonstrate that the system is free from interferences (by producing acceptable method blank data) before analyzing a batch of samples. Matrix effects from heavily contaminated waters can interfere with the internal standard responses, target analytes and surrogate recoveries, thereby hindering accurate quantitation. See Section 4.0 of SW-846 Method 8260C for further discussion.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; therefore, each chemical compound must be treated as a potential health hazard. Exposure to these chemicals must be reduced to the lowest possible level by whatever means available, such as the use of fume hoods, safety glasses, lab coats, and gloves. Neat compound sources and stock solutions must be collected into a lab pack upon expiration. The lab pack is delivered to Safety personnel for appropriate disposal. Expired secondary standard solutions in methanol must be disposed of as solvent waste. Pour expired secondary standard solutions into the appropriate solvent waste collection container. Aqueous calibration standard mixes are disposed of as nonhazardous aqueous waste due to the low concentration. Samples with a pH ≤2 are taken to storage until disposal in an acid waste container.

Personnel Training and Qualifications:

Education Requirement: A 4-year Baccalaureate Degree from an accredited College or University in one of the physical sciences and/or one to three years of relevant gas chromatography experience.

Analysts must be trained in the proper method of volatile organic sample preparation and analysis as determined by the supervisor(s). All training and education relating to volatile organic sample preparation and analysis must be documented by each analyst in his/her training record. All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP.

Specifically, each new chemist trains with an experienced chemist for the first 12 weeks depending on the individual and his/her previous experience. The first 12 weeks are spent working one-on-one with the trainer. This time is less if the new chemist has prior relevant experience in GC/MS and/or analytical chemistry background.

During the training period, the new chemist learns daily maintenance, calibration techniques, data and library search review, and forms generation. He/she is also required to read all relevant SOPs and EPA methods.

To evaluate the proficiency of each chemist, several checks have been established. The first is the ability to successfully calibrate. The chemist analyzes a series of at least five calibration standards and performs the calibration routine. Secondly, each analyst must perform a Demonstration of Capability (DOC). Refer to 1-P-QM-QMA-9015390 for specific requirements. Demonstration of Capability is performed annually and is maintained in the analyst's training records.

Sample Collection, Preservation, and Handling:

The samples to be analyzed with this method must be stored in a refrigerator at 0°C to 6°C, not frozen. Samples are collected in 40-mL vials with no headspace. Preserve samples to a pH of <2 in order to prevent degradation of aromatic compounds that are present in the sample. 1:1 HCL is the recommended preservative. Preserved samples must be analyzed within 14 days of collection; those that are not preserved must be analyzed within 7 days of collection.

Apparatus and Equipment:

1. Gastight micro-syringes – 1 to 1000 µL (various sizes)
2. 5-mL gastight syringes
3. Analytical balance, capable of accurately weighing ±0.0001 g
4. Glassware
    a. Class-A Volumetric flasks with ground-glass stopper
    b. Vials, 1.5-mL, 15-mL, and 40-mL screw cap, with Teflon™/silicone septa
    c. Mininert vials, 1 mL, 2 mL, and 5 mL

5. Purge and trap device – Consisting of the sample purger, the trap, and desorber; the OI Analytical 4560, OI Analytical 4660, or equivalent meets the requirements of this method. The purging chamber must have the purge gas passing through the sample as finely divided bubbles and minimize the headspace between the sample and the trap to <15 mL.

6. Autosampler – OI Analytical 4551, OI Analytical 4552, Archon, or equivalent meets the requirements of this method.

7. Spiker unit – OI analytical Model 4551/4552 SAM/Spiker or equivalent. One or two automated syringe spikers can be added to the OI Analytical Model 4551/4552 autosampler to automatically introduce 1 µL of internal standard (ISTD), surrogate standard, and/or matrix spiking solutions to the sample as it is being transferred to the sparge vessel. The Archon has a groove that can deliver 1 µL of appropriate standards.

8. GC/MS system – The Agilent 5890GC/5972 MSD, Agilent 6890GC/5973MSD, Agilent 6890GC/5975MSD and Shimadzu GC/MS QP5000 meet the requirements for this method.

9. Data System/Computer/Software – this is interfaced to the GC/MS system that continuously acquires and stores data during the analysis, and can process/reduce data to generate the appropriate forms and supporting data. The software used for acquisition is HP Chemstation®, and data reduction is accomplished using Target® software.

10. GC Columns

    a. Column 1 – 30M × 0.25 mm ID DB624 capillary column with a 1.4-µm film thickness from Agilent, or equivalent (to be used with the Shimadzu QP5000 or the Agilent 5972, 5973 and 5975 MSDs)

b. Column 2 – 20M × 0.18 mm ID DB624 capillary column with a 1.0-µm film thickness from Agilent, or equivalent (to be used with the Shimadzu QP5000 or the Agilent 5972, 5973 and 5975 MSDs)

c. Column 3 – 20M × 0.18 mm ID DB-VRX capillary column with a 1.0-µm film thickness from Agilent, or equivalent (to be used with the Shimadzu QP5000 or the Agilent 5972, 5973 and 5975 MSDs)

NOTE: Refer to 1-P-QM-PRO-9015467 for instrumentation maintenance and troubleshooting.

Reagents and Standards:

A. Reagents

1. Reagent water is defined as water in which an interferent is not observed at or above the reporting limit for parameters of interest. In general, the deionized water supplied at the taps in the laboratory meets these criteria. If the reagent water does not meet the requirements, see your supervisor for further instructions.

2. Methanol, Purge and Trap Grade or equivalent.

B. Standards

See 1-P-QM-PRO-9015469 for standards traceability.

1. Stock standard solutions – Stock solutions must be prepared in methanol. Standards are prepared from ampulated and neat compounds obtained from suppliers that indicate the purity of the compound. No correction for purity is made if the purity is listed as ≥96%. Pre-made solutions can be used if the supplier documents the concentrations of the solutions. All ampulated standards are stored at -10° to -15°C until the expiration date indicated by the vendor or for 1 year if no expiration date is provided.

a. For most of the target compounds, the stock standard solutions are purchased from a vendor as custom mixes (V for calibration and Q for separate source quality control). The internal and surrogate standards are purchased from a vendor, as well as the target compounds that are gases at room temperature. These gaseous standards have a 1-week expiration date, starting from the date they are opened.

b. 8260A Surrogate standard spiking solution (8260SS) – a 2500 µg/mL stock standard solution of dibromofluoromethane, toluene-d8, 4-bromofluorobenzene, and 1,2-dichloroethane-d4 is prepared in methanol by a commercial supplier.

c. 8260A Internal standard spiking solution (8260IS) – a 2500 µg/mL stock standard solution of fluorobenzene, chlorobenzene-d5, 1,4-dichlorobenzene-d4, and 12500 µg/mL deuterated tertiary butyl alcohol (tBA-d10) is prepared in methanol by a commercial supplier. Deuterated tertiary butyl alcohol (tBA-d10) is used sometimes as an auxiliary ISTD.

   To prepare stock standards from neat compounds:

   (1) Place about 9.8 mL methanol or an equivalent solvent into a tared 10.0-mL glass-stoppered volumetric flask. Weigh the flask to the nearest 0.1 mg.

   (2) Add the liquids using a syringe or pipette by adding 2 or more drops of the assayed material to the flask, being careful that no drop hits the side of the flask. Reweigh the flask, record/note the amount, dilute to volume, stopper, and mix by inverting the flask at least 3 times. Calculate the concentration of the standard.

(3) The stock standard solutions are stored in Teflon™-sealed screw-capped vials at -10° to -15°C. The compound name, concentration, date prepared, and expiration date must appear on the bottle.

(4) Replace in-house prepared stock standard solutions every 6 months.

2. Secondary dilution standards - Using the stock standard solutions, prepare secondary stock solutions in methanol containing the desired compounds. These standards are prepared by calculating the volume of each stock standard required to produce a given volume of a mixed working standard with a known concentration of each analyte. When custom mixes are used, these are diluted down individually or combined together with other mixes. The working standard is tested according to 1-P-QM-PRO-9015469. The verified working standard is poured into Teflon-lined screw-capped GC vials or mininert vials and stored at -10° to -15°C. A designator indicating the standard, month, and day of preparation must be on the standard vials. The designator and the calculations for the working standard preparation are to be recorded in the standards logbook. Replace secondary dilution standards every 6 months unless otherwise indicated.

a. 1,4-Bromofluorobenzene (BFB) standard – Prepare a 50-µg/mL solution of BFB in methanol by diluting the stock standard (prepared from neat material) with methanol to a final volume of 100 mL. The volume of stock standard used varies depending on the actual stock concentration.

b. IS/SS spiking solution – Dilute 1 mL of 8260IS and 1 mL of 8260SS with methanol to 10-mL final volume (resulting in a concentration of 250 µg/mL, 1250 µg/mL for tBA-d10). This is assuming a 1-µL groove in the autosampler. If the groove is determined to be other than 1 µL, the standard preparation must be adjusted so that appropriate final concentration is obtained.

c. Calibration spiking solution – Prepare solutions in methanol that contain the compounds of interest at known concentrations. Suggested calibration levels are 4, 10, 20, 50, 100, and 300 ppb for 5-mL purge analysis. Suggested calibration levels are 0.5, 1, 2, 5, 10, and 25 ppb for 25-mL purge analysis. To help prevent confusion, a Theoretical Standard Concentration (TSC) sheet is filled out for all initial calibrations (see Figures 1 and 2). Replace calibration spiking solution every month.

d. Matrix spiking solution – Prepare second source solutions in methanol that contain the compounds of interest at known concentrations. To help prevent confusion, a TSC sheet is filled out for all quality control samples (see Figures 4 and 5). These solutions serve as both the matrix spiking solution and the laboratory control sample solutions. Matrix spikes also serve as duplicates. Therefore, two aliquots of the same sample need to be spiked for analysis with these solutions. Replace matrix spiking solution every month.

Store all standard solutions at -10° to -15°C.

Preparation of Glassware:

All glassware is cleaned according to 1-P-QM-PRO-9015465.

Calibration:

A. Instrument conditions

1. The purge and trap device must have the trap conditioned for at least 10 minutes at 180° to 220°C at a flow rate of 20 to 60 mL/min prior to initial use.

2. An example of purge and trap conditions are listed below:

Purge Gas	Helium
Purge Flow	35 - 45 mL/min
Purge Temperature	40°C for 8260C waters
Purge Time	11 minutes
Desorb Temperature	190°- 220°C
Desorb Time	0.5 to 4 minutes **
Bake Temperature	180°-220°C
Bake Time	5 – 16 min

**Range as suggested by the purge and trap instrument manufacturer

NOTE: Purge and trap conditions are changed to optimize instrument operations. A record of actual purge and trap conditions for each instrument is found in the appropriate instrument maintenance log.

3. The suggested gas chromatographic operating conditions are listed in the table below, depending on the column used:

	Column 1	*Column 2*	*Column 3*
Column liquid phase	DB-624	DB-624	DB-VRX
Carrier gas	Helium	Helium	Helium
Carrier gas flow	0.8 mL/min	0.6 mL/min	0.6 mL/min
Make-up gas flow	None	None	None
Initial temperature	45°C	45°C	45°C
Initial hold time	4.5 min	2.5 min	4 min
Temperature ramp	12°/min until 100°C then 25°/min until 240°C	12°/min until 100°C then 25°/min until 235°C	25°/min until 60°C then 36°/min until 240°C
Final temperature	240°C	235°C	240°C
Final hold time	None	.02 min	1 min

4. The recommended mass spectrometer operating conditions are listed below:

Mass range:	35 – 300 amu
Scan time:	One scan cycle per second or less and resulting in at least five scans per chromatographic peak

NOTE: It is not necessary to use the exact parameters listed above. Equivalent columns and conditions that give the performance required by the method are acceptable.

B. Tuning

Tune the GC/MS system to meet the criteria in Table 1 following a 50-ng injection of BFB. The chromatographic conditions must be the same as those under which the samples are analyzed except that the temperature ramp is increased and the initial temperature and flow rate is different. The BFB tune must be verified every 12 hours.

The tune must be evaluated by taking the average of the three scans across the BFB peak apex with a background subtraction of a scan within 20 scans prior to the start of the BFB peak.

NOTE: All standards, samples, and associated quality control samples must be analyzed with the same MS parameters as those used to obtain a successful tune.

C. Initial calibration

1. The initial internal standard calibration consists of analyzing six distinct levels of analyte concentrations and producing response factors for each compound (six levels are required if second order regression fits are used). Refer to Figure 1 or 2 for the preparation of the calibration standards.

   The relative standard deviation of the response factors determines the suitability of the average relative response factor for calculation of the analyte concentration.

   NOTE: 5 levels of standard are required by the method.

a. When using an OI 4552 or OI 4551 autosampler, the standards (including target and surrogate compounds) are prepared and poured into 40-mL vials with Teflon™-lined septa. A 5-mL or 25-mL aliquot is withdrawn from the vial by the autosampler. The aliquot is transferred through the spiker unit to add the IS/SS spiking solution and then transferred to the sparge vessel.

b. Purge and desorb according to Calibration A.

c. Collect GC/MS data until the end of the GC run.

d. Empty and rinse the purging chamber at least twice with reagent water prior to loading another sample into the vessel, to minimize the possibility of carryover contamination.

e. Each level is analyzed as described above. Next, tabulate the area response of the characteristic ions (Table 2) against concentration for each analyte, surrogate standard, and internal standard and calculate relative response factors (RRF) for each compound (see Calculation section). The calibration is valid for 12 hours from the injection of the BFB tune standard, at which time a new tune check and a continuing calibration check standard are evaluated prior to the analysis of additional samples. The following table describes the guidelines for an acceptable initial calibration:

Frequency	Acceptance Criteria	Corrective Action
Initially and then when analytes in the daily calibration standard fail criteria.	1. % RSD of ≤20% is required for all analytes. 10% of the analytes may fail this criteria. 2. All compounds of interest must be detected in the MDL standard. 3. The relative retention times of the target compounds must agree within 0.06 relative retention time (RRT) units. The exception would be in the case of system maintenance. 4. Minimum response factors must be met for select compounds. See Table 3.	1. Any target analyte with a %RSD of ≤20% must use the average RRF for quantitation. For any analyte in which the %RSD >20%, a first-degree linear regression can be used (providing that the correlation coefficient [CC] is ≥0.99). A quadratic fit ** (using 6 stds) can also be used (provided the coefficient of determination [CD] is ≥0.99). If the linear fit and quadratic fit pass the criteria for any given analyte, then use the line/curve with the smallest positive y-intercept. If the y-intercept quantifies to be greater than the LOQ, consult your supervisor immediately or recalibrate. If CC or CD is <0.99, recalibrate. Supervisory approval is required for exceptions to these guidelines. If >10% target analytes fail, recalibration is required. 2. If a compound is not detected in the MDL standard, then report to the level of the lowest standard detected. 3.-4. Perform system maintenance and recalibrate.

**Consult USEPA method 8000B for non-linear curve fitting techniques/guidelines

NOTE: If a linear fit is used for a compound, the lowest calibration standard point must be recalculated against the curve. The recalculated concentration must be within ± 30% of the standard's true concentration. If this criteria is not met, notify a supervisor so that an alternate LOQ can be evaluated.

2. A method detection limit (MDL) standard must be analyzed with each initial calibration. This standard is prepared at or near the departmental MDL and is not to be included in the calibration curve. All compounds must be detected in the MDL standard. (See Figure 1 or 2 for the preparation information).

D. Following the calibration, an Initial Calibration Verification (ICV) standard must be run. The ICV is prepared according to the TSC sheet in Figures 3 and 5. The ICV acts as a second source standard to check against the initial calibration. All analytes must meet ICV acceptance windows of 70%-130%. If the ICV does not meet the aforementioned criteria, a second ICV is analyzed before invalidating the initial calibration. Upon failure of the second ICV, the system must be recalibrated after proper corrective action is taken.

E. Continuing calibration verification (CCV) – The CCV is performed by analyzing a CCV standard in subsequent tune periods after an initial calibration. The CCV is analyzed at 50 ppb for 5-mL purge waters and 10 ppb for 25-mL purge waters. The CCV is considered valid when the criteria listed below are met:

Frequency	Acceptance Criteria	Corrective Action
Every 12 hours.	1. % Drift of ≤20% is required for all analytes. 20% of analytes may fail this criteria if not detected in proceeding samples. 2. The relative retention times (RRT) of the target compounds must agree within 0.06 RRT units. The exception would be in the case of system maintenance. 3. The extracted ion current profile (EICP) area for each internal standard must fall within the window of –50 % to +100 % from the mid-level standard area produced during the last initial calibration. 4. Minimum response factors must be met for select compounds. See Table 3.	1.-4. In the event that the continuing calibration verification (CCV) standard fails <u>any</u> of these criteria, sample analysis must be suspended and the CCV must be re-analyzed. If the re-analysis fails any of the criteria then adjustments are to be made to the analytical system to return it to its original condition, followed by the analyses of 2 consecutive CCVs at the same level that failed. If both CCVs pass the criteria, then sample analysis can continue. Otherwise, the system must be recalibrated and the samples reanalyzed, or the data can be qualified.

F. MDL Sensitivity Check- A MDL Sensitivity Check must be analyzed in cases where compounds fail to meet the % drift criteria in the CCV and have decreased sensitivity (-20% drift or greater). Affected compounds can be reported as non-detects if it is demonstrated that there is adequate sensitivity to detect the compound at the MDL. If the failed compound is detected, the concentration must be reported as an estimated value.

Procedure:

A. Method Blank

Analyze the method blank as described above for the initial calibration standards. The method blank is examined for interfering peaks. Any target compound peaks are calculated as described under the Calculations section of this procedure. All compounds must be less than the reporting limit for the associated samples. If the blank values exceed these values, corrective action must be taken and the method blank reanalyzed until the criteria are met.

B. Laboratory Control Sample/ Duplicate and Matrix Spike/Duplicate: Refer to table in QA/QC section for specific requirements.

C. Qualitative analysis

A compound is identified by comparison of the following parameters with those of a standard of this suspected compound (standard reference spectra). In order to verify identification, the following criteria must be met:

1. The intensities of the characteristic ions of the compound must maximize in the same scan or within one scan of each other.

2. The compound relative retention time must compare within ±0.06 RRT units of the RRT of the standard.

3. The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity, or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum.

4. The relative intensities of the characteristic ions must agree within 30% of the relative intensities of these ions in the reference spectrum. Analyst discretion is used to determine compound identification. (Example: for an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%).

5. The above criteria apply to hits greater than or equal to the LOQ. For hits between the MDL and the LOQ, both the criteria listed above and the analyst's discretion is used to determine compound identification.

6. The analyst must account for peaks that are greater than 10% relative intensity in the sample mass spectrum, but not present in the standard mass spectrum. Also, if a compound fails any of the criteria listed above but in the judgment of the mass spectral interpretation specialist is a correct identification, the identification is used and the quantitation of the peak is performed.

   The primary and secondary ions for the target compounds can be found in Table 2.

D. Quantitative analysis

Once a compound has been identified, quantitation is based on the internal standard technique and the integrated area from the extracted ion current profile (EICP) of the primary characteristic ion. The list of primary characteristic ions is listed in Table 2.

E. Sample Analysis

A 5-mL or 25-mL aliquot of the sample is analyzed using the same instrumental conditions as the standard (whether ICAL or CCV), tune and method blank. If the QA criteria are satisfied and no target compounds are detected at concentrations above the calibration range, the results can be reported. To avoid possible matrix effects, sample carryover and re-analyses, an initial dilution is performed if:

1. Prescreening indicates a high volatile organic content in the sample

2. Historical data (or lack thereof) and/or sample appearance indicate a need for dilution

If target compounds are detected in the sample at concentrations above the calibration range, a dilution must be performed (See 1-P-QM-PRO-9015470 for information on when cleaning blanks must be run). See Section 11.5.6 in method SW-846 8260C for recommended dilution procedures.

Calculations:

A. Calibration calculations

1. Calculation of the relative response factor (RRF):

$$RRF = \frac{[A(x) \times C(is)]}{[A(is) \times C(x)]}$$

Where:

A(x) = Characteristic ion area for the compound being measured

A(is) = Characteristic ion area for the specific internal standard

C(x) = Concentration of the compound being measured

C(is) = Concentration of specific internal standard

2. Regression equations:

1st Order (linear) regression: $Y = Mx + B$

2nd order (quadratic) regression: $Y = Cx^2 + Mx + B$

Where:

x = Area(Std) /Area(Istd)

Y = Conc.(Std)/Conc.(Istd)

M = 1st degree slope

C = 2nd degree slope

B = Y-intercept

3. Percent relative standard deviation (%RSD):

$$\%RSD = \frac{Standard\ Deviation}{Mean} \times 100$$

4. Calculation of the percent drift:

$$\%\ Drift = \frac{C(i) - C(c)}{C(i)} \times 100$$

Where:

C(i) = Calibration check compound standard concentration

C(c) = Measured concentration using selected quantification method

B. QA Calculations:

1. Calculation of percent recovery

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

Where:

SSR = Spiked sample result

SR = Sample result

SA = Spike added

2. Relative percent difference (RPD)

$$RPD = \frac{MSR - MSDR}{(1/2)(MSR + MSDR)} x\ 100$$

Where:

MSR = Matrix spike measured concentration

MSDR = Matrix spike duplicate measured concentration

C. Analyte concentration

$$Concentration\ (\mu g/L) = \frac{(Ax)(Is)}{(Ais)(RRF)}$$

Where:

Ax = Area of the quantitation ion peak for the compound to be measured

Ais = Area of the quantitation ion peak for the appropriate internal standard

Is = Concentration of internal standard added in µg/L

RRF = Relative response factor from the initial calibration

Statistical Information/Method Performance:

The LCS must contain 80% to100% of the compounds in the calibration mix. LCS, MS, and surrogate recoveries and RPD are compared to the limits stored on the LIMS. These limits are statistically derived but must fall within 70% to 130% recovery for South Carolina compliance samples. Historical data for MS/Ds, LCS/Ds, measurement of uncertainty, is reviewed at least annually. Reporting limits including method detection limits (MDLs) and limits of quantitation (LOQs) are set according to EPA method requirements and are evaluated annually. Refer to 1-P-QM-QMA-9017309 for specific guidelines and procedures. Updates to the LIMS are made as needed by the QA Department and only as directed by the supervisor. The department database is updated via a download from the LIMS.

Quality Assurance/Quality Control:

Each analysis batch (consisting of no more that 20 samples) must contain a method blank, a laboratory control sample (LCS), and either an unspiked background sample (US), a matrix spike (MS), a matrix spike duplicate (MSD), a laboratory control sample/laboratory control sample duplicate (LCS/LCSD) or a duplicate (DUP). The LCS serves as a 2nd source standard verification of the initial calibration (ICAL). Additional

QC samples are required to meet project or state certification requirements. Every sample or QC analysis must contain internal standards and surrogate compounds at a concentration of 50 µg/L for a 5-mL purge or 10 µg/L for a 25-mL purge.

Quality Control Item	Acceptance Criteria	Corrective Action
Internal Standards Added to every sample, standard, method blank and QC sample	1. *Peak areas within -50% to +100% of the area in the associated reference standard.* 2. Retention time (RT) within 30 seconds of RT for associated reference standard.	1. Check instrument for possible problems and then reanalyze samples. 2. If re-injecting meets the criteria, report this analysis. 3. If this reanalysis still shows the same problem, report results from first analysis and qualify data with a comment.
Surrogates Added to every sample, standard, method blank and QC sample	All % recoveries must fall within statistically derived QC limits, which are evaluated on a semi-annual basis.	If non-compliant, check for calculation or preparation errors. If no errors are found, check system for problems and reanalyze. If this reanalysis still shows the same problem, report first analysis and qualify data with a comment. If recoveries are outside of specification high and no target compounds are detected, then a reanalysis or comment is not required.
Method Blank (MB) Performed during each tune period after the initial calibration or CCV (minimum of 1 MB per 20 samples)	1. Must meet internal standard criteria. 2. Must meet surrogate criteria. 3. Quantitative results for all target compounds must be less than the reporting limit for the associated samples.	1.-2. Inspect system for possible problems and reanalyze. 3. If the MB contains target analytes and the associated samples do not, then no corrective action is required. If the target compounds in the MB are also in the associated samples, then they must be reanalyzed after a clean MB is obtained (certain projects may allow some exceptions for common laboratory contaminants like methylene chloride and acetone up to 5X the LOQ)
Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) LCS analyzed with each batch of ≤ 20 samples LCSD analyzed if MS/MSD unavailable See Figures 4 and 5 for preparation info.	1. Must meet internal standard criteria. 2. Must meet surrogate criteria. 3. All % recoveries must fall within statistically derived QC limits, which are evaluated on a semi-annual basis.	1.-2. If non-compliant, check for calculation or preparation errors. If no errors found, check system for problems and reanalyze. 3. If LCS/LCSD re-analysis still fails, perform appropriate system maintenance and restart the tune period. Only with a LCS % recovery failing high (for the requested target compounds) with targets non-detected in the sample, can the results be reported. Otherwise, the sample must be analyzed with a compliant LCS.
Matrix Spike/Matrix Spike Duplicate (MS/MSD) MS/MSD analyzed with each batch of ≤ 20 samples (if sufficient sample volume available) See Figures 4 and 5 for preparation info.	1. % Recoveries must fall within statistically derived QC limits, which are evaluated on a semi-annual basis 2. RPDs within QC limits.	1. If LCS within QC limits, proceed with sample analysis. 2. If most recoveries and/or RPDs outside of QC limits, consult the supervisor.

NOTE: Prior to release from the analytical laboratory, all data is reviewed in accordance with 1-P-QM-PRO-9015471 or 1-P-QM-PRO-9017810 (dual purge and trap).

Attachment I

Gasoline Range Organics (GRO) by Gas Chromatography/Mass Spectroscopy (GC/MS)

This section is specific to the steps required for GRO analysis. See the main body of the SOP for general information/ processes.

Basic Principles:

The GRO analysis is typically performed in conjunction with the analysis of other volatile target compounds by SW-846 Method 8260C. The GRO quantitation range is 0.1 minutes before the peak apex of C6 (hexane) to 0.2 minutes after the peak apex of C12 (dodecane); however, other ranges can be established. By establishing a (C12) GRO window to 0.2 minutes following the elution of dodecane, the areas from a trio of unresolved peaks eluting near to the upper limit of the range must consistently be included in the total GRO area. In addition, the range remains tight enough to ensure that no C13 or greater compounds can be included in the total GRO area. The C4 range retention time is determined by selecting the first peak after the air and/or artifact peak minus 0.1 minutes in the first standard analyzed in the ICAL. This analysis must be performed by or under the direct supervision of an operator experienced in the analysis of volatile organics by GC/MS purge and trap methodologies. The area of the total ion chromatogram for the GRO range is determined. The area of the internal standards and surrogate standards are found and subtracted from the total area of the chromatogram within the desired time range. The resulting area is then quantitated versus the internal standard, fluorobenzene.

Interferences:

See main body of SOP.

Safety Precautions and Waste Handling:

See main body of SOP.

Personnel Training and Qualifications:

See main body of SOP.

NOTE: A separate Demonstration of Capability for GRO is required.

Sample Collection, Preservation, and Handling:

See main body of SOP.

Apparatus and Equipment:

See main body of SOP.

Reagents and Standards:

A. Reagents- See main body of SOP.

B. Standards- See main body of SOP for general standards.

1. GRO calibration standard – a 5500-µg/mL stock unleaded gasoline composite prepared in methanol by a commercial supplier.

2. GRO QC standard – a 20,000-µg/mL stock unleaded gasoline composite prepared in methanol by a commercial supplier

Store all standard solutions at -10° to -15°C

Calibration:

A. Initial calibration:

Prior to the analysis of any calibration level, retention time markers must be run for the GRO range of interest. The retention time markers are hexane (C6) and Dodecane (C12). Other markers can be used if different ranges are required by a project.

Internal standard calibration for GRO consists of analyzing six distinct levels of GRO area in order to produce a response factor for the GRO quantitation range of interest using the internal standard, fluorobenzene. The relative standard deviation of the response factor determines the suitability of the average relative response factor for calculation of the GRO concentration.

NOTE: 5 levels of standard are required by the method.

1. Prepare the calibration standards at appropriate levels. Suggested calibration levels are 44, 110, 550, 1100, 2200, and 4400 ppb.

   To prevent confusion and assure proper calibration, a Theoretical Standard Concentration (TSC) sheet is completed for each calibration (Figure 6). The TSC sheet contains the theoretical concentration for each certified analyte in the calibration at the various levels.

2. Each level is analyzed as described in the procedure under data analysis. Next, tabulate the area response for the GRO quantitation range minus the peak areas for the internal and surrogate standards that elute within the GRO range. Calculate the relative response factor (RRF) for GRO (see Calculation section) using the internal standard peak area for fluorobenzene.

   NOTE: Although four internal standard compounds are spiked for the 8260B analysis, only one, fluorobenzene, is used for the quantitation of the GRO result.

3. Calculate the average relative response factors for the GRO quantitation range of interest. The calibration levels are evaluated on the basis of the relative standard deviation of the RRF values (%RSD). The %RSD for the GRO range of interest must be ≤20%. If the calibration meets this requirement then the average RRF is used to calculate sample concentrations. If the %RSD is >20% then re-analysis of one or more levels can be necessary before the calibration is valid.

B. Initial Calibration Verification (ICV):

Following the calibration, an Initial Calibration Verification (ICV) standard must be run. The ICV is prepared according to the TSC sheet in Figure 6 (QC prep). The ICV acts as a second source standard to check against the initial calibration. Results must quantitate within the 70-130% window. If the ICV does not meet the aforementioned criteria, a second ICV can be run before invalidating the initial calibration. Upon failure of the second ICV, the system must be recalibrated after proper corrective action is taken.

C. Continuing calibration verification (CCV):

The CCV involves an analysis for the 1100-ppb standard. The calibration is considered valid if the percent drift is ≤20%. Also, the internal standard peak area of fluorobenzene for the CCV is monitored against the mid-point standard of the initial calibration and must be –50% to +100% of the area counts. If any criteria listed above fails, the CCV is considered invalid. In the case where two consecutive CCVs fail, corrective action must be taken which can include re-analysis of the calibration check, instrument maintenance, and/or recalibration. If the criteria are met, the selected quantitation method from the initial calibration is used for blank and sample calculations until the end of the 12-hour period.

Procedure:

Samples must be analyzed in accordance with the analyses listed in the main body of this SOP. However, additional requirements are required for the GRO data analysis.

A. The Total Ion Chromatogram (TIC) is reviewed to insure proper integration around the 8260 surrogates and internal standards. Also the TIC is checked to make sure all major peaks are integrated.

B. The quantitation of the GRO range is performed using the equations listed in the Calculations section of this procedure. All calculations must report concentrations in values of µg/L. In the case where the total GRO concentration exceeds the calibration range, the sample is re-analyzed at a dilution that brings the GRO concentration within the calibration range of the GC/MS system.

Calculations:

See main body of SOP.

Statistical Information/Method Performance:

See main body of SOP.

Quality Assurance/Quality Control:

See main body of SOP.

Table 1

BFB Key Ion Abundance Criteria

Mass	Ion 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

Table 2
Primary and Secondary Ions

Compound Name	Primary Ion	Secondary Ion
Chloromethane	50	52
Vinyl Chloride	62	64
Bromomethane	94	96
Chloroethane	64	66
1,1-Dichloroethene	96	61, 63
Acetone	43	58
Carbon Disulfide	76	78
Methylene Chloride	84	49, 86
1,1-Dichloroethane	63	65, 83
trans-1,2-Dichloroethene	96	61, 63
cis-1,2-Dichloroethene	96	61, 63
2-Butanone	43	72
Chloroform	83	85
1,2-Dichloroethane	62	98
1,1,1-Trichloroethane	97	61, 99
Carbon Tetrachloride	117	119
Benzene	78	
Trichloroethene	95	130, 132
1,2-Dichloropropane	63	76
Bromodichloromethane	83	85
cis-1,3-Dichloropropene	75	77, 110
trans-1,3-Dichloropropene	75	77, 110
1,1,2-Trichloroethane	97	83, 85
Dibromochloromethane	129	127
Bromoform	173	175
4-Methyl-2-pentanone	43	58
Toluene	92	91
Tetrachloroethene	166	131, 164
2-Hexanone	43	58
Chlorobenzene	112	77
Ethylbenzene	91	106
Xylene (total)	106	91
Styrene	104	78
1,1,2,2-Tetrachloroethane	83	85, 131
Dibromofluoromethane	113	111
1,2-Dichloroethane-d4	102	104
Fluorobenzene	96	70
Toluene-d8	98	100
Chlorobenzene-d5	117	82
4-Bromofluorobenzene	95	174
1,4-Dichlorobenzen-d4	152	115

Table 3
Minimum Relative Response Factors For ICAL and CCV

Volatile Compounds	Minimum Response Factor
Dichlorodifluoromethane	0.100
Chloromethane	0.100
Vinyl Chloride	0.100
Bromomethane	0.100
Chloroethane	0.100
Trichlorofluoromethane	0.100
1,1-Dichloroethene	0.100
1,1,2-Trichloro-1,2,2-trifluoroethane	0.100
Acetone	0.100
Carbon Disulfide	0.100
Methyl Acetate	0.100
Methylene Chloride	0.100
trans-1,2-Dichloroethene	0.100
cis-1,2-Dichloroethene	0.100
Methyl tert-Butyl Ether	0.100
1,1-Dichloroethane	0.200
2-Butanone	0.100
Chloroform	0.200
1,1,1-Trichloroethane	0.100
Cyclohexane	0.100
Carbon Tetrachloride	0.100
Benzene	0.500
1,2-Dichloroethane	0.100
Trichloroethene	0.200
Methylcyclohexane	0.100
1,2-Dichloropropane	0.100
Bromodichloromethane	0.200
cis-1,3-Dichloropropene	0.200
trans-1,3-Dichloropropene	0.100
4-Methyl-2-pentanone	0.100
Toluene	0.400
1,1,2-Trichloroethane	0.100
Tetrachloroethene	0.200
2-Hexanone	0.100
Dibromochloromethane	0.100
1,2-Dibromoethane	0.100
Chlorobenzene	0.500
Ethylbenzene	0.100

Volatile Compounds	Minimum Response Factor
m&p-Xylene	0.100
o-Xylene	0.300
Styrene	0.300
Bromoform	0.100
Isopropylbenzene	0.100
1,1,2,2-Tetrachloroethane	0.300
1,3-Dichlorobenzene	0.600
1,4-Dichlorobenzene	0.500
1,2-Dichlorobenzene	0.400
1,2-Dibromo-3-chloropropane	0.050
1,2,4-Trichlorobenzene	0.200

Figure 1

Theoretical Standard Concentrations
Initial Calibration for Large Curve
Purchased Standards
EPA SW846 Method 8260A/B/C

Date:_____
Instrument:_____

VOA1= 1:5 dilution of VCS#1B, VCS#2B, and VCS#4C
VOA2= 1:5 dilution of VCS#2B
VOA3= 1:5 dilution of VCS#3B and Vacrolein
VOA6= 1:5 dilution of VCS#6
2CEVE= 1:5 dilution of VCS#1B-2CEVE
VOA8= 1:5 dilution of Hexachloroethane and 2,2'-oxybis(1-Chloropropane)

Stock mix name	VOA1 2CEVE 1,3-BUT	VOA3	VOA2	VOA6 EE Custom V LG Freons	n-PEN VOA8	CYC	EOH	Restek Gases (2000 ppm) Lt#_____ TAEE		Flask mL	
300 ppb std	15 µL	6 µL		15µL	15 µL	30 µL	30 µL	7.5 µL		50	
100 ppb std	5 µL	2 µL		5 µL	5 µL	10 µL	10 µL	2.5 µL		50	
50 ppb std	5 µL	2 µL		5 µL	5 µL	10 µL	10 µL	2.5 µL		100	
20 ppb std	4 µL	1.6 µL	4 µL	4 µL	4 µL	16 µL	16 µL	2.0 µL		200	
10 ppb std	2 µL	0.8 µL	2 µL	2 µL	2 µL	8 µL	8 µL	1.0 µL		200	
4 ppb std	4 µL	1.6 µL	12 µL	4 µL	4 µL	32 µL	20 µL	2.0 µL		1000 *	
1 ppb std	* Aliquot 12.5 mL of 1000 mL flask into 50 mL flask										
0.5 ppb MDL std	+ Aliquot 12.5 mL of 1000 mL flask into 100 mL flask										

Compound name	std mix	Stock ppm	300 ppb	100 ppb	50 ppb	20 ppb	10 ppb	4 ppb	1 ppb	0.5 ppb
Benzene	CS#1B	5000	300	100	50	20	10	4	1	0.5
Bromobenzene		5000	300	100	50	20	10	4	1	0.5
Bromodichloromethane		5000	300	100	50	20	10	4	1	0.5
Bromoform		5000	300	100	50	20	10	4	1	0.5
n-Butylbenzene		5000	300	100	50	20	10	4	1	0.5
sec-Butylbenzene		5000	300	100	50	20	10	4	1	0.5
tert-Butylbenzene		5000	300	100	50	20	10	4	1	0.5
Carbon Tetrachloride		5000	300	100	50	20	10	4	1	0.5
Chlorobenzene		5000	300	100	50	20	10	4	1	0.5
Chloroform		5000	300	100	50	20	10	4	1	0.5
2-Chlorotoluene		5000	300	100	50	20	10	4	1	0.5
4-Chlorotoluene		5000	300	100	50	20	10	4	1	0.5
Dibromochloromethane		5000	300	100	50	20	10	4	1	0.5
1,2-Dibromo-3-chloropropane		5000	300	100	50	20	10	4	1	0.5
1,2-Dibromoethane (EDB)		5000	300	100	50	20	10	4	1	0.5
Dibromomethane		5000	300	100	50	20	10	4	1	0.5
1,2-Dichlorobenzene		5000	300	100	50	20	10	4	1	0.5
1,3-Dichlorobenzene		5000	300	100	50	20	10	4	1	0.5
1,4-Dichlorobenzene		5000	300	100	50	20	10	4	1	0.5

Figure 1 Continued

Theoretical Standard Concentrations
Initial Calibration for Large Curve
Purchased Standards
EPA SW846 Method 8260A/B/C

Compound name	std mix	Stock ppm	300 ppb	100 ppb	50 ppb	20 ppb	10 ppb	4 ppb	1 ppb	0.5 ppb
1,1-Dichloroethane	CS#1B	5000	300	100	50	20	10	4	1	0.5
1,2-Dichloroethane		5000	300	100	50	20	10	4	1	0.5
1,1-Dichloroethene		5000	300	100	50	20	10	4	1	0.5
cis-1,2-Dichloroethene		5000	300	100	50	20	10	4	1	0.5
trans-1,2-Dichloroethene		5000	300	100	50	20	10	4	1	0.5
1,2-Dichloropropane		5000	300	100	50	20	10	4	1	0.5
1,3-Dichloropropane		5000	300	100	50	20	10	4	1	0.5
2,2-Dichloropropane		5000	300	100	50	20	10	4	1	0.5
1,1-Dichloropropene		5000	300	100	50	20	10	4	1	0.5
cis-1,3-Dichloropropene		5000	300	100	50	20	10	4	1	0.5
trans-1,3-Dichloropropene		5000	300	100	50	20	10	4	1	0.5
Ethylbenzene		5000	300	100	50	20	10	4	1	0.5
Hexachlorobutadiene		5000	300	100	50	20	10	4	1	0.5
Isopropylbenzene		5000	300	100	50	20	10	4	1	0.5
p-Isopropyltoluene		5000	300	100	50	20	10	4	1	0.5
Methylene Chloride		5000	300	100	50	20	10	4	1	0.5
Naphthalene		5000	300	100	50	20	10	4	1	0.5
n-Propylbenzene		5000	300	100	50	20	10	4	1	0.5
Styrene		5000	300	100	50	20	10	4	1	0.5
1,1,1,2-Tetrachloroethane		5000	300	100	50	20	10	4	1	0.5
1,1,2,2-Tetrachloroethane		5000	300	100	50	20	10	4	1	0.5
Tetrachloroethene		5000	300	100	50	20	10	4	1	0.5
Toluene		5000	300	100	50	20	10	4	1	0.5
1,2,3-Trichlorobenzene		5000	300	100	50	20	10	4	1	0.5
1,2,4-Trichlorobenzene		5000	300	100	50	20	10	4	1	0.5
1,3,5-Trichlorobenzene		5000	300	100	50	20	10	4	1	0.5
1,1,1-Trichloroethane		5000	300	100	50	20	10	4	1	0.5
1,1,2-Trichloroethane		5000	300	100	50	20	10	4	1	0.5
Trichloroethene		5000	300	100	50	20	10	4	1	0.5
1,2,3-Trichloropropane		5000	300	100	50	20	10	4	1	0.5
1,2,4-Trimethylbenzene		5000	300	100	50	20	10	4	1	0.5
1,3,5-Trimethylbenzene		5000	300	100	50	20	10	4	1	0.5
m-Xylene		5000	300	100	50	20	10	4	1	0.5
o-Xylene		5000	300	100	50	20	10	4	1	0.5
p-Xylene		5000	300	100	50	20	10	4	1	0.5
1-Chlorohexane		5000	300	100	50	20	10	4	1	0.5
Pentachloroethane	CS#6	5000	300	100	50	20	10	4	1	0.5
Allyl Chloride		5000	300	100	50	20	10	4	1	0.5
Bromochloromethane		5000	300	100	50	20	10	4	1	0.5
Methyl Acetate		5000	300	100	50	20	10	4	1	0.5
Methylcyclohexane		5000	300	100	50	20	10	4	1	0.5
2-Methylnaphthalene		5000	300	100	50	20	10	4	1	0.5
1,2,3-Trimethylbenzene		5000	300	100	50	20	10	4	1	0.5
1,2-Diethylbenzene		5000	300	100	50	20	10	4	1	0.5
1,3-Diethylbenzene		5000	300	100	50	20	10	4	1	0.5
1,4-Diethylbenzene		5000	300	100	50	20	10	4	1	0.5

Figure 1 Continued

Theoretical Standard Concentrations
Initial Calibration for Large Curve
Purchased Standards
EPA SW846 Method 8260A/B/C

Compound name	Std mix	Stock ppm	300 ppb	100 ppb	50 ppb	20 ppb	10 ppb	4 ppb	1 ppb	0.5 ppb
Methacrylonitrile	CS#2B	12500	750	250	125	100	50	40	10	5
Propionitrile		25000	1500	500	250	200	100	80	20	10
trans-1,4-Dichloro-2-Butene		12500	750	250	125	100	50	40	10	5
t-Butyl Alcohol		25000	1500	500	250	200	100	80	20	10
2-Propanol		25000	1500	500	250	200	100	80	20	10
Isobutyl Alcohol		62500	3750	1250	625	500	250	200	50	25
n-Butanol		125000	7500	2500	1250	1000	500	400	100	50
1,4-Dioxane		62500	3750	1250	625	500	250	200	50	25
2-Butanone	CS#3B	25000	600	200	100	40	20	8	2	1
2-Hexanone		25000	600	200	100	40	20	8	2	1
4-Methyl-2-Pentanone		25000	600	200	100	40	20	8	2	1
Acetone		25000	600	200	100	40	20	8	2	1
Acrylonitrile		12500	300	100	50	20	10	4	1	0.5
2-Nitropropane		25000	600	200	100	40	20	8	2	1
Tetrahydrofuran		25000	600	200	100	40	20	8	2	1
Methyl-t-butyl Ether	CS#4C	5000	300	100	50	20	10	4	1	0.5
Ethyl Methacrylate		5000	300	100	50	20	10	4	1	0.5
Methyl Methacrylate		5000	300	100	50	20	10	4	1	0.5
Freon 113		5000	300	100	50	20	10	4	1	0.5
Hexane		5000	300	100	50	20	10	4	1	0.5
Heptane		5000	300	100	50	20	10	4	1	0.5
Cyclohexane		5000	300	100	50	20	10	4	1	0.5
Benzyl Chloride		5000	300	100	50	20	10	4	1	0.5
Methyl Iodide		5000	300	100	50	20	10	4	1	0.5
Carbon Disulfide		5000	300	100	50	20	10	4	1	0.5
2-Chloro-1,3-Butadiene		5000	300	100	50	20	10	4	1	0.5
di-Isopropyl Ether		5000	300	100	50	20	10	4	1	0.5
tert-Amyl Methyl Ether		5000	300	100	50	20	10	4	1	0.5
Ethyl-t-butyl Ether		5000	300	100	50	20	10	4	1	0.5
Bromomethane	Gas	2000	300	100	50	20	10	4	1	0.5
Chloroethane	mix	2000	300	100	50	20	10	4	1	0.5
Chloromethane		2000	300	100	50	20	10	4	1	0.5
Dichlorodifluoromethane		2000	300	100	50	20	10	4	1	0.5
Trichlorofluoromethane		2000	300	100	50	20	10	4	1	0.5
Vinyl Chloride		2000	300	100	50	20	10	4	1	0.5
Cyclohexanone	CYC	6250	3750	1250	625	500	250	200	50	25
2-Chloroethyl Vinyl Ether	2CEVE	5000	300	100	50	20	10	4	1	0.5
1,3-Butadiene	1,3-BUT	1000	300	100	50	20	10	4	1	0.5

Figure 1 Continued

Theoretical Standard Concentrations
Initial Calibration for Large Curve
Purchased Standards
EPA SW846 Method 8260A/B/C

Compound name	std mix	Stock ppm	300 ppb	100 ppb	50 ppb	20 ppb	10 ppb	4 ppb	1 ppb	0.5 ppb
Acrolein	VACR	125000	3000	1000	500	200	100	40	10	5
tert-Amyl ethyl ether	TAEE	2000	300	100	50	20	10	4	1	0.5
Ethyl Ether	EE	1000	300	100	50	20	10	4	1	0.5
n-Pentane	n-PEN	1000	300	100	50	20	10	4	1	0.5
Freon 123a	Custom V	1000	300	100	50	20	10	4	1	0.5
Dichlorofluoromethane	LG Freon	1000	300	100	50	20	10	4	1	0.5
Hexachloroethane	VOA8	5000	300	100	50	20	10	4	1	0.5
2,2'-oxybis(1-Chloropropane)		5000	300	100	50	20	10	4	1	0.5
Ethanol	EOH	12500	7500	2500	1250	1000	500	250	62.5	31.25

ppb of analytical standard = (stock ppm)(µL stock) / flask mL

Analyst:_____
Date:_____

Figure 2

Theoretical Standard Concentrations
Initial Calibration for Large Curve
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
25 mL Purge

Date:_____
Instrument:_____

RV4MIX1 = 50 µl VOA1 + 100 µl VOA3 + 150 µl VOA2 + 700 µl MeOH
RV4MIX2 = 50 µl VOA6 + 50 µl EE + 50 µl 13BUT + 25 µl 1-Bromo-2-chloroethane + 825 µl MeOH
RV4GAS= 25 µl Restek 502.2 Mix1 (2000ppm) + 50 µl Restek Custom V LG Freon Std + 925 µl MeOH
VOA1= 1:5 dilution of VCS#1B, VCS#2B, and VCS#4C
VOA2= 1:5 dilution of VCS#2B
VOA3= 1:5 dilution of VCS#3B and Vacrolein
VOA6= 1:5 dilution of VCS#6
2CEVE= 1:5 dilution of VCS#1B-2CEVE

Stock mix name	RV4MIX1 _____ RV4GAS _____	RV4MIX2 _____					Flask ml
25 ppb std	25 µl	25 µl					50
10 ppb std	10 µl	10 µl					50
5 ppb std	5 µl	5 µl					50
2 ppb std	2 µl	2 µl					50
1 ppb std	2 µl	2 µl					100
.5 ppb std	2 µl	2 µl					200
.2 ppb std	2 µl	2 µl					500
.1 ppb std	1 µl	1 µl					500

	Std mix	Stock ppm	25 ppb	10 ppb	5 ppb	2 ppb	1 ppb	.5 ppb	.2 ppb	.1 ppb
Benzene	CS#1B	5000	25	10	5	2	1	.5	.2	.1
Bromobenzene		5000	25	10	5	2	1	.5	.2	.1
Bromodichloromethane		5000	25	10	5	2	1	.5	.2	.1
Bromoform		5000	25	10	5	2	1	.5	.2	.1
n-Butylbenzene		5000	25	10	5	2	1	.5	.2	.1
sec-Butylbenzene		5000	25	10	5	2	1	.5	.2	.1
tert-Butylbenzene		5000	25	10	5	2	1	.5	.2	.1
Carbon Tetrachloride		5000	25	10	5	2	1	.5	.2	.1
Chlorobenzene		5000	25	10	5	2	1	.5	.2	.1
Chloroform		5000	25	10	5	2	1	.5	.2	.1
2-Chlorotoluene		5000	25	10	5	2	1	.5	.2	.1
4-Chlorotoluene		5000	25	10	5	2	1	.5	.2	.1
Dibromochloromethane		5000	25	10	5	2	1	.5	.2	.1
1,2-Dibromo-3-chloropropane		5000	25	10	5	2	1	.5	.2	.1
1,2-Dibromoethane (EDB)		5000	25	10	5	2	1	.5	.2	.1
Dibromomethane		5000	25	10	5	2	1	.5	.2	.1
1,2-Dichlorobenzene		5000	25	10	5	2	1	.5	.2	.1
1,3-Dichlorobenzene		5000	25	10	5	2	1	.5	.2	.1
1,4-Dichlorobenzene		5000	25	10	5	2	1	.5	.2	.1
1,1-Dichloroethane		5000	25	10	5	2	1	.5	.2	.1

Page 1 of 4

Figure 2 Continued

Theoretical Standard Concentrations
Initial Calibration for Large Curve
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C

Compound name	std mix	Stock ppm	25 ppb	10 ppb	5 ppb	2 ppb	1 ppb	.5 ppb	.2 ppb	.1 ppb
1,2-Dichloroethane	CS#1B	5000	25	10	5	2	1	.5	.2	.1
1,1-Dichloroethene		5000	25	10	5	2	1	.5	.2	.1
cis-1,2-Dichloroethene		5000	25	10	5	2	1	.5	.2	.1
trans-1,2-Dichloroethene		5000	25	10	5	2	1	.5	.2	.1
1,2-Dichloropropane		5000	25	10	5	2	1	.5	.2	.1
1,3-Dichloropropane		5000	25	10	5	2	1	.5	.2	.1
2,2-Dichloropropane		5000	25	10	5	2	1	.5	.2	.1
1,1-Dichloropropene		5000	25	10	5	2	1	.5	.2	.1
cis-1,3-Dichloropropene		5000	25	10	5	2	1	.5	.2	.1
trans-1,3-Dichloropropene		5000	25	10	5	2	1	.5	.2	.1
Ethylbenzene		5000	25	10	5	2	1	.5	.2	.1
Hexachlorobutadiene		5000	25	10	5	2	1	.5	.2	.1
Isopropylbenzene (Cumene)		5000	25	10	5	2	1	.5	.2	.1
p-Isopropyltoluene		5000	25	10	5	2	1	.5	.2	.1
Methylene Chloride		5000	25	10	5	2	1	.5	.2	.1
Naphthalene		5000	25	10	5	2	1	.5	.2	.1
n-Propylbenzene		5000	25	10	5	2	1	.5	.2	.1
Styrene		5000	25	10	5	2	1	.5	.2	.1
1,1,1,2-Tetrachloroethane		5000	25	10	5	2	1	.5	.2	.1
1,1,2,2-Tetrachloroethane		5000	25	10	5	2	1	.5	.2	.1
Tetrachloroethene		5000	25	10	5	2	1	.5	.2	.1
Toluene		5000	25	10	5	2	1	.5	.2	.1
1,2,3-Trichlorobenzene		5000	25	10	5	2	1	.5	.2	.1
1,2,4-Trichlorobenzene		5000	25	10	5	2	1	.5	.2	.1
1,3,5-Trichlorobenzene		5000	25	10	5	2	1	.5	.2	.1
1,1,1-Trichloroethane		5000	25	10	5	2	1	.5	.2	.1
1,1,2-Trichloroethane		5000	25	10	5	2	1	.5	.2	.1
Trichloroethene		5000	25	10	5	2	1	.5	.2	.1
1,2,3-Trichloropropane		5000	25	10	5	2	1	.5	.2	.1
1,2,4-Trimethylbenzene		5000	25	10	5	2	1	.5	.2	.1
1,3,5-Trimethylbenzene		5000	25	10	5	2	1	.5	.2	.1
m-Xylene		5000	25	10	5	2	1	.5	.2	.1
o-Xylene		5000	25	10	5	2	1	.5	.2	.1
p-Xylene		5000	25	10	5	2	1	.5	.2	.1
1-Chlorohexane		5000	25	10	5	2	1	.5	.2	.1
2-Chloroethyl Vinyl Ether	2-CEVE	5000	25	10	5	2	1	.5	.2	.1
Bromomethane	Gas	2000	25	10	5	2	1	.5	.2	.1
Chloroethane	mix	2000	25	10	5	2	1	.5	.2	.1
Chloromethane		2000	25	10	5	2	1	.5	.2	.1
Dichlorodifluoromethane		2000	25	10	5	2	1	.5	.2	.1
Trichlorofluoromethane		2000	25	10	5	2	1	.5	.2	.1
Vinyl Chloride		2000	25	10	5	2	1	.5	.2	.1

Page 2 of 4

Figure 2 Continued

Theoretical Standard Concentrations
Initial Calibration for Large Curve
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C

Compound name	std mix	Stock ppm	25 ppb	10 ppb	5 ppb	2 ppb	1 ppb	.5 ppb	.2 ppb	.1 ppb
Methacrylonitrile	CS#2B	12500	250	100	50	20	10	5	2	1
Propionitrile		25000	500	200	100	40	20	10	4	2
trans-1,4-Dichloro-2-Butene		12500	250	100	50	20	10	5	2	1
t-Butyl Alcohol		25000	500	200	100	40	20	10	4	2
2-Propanol		25000	500	200	100	40	20	10	4	2
Isobutyl Alcohol		62500	1250	500	250	100	50	25	10	5
n-Butanol		125000	2500	1000	500	200	100	50	20	10
1,4-Dioxane		62500	1250	500	250	100	50	25	10	5
2-Butanone	CS#3B	25000	250	100	50	20	10	5	2	1
2-Hexanone		25000	250	100	50	20	10	5	2	1
4-Methyl-2-Pentanone		25000	250	100	50	20	10	5	2	1
Acetone		25000	250	100	50	20	10	5	2	1
2-Nitropropane		25000	250	100	50	20	10	5	2	1
Tetrahydrofuran		25000	250	100	50	20	10	5	2	1
Acrylonitrile		12500	125	50	25	10	5	2.5	1	.5
Methyl-t-butyl Ether	CS#4C	5000	25	10	5	2	1	.5	.2	.1
Ethyl Methacrylate		5000	25	10	5	2	1	.5	.2	.1
Methyl Methacrylate		5000	25	10	5	2	1	.5	.2	.1
Freon 113		5000	25	10	5	2	1	.5	.2	.1
Hexane		5000	25	10	5	2	1	.5	.2	.1
Heptane		5000	25	10	5	2	1	.5	.2	.1
Cyclohexane		5000	25	10	5	2	1	.5	.2	.1
Benzyl Chloride		5000	25	10	5	2	1	.5	.2	.1
Methyl Iodide		5000	25	10	5	2	1	.5	.2	.1
Carbon Disulfide		5000	25	10	5	2	1	.5	.2	.1
2-Chloro-1,3-Butadiene		5000	25	10	5	2	1	.5	.2	.1
di-Isopropyl Ether		5000	25	10	5	2	1	.5	.2	.1
tert-Amyl Methyl Ether		5000	25	10	5	2	1	.5	.2	.1
Ethyl-t-butyl Ether		5000	25	10	5	2	1	.5	.2	.1
Acrolein	VACR	125000	1250	500	250	100	50	25	10	5
Ethyl Ether	EE	1000	25	10	5	2	1	.5	.2	.1
1,3-Butadiene	13BUT	1000	25	10	5	2	1	.5	.2	.1
Dichlorofluoromethane	Custom V LG Freon Std.	1000	25	10	5	2	1	.5	.2	.1
Freon 123a		1000	25	10	5	2	1	.5	.2	.1

Figure 2 Continued

Theoretical Standard Concentrations
Initial Calibration for Large Curve
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C

Compound name	std mix	Stock ppm	25 ppb	10 ppb	5 ppb	2 ppb	1 ppb	.5 ppb	.2 ppb	.1 ppb
Bromochloromethane	CS#6	5000	25	10	5	2	1	.5	.2	.1
Allyl Chloride		5000	25	10	5	2	1	.5	.2	.1
Methyl Acetate		5000	25	10	5	2	1	.5	.2	.1
Methylcyclohexane		5000	25	10	5	2	1	.5	.2	.1
Pentachloroethane		5000	25	10	5	2	1	.5	.2	.1
1,2,3-Trimethylbenzene		5000	25	10	5	2	1	.5	.2	.1
2-Methylnaphthalene		5000	25	10	5	2	1	.5	.2	.1
1,2-Diethylbenzene		5000	25	10	5	2	1	.5	.2	.1
1,3-Diethylbenzene		5000	25	10	5	2	1	.5	.2	.1
1,4-Diethylbenzene		5000	25	10	5	2	1	.5	.2	.1
1-Bromo-2-chloroethane	BCE	2000	25	10	5	2	1	.5	.2	.1
1-Chlorohexane	1-CLHEX	1000	25	10	5	2	1	.5	.2	.1

ppb of analytical standard = (stock ppm)(µL stock) / flask mL

Analyst:_____
Date:_____

page 4 of 4

(saved as 8260C Lg Ical 25 mL purge)

Figure 3

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water, Low Soil, and NJ MeOH Prep

Date:_____
Instrument:_____

Qn-pentane = 40ul of n-pentane lot#_____ to 960ul MEOH lot# _____
QBUT = 40ul of 1,3-Butadiene lot#_____ to 960ul MEOH lot# _____
Custom Q LG Freon = 40uL of Custom V LG Freons Std. lot#_____ to 960 uL MeOH lot #_____
VOA8= 1:5 dilution of Hexachloroethane and 2,2'-oxybis(1-Chloropropane)

Stock mix Name	QCS#1B _____ QCS#2B _____ QCS#3B _____ QCS#4C _____	QCYC _____ QEE _____ QBUT _____	QEOH _____ Qn-pentane _____ Custom Q LG Freon _____ 50.0 µL	QCS#1B 2CEVE _____ QCS#6 _____ QACR _____ VOA8 _____	Restek 502.2 "Q" Gas mix _____ TAEE _____	Final Volume
20 ppb	2.0 µL	50.0 µL		2.0 ul	1.0 µL	100 mL Flask

Compound name	Std mix	Stock	20 ppb
		ppm	
Benzene	QCS#1B	1000	20
Bromobenzene		1000	20
Bromodichloromethane		1000	20
Bromoform		1000	20
n-Butylbenzene		1000	20
sec-Butylbenzene		1000	20
tert-Butylbenzene		1000	20
Carbon Tetrachloride		1000	20
Chlorobenzene		1000	20
Chloroform		1000	20
2-Chlorotoluene		1000	20
4-Chlorotoluene		1000	20
Dibromochloromethane		1000	20
1,2-Dibromo-3-chloropropane		1000	20
1,2-Dibromoethane (EDB)		1000	20
Dibromomethane		1000	20
1,2-Dichlorobenzene		1000	20
1,3-Dichlorobenzene		1000	20
1,4-Dichlorobenzene		1000	20
1,1-Dichloroethane		1000	20
1,2-Dichloroethane		1000	20
1,1-Dichloroethene		1000	20
cis-1,2-Dichloroethene		1000	20
trans-1,2-Dichloroethene		1000	20
1,2-Dichloropropane		1000	20

Figure 3 Continued

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water, Low Soil, and NJ MeOH Prep

Compound name	Std mix	Stock	20 ppb
		ppm	
1,3-Dichloropropane	QCS#1B	1000	20
2,2-Dichloropropane		1000	20
1,1-Dichloropropene		1000	20
cis-1,3-Dichloropropene		1000	20
trans-1,3-Dichloropropene		1000	20
Ethylbenzene		1000	20
Hexachlorobutadiene		1000	20
p-Isopropyltoluene		1000	20
Methylene Chloride		1000	20
Isopropylbenzene (Cumene)		1000	20
Naphthalene		1000	20
n-Propylbenzene		1000	20
Styrene		1000	20
1,1,1,2-Tetrachloroethane		1000	20
1,1,2,2-Tetrachloroethane		1000	20
Tetrachloroethene		1000	20
Toluene		1000	20
1,2,3-Trichlorobenzene		1000	20
1,2,4-Trichlorobenzene		1000	20
1,3,5-Trichlorobenzene		1000	20
1,1,1-Trichloroethane		1000	20
1,1,2-Trichloroethane		1000	20
Trichloroethene		1000	20
1,2,3-Trichloropropane		1000	20
1,2,4-Trimethylbenzene		1000	20
1,3,5-Trimethylbenzene		1000	20
m-Xylene		1000	20
o-Xylene		1000	20
p-Xylene		1000	20
1-Chlorohexane		1000	20
Bromomethane	QGas	2000	20
Chloroethane	mix	2000	20
Chloromethane		2000	20
Dichlorodifluoromethane		2000	20
Trichlorofluoromethane		2000	20
Vinyl Chloride		2000	20
Methacrylonitrile	QCS#2B	7500	150
Propionitrile		7500	150
trans-1,4-Dichloro-2-Butene		5000	100
t-Butyl Alcohol		10000	200
2-Propanol		7500	150
Isobutyl Alcohol		25000	500
n-Butanol		50000	1000

Figure 3 Continued

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water, Low Soil, and NJ MeOH Prep

Compound name	Std mix	Stock	20 ppb
		ppm	
1,4-Dioxane	QCS#2B	25000	500
2-Butanone	QCS#3B	7500	150
2-Hexanone		5000	100
4-Methyl-2-Pentanone		5000	100
Acetone		7500	150
Acrylonitrile		5000	100
2-Nitropropane		1000	20
Tetrahydrofuran		5000	100
Methyl-t-butyl Ether	QCS#4C	1000	20
Ethyl Methacrylate		1000	20
Methyl Methacrylate		1000	20
Freon 113		1000	20
Hexane		1000	20
Heptane		1000	20
Cyclohexane		1000	20
Benzyl Chloride		1000	20
Methyl Iodide		1000	20
Carbon Disulfide		1000	20
2-Chloro-1,3-Butadiene		1000	20
di-Isopropyl Ether		1000	20
tert-Amyl Methyl Ether		1000	20
Ethyl-t-butyl Ether		1000	20
Pentachloroethane	QCS#6	1000	20
Allyl Chloride		1000	20
Bromochloromethane		1000	20
Methyl Acetate		1000	20
Methylcyclohexane		1000	20
2-Methylnaphthalene		1000	20
1,2,3-Trimethylbenzene		1000	20
1,2-Diethylbenzene		1000	20
1,3-Diethylbenzene		1000	20
1,4-Diethylbenzene		1000	20
Acrolein	QACR	7500	150
2- Chloroethyl Vinyl Ether	QCS#1B 2CEVE	1000	20
Cyclohexanone	QCYC	1000	500
Ethyl Ether	QEE	40	20

Figure 3 Continued

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water, Low Soil, and NJ MeOH Prep

Compound name	Std mix	Stock	20 ppb
		ppm	
Dichlorofluoromethane	Custom Q LG	40	20
Freon 123a	Freon	40	20
tert-Amyl ethyl ether	TAEE	2000	20
1,3-Butadiene	QBUT	40	20
Hexachloroethane	VOA8	5000	20
2,2'-oxybis(1-Chloropropane)		5000	20
Ethanol	QEOH	1000	500
n-Pentane	Qn-PEN	40	20

ppb of analytical standard = (stock ppm)(µl stock) / final volume

Analyst:_____
Date:_____

Page 4 of 4

Figure 4

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water Prep

Date:_____
Instrument:_____

QTAEE = 20ul t-Amyl ethyl ether lot#_____ to 980ul MEOH lot #_____
QARC = 1: 25 QCS#1B2CEVE, QACR stock
QVOA6= 1:25 QCS#6
QVOA1= 1:25 QCS#1B, QCS#2B, QCS3B, QCS#4C
QVOA8= 1:25 VOA8
QGASES= 1:50 Restek 502.2 "Q" Gas mix
Qn-pentane = 40ul of n-pentane lot#_____ to 960ul MEOH lot# _____
QBUT = 40ul of 1,3-Butadiene lot#_____ to 960ul MEOH lot# _____
QCustom LG Freon = 40ul of Custom Q LG Freon lot#_____to 960 ul MEOH lot#_____

Stock mix Name	QVOA1 _____ QARC _____ QCustom LG Freon _____	QVOA6 _____ QEE _____ QDEM _____	QEOH _____ QCYC _____ QBUT _____	8260 SS 2500 ppm Lot#_____	QGASES _____ Qn-pentane _____ QVOA8 _____ QTAEE _____	Final Volume	MeOH Lot# _____	Used
20 ppb	2.5 µL	2.5 µL	2.5 µL	0.1 ul	2.5 µL	5 mL Syringe	.1 mL	
20 ppb	21.5 µL	21.5 µL	21.5 µL	-	21.5 µL	43 mL Vial	-	
20 ppb	25.0 µL	25.0 µL	25.0 µL	1.0 ul	25.0 µL	50 mL Flask	1 mL	

Compound name	std mix	Stock ppm	20 ppb
Benzene	QCS#1B	1000	20
Bromobenzene		1000	20
Bromodichloromethane		1000	20
Bromoform		1000	20
n-Butylbenzene		1000	20
sec-Butylbenzene		1000	20
tert-Butylbenzene		1000	20
Carbon Tetrachloride		1000	20
Chlorobenzene		1000	20
Chloroform		1000	20
2-Chlorotoluene		1000	20
4-Chlorotoluene		1000	20
Dibromochloromethane		1000	20
1,2-Dibromo-3-chloropropane		1000	20
1,2-Dibromoethane (EDB)		1000	20
Dibromomethane		1000	20
1,2-Dichlorobenzene		1000	20
1,3-Dichlorobenzene		1000	20
1,4-Dichlorobenzene		1000	20
1,1-Dichloroethane		1000	20

Page 1 of 4

Figure 4 Continued

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water Prep

Compound name	std mix	Stock ppm	20 ppb
1,2-Dichloroethane	QCS#1B	1000	20
1,1-Dichloroethene		1000	20
cis-1,2-Dichloroethene		1000	20
trans-1,2-Dichloroethene		1000	20
1,2-Dichloropropane		1000	20
1,3-Dichloropropane		1000	20
2,2-Dichloropropane		1000	20
1,1-Dichloropropene		1000	20
cis-1,3-Dichloropropene		1000	20
trans-1,3-Dichloropropene		1000	20
Ethylbenzene		1000	20
Hexachlorobutadiene		1000	20
p-Isopropyltoluene		1000	20
Methylene Chloride		1000	20
Isopropylbenzene (Cumene)		1000	20
Naphthalene		1000	20
n-Propylbenzene		1000	20
Styrene		1000	20
1,1,1,2-Tetrachloroethane		1000	20
1,1,2,2-Tetrachloroethane		1000	20
Tetrachloroethene		1000	20
Toluene		1000	20
1,2,3-Trichlorobenzene		1000	20
1,2,4-Trichlorobenzene		1000	20
1,3,5-Trichlorobenzene		1000	20
1,1,1-Trichloroethane		1000	20
1,1,2-Trichloroethane		1000	20
Trichloroethene		1000	20
1,2,3-Trichloropropane		1000	20
1,2,4-Trimethylbenzene		1000	20
1,3,5-Trimethylbenzene		1000	20
m-Xylene		1000	20
o-Xylene		1000	20
p-Xylene		1000	20
1-Chlorohexane		1000	20
Bromomethane	QGas	2000	20
Chloroethane	mix	2000	20
Chloromethane		2000	20
Dichlorodifluoromethane		2000	20
Trichlorofluoromethane		2000	20
Vinyl Chloride		2000	20
Methacrylonitrile	QCS#2B	7500	150
Propionitrile		7500	150

Page 2 of 4

Figure 4 Continued

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water Prep

Compound name	std mix	Stock ppm	20 ppb
trans-1,4-Dichloro-2-Butene		5000	100
t-Butyl Alcohol		10000	200
2-Propanol		7500	150
Isobutyl Alcohol		25000	500
n-Butanol		50000	1000
1,4-Dioxane		25000	500
2-Butanone	QCS#3B	7500	150
2-Hexanone		5000	100
4-Methyl-2-Pentanone		5000	100
Acetone		7500	150
Acrylonitrile		5000	100
2-Nitropropane		1000	20
Tetrahydrofuran		5000	100
Methyl-t-butyl Ether	QCS#4C	1000	20
Ethyl Methacrylate		1000	20
Methyl Methacrylate		1000	20
Freon 113		1000	20
Hexane		1000	20
Heptane		1000	20
Cyclohexane		1000	20
Benzyl Chloride		1000	20
Methyl Iodide		1000	20
Carbon Disulfide		1000	20
2-Chloro-1,3-Butadiene		1000	20
di-Isopropyl Ether		1000	20
tert-Amyl Methyl Ether		1000	20
Ethyl-t-butyl Ether		1000	20
Pentachloroethane	QCS#6	1000	20
Allyl Chloride		1000	20
Bromochloromethane		1000	20
Methyl Acetate		1000	20
Methylcyclohexane		1000	20
2-Methylnaphthalene		1000	20
1,2,3-Trimethylbenzene		1000	20
1,2-Diethylbenzene		1000	20
1,3-Diethylbenzene		1000	20
1,4-Diethylbenzene		1000	20
Dichlrofluoromethane	QCustom	1000	20
Freon 123a	LG Freon		
Acrolein	QACR	7500	150

Page 3 of 4

Figure 4 Continued

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water Prep

Compound name	std mix	Stock ppm	20 ppb
2- Chloroethyl Vinyl Ether	QCS#1B 2CEVE	1000	20
tert-Amyl ethyl ether	QTAEE	2000	20
Cyclohexanone	QCYC	1000	500
Ethyl Ether	QEE	40	20
n-Pentane	Qn-PEN	40	20
Diethoxymethane	QDEM	40	20
1,3-Butadiene	QBUT	40	20
Hexachloroethane	QVOA8	1000	20
2,2'-oxybis(1-Chloropropane)		1000	20
Ethanol	QEOH	1000	500

ppb of analytical standard = (stock ppm)(µl stock) / final volume

Analyst:_____
Date:_____

Page 4 of 4

Figure 5

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water Prep

Date:_____
Instrument:_____

QTAEE = 20ul t-Amyl ethyl ether lot#_____ to 980ul MEOH lot #_____
QARC = 1: 25 QCS#1B2CEVE, QACR stock
QVOA6= 1:25 QCS#6
QVOA1= 1:25 QCS#1B, QCS#2B, QCS3B, QCS#4C
QVOA8= 1:25 VOA8
QGASES= 1:50 Restek 502.2 "Q" Gas mix
Qn-pentane = 40ul of n-pentane lot#_____ to 960ul MEOH lot# _____
QBUT = 40ul of 1,3-Butadiene lot#_____ to 960ul MEOH lot# _____
QCustom LG Freon = 40ul of Custom Q LG Freon lot#_____to 960 ul MEOH lot#_____

Stock mix Name	QVOA1 _____ QARC _____ QCustom LG Freon _____	QVOA6 _____ QEE _____ QDEM _____	QEOH _____ QCYC _____ QBUT _____	8260 SS 2500 ppm Lot#_____	QGASES _____ Qn-pentane _____ QVOA8 _____ QTAEE _____	Final Volume	MeOH Lot# _____	Used
20 ppb	2.5 µL	2.5 µL	2.5 µL	0.1 ul	2.5 µL	5 mL Syringe	.1 mL	
20 ppb	21.5 µL	21.5 µL	21.5 µL	-	21.5 µL	43 mL Vial	-	
20 ppb	25.0 µL	25.0 µL	25.0 µL	1.0 ul	25.0 µL	50 mL Flask	1 mL	

Compound name	std mix	Stock ppm	20 ppb
Benzene	QCS#1B	1000	20
Bromobenzene		1000	20
Bromodichloromethane		1000	20
Bromoform		1000	20
n-Butylbenzene		1000	20
sec-Butylbenzene		1000	20
tert-Butylbenzene		1000	20
Carbon Tetrachloride		1000	20
Chlorobenzene		1000	20
Chloroform		1000	20
2-Chlorotoluene		1000	20
4-Chlorotoluene		1000	20
Dibromochloromethane		1000	20
1,2-Dibromo-3-chloropropane		1000	20
1,2-Dibromoethane (EDB)		1000	20
Dibromomethane		1000	20
1,2-Dichlorobenzene		1000	20
1,3-Dichlorobenzene		1000	20
1,4-Dichlorobenzene		1000	20
1,1-Dichloroethane		1000	20

Page 1 of 4

Figure 5 Continued

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water Prep

Compound name	std mix	Stock ppm	20 ppb
1,2-Dichloroethane	QCS#1B	1000	20
1,1-Dichloroethene		1000	20
cis-1,2-Dichloroethene		1000	20
trans-1,2-Dichloroethene		1000	20
1,2-Dichloropropane		1000	20
1,3-Dichloropropane		1000	20
2,2-Dichloropropane		1000	20
1,1-Dichloropropene		1000	20
cis-1,3-Dichloropropene		1000	20
trans-1,3-Dichloropropene		1000	20
Ethylbenzene		1000	20
Hexachlorobutadiene		1000	20
p-Isopropyltoluene		1000	20
Methylene Chloride		1000	20
Isopropylbenzene (Cumene)		1000	20
Naphthalene		1000	20
n-Propylbenzene		1000	20
Styrene		1000	20
1,1,1,2-Tetrachloroethane		1000	20
1,1,2,2-Tetrachloroethane		1000	20
Tetrachloroethene		1000	20
Toluene		1000	20
1,2,3-Trichlorobenzene		1000	20
1,2,4-Trichlorobenzene		1000	20
1,3,5-Trichlorobenzene		1000	20
1,1,1-Trichloroethane		1000	20
1,1,2-Trichloroethane		1000	20
Trichloroethene		1000	20
1,2,3-Trichloropropane		1000	20
1,2,4-Trimethylbenzene		1000	20
1,3,5-Trimethylbenzene		1000	20
m-Xylene		1000	20
o-Xylene		1000	20
p-Xylene		1000	20
1-Chlorohexane		1000	20
Bromomethane	QGas	2000	20
Chloroethane	mix	2000	20
Chloromethane		2000	20
Dichlorodifluoromethane		2000	20
Trichlorofluoromethane		2000	20
Vinyl Chloride		2000	20
Methacrylonitrile	QCS#2B	7500	150
Propionitrile		7500	150

Figure 5 Continued

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water Prep

Compound name	std mix	Stock ppm	20 ppb
trans-1,4-Dichloro-2-Butene		5000	100
t-Butyl Alcohol		10000	200
2-Propanol		7500	150
Isobutyl Alcohol		25000	500
n-Butanol		50000	1000
1,4-Dioxane		25000	500
2-Butanone	QCS#3B	7500	150
2-Hexanone		5000	100
4-Methyl-2-Pentanone		5000	100
Acetone		7500	150
Acrylonitrile		5000	100
2-Nitropropane		1000	20
Tetrahydrofuran		5000	100
Methyl-t-butyl Ether	QCS#4C	1000	20
Ethyl Methacrylate		1000	20
Methyl Methacrylate		1000	20
Freon 113		1000	20
Hexane		1000	20
Heptane		1000	20
Cyclohexane		1000	20
Benzyl Chloride		1000	20
Methyl Iodide		1000	20
Carbon Disulfide		1000	20
2-Chloro-1,3-Butadiene		1000	20
di-Isopropyl Ether		1000	20
tert-Amyl Methyl Ether		1000	20
Ethyl-t-butyl Ether		1000	20
Pentachloroethane	QCS#6	1000	20
Allyl Chloride		1000	20
Bromochloromethane		1000	20
Methyl Acetate		1000	20
Methylcyclohexane		1000	20
2-Methylnaphthalene		1000	20
1,2,3-Trimethylbenzene		1000	20
1,2-Diethylbenzene		1000	20
1,3-Diethylbenzene		1000	20
1,4-Diethylbenzene		1000	20
Dichlrofluoromethane	QCustom	1000	20
Freon 123a	LG Freon		
Acrolein	QACR	7500	150

Page 3 of 4

Figure 5 Continued

Theoretical Standard Concentrations
Quality Control
Purchased Standards
HP Capillary Column
EPA SW846 Method 8260A/B/C
Water Prep

Compound name	std mix	Stock ppm	20 ppb
2- Chloroethyl Vinyl Ether	QCS#1B 2CEVE	1000	20
tert-Amyl ethyl ether	QTAEE	2000	20
Cyclohexanone	QCYC	1000	500
Ethyl Ether	QEE	40	20
n-Pentane	Qn-PEN	40	20
Diethoxymethane	QDEM	40	20
1,3-Butadiene	QBUT	40	20
Hexachloroethane	QVOA8	1000	20
2,2'-oxybis(1-Chloropropane)		1000	20
Ethanol	QEOH	1000	500

ppb of analytical standard = (stock ppm)(µl stock) / final volume

Analyst:_____
Date:_____

Page 4 of 4

Figure 6

Theoretical Standard Concentrations
Gasoline Range Organics
Water Prep

Instrument:_____
Restek Certified BTEX in Unleaded Gas Composite Date:_____

Lot: _____ Exp: _____

INITIAL CALIBRATION TSC

Compound Name	CAS #	Stock ppm	level 6 Conc. ug/L	level 5 Conc. ug/L	level 4 Conc. ug/L	level 3 Conc. ug/L	level 2 Conc. ug/L	level 1 Conc. ug/L	MDL Conc. ug/L
		ul stock	40	20	10	10	2	4	2
		FV H20 Ml	50	50	50	100	100	500	500
Unleaded gasoline Composite	8006-61-9	5500	4400	2200	1100	550	110	44	22

Analyst:_____
Date:_____

QUALITY CONTROL TSC
Supelco Gasoline Lot_____ 20000ug/mL
QGRO=1:10 Supelco Gasoline

Stock mix	QGRO _____	Final Volume	Prep Used
1000 ppb GRO	21.5 ul	43 ml Vial	
1000 ppb GRO	25.0 ul	50 mL Flask	

Analyst:_____
Date:_____

Page 1 of 1

Eurofins Document Reference	1-P-QM-WI -9015100	**Revision**	6
Effective Date	Mar 23, 2016	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 10461, 10462, 10726,		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Rachel Cochis
Reviewed and Approved by	Richard Karam;Review;Tuesday, March 8, 2016 9:26:06 AM EST Christiane Sweigart;Approval;Wednesday, March 9, 2016 7:01:45 PM EST

Revision Log:

Revision: 6		**Effective Date:** This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout Document	Reflects re-identification of documents in EtQ	Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Procedure F.1	Correction	Change table reference to table II
Procedure I.4	Correction	Change table reference to table III
Procedure J	Correction	Change table reference to table III

Revision: 5		**Effective Date:** Jan 23, 2015
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout Document	Reflect re-identification of documents in EtQ	Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Document Title	Enhancement	Add matrices and instrumentation to title. Semivolatile Organic Compounds by Method 8270D in Aqueous and Non-Aqueous Matrices using GC-MS
Basic Principles	Correction	Changed quadruple to quadrupole
Sample Collection, Preservation, and Handling	Reflects current practices	Changed sample storage conditions
Procedure D	Correction	Changed return to retune
Procedure F	Reflects current practices	Changed acceptance criteria #4 from average areas to areas from the mid-level standard of the calibration
Quality Assurance/ Quality Control	Reflects current practices	Updated acceptance criteria to specify that LCS and MS/D windows are updated semiannually and not annually

Reference:

1. Test Methods for Evaluating Solid Wastes, SW-846 Method 8270D, Rev. 4, February 2007.

2. Test Methods for Evaluating Solid Wastes, SW-846 Method 8000B, Rev. 2, December 1996.

3. *Federal Register*, Vol. 57, No. 227, November 24, 1992, p. 55114 (TCLP).

4. *Federal Register*, Vol. 57, No. 160, August 18, 1992, p. 37203 (CCW).

5. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
1-P-QM-FOR-9007858	Nonconformance Form
1-P-QM-PRO-9015393	GC/MS Preventative and Corrective Maintenance
1-P-QM-PRO-9015452	Semivolatile Spiking and Calibration Standards
1-P-QM-QMA-9015390	Demonstrations of Capability

Scope:

This method is suitable for the determination of the concentration of certain semivolatile organic compounds (priority pollutant list, target compound list, Appendix IX list, TCLP list, and CCW list) found in soils, tissues, waters, and leachates. Typical limits of quantitation (LOQ) achieved are 33 µg/kg for soils, 132 µg/kg for tissues, 1 µg/L for waters and 0.002 mg/L for leachates. Specific compound lists and associated method detection limits (MDLs) and LOQ can be found in the Laboratory Information Management System (LIMS) under the analysis numbers listed in the header of this SOP.

Basic Principles:

A 1-microliter mixture of organic compounds in methylene chloride is injected onto a fused silica capillary column coated with a relatively non-polar stationary phase, which is enclosed in a temperature controlled oven. A carrier gas, ultra pure helium, passes continuously through the column. The GC oven is temperature programmed and the organic mixture separates into its individual components as it moves along the length of the column. This separation is a function of the polarity and boiling point of the individual compounds. The column empties into a mass selective detector. When a compound reaches the detector, it is bombarded by high energy electrons (70 eV). This causes the compounds to fragment, forming ions. By applying various voltages to lenses in the area where the ions are formed, the positive ions are thrust into a quadrupole mass analyzer, which selects for a given mass fragment at a given time. These selected fragments reach an electron multiplier, which detects and generates a signal for each mass fragment. The signals are amplified and sent to a computer making storage and manipulation of the data possible. Target compounds are identified on the basis of relative retention times and spectral match to standards. Standards are injected every 12 hours on each system used for analysis.

Quantification is achieved via use of the internal standard calibration technique. The average relative response factor of a multi-point calibration is used for quantification when the appropriate criteria are met.

Interferences:

Method interferences may be caused by impurities in solvents, reagents, and glassware, or other hardware used in the processing of samples. All glassware is solvent rinsed before use and a method blank is performed with each extraction batch to demonstrate that the extraction system is free of contamination.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound and reagent should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means are available such as fume hoods, safety glasses, lab coats, and gloves.

All solvent waste generated from this analysis must be collected for recycling (if applicable) or must be disposed of in designated containers. These are then transferred to a lab-wide disposal facility. Any solid waste material (disposable pipettes, broken glassware, pH paper) must be disposed of in the normal solid waste collection containers or sharps containers, as applicable.

Personnel Training and Qualifications:

Education Requirement: Degree in science or relevant experience.

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC) which is maintained in the analyst's training records.

Initially, each analyst performing instrumental analysis must work with an experienced analyst for a period of time until they can independently perform daily maintenance, column and source changing procedures, calibration techniques, interpret chromatograms, calculation, data review, and enter data into the LIMS. Proficiency is measured through documented audits of the tasks listed and over checking of data as well as an Initial Demonstration of Capability (IDOC).

The IDOC consists of four laboratory control samples that are carried through all steps of the analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Various options are available for a DOC and can include four laboratory control samples or one blind sample. Refer to 1-P-QM-QMA-9015390 (LOM-SOP-ES-238 for more guidance on these options.

Sample Collection, Preservation, and Handling:

Water samples may be preserved with sodium thiosulfate ($Na_2S_2O_3$) and must be extracted within 7 days of collection. Solid samples are not preserved and must be extracted within 14 days of collection.

Samples are stored at 0º to 6ºC, not frozen. Extracts must be analyzed within 40 days of extraction and are stored in amber vials at ≤ -10C (freezer).

Apparatus and Equipment:

1. 25-µL syringe

2. Hewlett-Packard Model 5890 (Series I and II) or Hewlett-Packard/Agilent 6890 Gas Chromatograph or equivalent

3. Hewlett-Packard Models 5971, 5972, and Hewlett-Packard/Agilent 5973, 5975 Mass Selective Detector or equivalent

4. Thru-Put Systems Target Acquisition Software/Oracle Database or equivalent

Reagents and Standards:

A. Standard/spiking concentration and reagent vendors are subject to change without notification.

B. Reagents

1. Methylene chloride, pesticide grade. Store at room temperature.

2. UPC (ultra pure carrier) helium for carrier gas.

C. Standards

1. Documentation of all stocks and calibration standards is maintained in the Standards Database (electronic standard preparation notebook) or in a standards preparation logbook.

2. 50 ng/µL Solution of decafluorotriphenylphosphine (DFTPP) containing pentachlorophenol, benzidine and DDT, prepared from Absolute Standards, Inc., Part #43030 in methylene chloride or equivalent. Store at 0° to 6°C for up to 6 months.

3. Supelco Equity Semivolatile Internal Standard Mix, Part #46955-U or equivalent, 1000 µg/mL in methylene chloride. Ampulated solutions are maintained under refrigeration (0º to 6ºC) until consumed or manufacturer determined expiration date. Working solution is maintained at room temperature and is replenished daily from ampulated solutions.

4. Refer to 1-P-QM-PRO-9015452 (SOP-EX-001) for the preparation and storage of calibration, check, and spiking solutions.

Calibration:

See Procedure E for initial calibration processing and Procedure F for continuing calibration check processing.

Procedure:

A. Standard preparation – These solutions are used to standardize the GC/MS system every 12 hours and are prepared approximately every week to 10 days or more frequently if needed based on consumption. See 1-P-QM-PRO-9015452 for standard preparation. Calibration standard solutions may be used up to the labeled expiration date or until component degradation is observed.

B. Internal standard mix is added to all standards and subsequent samples at a concentration of 20 µg/mL. Using a 25-µL syringe, 20 µL of Supelco Equity Semivolatile Internal Standard Mix or equivalent, 1000 µg/mL in methylene chloride are added to the 1 mL of standard or sample extract.

C. Daily maintenance – Refer to 1-P-QM-PRO-9015393 (MC-EX-001) for this procedure.

D. Instrument conditions

Equip a GC/MS (such as referenced under Apparatus and Equipment) in one of the two following manners:

1. For a 5890/5971 or 5972 and 6890/5973 or 5975

    a. Column – 30M × 0.25 mm ID, 1.0 um df, J&W Scientific DB-5MS or equivalent

    b. Injector – Split/splitless operated in splitless mode

    c. Injector Temp – 275°C

    d. Detector Temp – 300°C

    e. Gas – Helium at approximately 1.5 mL/min, constant flow mode

    f. Oven Temp – 45°C for 3 minutes, ramp at 8°C/minute to 225°C, then ramp at 12°C/minute to 300°C and hold for 7.5 minutes.

2. For a 6890/5973 or 5975

    a. Column – 20M × 0.18 mm ID, 0.18 um df, J&W Scientific DB-5MS or equivalent

    b. Injector – Split/splitless operated in split mode, 30:1 split

c. Injector Temp – 275°C

d. Detector Temp – 280°C

e. Gas – Helium at approximately 1.0 mL/min, constant flow mode

f. Oven Temp – 40°C for 1 minute, ramp at 25°C/minute to 100°C, then ramp at 30°C/minute to 280°C, followed by another ramp at 25°C/minute to 320°C, hold for 2 minutes.

NOTE: It is not necessary to use the exact parameters listed above. Equivalent columns and conditions that give the performance required by the method are acceptable.

E. Tuning

The GC/MS must be tuned using a 50-ng/µL solution of DFTPP containing pentachlorophenol, benzidine, and DDT.

Frequency	Acceptance Criteria	Corrective Action
Every 12 hours	1. Criteria in Table I 2. DDT breakdown ≤20%* 3. Tailing factors: • Benzidine ≤2 • Pentachlorophenol ≤2	1. Retune. Analysis cannot proceed until tune meets criteria 2. More aggressive injection port maintenance 3. Clean the source 4. Change the column

***NOTE:** DDT breakdown greater than 20 percent may be acceptable if you are calibrating for polynuclear aromatic hydrocarbon compounds only. Consult supervisor when this situation occurs.

1. Use only the background-subtracted spectrum of the following when evaluating the DFTPP:

   A three scan average of the apex of the scan, the apex of the scan –1 and the apex of the scan +1.

   NOTE: All standards, samples, and associated quality control samples with a particular tune must use the identical conditions of the mass spectrometer.

2. Calculation of DDT breakdown

$$\%\ DDT\ \ Breakdown\ = \frac{DDE\ \ TIC\ \ AREA + DDD\ \ TIC\ \ AREA}{DDE\ \ TIC\ \ AREA + DDD\ \ TIC\ \ AREA + DDT\ \ TIC\ \ AREA}\ x\ 100$$

Where:

DDE and DDD = The breakdown products of DDT

TIC = Total Ion Chromatogram

F. Initial calibration (ICAL)

1. Perform standardization by analyzing at least six levels of calibration standards ranging from 0.5 µg/mL to 120 µg/mL. (Refer to 1-P-QM-PRO-9015452 for the preparation of calibration standards.) Use the internal standard calibration technique to generate an average relative response factor for each compound. Table II lists the six internal standards used for the method and the target compounds that are associated with each internal standard.

2. A method detection limit (MDL) standard must be analyzed with each initial calibration. This standard is prepared at the departmental MDL and is not to be included in the calibration curve. All compounds must be detected in the MDL standard.

3. Initial Calibration Verification (ICV) standard is also analyzed with each initial calibration. The ICV is made from a second source standard and has an acceptance window of 70% - to 130%.

Frequency	Acceptance Criteria	Corrective Action
Initially and when the daily calibration standard fails criteria. Initially establish with at least six levels of standards and an MDL standard.	1. Minimum response factors must be met in all levels of the calibration – especially in the lowest level of the calibration (see table IV). 2. %RSD for each compound should be less than or equal to 20%. If more than 10% of the compounds in the ICAL exceed 20% RSD and/or also do not meet the minimum correlation coefficient for alternate fits (ie, the correlation coefficient is <0.990) then the analysis cannot proceed. 3. If a linear calibration is used, the low calibration is re-fitted back into the curve and the recalculated concentration of the low calibration point must be within plus or minus 30% of the standard's true concentration to verify the linearity of the curve. 4. All compounds of interest must be detected in the MDL standard. 5. The relative retention times of the target compounds must agree within 0.06 relative retention time units. The exception would be in the case of system maintenance. 6. Structural isomers that produce very similar mass spectra are identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is <50% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.	1. Any target analyte with an %RSD of ≥20% should use the average RRF. For any analyte in which the %RSD >20%, use a first degree (linear) fit if the correlation coefficient is ≥0.99. If the CC of the linear fit is <0.99, then a second order (quadratic) fit may be used provided the coefficient of determination is ≥0.99. If both the CC for the linear fit and the COD for the quadratic fit are ≥0.99 for any given analyte, then use the fit with the smallest negative y-intercept. When using a quadratic fit, if the y-intercept quantifies to be greater than the MDL, consult your supervisor immediately or recalibrate. See below for corrective action if the coefficient of determination (COD) for a quadratic fit is <0.99.** 2. When a linear regression is used, If the recalculated concentration of the low calibration point exceeds 30% then the limit of quantitation will need to be raised or target analytes that failed this criteria will be reported as estimated when the concentration is at or near the lowest calibration point. 3. If a compound is not detected in the MDL standard, then report to the level of the lowest standard detected. All compounds manually integrated in this standard must be checked for in each sample analyzed under this initial calibration.* 4. More aggressive system maintenance, and recalibrate

*If these situations occur, your supervisor is to be consulted immediately.

**See USEPA Method 8000B for the calculations associated with non-linear fit types.

With supervisory approval, the following problematic compounds can be allowed to fail the 0.99 coefficient of determination criteria for a quadratic fit:

1,4-Phenylenediamine
4-Aminobiphenyl
3,3'-Dimethylbenzidine
4,4'-Methylenebis(2-chloroaniline)
4-Nitroquinoline-1-oxide
1,4-Naphthoquinone
methapyrilene

If the COD is less than 0.99 for any other compound, the system should be inspected for problems and recalibrated. Supervisory approval is required for exceptions to these guidelines.

NOTE: Quadratic fits <u>are not</u> permitted when analyzing samples from South Carolina.

G. Continuing Calibration Verification (CCV)

Frequency	Acceptance Criteria	Corrective Action
1. Every 12 hours 2. Check standard area analyzed at the 30 µg/mL concentration or the fifth level of the calibration.	1. Target analytes should meet the minimum response factor criteria (see Table IV). 2. The maximum % drift for all target analytes is 20%. No more than 20% of the target analytes can be greater than 20% drift. All target analytes that exceed 20% drift must be less than or equal to 50% drift. 3. The relative retention times of the target compounds must agree within 0.06 relative retention time units. The exception would be for the case of system maintenance. 4. The EICP area for each internal standard must fall within the window of -50% to +100% from the areas of the mid-level standard produced during the last initial calibration. 5. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is <50% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs. The resolution should be verified on the mid-point concentration of the ICAL as well as the check standard.	1. More aggressive system maintenance 2. In cases where compounds fail, they may still be reported as non-detects if it can be demonstrated that there was adequate sensitivity to detect the compound at the applicable quantitation limit. For situations when the failed compound is present, the concentrations must be reported as estimated values. 3. Recalibrate

In the event that two consecutive continuing calibration check standards fail for the list of target analytes being quantified, then after the appropriate system maintenance has been performed, two consecutive continuing calibration check standards must pass criteria, before analysis can continue. If the analytical system cannot pass two consecutive checks, then the system must be recalibrated.

H. Calibration calculations

1. Calculation of the relative response factor (RRF):

$$RRF = \frac{[A(x) \times C(is)]}{[A(is) \times C(x)]}$$

Where:

A(x) = Area of the characteristic ion for the compound being measured

A(is) = Area of the characteristic ion for the specific internal standard

C(x) = Concentration of the compound being measured

C(is) = Concentration of specific internal standard

2. Regression equations

1st Order (linear) regression: Y = M(X) + B
2nd Order (quadratic) regression: Y = B + M(X) + CX2

Where:

Y = $\frac{\text{Conc Std}}{\text{Conc Istd}}$

X = $\frac{\text{Area Std}}{\text{Area Istd}}$

M = 1st degree slope

C = 2nd degree slope

B = Y intercept

3. Calculation of the percent drift:

$$\%Drift = \frac{C(i) - C(c)}{C(i)} \times 100$$

Where:

C(i) = Calibration check compound standard concentration

C(c) = Measured concentration using selected quantification method

4. Calculation of the percent relative standard deviation (%RSD):

$$\%RSD = \frac{SD}{\overline{RF}} \times 100$$

Where:

SD = Standard deviation

$\overline{RF}$ = Average response factor

I. Qualitative analysis

A compound is identified by comparison of the following parameters with those of a standard of this suspected compound (standard reference spectra). In order to verify identification, the following criteria must be met:

1. The intensities of the characteristic ions of the compound must maximize in the same scan or within one scan of each other.

2. The sample component relative retention time must compare within ±0.06 RRT units of the RRT of the standard component.

3. The characteristic ions from the reference mass spectrum are defined to be the three ions of greatest relative intensity, or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum.

4. The primary and secondary ions can be found in Table III.

NOTE: N-Nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine. For this reason, it is acceptable to report the combined result for both n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration.

NOTE: 1,2-Diphenylhydrazine is unstable even at room temperature and readily converts to azobenzene. Given the stability problems, it would be acceptable to calibrate for 1,2-diphenylhydrazine using azobenzene. Under these poor compound separation circumstances the results for either of these compounds should be reported as a combined concentration.

J. Quantitative analysis

Once a compound has been identified, quantitation is based on the internal standard technique and the integrated abundance from the extracted ion current profile (EICP) of the primary characteristic ion. The list of primary characteristic ions is listed in Table III.

Waters:

$$Concentrat\ ion\ (\mu g / L) = \frac{A(x) \times I(s) \times V(t) \times D_f}{A(is) \times RRF \times V(o) \times V(i)}$$

Where:

A(x) = Area of characteristic ion for compound being measured

I(s) = Amount of internal standard injected (ng)

V(t) = Volume of concentrated extract in microliters (µL)

D_f = Dilution factor

A(is) = Area of characteristic ion for the internal standard

RRF = Relative response factor for the compound being measured

V(i) = Volume of extract injected (µL)

V(o) = Volume of water extracted (mL)

Soils:

$$Concentrat\ ion\ (\mu g/kg) = \frac{A(x) \times I(s) \times V(t) \times G \times D_f}{A(is) \times RRF \times W(s) \times V(i) \times D}$$

Where:

A(x) = Area of characteristic ion for compound being measured

I(s) = Amount of internal standard injected (ng)

V(t) = Volume of concentrated extract in microliters

D_f = Dilution factor

A(is) = Area of characteristic ion for the internal standard

RRF = Relative Response factor for the compound being measured

V(i) = Volume of extract injected (µL)

W(s) = Weight of sample extracted or diluted in grams

D = The percent solids (100 - % moisture)/100

G = 1 if extract did not require GPC cleanup

G = 2 if extract required GPC cleanup

Calculations:

Calculations are found throughout document.

Statistical Information/Method Performance:

The LCS/MS and surrogate recoveries and RPD are compared to statistically generated limits for acceptance criteria. The current data is stored in the LIMS under the analysis numbers listed in the header of this SOP. The historical data for MDLs, MS/MSD, LCS/D, and measurement of uncertainty is reviewed at least annually and updated if necessary. Refer to the Quality Assurance/Quality Control section of this SOP and the criteria listed throughout this procedure for additional information on the performance of this method.

Quality Assurance/Quality Control:

Each extraction batch must contain a method blank, a laboratory control sample (LCS), and either an unspiked background sample (US), a matrix spike (MS), a matrix spike duplicate (MSD) or a laboratory control sample/laboratory control sample duplicate (LCS/LCSD). Refer to 1-P-QM-PRO-9015452 for the preparation of quality control spikes. Additional QC samples may be required to meet project or state certification requirements.

Quality Control Item	Acceptance Criteria	Corrective Action
Internal Standards	1. Peak area within -50% to +100% of the area in the associated reference standard. 2. Retention time (RT) within 30 seconds of RT for associated reference standard.	1. Check instrument for possible problems and then reanalyze samples. 2. If reinjection meets the criteria, report this injection. 3. If reinjection still shows same problem, report first injection and qualify data with a comment.
Method Blank	1. Must meet internal standard criteria. 2. Must meet surrogate criteria. 3. All target compounds must be less than the reporting limit for the associated samples.	1. Inspect system for possible problems and reanalyze. 2. If the surrogates are out of spec high data can be used. (Unless project requirements dictate otherwise).* 3. If the method blank contains target analytes and the associated samples do not contain these compounds, no corrective action is required. If the target compounds in the blank are also in the associated samples, the samples should be reextracted unless it does not interfere with project data requirements.
Laboratory Control Sample/Laboratory Control Sample Duplicate	All percent recoveries within QC limits. Refer to the GC/MS Semivolatile SOP manual for QC windows. These are reviewed and updated on a semiannual basis.	1. If non-compliant, check for calculation or preparation errors. 2. If no errors found, check system for problems and reanalyze. 3. If LCS/LCSD still out of spec, consult supervisor immediately. Samples may need to be re-extracted.
Matrix Spike/Matrix Spike Duplicate (MS/MSD)	1. % Recoveries within QC limits. Refer to the GC/MS Semivolatile SOP manual for QC windows. These are reviewed and updated on a semiannual basis. . 2. RPDs within QC limits.	1. If LCS within QC limits, proceed with sample analysis. 2. If most recoveries or RPDs out of spec, consult supervisor.
Surrogates	All recoveries must be within QC limits. Refer to the GC/MS Semivolatile SOP manual for surrogate windows. These are updated on a semiannual basis.	1. If non-compliant, check for calculation or preparation errors. 2. If no errors found, check system for problems and reanalyze. If no problem is found, reextract and reanalyze. If surrogates are out of spec high and no targets are detected in the sample no corrective action is required.

*Requires approval of supervisor and completion of Non-Conformance Form 2586 (1-P-QM-FOR-9007858).

A. Dilution Criteria

1. Initial dilutions:

   a. More than three internal standard areas are less than -50%.

   b. Either of the last two internal standard areas are less than -80%.

   c. Prescreen data or analyst's judgement of a sample extract's color or viscosity, indicate a possible matrix interference.

2. Secondary dilutions:

   Are required to bring all target compounds in the calibration range of the GC/MS.

B. QC Calculations

1. Percent Recovery:

$$\%Recovery = Concentration\ found \div Concentration\ spiked \times 100$$

2. Calculations for MS/MSD:

$$Matrix\ spike\ recovery = SSR \times SR \div SA \times 100$$

Where:

SSR = Spike sample result

SR = Sample result

SA = Spike added

3. Relative Percent Difference (RPD):

$$RPD = \left\{ \left| MSR \; x \; MSDR \right| \div ½ \left(MSR \; x \; MSDR \right) \right\} x \, 100$$

Where:

RPD = Relative percent difference

MSR = Matrix Spike Recovery

MSDR = Matrix Spike Dup Recovery

Table I
DFTPP Key Ions and Ion Abundance Criteria

Mass	Ion Abundance Criteria
51	10% to 80% of mass 198
68	<2% of mass 69
70	<2% of mass 69
127	10% to 80% of mass 198
197	<2% of mass 198
198	Base peak, or >50% of mass 442
199	5% to 9% of mass 198
275	10% to 60% of mass 198
365	>1% of mass 198
441	Present but less than 24% of mass 442
442	Base peak, or >50% of mass 198
443	15% to 24% of mass 442

Table II
Semivolatile Internal Standard with Corresponding Analytes Assigned for Quantitation

1,4-Dichlorobenzene-d_4	Naphthalene-d_8	Acenaphthene-d_{10}
Acrylamide		
Aniline	Acetophenone	Acenaphthene
Benzyl alcohol	Benzoic acid	Acenaphthylene
Bis(2-chloroethyl) ether	Bis(2-chloroethoxy)methane	1-Chloronaphthalene
Bis(2-chloroisopropyl) ether	4-Chloroaniline	2-Chloronaphthalene
2-Chlorophenol	4-Chloro-3-methylphenol	4-Chlorophenyl phenyl ether
1,3-Dichlorobenzene	2,4-Dichlorophenol	Dibenzofuran
1,4-Dichlorobenzene	2,6-Dichlorophenol	Diethyl phthalate
1,2-Dichlorobenzene	α,α-Dimethylphenylamine	Dimethyl phthalate
Ethyl methanesulfonate	2,4-Dimethylphenol	2,4-Dinitrophenol
2-Fluorophenol (surr)	Hexachlorobutadiene	2,4-Dinitrotoluene
Hexachloroethane	Isophorone	2,6-Dinitrotoluene
Methyl methanesulfonate	2-Methylnaphthalene	Fluorene
2-Methylphenol	Naphthalene	2-Fluorobiphenyl (surr)
4-Methylphenol	Nitrobenzene	Hexachlorocyclopentadiene
N-Nitrosodimethylamine	Nitrobenzene-d5 (surr)	1-Naphthylamine
N-Nitroso-di-n-propyl amine	2-Nitrophenol	2-Naphthylamine
Phenol	N-Nitrosodi-n-butylamine	2-Nitroaniline
Phenol-d6 (surr)	N-Nitrosopiperidine	3-Nitroaniline
2-Picoline	1,2,4-Trichlorobenzene	4-Nitroaniline
1,4-Dioxane	1-Methylnaphthalene	4-Nitrophenol
Pyridine	O,O,O-triethylphosphorothioate	Pentachlorobenzene
		1,2,3,4-Tetrachlorobenzene
		1,2,3,5-Tetrachlorobenzene
Acetophenone	Hexachlorpropene	1,2,4,5-Tetrachlorobenzene
o-Toluidine	1,4-Phenylenediamine	2,3,4,6-Tetrachlorophenol
N-Nitrosomethylethylamine	Safrole	2,4,6-Tribromophenol (surr)
N-Nitrosodiethylamine	(2-Bromoethyl)benzene	2,4,6-Trichlorophenol
N-Nitrosopyrrolidine	Caprolactam	2,4,5-Trichlorophenol
N-Nitrosomorpholine	1, 3, 5 – Trichlorobenzene	1,1'-Biphenyl
N,N-dimethyl formamide	1, 2, 3 – Trichlorobenzene	Diphenyl ether
N,N-dimethyl acetamide	1, 2, 3, 4 – Tetrachlorobenzene	Isosafrole
Benzaldehyde	1 – Chloro-4-Nitrobenzene	1,4-Naphthoquinone
	2-chlorobenzaldehyde	1,4-Dinitrobenzene
		1,3-Dinitrobenzene
		Thionazin
		5-Nitro-o-toluidine
(surr) = surrogate		2-chlorobenzalmalononitrile

Table II (continued)

Phenanthrene-d_{10}	Pyrene-d_{10}	Perylene-d_{12}
4-Aminobiphenyl	Benzidine	Benzo(b)fluoranthene
Anthracene	Benzo(a)anthracene	Benzo(k)fluoranthene
4-Bromophenyl phenyl ether	Bis(2-ethylhexyl) phthalate	Benzo(g,h,i)perylene
Di-n-butyl phthalate	Butyl benzyl phthalate	Benzo(a)pyrene
4,6-Dinitro-2-methylphenol	Chrysene	Dibenz(a,j)acridine
Fluoranthene	3,3'-Dichlorobenzidine	Dibenz(a,h)anthracene
Hexachlorobenzene	p-Dimethylaminoazobenzene	Indeno(1,2,3-cd)pyrene
N-Nitrosodiphenylamine	Pyrene	Di-n-octylphthalate
Octachlorostyrene		
Pentachlorophenol	Terphenyl-d_{14} (surr)	3-Methylcholanthrene
Pentachloronitrobenzene	7,12-Dimethylbenz(a)anthracene	
Phenacetin	Chlorobenzilate	
Phenanthrene	2-Acetylaminofluorene	
Pronamide	3,3'-Dimethylbenzidine	
1-Nitronaphthalene	4,4'-Methylenebis(2-Chloroaniline)	
1,2-Diphenylhydrazine	3-Quinuclidinyl benzilate	
Carbazole		
Tetraethyldithiopyrophosphate		
1,3,5-Trinitrobenzene		
Diallate trans/cis		
Phorate		
Dimethoate		
Methyl parathion		
Parathion		
4-Nitroquinoline-1-oxide		
Methapyrilene		
Isodrin		
Atrazine		

(surr) = surrogate
Benzophenone

Table III
Characteristic Ions for Semivolatile Compounds

1.1.1 Compound	Primary Ion	Secondary Ions
2-Picoline	93	66,92
Aniline	93	66,65
Phenol	94	65,66
Bis(2-chloroethyl) ether	93	63,95
2-Chlorophenol	128	64,130
1,3-Dichlorobenzene	146	148, 113
1,4-Dichlorobenzene-d_4 (IS)	152	150,115
1,4-Dichlorobenzene	146	148, 113
Benzyl alcohol	108	79,77
1,2-Dichlorobenzene	146	148, 113
N-Nitrosomethylethylamine	88	42,43,56
Bis(2-chloroisopropyl) ether	45	77, 121, 79
Methyl methanesulfonate	80	79,65,95
N-Nitrosodi-n-propylamine	70	42,101,130
Hexachloroethane	117	201,199
Nitrobenzene	77	123,65
Isophorone	82	95,138
N-Nitrosodiethylamine	102	42,57,44,56
2-Nitrophenol	139	109,65
2,4-Dimethylphenol	107	122, 121
Bis(2-chloroethoxy)methane	93	95,123
Benzoic acid	105	122,77
2,4-Dichlorophenol	162	164,98
Ethyl methanesulfonate	109	79,97,45,65
1,2,4-Trichlorobenzene	180	182,145
Naphthalene-d_8 (IS)	136	68
Naphthalene	128	129,127
Hexachlorobutadiene	225	223,227
4-Chloro-3-methylphenol	107	144,142
2-Methylnaphthalene	142	141, 115
2-Methylphenol	108	107,77,79,90
Hexachloropropene	213	211, 215, 117, 141
Hexachlorocyclopentadiene	237	235,272
N-Nitrosopyrrolidine	100	41,42,68,69
Acetophenone	105	71,51,120
4-Methylphenol	108	107,77,79,90
2,4,6-Trichlorophenol	196	198,200

Table III (continued)

1.1.2 Compound	Primary Ion	Secondary Ions
o-Toluidine	106	107,77,51,79
3-Methylphenol (as 4-Methylphenol)	108	107,77,79,90
2-Chloronaphthalene	162	127,164
N-Nitrosopiperidine	114	42,55,56,41
1,4-Phenylenediamine	108	80,53,54,52
1-Chloronaphthalene	162	127,164
2-Nitroaniline	138	92, 65
Dimethyl phthalate	163	194,164
Acenaphthylene	152	151,153
2,6-Dinitrotoluene	165	63,89, 121
Phthalic anhydride	104	76,148
3-Nitroaniline	138	108,92
Acenaphthene-d_{10} (IS)	164	162,160
Acenaphthene	153	154, 152
2,4-Dinitrophenol	184	63, 154, 107
2,6-Dinitrophenol	162	164,126,98,63
4-Chloroaniline	127	129,65,92
Isosafrole	162	131,104,77,51
Dibenzofuran	168	139
2,4-Dinitrotoluene	165	63,89, 182
4-Nitrophenol	109	139,65
2-Naphthylamine	143	115,116
1,4-Naphthoquinone	158	104,102,76,130
Diethyl phthalate	149	177,150
Fluorene	166	165,167
N-Nitrosodi-n-butylamine	84	57,41,116,158
4-Chlorophenyl phenyl ether	204	206,141
4,6-Dinitro-2-methylphenol	198	51, 105, 182, 77
N-Nitrosodiphenylamine	169	168,167
Safrole	162	104,77,103,135
Diphenylamine	169	168,167
1,2,4,5-Tetrachlorobenzene	216	214,179,143,218
1-Naphthylamine	143	115,89,63
4-Bromophenyl phenyl ether	248	250,141
2,4,5-Trichlorophenol	196	198,97,132,200
Hexachlorobenzene	283	142,249
Pentachlorophenol	266	264,268
5-Nitro-o-toluidine	152	77,79,106,94
Thionazin	107	96,97,143,79

Table III (continued)

1.1.3 Compound	Primary Ion	Secondary Ions
4-Nitroaniline	138	65,108,92,80
Phenanthrene-d_{10} (IS)	188	94,80
Phenanthrene	178	179,176
Anthracene	178	176,179
1,4-Dinitrobenzene	168	75,50,76,92
1,3-Dinitrobenzene	168	76,50,75,92
Diallate (cis or trans)	86	234,43,70
Pentachlorobenzene	250	252,248,215,254
5-Nitro-o-anisidine	168	79,52,138,153,77
Pentachloronitrobenzene	237	142,214,249,295
4-Nitroquinoline-1-oxide	190	160, 116, 114
Di-n-butyl phthalate	149	150,104
2,3,4,6-Tetrachlorophenol	232	131,230,166,234
Fluoranthene	202	101, 203, 100
1,3,5-Trinitrobenzene	213	74,75,120,91
Benzidine	184	92,185
Pyrene	202	101,203
Phorate	75	121,97,93,260
Phenacetin	108	179,109,137,80
Dimethoate	87	93,125,143,229
4-Aminobiphenyl	169	168,170,115
Pronamide	173	175,145,109,147
Dinoseb	211	163,147,117,240
Disulfoton	88	97,89,142,186
Butyl benzyl phthalate	149	91,206
Methyl parathion	109	125,263,79,93
Dimethylaminoazobenzene	225	120,77,148,42
Benz(a)anthracene	228	229,226
Chrysene-d_{12} (IS)	240	120,236
3,3'-Dichlorobenzidine	252	254,126
Chrysene	228	226,229
Parathion	109	97,291, 186
Bis(2-ethylhexyl) phthalate	149	167,279
3,3'-Dimethylbenzidine	212	106,196,180
Methapyrilene	97	58, 72, 191, 261
Isodrin	193	66, 195, 263, 265,
Di-n-octyl phthalate	149	167,43, 150
2-Aminoanthraquinone	223	167, 195, 139
Aramite	185	191,319,334,197,321

Table III (continued)

1.1.4 Compound	Primary Ion	Secondary Ions
Benzo(b)fluoranthene	252	253,125
Benzo(k)fluoranthene	252	253,125
Chlorobenzilate	139	251, 253, 111, 141
Benzo(a)pyrene	252	253,125
Perylene-d_{12} (IS)	264	260,265
7,12-Dimethylbenz(a)anthracene	256	241,239,120
2-Acetylaminofluorene	181	180,223,152
4,4'-Methylenebis(2-chloroaniline)	231	266, 140, 195
3-Methylcholanthrene	268	252,253,126,134
Indeno(1,2,3-cd)pyrene	276	138,227
Dibenz(a,h)anthracene	278	139,279
Benzo(g,h,i)perylene	276	138,277
1,2-Diphenylhydrazine	77	105, 182, 51
Endosulfan I	195	33
2-Fluorobiphenyl (surr)	172	171
2-Fluorophenol (surr)	112	64, 92
Nitrobenzene-d_5 (surr)	82	128,54
N-Nitrosodimethylamine	74	42,44
Phenol-d_6 (surr)	99	42,71
Terphenyl-d_{14} (surr)	244	122,212
2,4,6-Tribromophenol (surr)	330	332,141
N,N-dimethyl formamide	73	44,42
N,N-dimethyl acetamide	87	72,44,42
(2-Bromoethyl)benzene	184	77,91,105,186
Atrazine	200	173,215
Benzaldehyde	77	105, 106
Caprolacatam	113	55,56
1,1-Biphenyl	154	153,152,76
Carbazole	167	166,139
1,3,5-Trichlorobenzene	180	182,145,109
1,2,3-Trichlorobenzene	180	182,145,109
1,2,3,4-Tetrachlorobenzene	216	214,218,179
1-Chloro-4-Nitrobenzene	157	111,75,99

IS = internal standard
surr = surrogate

Table III (continued)

1.1.5 Compound	Primary Ion	Secondary Ions
Acrylamide	71	55, 44
Octachlorostyrene	308	343, 380, 273
1,2,3,5-tetrachlorobenzene	216	214, 218, 179, 143
1,2,3,4-tetrachlorobenzene	216	214, 218, 179, 143
2-chlorobenzaldehyde	139	111, 140, 76
Benzophenone	105	182, 77, 51
3-Quinuclidinyl benzilate	183	126, 337, 110
2-chlorobenzalmalononitrile	153	188, 126

Table IV
Recommended Minimum Response Factor Criteria for Initial and Continuing Calibration Verification Using the Suggested Ions from Table III

Semivolatile Compounds	Minimum Response Factor (RF)
Benzaldehyde	0.010
Phenol	0.800
Bis(2-chloroethyl)ether	0.700
2-Chlorophenol	0.800
2-Methylphenol	0.700
2,2'-Oxybis-(1-chloropropane)	0.010
Acetophenone	0.010
4-Methylphenol	0.600
N-Nitroso-di-n-propylamine	0.500
Hexachloroethane	0.300
Nitrobenzene	0.200
Isophorone	0.400
2-Nitrophenol	0.100
2,4-Dimethylphenol	0.200
Bis(2-chloroethoxy)methane	0.300
2,4-Dichlorophenol	0.200
Naphthalene	0.700
4-Chloroaniline	0.010
Caprolactam	0.010
4-Chloro-3-methylphenol	0.200
2-Methylnaphthalene	0.400
Hexachlorocyclopentadiene	0.050

Table IV (continued)

Semivolatile Compounds	Minimum Response Factor (RF)
2,4,6-Trichlorophenol	0.200
2,4,5-Trichlorophenol	0.200
1,1'-Biphenyl	0.010
2-Chloronaphthalene	0.800
2-Nitroaniline	0.010
Dimethylphthalate	0.010
2,6-Drintrotoluene	0.200
Acenaphthylene	0.900
3-Nitroaniline	0.010
Acenaphthene	0.900
2,4-Dintirophenol	0.010
4-Nitrophenol	0.010
Dibenzofuran	0.800
2,4Dinitrotoluene	0.200
Diethylphthalate	0.010
1,2,4,5-Tetrachlorobenzene	0.010
4-Chlorophenyl-phenylether	0.400
Fluorene	0.900
4-Nitroaniline	0.010
4,6-Dinitro-2-methylphenol	0.010
4-Bromophenyl-phenylether	0.100
N-Nitrosodiphenylamine	0.010
Hexachlorobenzene	0.100

Table IV (continued)

Semivolatile Compounds	Minimum Response Factor (RF)
Atrazine	0.010
Pentachlorophenol	0.050
Phenanthrene	0.700
Anthracene	0.700
Carbazole	0.010
Di-n-butylphthalate	0.010
Fluoranthene	0.600
Pyrene	0.600
Butylbenzylphthalate	0.010
3,3'-Bichlorobenzidine	0.010
Benzo(a)anthracene	0.800
Chrysene	0.700
Bis(2-ethylhexyl)phthalate	0.010
Di-n-octlyphthalate	0.010
Benzo(b)fluoranthene	0.700
Benzo(k)fluoranthene	0.700
Benzo(a)pyrene	0.700
Indeno(1,2,3-cd)pyrene	0.500
Dibenz(a,h)anthracene	0.400
Benzo(g,h,i)perylene	0.500
2,3,4,6-Tetrachlorophenol	0.010

Eurofins Document Reference	1-P-QM-WI -9012741	**Revision**	8
Effective Date	Nov 9, 2015	**Status**	Effective
Historical/Local Document Number	Analysis 0542		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Sue Hibner
Reviewed and Approved by	Erik Frederiksen;Review;Monday, October 26, 2015 3:14:01 PM EDT Kathryn Brungard;Approval;Monday, October 26, 2015 4:29:57 PM EDT

Revision Log:

Revision: 8		**Effective Date:**	This version
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Throughout Document	Reflects re-identification of documents in EtQ		Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Document Title	Enhancement		Add method: Ignitability of Solids by 40 CFR, Part 261.21
Sample Collection, Preservation and Sampling	Reflects current industry standards		Replaced 4° ± 2°C with 0° to 6°C, not frozen.

Revision: 07		**Effective Date:**	May 13, 2011
Section	**Justification**		**Changes**
Revision Log	Formatting requirements per LOM-SOP-LAB-201		Removed revision logs up to the previous version.
Safety Precautions and Waste Handling	Formatting requirements per LOM-SOP-LAB-201		Added required text
Personnel Training and Qualifications	Formatting requirements per LOM-SOP-LAB-201		Added required text
Sample Collection, Preservation and Handling	Clarification		Expanded container and storage condition information
Calibration	Formatting requirements per LOM-SOP-LAB-201		Added required section

Reference:

1. *40 CFR, Part 261.21*.

2. *Chemical Hygiene Plan,* current version.

Cross Reference:

Document	Document Title
Analysis #0430	Determination of Flash Point for Liquids and Solids
1-P-QM-QMA-9015389	Balance, Syringe, Pipette Verification
1-P-QM-QMA-9021767	Laboratory Notebooks, Logbooks, and Documentation for Environmental Testing

Scope:

This method is applicable to testing solid samples for ignitability. Analyze liquid samples using Analysis #0430.

The overall test allows clients to classify their solid waste for the RCRA characteristic of ignitability using the definitions listed in the *Code of Federal Regulations* (40 CFR 261.21).

Basic Principles:

The CFR defines a solid waste as ignitable if “it is not a liquid and is capable, under conditions of standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.”

Since no official method exists for checking ignitability of solids, this in-house method was developed after consultation with the US EPA and Texas Water Commission.

Interferences:

Not applicable to this procedure.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC) which is maintained in the analyst's training records.

Analysts are considered proficient when they have successfully demonstrated competency under supervision of a group leader or other trained analyst.

Sample Collection, Preservation, and Handling:

Samples for the analysis must be unpreserved, collected in glass containers and refrigerated at 0° to 6°C, not frozen, up to the time of analysis. Analyze at room temperature within 28 days of collection.

Apparatus and Equipment:

1. Crucible, aluminum pan, or equivalent
2. 400 grit size sandpaper, or equivalent
3. Pensky-Martens closed cup tester
4. Glass stirring rod, or equivalent
5. Pan balance or equivalent. Refer to 1-P-QM-QMA-9015389.

6. Bunsen burner (needed for samples that yield a positive flash during the closed-cup portion of the analysis)

Reagents and Standards:

Not applicable to this procedure.

Calibration:

Balances must be calibrated each day before use. Refer to 1-P-QM-QMA-9015389.

Procedure:

Record data in a raw data logbook following instructions in 1-P-QM-QMA-9021767.

1. Weigh approximately 5 g of sample. Leave the sample in contact with air for 10 minutes. If the sample shows any signs of spontaneous combustion upon exposure to air, it is considered spontaneously ignitable.

2. Add approximately 5 mL of reagent water dropwise, to approximately 5 g of sample. Observe the sample at all times for signs of combustion. If the sample shows any signs of combustion upon contact with water, it is considered ignitable.

3. Using a glass-stirring rod, rub approximately 1 g of sample against extremely fine sandpaper (400 grit size). Perform this test under a hood. Maintain a safe working distance from the sample. If the sample shows any signs of combustion during the test, it is considered ignitable by friction.

4. Fill the cup of a closed-cup flash point tester half full with sample. Allow the sample to sit in the closed cup for 5 minutes at room temperature, then test the sample for ignitable fumes following Analysis #0430, **except do not stir and do not heat the sample.** If the fumes ignite, it is considered ignitable by a closed-flame source. If the fumes do ignite, proceed to Step 5.

5. If the fumes do ignite in Step 4, hold an approximately 5 g portion of the sample over a Bunsen burner to confirm the sample itself is ignitable. Remove sample from the flame and carefully document all reactions in the raw data logbook.

   NOTE: After all portions of the analysis are complete, edit Comment #252 appropriately in LIMS.

Calculations:

No calculations are needed for this analysis.

Statistical Information/Method Performance:

Not applicable to this procedure.

Quality Assurance/Quality Control:

No quality assurance procedures are available for this analysis.

Eurofins Document Reference	1-P-QM-WI -9011685	**Revision**	10
Effective Date	Aug 8, 2014	**Status**	Effective
Historical/Local Document Number	Analysis 0394, 0496		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Michele Graham
Reviewed and Approved by	Erik Frederiksen;Review;Friday, July 25, 2014 1:46:48 PM EDT Dorothy Love;Approval;Friday, July 25, 2014 3:02:29 PM EDT

Revision Log:

Revision: 10	**Effective Date:**	This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Procedure 7. **NOTE**	New Requirement	Added NOTE dealing with pH results reporting with qualifying flag if outside calibration standards

Revision: 9	**Effective Date:**	Dec 25, 2013
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout Document	Reflect re-identification of documents in EtQ	Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Cross Reference	No longer used	Replaced LOM-SOP-LAB-208 with 1-P-QM-QMA-9015389
Sample Collection, Preservation, and Handling	Reflect current practice	Updated temp to 0° to 6°C not frozen
Reagents and Standards 1.	New requirement	Replaced buffer 6.86 with buffer 7.00 ISO 17025 approved vendor
Quality Assurance/Quality Control	New requirement	Replaced LCS/CCV buffer 6.86 with buffer 7.00

Reference:

1. Test Methods for Evaluating Solid Wastes, SW-846 Method 9045C Modified, January 1995.

2. Test Methods for Evaluating Solid Wastes, SW-846 Method 9045D Modified, November 2004.

3. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, p. 150.1.

4. Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998, pp. 4-87 to 4-91.

5. Test Methods for Evaluating Solid Wastes, SW-846 Chapter 7.

6. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
1-P-QM-PRO-9015421	pH Probes and Meters
1-P-QM-PRO-9015535	Quality Control Data for Wet Chemistry
1-P-QM-QMA-9015389	Balance, Syringe, Pipette Verification
1-P-QM-QMA-9017328	Reagents and Standards

Scope:

This SOP provides the guidelines for analysts performing pH on solid, soil, and solvent samples. This procedure is applicable to solid/soil/solvent samples.

The sensitivity limit for this technique is 0.01 pH units.

Basic Principles:

The electrometric pH is a measure of the activity of hydrogen ions in a sample using a combination pH electrode.

Reference Modifications:

Method 9045C/D has been modified for the analysis of solid, soil, and solvent samples in the following ways. An Automatic Temperature Compensator is used for all samples instead of manually performing calculations to correct measured pH values if the sample and buffer solution temperatures differ by more than 2°C. The method is modified by using 25 g of soil to 25 g reagent water instead of the 20 g: 20 mL ratio. Also, the samples are tumbled for approximately 30 minutes instead of stirred with a stir bar for 5 minutes. These modifications are performed in order to allow for adequate agitation and to provide sufficient supernatant to immerse the pH electrode during analysis.

Reference Modifications specific to tobacco samples:

Method 9045C has been modified for the analysis of tobacco samples in the following ways. An Automatic Temperature Compensator is used for all samples. The method is modified by using 2 g of tobacco to 25 mL reagent water and the samples are tumbled for approximately 30 minutes. These modifications are performed in order to allow for adequate agitation and to provide sufficient supernatant to immerse the pH electrode during analysis.

Interferences:

Interferences occur when oily or particulate matter adheres to the electrodes and reduces the response. Gentle wiping or rinsing with reagent water usually corrects this problem. Temperature effects are compensated for by calibrating the pH meter at the temperature of the sample or using a pH meter equipped with temperature compensators. There are no means of controlling temperature effects caused by shifts in ionic equilibria of the sample.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention. Standard safe laboratory procedure must be followed as outlined in the Chemical Hygiene Plan.

Personnel Training and Qualifications:

All analysts performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and a documented Demonstration of Capability.

A Demonstration of Capability usually consists four laboratory control samples that are carried through all steps of the analysis and meet the acceptance criteria for the LCS. Documentation for these studies is in each individual's training records.

Sample Collection, Preservation, and Handling:

Sample must be collected in an unpreserved container and stored at 0° to 6°C; not frozen, until the time of analysis. There is no published holding time for pH analysis on soil; analysis is performed as soon as possible after sample is received in the laboratory.

Apparatus and Equipment:

1. Analytical balance capable of weighing 0.0001 g

2. pH meter equipped with an ATC probe (Automatic Temperature Compensator)

3. Combination electrode or equivalent

4. Stir bar and stir plate

Reagents and Standards:

Alternative weights and volumes are acceptable provided final concentrations remain the same. Refer to 1-P-QM-QMA-9017328 for appropriate labeling and documentation of reagents and standards preparation.

1. 7.00 pH Buffer (**ISO 17025 approved vendor**) – purchased; see container for shelf life information.

2. Appropriate pH electrode filling solution for electrode, purchased. Store at room temperature. See label for expiration date.

Calibration:

Balances must be calibrated each day before use. Refer to 1-P-QM-QMA-9015389.

Calibrate pH meter as described in 1-P-QM-PRO-9015421.

Procedure:

1. Calibrate the pH meter as described in 1-P-QM-PRO-9015421.

2. If sample is tobacco refer to step #11. If sample is not tobacco then proceed with step 2. Weigh 25 ± 0.5 g of sample into a clean specimen cup and add 25 ± 0.5 mL of reagent water (makes a 1:1 slurry). If the sample absorbs the water, add an additional 25 ± 0.5 mL of reagent water (makes a 1:2 slurry). If a 1:2 slurry does not provide sufficient supernatant to immerse the pH electrode, use less sample and add reagent water in proportion to the weight selected. Enter a comment in the databook indicating the dilution.

3. Tightly place the screw-cap lid on the sample and mix the slurry in the tumbler for approximately 30 minutes.

4. Remove the sample from the tumbler and allow the sample to settle for about 1 hour.

5. Rinse and shake off any water on the electrodes.

6. Dip the electrodes into the supernatant (aqueous layer) of the sample and allow to equilibrate. If necessary, decant or pipette this layer into another container.

7. Using the calibrated pH meter note the pH value of the sample after the meter equilibrates, and enter the value in the corresponding laboratory data notebook.

   NOTE: If pH reading is < 4.00 or >10.00, then the pH result will be reported with a qualifying flag.

8. Note the temperature of the sample and record the value in the corresponding laboratory data notebook.

9. Rinse and clean the electrodes before proceeding to the next sample.

10. This method is also used to determine corrosivity (analysis 0496). To do this, the pH value and the corresponding corrosivity determination are entered as a "see below" Comment. (A sample is typically considered corrosive if the pH is <2 or >12). When determining corrosivity, three repeat pH measurements must be performed on each sample to verify that the pH does not differ by more than 0.1 pH unit. Record each measurement in the laboratory data notebook.

11. This step is to be followed when sample is tobacco. Weigh 2 ± 0.5 g of tobacco into a clean specimen cup and add 25 ± 0.5 mL of reagent water (makes a 1:13 slurry). If the sample absorbs the water, add an additional 25 ± 0.5 mL of reagent water. If this slurry does not provide sufficient supernatant to immerse the pH electrode, use less sample and add reagent water in proportion to the weight selected. Enter a comment in the databook indicating the dilution. Proceed to Procedure 3.

Calculations:

Not applicable.

Statistical Information/Method Performance:

For statistical information, refer to Test Methods for Evaluating Solid Wastes, SW-846 Method 9045C Modified, September 1994.

Quality Assurance/Quality Control:

A Laboratory Control Sample (LCS; 7.00 pH Solution) must be analyzed at the beginning of each batch. A CCV (7.00 pH Solution) must be analyzed after every ten samples and at the end of the day's run. If the meter is resloped, a LCS must be analyzed after calibration is performed. One batch consists of no more than 20 samples.

Two matrix duplicates must be analyzed per batch of 20 samples. If 10 or less samples are on a batch than only one matrix duplicate is needed. When analyzing for Corrosivity, a pH check using buffers 2 and 12 must be run before analyzing the sample. See Analysis Summary in the LIMS for current quality control acceptance windows. Refer to 1-P-QM-PRO-9015535 if any of the QC samples do not meet required specifications.

Eurofins Document Reference	1-P-QM-WI -9015159	**Revision**	12
Effective Date	Jan 19, 2015	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 5705, 10636		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Debra Bryan
Reviewed and Approved by	Robert Strocko;Review;Monday, January 19, 2015 10:01:16 AM EST Barbara Reedy;Approval;Monday, January 19, 2015 10:20:19 AM EST

Revision Log:

Revision: 12		Effective Date:	This version
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Reference Modifications	To be consistent with EPA procedure 3010A		Removed 3 and 4
Procedure A and B	Clarification		Reworded numbers 2, 5 and 6 to clarify steps found in the EPA procedure for 3010A

Revision: 11		Effective Date:	Nov 27, 2013
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Throughout Document	Reflect re-identification of documents in EtQ		Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Sample Collection, Preservation, and Handling	Process change		Changed sample storage temperature from 4° ± 2° C to 0° to 6°C but not frozen.
Procedure A	Reflect current procedure		Added text to NOTE pertaining to the blank and LCS must also be filtered if any samples are filtered due to insoluble matter present in the digested sample. Added text to NOTE pertaining to the blank and spiked LCS must also be prepared with filtered reagent water, if any samples are filtered due to soluble metals analysis Delete text in NOTE pertaining to using a smaller sample aliquot if insufficient sample is submitted. Deleted text to NOTE pertaining to samples concentration. Added NOTE pertaining to using reduced volumes is acceptable as long as the sample reagent rations are maintained.
Procedure A.1	Clarification		Added text pertaining to adding spike solution, after the sample has been poured.
Procedure B	Reflect current procedure		Added text to NOTE pertaining to the blank and LCS must also be filtered if any samples are filtered due to insoluble matter present in the digested sample. Added text to NOTE pertaining to the blank and spiked LCS must also be prepared with filtered reagent water, if any samples are filtered due to soluble metals analysis. Deleted text in NOTE pertaining to using a smaller sample aliquot if insufficient sample is submitted. Deleted text to NOTE pertaining to samples concentration. Added NOTE pertaining to using reduced volumes in acceptable as long as the sample reagent rations are maintained.
Procedure B.1	Clarification		Added text pertaining to adding spike solution, after the sample has been poured.
Block Digestor Instructions	Reflect current procedure		Clarified instruction steps. Deleted text pertaining to the difference between sample temperature and display temperature.
Quality Assurance/Quality Control	Reflect current procedure		Added reference to Analysis #6966, 1643, 6935,… for batch quality control requirements.

Reference:

1. Test Methods for Evaluating Solid Wastes, SW-846 Method 3010A, July 1992

2. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …	Metals by Inductively Coupled Plasma Atomic Emissions Spectroscopy for SW-846 Methods 6010B/C (aqueous, solid, tissue) and EPA 200.7(aqueous)
1-P-QM-FOR-9009182	Working Instructions for Prep Solutions and Standards
1-P-QM-QMA-9015390	Demonstrations of Capability

Purpose:

This digestion procedure is used to prepare wastewater and leachate samples for measurement of total metals by inductively coupled plasma atomic emission spectrometry (ICP-AES) following SW-846 protocol.

Scope:

This digestion procedure is used by the Metals department of the Environmental Sciences division.

Basic Principles:

A mixture of nitric acid and the sample is refluxed in a covered beaker or a covered polypropylene container (digestion vessel) at low volume. Then it is refluxed with hydrochloric acid and brought up to volume with reagent water.

Reference Modifications:

1. A 50-mL final volume is used instead of 100-mL to improve digestion throughout, conserve sample usage, and limit waste generation. Because all reagents are also adjusted so that concentrations are equivalent to a 100-mL aliquot, there is no impact on the data.

2. Ribbed watch glasses are not used; samples are evaporated without watch glasses in nonmetallic hoods to speed evaporation. No contamination trends have been observed in prep blanks evaporated without using watch glasses.

Definitions:

1. ACS – American Chemical Society

2. ASTM – American Society of Testing and Materials

3. D – Sample Duplicate

4. DOC – Demonstration of Capability

5. IDOC – Initial Demonstration of Capability

6. LCS/LCSD – Laboratory Control Sample/ Laboratory Control Sample Duplicate

7. LCSW – Laboratory Control Sample Water

8. LLENS – the computer program that integrates a PC with an analytical balance to collect data directly from the balance. The program organizes the data and transmits the readings to the LIMS.

9. LIMS – Laboratory Information Management Systems

10. LLI Sample ID – unique 7-digit number assigned to a client sample.

11. LOQ – Limit of Quantitation

12. MDL – Method Detection Limit

13. MS (R) – Matrix Spike

14. MSD (M) – Matrix spike duplicate

15. PB/PBW–Preparation Blank/ Preparation Blank Water

16. QC – Quality Control

17. Method Blank – equivalent to a Preparation Blank. A designated sample designed to monitor for sample contamination during the analysis process. A volume of reagent laboratory water is typically used to monitor water sample analysis, while solids blanks consist of a purified solid matrix or just the reagents used in the test. The blank demonstrates that no artifacts were introduced during the analysis process.

18. SOP – Standard Operating Procedure

19. SPLP – Synthetic Precipitation Leaching Procedure

20. STLC – Soluble Threshold Limit Concentration

21. TCLP – Toxicity Characteristic Leaching Procedure

22. U or US – unspiked background sample

Interferences:

Not applicable to this procedure

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

Preparing samples for inorganic analysis involves working with concentrated acids and other chemicals which are dangerous if not handled carefully:

Nitric acid (HNO_3) – This acid can cause skin burns. Add nitric acid to samples in a hood or use the designated dispensing equipment to avoid exposure to toxic fumes.

Hydrochloric acid (HCl) – This acid can cause skin burns. Never mix HCI with concentrated H_2SO_4 to avoid a violent reaction. Always use in a fume hood or use the designated dispensing equipment.

When diluting strong acids, never add water to acid; always add acid to water.

Store concentrated acids in the prep room acid lockers. Only acids are to be stored in these lockers. (Store solvents in the flammable liquid storage cabinet.) Some concentrated acids are kept in the acid reagent bottles on prep room counters. Fill reagent bottles in an operating fume hood using caution to avoid spills.

Perform acid digestions in hoods that are turned on and have active alarms. Notify a supervisor immediately if the hood is malfunctioning or the alarm sounds.

Samples that contain dust may be hazardous. Open in a fume hood.

When a hazardous flag is added indicating possible cyanide, special precautions are required to avoid exposure to hydrogen cyanide gas. Contact your supervisor prior to adding acid. Always open these samples and add the acid in a hood.

Use spill pillows to absorb large acid spills (small spills are cleaned with wet paper towels.) Use SPILL-X-A powder or equivalent to neutralize any remaining acid and then rinse the area thoroughly with water. Spill pillows and SPILL-X-A are stored on the prep room shelf.

Dispose of acid waste properly. Collect all acid digestions, waste solutions, and expired reagent solutions in waste containers. When the acid waste containers are full, a designated acid waste handler transfers the waste to the acid neutralization tank.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and a documented Demonstration of Capability for this or an equivalent procedure.

Initially, each employee performing this digestion procedure must work with an experienced employee for a period of time until they can independently set up batches and perform the necessary steps outlined in this procedure. Proficiency is measured through documentation of the critical steps in this procedure, over checking of data as well as an IDOC.

The IDOC and the DOC consists of four laboratory control samples that are carried through all steps of the analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Refer to 1-P-QM-QMA-9015390, for specific requirements. A DOC is performed annually and is maintained in the analyst's training records.

Sample Collection, Preservation, and Handling:

Samples are collected in plastic containers and preserved to a pH of < 2 with HNO3 (samples submitted for soluble metals that are to be lab filtered must be unpreserved. The sample is run through a 0.45 micron filter within 5 days of receipt and then preserved.) The pH is checked upon receipt and adjusted as necessary by Sample Support; samples that are pH adjusted at the lab must not be digested for a minimum of

24 hours. If samples fail to maintain a pH of < 2 the Client Service Representative is notified for further direction. Samples are stored at 0° to 6°C, but not frozen, prior to digestion. Sample must be digested within 6 months of collection. Digested samples are stored in plastic at room temperature and have a 6 month holding time.

Apparatus and Equipment:

1. Polypropylene containers (digestion vessels) – certified clean and Class A equivalent

2. Watch glasses or reflux caps

3. 50-mL graduated cylinders or other appropriate graduated cylinders if necessary

4. 50–mL volumetric flasks or other appropriate Class A volumetric flasks if necessary

5. 250-mL beakers, or other appropriate beakers

6. Hotblocks or hot plates, adjustable and capable of maintaining a temperature of 90° to 95°C

Reagents and Standards:

For reagent preparation, shelf life, and storage conditions, see Form 1-P-QM-FOR-9009182.

1. Nitric Acid, HNO_3 - Fisher, Trace Metal Grade, or equivalent. Store at room temperature and re-evaluate annually.

2. Hydrochloric acid - Fisher, Trace Metal Grade, or equivalent. Store at room temperature and re-evaluate annually.

3. Hydrochloric Acid (1:1) – Add 500 mL of HCl to 500 mL of reagent water. Store at room temperature. Expires in 6 months.

NOTE: It is acceptable to prepare solutions using multiples of indicated volumes if exact ratios are maintained.

Calibration:

Not applicable to this procedure

Procedure:

This SOP has been set up to outline the procedures for both hot plate and hotblock digestions (see below). Choose the procedure that corresponds to the sample heating technique being used for sample digestion.

A. Hotblocks

NOTE: When insoluble matter is present in the digested sample, allow it to settle by gravity or filter prior to introduction to the instrument. If any samples are filtered, the prep blank and LCS must also be filtered.

NOTE: For soluble metals analysis, filter unpreserved sample through 0.45–micron filter paper. Adjust the filtered sample to pH <2 with nitric acid preserving solution. Measure the volume of sample, as stated in this procedure, and digest as normal. The prep blank and spiked LCS must also be prepared with filtered reagent water.

NOTE: If the sample contains high solids, use a smaller aliquot of the sample and bring sample to final volume as stated in this procedure. Make appropriate acid, reagent, and spike volume adjustments based on sample final volume.

NOTE: It is acceptable to reduce the volume of sample being analyzed as long as the sample reagent ratios are maintained.

1. Shake sample well. Transfer 50 mL of well-mixed sample to a 68-mL digestion vessel. After the sample has been poured, add the spiking solution. For sample batch spiking procedures see Form 1-P-QM-FOR-9009182. For sample batch quality control requirements see Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …

   NOTE: For leachate samples, use the appropriate extraction fluid for the PBW and LCS. The extraction fluid are as follows: TCLP, SPLP, STLC, ASTM, Filtration, and Elutriate.

2. Add 1.5 mL of concentrated HNO_3. Place the digestion vessel in a hotblock at 90° to 95°C, and cautiously evaporate to low volume (about 5 mL), making certain that the sample does not boil and that no portion of the bottom of the digestion vessel is allowed to go dry.

3. Allow the digestion vessel to cool then add another 1.5-mL portion of concentrated HNO_3.

4. Cover the digestion vessel with a reflux cap and return to the hotblock. Increase the temperature of the hotblock so that a gentle reflux action occurs.

   NOTE: If a sample is allowed to go to dryness, low recoveries result. If this occurs, discard the sample and re-prepare in a new batch.

5. Continue heating (refluxing), adding additional acid as necessary, until the digestion is complete (generally indicated when the digestate is light in color or does not change in appearance with continued refluxing).

6. When digestion is complete, uncover the digestion vessel and evaporate to low volume (about 3 mL). Do not allow any portion of the bottom of the digestion vessel to go dry. Allow the digestion vessel to cool.

7. Add 5 mL (1:1) HCl, cover the digestion vessel, and reflux for an additional 15 minutes to dissolve any precipitate or residue from evaporation. Allow the digestion vessel to cool.

8. Adjust sample volume to 50 mL mark on the certified digestion vessel with reagent water, cap and mix.

9. The sample is now ready for analysis.

B. Hotplates

NOTE: If boron (B) is requested on a sample, use Teflon vessels.

NOTE: When insoluble matter is present in the digested sample, allow it to settle by gravity or filter prior to introduction to the instrument. If any samples are filtered, the prep blank and LCS must also be filtered.

NOTE: For soluble metals analysis, filter unpreserved sample through 0.45–micron filter paper. Adjust the filtered sample to pH <2 with nitric acid preserving solution. Measure the volume of sample, as stated in this procedure, and digest as normal. The prep blank and spiked LCS must also be prepared with filtered reagent water.

NOTE: If the sample contains high solids, use a smaller aliquot of the sample and bring sample to final volume as stated in this procedure. Make appropriate acid, reagent, and spike volume adjustments based on sample final volume.

NOTE: It is acceptable to reduce the volume of sample being analyzed as long as the sample reagent ratios are maintained.

1. Shake sample well. Use a 50-mL graduated cylinder to transfer 50 mL of well-mixed sample to a 250-mL beaker. After the sample has been poured, add the spiking solution. For sample batch spiking procedures see form 7164. For sample batch quality control requirements see Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …

   NOTE: For leachate samples, use the appropriate extraction fluid for the PBW and LCS. The extraction fluids are as follows: TCLP, SPLP, STLC, ASTM, Filtration, and Elutriate.

2. Add 1.5 mL of concentrated HNO_3. Place the beaker on a hot plate and cautiously evaporate to low volume (about 5 mL), making certain that the sample does not boil and that no portion of the bottom of the beaker is allowed to go dry.

3. Allow the beaker to cool then add another 1.5-mL portion of concentrated HNO_3.

4. Cover the beaker with a watch glass and return to the hot plate. Increase the temperature of the hot plate so that a gentle reflux action occurs.

   NOTE: If a sample is allowed to go to dryness, low recoveries result. If this occurs, discard the sample and re-prepare in a new batch.

5. Continue heating (refluxing), adding additional acid as necessary, until the digestion is complete (generally indicated when the digestate is light in color or does not change in appearance with continued refluxing).

6. When digestion is complete, uncover the beaker and evaporate to low volume (about 3 mL). Do not allow any portion of the bottom of the beaker to go dry. Allow the beaker to cool.

7. Add 5 mL (1:1) HCl, cover the beaker, and reflux for an additional 15 minutes to dissolve any precipitate or residue from evaporation. Allow the beaker to cool.

8. Transfer the solution to a 50–mL volumetric flask. Adjust sample volume to the 50 mL mark with reagent water and mix.

9. Pour the mixed sample into a polypropylene container and cap.

10. The sample is now ready for analysis.

Block Digestor Instructions:

1. Turn block digestor on by pressing rocker switch located on the cord.

2. Wait about 8 seconds until controller display indicates current block temperature.

3. PRESS and hold STAR (*) key.

4. The display shows the Set Point Temperature.

5. The digits can be changed to the desired value by pressing the up and down arrow keys while holding the (*) key.

6. Confirm Control Point temperature is set to the block temperature that provides 90° to 95°C.

   NOTE: See HotBlock Control Point Temperature Logbook to obtain control point temperature setting for the HotBlock being used for digestion. If necessary, adjust Control Point temperature to the proper setting.

   NOTE: Polypropylene containers must not be heated above 130°C.

Calculations:

Not applicable to this procedure.

Statistical Information/Method Performance:

Not applicable to this procedure.

Quality Assurance/Quality Control:

Perform a method blank, sample duplicate, sample matrix spike, sample matrix spike duplicate, and laboratory control sample with every digestion batch (20 samples or less). Each piece of batch QC is digested following the procedure in this SOP.

For sample batch quality control requirements see Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …

Eurofins Document Reference	1-P-QM-WI -9015133	**Revision**	16
Effective Date	Dec 3, 2014	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 1848, 10635		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Debra Bryan
Reviewed and Approved by	Robert Strocko;Review;Wednesday, November 19, 2014 1:11:31 PM EST Barbara Reedy;Approval;Wednesday, November 19, 2014 1:15:26 PM EST

Revision Log:

Revision: 16		**Effective Date:** This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Historical/Local Document Number	No longer part of current procedure	Removed 5720
Reference	No longer part of current procedure	Removed CLP ILM02.1, ILM04.0, ILM05.2
Scope	No longer part of current procedure	Removed reference to CLP
Apparatus and Equipment	Reflect current procedure	Included DEENA to item 6.
Procedure A	No longer part of current procedure	Removed Analysis 5720 (CLP) entire section
Procedure B	Clarification No longer part of current procedure	NOTE: Reworded text pertaining to the preparation of the PB and LCS for soluble metals analysis Removed Analysis 5720 (CLP)
Procedure C	Reflect current procedure	Included analysis 10635 (SW-846)
Procedure C.2	Reflect current procedure	Added DEENA temperature 90° to 95°C
Procedure C.5	Updated to current procedure	Replaced DI water with reagent water.
Quality Assurance/Quality Control	No longer part of current procedure	Removed reference to CLP digestion 5720 batch.

Revision: 15		**Effective Date:** Nov 27, 2013
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout Document	Reflect re-identification of documents in EtQ	Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Sample Collection, Preservation, and Handling	Process change	Changed sample storage temperature from 4° ± 2°C to 0° to 6° C but not frozen, prior to digestion.
Procedure A	Reflect current procedure	Added text, to NOTE, pertaining to the blank and LCS must also be filtered if any samples are filtered due to insoluble matter present in the digested sample. Added NOTE, pertaining to using a smaller aliquot of the sample and bring sample to final volume, if contains high solids Added NOTE, pertaining to filtering unpreserved sample and preparing the blank and spiked LCS using filtered reagent water, for soluble metals analysis
Procedure A.1.a	Clarification	Added text pertaining to adding spike solution, after the sample has been poured.
Procedure A.2.a	Clarification	Added text pertaining to adding spike solution, after the sample has been poured.
Procedure A.2.a	Reflect current procedure	Added reference to Analysis 6966, 1643…… Deleted reference to SOP SOP-IO-014
Procedure A.2	Reflect current procedure	Added 2nd NOTE pertaining to Lab filtering.

Revision: 15		**Effective Date:**	Nov 27, 2013
Procedure B	Reflect current procedure		Added text, to NOTE, pertaining to the blank and LCS must also be filtered if any samples are filtered due to insoluble matter present in the digested sample. Added NOTE, pertaining to filtering unpreserved sample and preparing the blank and spiked LCS using filtered reagent water, for soluble metals analysis Added NOTE, pertaining to using a smaller aliquot of the sample and bring sample to final volume, if contains high solids.
Procedure B.1.a	Clarification		Added text pertaining to adding spike solution, after the sample has been poured.
Procedure B.2	Reflect current procedure		Added NOTE pertaining to Lab filtering.
Procedure B.2.a	Clarification		Added text pertaining to adding spike solution, after the sample has been poured.
Procedure C	New equipment in use		Added entire section pertaining to DEENA Auto-digester.
Procedure C	Reflect current procedure		Added NOTE, pertaining to using a smaller aliquot of the sample and bring sample to final volume, if contains high solids. Added NOTE, pertaining to filtering sample, prep blank, and LCS if insoluble matter is present in the digested sample, or allow to settle by gravity. Added NOTE, pertaining to filtering unpreserved sample and preparing the blank and spiked LCS using filtered reagent water, for soluble metals analysis
Block Digester Instruction	Reflect current procedure		Clarified instruction steps. Deleted text pertaining to the difference between sample temperature and display temperature.
Quality Assurance/Quality Control	Reflect current procedure		Added reference to SOP 6966, 1643…for batch quality control requirements.

Reference:

1. *Test Methods for Evaluating Solid Waste*, SW-846 Method 3005A, July 1992

2. *Chemical Hygiene Plan*, current version

Cross Reference:

Document	Document Title
Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …	Metals by Inductively Coupled Plasma Atomic Emissions Spectroscopy for SW-846 Methods 6010A/B/C (aqueous, solid, tissue), CLP 2.1(water/solid/tissue), CLP 4.0(water/solid/tissue), CLP 5.2 (water/solid/tissue) and EPA 200.7(aqueous)
1-P-QM-FOR-9009182	Working Instructions for Prep Solutions and Standards
1-P-QM-QMA-9015390	Demonstrations of Capability

Scope:

This acid digestion procedure is used by the Metals Department of the Environmental Sciences Division at Lancaster Laboratories to prepare wastewater, surface water, and groundwater samples for measurement of total recoverable metals by inductively coupled plasma optical emission spectroscopy (ICP-OES) following SW-846 protocol.

This method is used whenever SW-846 Method 3010 is not requested or required for total metals.

Basic Principles:

Samples are heated with nitric and hydrochloric acids with a substantial reduction in volume during digestion to dissolve metals.

Reference Modifications:

1. A 50-mL sample aliquot and final volume is used instead of 100 mL to improve digestion throughput, conserve sample usage, and limit waste generation. Because all reagents are also adjusted so that concentrations are equivalent to a 100-mL aliquot, there is no impact on the data.

2. Ribbed watch glasses or reflux caps are not used during evaporation; samples are heated without watch glasses in non-metallic hoods to speed evaporation. No contamination trends have been observed in prep blanks evaporated without using watch glasses.

3. Samples are heated at 90^{o} to 95°C on hotplates or Hotblocks, not 92° to 95°C as stated in ILMO4.0; hotplates cannot be maintained within 3°C range.

Definitions:

1. ACS – American Chemical Society

2. D – Sample Duplicate

3. DOC – Demonstration of Capability

4. IDOC – Initial Demonstration of Capability

5. LCS/LCSD – Laboratory Control Sample/ Laboratory Control Sample Duplicate

6. LCSW– Laboratory Control Sample Water

7. LLENS - the computer program that integrates a PC with an analytical balance to collect data directly from the balance. The program organizes the data and transmits the readings to the LIMS.

8. LIMS – Laboratory Information Management Systems

9. LLI Sample ID – unique 7-digit number assigned to a client sample.

10. LOQ – Limit of Quantitation

11. MDL – Method Detection Limit

12. MS (R) – Matrix Spike

13. MSD (M) – Matrix spike duplicate

14. PB/PBW–Preparation Blank/ Preparation Blank Water

15. QC – Quality Control

16. Method Blank - equivalent to a Preparation Blank. A designated sample designed to monitor for sample contamination during the analysis process. A volume of reagent laboratory water is typically used to monitor water sample analysis, while solids blanks consist of a purified solid matrix or just the reagents used in the test. The blank demonstrates that no artifacts were introduced during the analysis process.

17. SOP- Standard Operating Procedure

18. U or US – unspiked background sample

Interferences:

Not applicable to this procedure

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

Preparing samples for inorganic analysis involves working with concentrated acids and other chemicals which are dangerous if not handled carefully:

Nitric acid (HNO_3) – This acid can cause skin burns. Add nitric acid to samples in a hood to avoid exposure to toxic fumes or use the designated dispensing equipment.

Hydrochloric acid (HCl) – This acid can cause skin burns. Never mix HCl with concentrated H_2SO_4 to avoid a violent reaction. Always use in a fume hood or use the designated dispensing equipment.

When diluting strong acids, never add water to acid; always add acid to water.

Store concentrated acids in the prep room acid lockers. Only acids are to be stored in these lockers. (Store solvents in the flammable liquid storage cabinet.) Some concentrated acids are kept in the acid reagent bottles on prep room counters. Fill reagent bottles in an operating fume hood using caution to avoid spills.

Perform acid digestions in hoods that are turned on and have active alarms. Notify a supervisor immediately if the hood is malfunctioning or the alarm sounds.

Samples that contain dust may be hazardous. Open in a fume hood.

When a hazardous flag is added indicating possible cyanide, special precautions are required to avoid exposure to hydrogen cyanide gas. Contact your supervisor prior to adding acid. Always open these samples and add the acid in a hood.

Use spill pillows to absorb large acid spills (small spills are cleaned with wet paper towels.) Use SPILL-X-A powder or equivalent to neutralize any remaining acid and then rinse the area thoroughly with water. Spill pillows and SPILL-X-A are stored on the prep room shelf.

Dispose of acid waste properly. Collect all acid digestions, waste solutions, and expired reagent solutions in waste containers. When the acid waste containers are full, a designated acid waste handler transfers the waste to the acid neutralization tank.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and a documented Demonstration of Capability for this or an equivalent procedure.

Initially, each employee performing this digestion procedure must work with an experienced employee for a period of time until they can independently set up batches and perform the necessary steps outlined in this procedure. Proficiency is measured through documentation of the critical steps in this procedure, over checking of data as well as an IDOC.

The IDOC and the DOC consists of four laboratory control samples that are carried through all steps of the analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Refer to1-P-QM-QMA-9015390, for specific requirements. A DOC is performed annually and is maintained in the analyst's training records.

Sample Collection, Preservation, and Handling:

Samples are collected in plastic containers and preserved to a pH of <2 with HNO_3. (Samples to be analyzed for soluble metals requiring filtration at the lab must be submitted unpreserved. The sample is run through a 0.45 micron filter within 5 days of receipt and then preserved.) The pH is checked upon receipt and adjusted as necessary by Sample Support; samples that are pH adjusted at the lab must not be digested for a minimum of 24 hours. If samples fail to maintain a pH of < 2 the Client Service Representative is notified for further direction. Samples are stored at 0° to 6°C, but not frozen, prior to digestion. Samples must be digested within 6 months of collection. Digested samples are stored in plastic at room temperature and have a 6 month holding time.

Apparatus and Equipment:

1. Polypropylene containers (digestion vessels) – certified clean and Class A equivalent

2. 250-mL beakers, 400-mL beakers (or other volumes as appropriate)

3. 100-mL graduated cylinders (or other volumes as appropriate)

4. 100-mL Class A volumetric flasks (or other volumes as appropriate)

5. 125-mL Nalgene bottles (or other volumes as appropriate)

6. Hot plates, Hotblocks, or DEENA, adjustable and capable of maintaining a temperature of 90° to 95°C

Reagents and Standards:

For reagent preparation, shelf life, and storage conditions, see Form 1-P-QM-FOR-9009182.

1. Nitric acid, HNO_3 - Fisher, Trace Metal Grade, or equivalent. Store at room temperature and reevaluate annually.

2. Hydrochloric acid, HCl - Fisher, Trace Metals Grade, or equivalent. Store at room temperature and reevaluate annually.

3. Nitric acid (1:1) – Add 500 mL of HNO_3 to 500 mL of reagent water. Store at room temperature. Expires in 6 months.

4. Hydrochloric acid (1:1) – Add 500 mL of HCl to 500 mL of reagent water. Store at room temperature. Expires in 6 months.

NOTE: It is acceptable to prepare solutions using multiples of indicated volumes if exact ratios are maintained.

Calibration:

Not applicable to this method.

Procedure:

This SOP has been set up to outline the procedures for hotblock, hot plate, and auto-digester (see below). Choose the procedure that corresponds to the sample heating technique being used for sample digestion.

A. Hotblocks

NOTE: It is acceptable to reduce the volume of sample being analyzed as long as the sample reagent ratios are maintained.

NOTE: If the sample contains high solids, use a smaller aliquot of the sample and bring sample to final volume as stated in this procedure. Make appropriate acid, reagent, and spike volume adjustments based on sample final volume.

NOTE: When insoluble matter is present after digestion, allow it to settle by gravity or filter prior to introduction to the instrument. If any samples are filtered, the prep blank and LCS must also be filtered.

NOTE: For soluble metals analysis, filter unpreserved sample through 0.45-micron filter paper. Adjust the filtered sample to pH <2 with nitric acid preserving solution. Measure the volume of sample, as stated in this procedure, and digest as normal. The prep blank and spiked LCS must also be prepared with filtered reagent water.

See Hotblock Control Point Temperature Logbook to obtain control point temperature setting for the Hotblock being used for digestion. If necessary, adjust control point temperature to the proper setting as instructed below.

Analyses 1848 and 10635 (SW-846):

NOTE: The procedures for analysis 1848 and 10635 are equivalent as outlined below. Analysis 10635 is used only for SW-846 Update IV. When entering the batch number in the LIMS the “1” is omitted (i.e. use YYDDD0635###, where YY is the year, DDD is the julian day, and ### is the digest number).

1. Shake sample well. Transfer 50-mL of well-mixed sample into a 68-mL digestion vessel. After the sample has been poured, add the spiking solution. For sample batch spiking procedures see form 1-P-QM-FOR-9009182. For sample batch quality control requirements see SOP Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …

2. Add 2 mL of (1:1) HNO3 and 5 mL of (1:1) HCl.

3. Heat the solution in a Hotblock at about 90° to 95°C until sample volume is reduced to between 15 and 20 mL, making certain the sample does not boil.

4. Allow to cool.

5. Adjust volume to the 50-mL mark on the digestion vessel with reagent water, cap and mix.

6. The sample is now ready for analysis.

B. Hot Plates:

NOTE: If boron (B) is requested on a sample, use Teflon vessels.

NOTE: It is acceptable to reduce the volume of sample being analyzed as long as the sample reagent ratios are maintained.

NOTE: When insoluble matter is present in the digested sample, allow it to settle by gravity or filter prior to introduction to the instrument. If any samples are filtered, the prep blank and LCS must also be filtered.

NOTE: For soluble metals analysis, filter unpreserved sample through 0.45-micron filter paper. Adjust the filtered sample to pH <2 with nitric acid preserving solution. Measure the volume of sample, as stated in this procedure, and digest as normal. The prep blank and spiked LCS must also be prepared with filtered reagent water.

NOTE: If the sample contains high solids, use a smaller aliquot of the sample and bring sample to final volume as stated in this procedure. Make appropriate acid, reagent, and spike volume adjustments based on sample final volume.

Analyses 1848 and 10635 (SW-846):

1. Shake sample well. Using a 50-mL graduated cylinder, transfer 50 mL of well-mixed sample into a 250-mL beaker. After the sample has been poured, add the spiking solution. For sample batch spiking procedures see form 1-P-QM-FOR-9009182. For sample batch quality control requirements see SOP Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …

2. Add 2 mL of (1:1) HNO_3 and 5 mL of (1:1) HCl.

3. Heat the solution on a hot plate at 90^o to 95°C until sample volume is reduced to between 15 and 20 mL, making certain the sample does not boil.

4. Allow to cool.

5. Transfer the solution to a 50-mL volumetric flask. Adjust volume to the 50-mL mark with reagent water and mix.

6. Transfer the solution to a 125-mL Nalgene container and cap.

7. The sample is now ready for analysis.

C. DEENA Auto-digester

NOTE: If the sample contains high solids, use a smaller aliquot of the sample and bring sample to final volume as stated in this procedure. Make appropriate acid, reagent, and spike volume adjustments based on sample final volume.

NOTE: When insoluble matter is present after digestion, allow it to settle by gravity or filter prior to introduction to the instrument. If any samples are filtered, the prep blank and LCS must also be filtered.

NOTE: For soluble metals analysis, filter unpreserved sample through 0.45-micron filter paper. Adjust the filtered sample to pH <2 with nitric acid preserving solution. Measure the volume of sample, as stated in this procedure, and digest as normal. The prep blank and spiked LCS must also be prepared with filtered reagent water.

Analysis 1848 and 10635 (SW-846):

1. Shake sample well. Transfer 50-mL of well mixed sample into a 68-mL digestion vessel. After the sample has been poured, add the spiking solution. For sample batch spiking procedures see form 1-P-QM-FOR-9009182. For sample batch quality control requirements see. SOP Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …

2. Verify the DEENA temperature is 90° to 95°C

3. Place samples into 20 position sample trays starting in position one. Place the trays into the DEENA.

4. Open the DEENA software. Click the Rack Definition button and input the total number of samples to be run.

5. Make sure all reagents have sufficient volume and that the transfer tubes are in the appropriate reagent. Make sure the waste beaker is clean and has 5-10 mL of reagent water in it.

6. Press the Green traingle (GO) button.

Block Digestor Instructions:

1. Turn block digestor on by pressing rocker switch located on the cord.

2. Wait about 8 seconds until controller display indicates current block temperature.

3. PRESS and hold STAR (*) key.

4. The display shows the Set Point Temperature.

5. The digits can be changed to the desired value by pressing the up and down arrows keys while holding the (*) key.

6. Confirm Control Point temperature is set to the block temperature that provides 90° to 95°C.

   NOTE: See HotBlock Control Point Temperature Logbook to obtain control point temperature setting for the HotBlock being used for digestion. If necessary, adjust Control Point temperature to the proper setting.

   NOTE: Polypropylene containers must not be heated above 130°C.

Calculations:

Not applicable to this procedure.

Statistical Information/Method Performance:

Not applicable to this procedure.

Quality Assurance/Quality Control:

A method blank, sample duplicate, sample matrix spike, sample matrix spike duplicate, and laboratory control sample must be performed for every SW-846 digestion batch (analysis 1848 or 10635). A batch is 20 samples or less.

A method blank, sample duplicate, sample matrix spike, and laboratory control sample must be performed every CLP digestion batch (analysis 5720). A batch is 20 samples or less.

Each piece of batch QC is digested following the procedures in this SOP.

For sample batch quality control requirements see Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …

Eurofins Document Reference	1-P-QM-WI -9015160	**Revision**	22
Effective Date	Aug 21, 2014	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 5708, 10637		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Debra Bryan
Reviewed and Approved by	Robert Strocko;Review;Thursday, August 7, 2014 8:55:25 AM EDT Kathryn Brungard;Approval;Thursday, August 7, 2014 11:48:56 AM EDT

Revision Log:

Revision: 22		**Effective Date:**	This version
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Document Title	Clarification		Removed Fish from the title so that the word Tissue is not limited to only Fish.
Procedure	Clarification		Removed the word fish from tissue section and included or other tissue samples are used.

Revision: 21		**Effective Date:**	Mar 17, 2014
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Cross Reference	Reflect current procedure		Added reference Analysis #6142, 6123, 6125, 10801…
Scope	Clarification		Reworded section.
Sample Collection, Preservation and Handling	Reflect current procedure		Changed sample storage temperature to 0° to 6°C, but not frozen.
Reagents and Standards	Reflect current procedure		Added reference to 1-P-QM-FOR-9009182.
Procedure	Reflect current procedure		Add boiling stones to the batch blank and LCS for the fish samples.
Block Digestor Instructions	Reflect current procedure No longer used		Hold and press the star key. Deleted test pertaining to the control panel grey buttons.
Quality Assurance/Quality Control	Reflect current procedure		Added reference to ICP/MS Analysis #6142, 6123, 6125, 10801, …. for batch requirements.

Reference:

1. Test Methods for Evaluating Solid Wastes, SW-846 Method 3050B, December 1996.

2. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
Analysis #6142, 6123, 6125, 10801, 6126, 6127, 6129, 6128, 6132, 6131, 6133, 6134, 6140, 6136, 6137, 6138, 6143, 6139, 6135, 6124, 6141, 6146, 6144, 6147, 6145, …	Metals by Inductively Coupled Plasma Mass Spectrometry for SW-846 Methods 6020/6020A (aqueous, solid, tissue), CLP 5.2 (aqueous, solid, tissue) and EPA 200.8 (aqueous)
Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …	Metals by Inductively Coupled Plasma Atomic Emissions Spectroscopy for SW-846 Methods 6010A/B/C (aqueous, solid, tissue), CLP 2.1(water/solid/tissue), CLP 4.0(water/solid/tissue), CLP 5.2 (water/solid/tissue) and EPA 200.7(aqueous)
1-P-QM-FOR-9009182	Working Instructions for Prep Solutions and Standards

Purpose:

This digestion procedure is for the preparation of solid samples for analysis by ICP and ICP/MS following SW-846 protocol.

Scope:

This method is used for preparation of metals in solid samples for analysis by ICP and ICP/MS.

Basic Principles:

A representative sample is digested with repeated additions of nitric acid (HNO3) and hydrogen peroxide (H2O2). Hydrochloric acid (HCl) is added to the initial digestate and the sample is refluxed. The resultant digestate is diluted and analyzed.

This method is not a total digestion technique for most samples; it is a very strong acid digestion that dissolves almost all elements that could become “environmentally available.” By design, elements bound in silicate structures are not normally dissolved by this procedure.

Definitions:

1. ACS – American Chemical Society
2. D – Sample Duplicate
3. DOC – Demonstration of Capability
4. IDOC – Initial Demonstration of Capability
5. LCS/LCSD – Laboratory Control Sample/ Laboratory Control Sample Duplicate
6. LCSW– Laboratory Control Sample Water
7. LLENS - the computer program that integrates a PC with an analytical balance to collect data directly from the balance. The program organizes the data and transmits the readings to the LIMS.
8. LIMS – Laboratory Information Management Systems
9. LLI Sample ID – unique 7-digit number assigned to a client sample.
10. LOQ – Limit of Quantitation
11. MDL – Method Detection Limit
12. MS (R) – Matrix Spike
13. MSD (M) – Matrix spike duplicate

14. PB/PBW–Preparation Blank/ Preparation Blank Water

15. QC – Quality Control

16. Method Blank - equivalent to a Preparation Blank. A designated sample designed to monitor for sample contamination during the analysis process. A volume of reagent laboratory water is typically used to monitor water sample analysis, while solids blanks consist of a purified solid matrix or just the reagents used in the test. The blank demonstrates that no artifacts were introduced during the analysis process.

17. SOP- Standard Operating Procedure

18. U or US – unspiked background sample

Interferences:

When analyzing sample by ICP-MS using this digestion procedure we follow the instrument manufacturer's guidelines to eliminate polyatomic interferences typically caused by Chlorine. The process we follow involves the use of a collision/reaction cell on the ICP-MS. Below is a description of how the collision/reaction cell works.

Reaction Process - The primary method of interference removal is through a reaction event. When using a reaction gas, either the target interference is more reactive than the target analyte, leading to preferential removal of the interferent or (less commonly) the target analyte is more reactive and is converted to a new species at a different mass which is free from any existing or newly-formed overlap

Collision Process - The primary method of interference removal is through a non-reactive event. This process of interference removal is kinetic energy discrimination (KED). Energy Discrimination is most commonly used with an inert gas, which means the interference removal process is not affected by reactions in the cell.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

Preparing samples for inorganic analysis involves working with concentrated acids and other chemicals which are dangerous if not handled carefully:

Nitric acid (HNO3) – This acid can cause skin burns. Add nitric acid to samples in a hood or use the designated dispensing equipment to avoid exposure to toxic fumes.

Hydrochloric acid (HCl) – This acid can cause skin burns. Never mix HCI with concentrated H2SO4 to avoid a violent reaction. Always use in a fume hood or use the designated dispensing equipment.

Hydrogen peroxide (H2O2) - This is a strong oxidizing agent and causes severe burns. Avoid contact with skin.

When diluting strong acids, never add water to acid; always add acid to water.

Store concentrated acids in the prep room acid lockers. Only acids are to be stored in these lockers. (Store solvents in the flammable liquid storage cabinet.) Some concentrated acids are kept in the acid reagent bottles on prep room counters. Fill reagent bottles in an operating fume hood using caution to avoid spills.

Perform acid digestions in hoods that are turned on and have active alarms. Notify a supervisor immediately if the hood is malfunctioning or the alarm sounds.

Samples that contain dust may be hazardous. Open in a fume hood.

When a hazardous flag is added indicating possible cyanide, special precautions are required to avoid exposure to hydrogen cyanide gas. Contact your supervisor prior to adding acid. Always open these samples and add the acid in a hood.

Use spill pillows to absorb large acid spills (small spills are cleaned with wet paper towels.) Use SPILL-X-A powder or equivalent to neutralize any remaining acid and then rinse the area thoroughly with water. Spill pillows and SPILL-X-A are stored on the prep room shelf.

Dispose of acid waste properly. Collect all acid digestions, waste solutions, and expired reagent solutions in waste containers. When the acid waste containers are full, a designated acid waste handler transfers the waste to the acid neutralization tank.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and a documented Demonstration of Capability (DOC).

Initially, each employee performing this digestion procedure must work with an experienced employee for a period of time until they can independently set up batches and perform the necessary steps outlined in this procedure. Proficiency is measured through documentation of the critical steps in this procedure, over checking of data as well as an IDOC.

The IDOC and the DOC consists of four laboratory control samples that are carried through all steps of the analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation.

Sample Collection, Preservation, and Handling:

Solid samples require no chemical preservation.

Samples must be submitted in glass or plastic containers and stored at 0° to 6°C, but not frozen, prior to digestion. Samples must be digested within 6 months (180 days) of sample collection.

Digested samples are stored in polypropylene bottles at room temperature.

Apparatus and Equipment:

1. Polypropylene containers and covers (digestion vessels) - certified clean and Class A equivalent

2. Whatman No. 41 filter paper or equivalent

3. Funnels

4. Environmental Express HotBlock (block digestor) - adjustable and capable of maintaining a temperature of 90 to 95°C

5. Balance capable of reading 0.01 g

6. Chemware Ultra-Pure PTFE boiling stones, or equivalent.

7. Computer and software LLENS (Lancaster Laboratories Electronic Notebook System)

Reagents and Standards:

For reagent preparation, shelf life, and storage conditions, see Form 1-P-QM-FOR-9009182.

1. Nitric acid (HNO_3) _ Fisher, Trace Metal Grade, or equivalent. Store at room temperature. Re-evaluate annually.

2. Nitric acid (1:1) – Add 500 mL of HNO_3 to 500 mL of reagent water. Store in polypropylene at room temperature. Expires 6 months from date of preparation. (Different volumes are acceptable but ratios must stay the same.)

3. Hydrogen peroxide, 30% (H_2O_2) – Fisher, Certified ACS or equivalent. Store at room temperature. Re-evaluate annually.

4. Hydrochloric acid (HCl) – Baker Instra-Analyzed, or equivalent. Store at room temperature. Re-evaluate annually.

   NOTE: It is acceptable to prepare using multiples of indicated weights and volumes if ratios are maintained.

Calibration:

Not applicable.

Procedure:

1. Turn block digestor on and allow block to reach the Control Point setting that provides 90° to 95°C sample temperature. (The block temperature setting is not necessarily the sample temperature.) See below for **Block Digestor Instructions** section.

2. Weigh 1.00 to 1.05 g (to the nearest 0.01 g) of a well mixed sample into a polypropylene digestion vessel. (If the sample is watery use 5.00 to 5.05 grams for analysis. Additional information on non-standard matrices is found at the end of the procedure section.) Add 1.00 to 1.49 g of Chemware Ultra-Pure PTFE boiling stones to the digestion vessel for the blank and LCS. Enter the blank and LCS weight as 1.0000 to 100.0000 final volume in the LLENS. For sample batch spiking procedures see 1-P-QM-FOR-9009182. All spiking must be performed prior to starting the digestion procedure.

3. Add 10 mL of (1:1) HNO_3, swirl to mix, and cover with a polypropylene cover.

4. Place sample vessel in block digestor. Heat (reflux) the sample at 90° to 95°C for 10 to 15 minutes without boiling.

5. Remove vessel from digestion block and allow sample to cool.

6. Add 5 mL of concentrated HNO_3. Replace cover, return vessel to digestion block and heat for 30 minutes.

   NOTE: If brown fumes are generated (indicating oxidation of the sample by HNO_3) continue the process of adding 5 mL HNO3 and heating until no brown fumes are given off by the sample. This indicates that the reaction with HNO_3 is complete. Add the same amount of HNO_3 to the entire digestion batch.

7. With cover on, heat at 90° to 95°C without boiling for 2 hours. Maintain a covering of solution over the bottom of the vessel at all times (add reagent water if necessary).

8. Remove vessel from digestion block and allow sample to cool.

9. Add 2 mL of reagent water and 3 mL of 30% H_2O_2. With cover on, return vessel to digestion block and heat until effervescence subsides. Care must be taken to ensure that losses do not occur due to excessively vigorous effervescence.

10. Continue to add 30% H_2O_2 in 1-mL aliquots with warming until the effervescence is minimal or until the general sample appearance is unchanged.

    NOTE: Do not add more than a total of 10 mL 30% H_2O_2.

11. With cover on, continue heating the acid-peroxide digestate at 90° to 95°C without boiling for 2 hours. Maintain a covering of solution over the bottom of the vessel at all times (add reagent water if necessary).

12. Remove sample vessel from digestion block and allow to cool.

13. Add 10 mL of HCl. With the cover on, return vessel to digestion block and heat at 90° to 95°C for 15 minutes.

14. Remove sample vessel from digestion block.

15. If floating particulate is evident after digestion, the sample must be filtered.

    a. Filter through Whatman No. 41 filter paper into a polypropylene container.

    b. Wash sample vessel, residue, and paper thoroughly with reagent water.

    c. If any samples are filtered, the prep blank and LCS must also be filtered.

16. Adjust volume to the 100mL mark on the digestion vessel with reagent water and mix. Seal vessel with a screw cap. The sample is now ready for analysis.

NOTE: When special limits of quantitation are required by the client, use more sample weight.

For wipe samples:

When wipes are digested by this method, one blank media each must be used for the batch preparation blank, the laboratory control sample (LCS), and the laboratory control sample duplicate (LCSD). Refer to Form 1-P-QM-FOR-9009182 for the spiking of the LCS and LCSD. Digest wipes in their own batch. Use reagent water to rinse any particulate matter from the wipe container into the vessel containing the wipe before digesting. If brown fumes are evolved during wipe sample digestion, perform only two 5 mL HNO_3 additions with 30-minute refluxing each; add the same amount of HNO_3 to the entire batch. Proceed with digestion.

For tissue samples:

When fish tissues, or other tissue samples are digested by this method, refer to Form 1-P-QM-FOR-9009182 for the spiking of the LCS, LCSD (if needed), R (matrix spike), and M (matrix spike duplicate). Add 1.00 to 1.49 g of Chemware Ultra-Pure PTFE

boiling stones to the digestion vessel for the blank and LCS. Digest tissue samples in their own batch.

Block Digestor Instructions:

1. Turn block digestor on by pressing rocker switch located on the cord.

2. Wait about 8 seconds until controller display indicates current block temperature.

3. PRESS and hold STAR (*) key.

4. The display shows Control Point temperature.

5. The digits can be changed to the desired value by pressing the up and down arrow keys while holding the (*) key.

6. Confirm Control Point temperature is set to the block temperature that provides 90° to 95°C.

   NOTE: See HotBlock Control Point Temperature Logbook to obtain control point temperature setting for the HotBlock being used. If necessary, adjust Control Point temperature to the proper setting as instructed below.

   NOTE: Polypropylene containers must not be heated above 130°C.

Calculations:

Not applicable

Statistical Information/Method Performance:

Not applicable to this procedure. See analysis method.

Quality Assurance/Quality Control:

For sample batch spiking instructions see form 1-P-QM-FOR-9009182. Refer to ICP section when prepping ICP analysis. Refer to ICP/MS section when prepping ICP/MS analysis. Prepare a method blank, sample duplicate, sample matrix spike, sample matrix spike duplicate, and laboratory control sample with every digestion batch (20 samples or less). Each piece of batch QC is digested following the procedure in this SOP. If any samples are filtered the prep blank and LCS must also be filtered.

Refer to ICP Analysis #6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, … for sample batch quality control requirements, acceptance criteria and corrective action.

Refer to ICP/MS Analysis #6142, 6123, 6125, 10801, 6126, 6127, 6129, 6128, 6132, 6131, 6133, 6134, 6140, 6136, 6137, 6138, 6143, 6139, 6135, 6124, 6141, 6146, 6144, 6147, 6145, … for sample batch quality control requirements, acceptance criteria and corrective action.

Eurofins Document Reference	1-P-QM-WI -9015082	**Revision**	18
Effective Date	Apr 29, 2015	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 5713, 5714		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Debra Bryan
Reviewed and Approved by	Robert Strocko;Review;Tuesday, April 14, 2015 3:13:19 PM EDT Barbara Reedy;Approval;Wednesday, April 15, 2015 8:24:40 AM EDT

Table of Contents

Revision Log:

Revision: 18		**Effective Date:** This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Document Title	No longer part of current procedure	Deleted CLP2.1, CLP4.0, and CLP5.2
Historical/Local Document Number	No longer part of current procedure	Deleted 0821
Throughout Document	No longer part of current procedure No longer used for this procedure	Deleted reference to CLP2.1, CLP4.0, and CLP5.2 Deleted reference to the use of DEENA Automated Sample Preparation System
Cross Reference	Reflect current procedure	Added 1-P-QM-QMA-9015390
Safety Precautions and Waste Handling	Clarification	Added the use of designated dispensing equipment for acids. Added text pertaining to hazardous flags.
Personnel Training and Qualifications	Reflect current procedure	Added 1-P-QM-QMA-9015390
Sample Collection, Preservation, and Handling	Clarification	Added text pertaining to pH checks and pH adjustments.
Apparatus and Equipment	No longer used for this procedure	Deleted 100 mL polypropylene containers
Reagents and Standards	Clarification No longer used for this procedure	Added reference to 1-P-QM-FOR-9008921 for reagent preparation, shelf life, and storage conditions. Deleted NOTE referencing the use of water bath.
Reagents and Standards C.	Reflect current procedure	Deleted preparation of Calibration Curve, ICV, CCV, CRA, ICB, and CCB
Block Digester Instructions	Reflect current procedure	Added entire section

Revision: 17		**Effective Date:** Apr 22, 2014
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Procedure B	Clarification throughout	Adjusted final volume from 50 to 40.

Reference:

1. Test Methods for Evaluating Solid Wastes, SW-846 Method 7470A, September 1994

2. Method 245.1 (rev. 3), Determination of Mercury in Water by Cold Vapor Atomic Absorption Spectroscopy, USEPA 600/R-94/111 May 1994.

3. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
1-P-QM-FOR-9008921	Working Instructions for Preparation of Mercury Solutions and Standards
1-P-QM-QMA-9015390	Demonstrations of Capability

Purpose:

The purpose of this SOP is to describe the proper digestion of aqueous samples for Mercury by SW-846 Method 7470A and EPA 245.1.

Scope:

This method is used for automated and manual digestion of samples to be analyzed for Mercury in aqueous samples.

Basic Principles:

The samples are digested with nitric acid, sulfuric acid, potassium permanganate, and potassium persulfate to oxidize mercury compounds to mercuric ions. Mercuric ions are reduced to mercury metal using stannous chloride. Mercury measurement is performed using the mercury cold vapor technique.

The DEENA Automated Sample Preparation System utilizes automated addition of reagents, heating, and filling to final volume to digest Mercury samples following SW-846 Method 7470A, EPA 245.1, CLP 2.1, CLP 4.0 and CLP 5.2.

Reference Modifications:

Manual digestions: To increase efficiency, polypropylene containers are used in place of BOD bottles. Prior to analysis (after excess potassium permanganate is reduced with sodium chloride/hydroxylamine hydrochloride solution) samples are adjusted to 50 ml in volumetric flasks. This allows aliquots to be taken as required for analysis; aliquots cannot be taken when BOD bottles are used.

To increase efficiency and temperature accuracy, a hot block digester is used in place of a 95°C water bath.

Definitions:

1. 0.15% HNO3 – 0.15% Nitric Acid Solution
2. ACS – American Chemical Society
3. Calibration Blanks – includes ICBs and CCBs
4. CCB – Continuing Calibration Blank
5. CCV – Continuing Calibration Verification
6. D – Sample Duplicate
7. DOC – Demonstration of Capability
8. Dummy tubes – purchased weighted tubes filled with ballast
9. ICB – Initial Calibration Blank
10. ICV – Initial Calibration Verification
11. IDOC – Initial Demonstration of Capability

12. LCS/LCSD – Laboratory Control Sample/ Laboratory Control Sample Duplicate

13. LCSW – Laboratory Control Sample Water

14. LLENS – the computer program that integrates a PC with an analytical balance to collect data directly from the balance. The program organizes the data and transmits the readings to the LIMS.

15. LIMS – Laboratory Information Management Systems

16. LLI Sample ID – unique 7-digit number assigned to a client sample.

17. LOQ – Limit of Quantitation

18. MDL – Method Detection Limit

19. MS (R) – Matrix Spike

20. MSD (M) – Matrix spike duplicate

21. PB/PBW–Preparation Blank/ Preparation Blank Water

22. QC – Quality Control

23. Method Blank – equivalent to a Preparation Blank. A designated sample designed to monitor for sample contamination during the analysis process. A volume of deionized laboratory water is typically used to monitor water sample analysis, while solids blanks consist of a purified solid matrix or just the reagents used in the test. The blank demonstrates that no artifacts were introduced during the analysis process.

24. SOP – Standard Operating Procedure

25. U or US – unspiked background sample

Interferences:

Not applicable to this procedure.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

Preparing samples for inorganic analysis involves working with concentrated acids and other chemicals which are dangerous if not handled carefully:

Nitric acid (HNO_3) – This acid can cause skin burns. Add nitric acid to samples in a hood to avoid exposure to toxic fumes, or use the designated dispensing equipment.

Sulfuric acid (H_2SO_4) – This acid is a strong oxidizing agent and can cause severe burns. Sulfuric acid spills are extremely slippery, adding to the danger. Always use in a fume hood, or use the desinated dispensing equipment. Never mix with concentrated HCl or concentrated KMNO4 to avoid a violent reaction (explosive splattering and extreme heat).

Hydrochloric acid (HCl) – This acid can cause skin burns. Never mix HCI with concentrated H_2SO_4 to avoid a violent reaction. Always use in a fume hood, or use the designated dispensing equipment.

When diluting strong acids, never add water to acid; always add acid to water.

Store concentrated acids in the prep room acid lockers. Only acids are to be stored in these lockers. (Store solvents in the flammable liquid storage cabinet.) Some concentrated acids are kept in the acid reagent bottles on prep room counters. Fill reagent bottles in an operating fume hood using caution to avoid spills.

Perform acid digestions in hoods that are turned on and have active alarms. Notify a supervisor immediately if the hood is malfunctioning or the alarm sounds.

Samples that contain dust may be hazardous. Open in a fume hood.

When a hazardous flag is added indicating possible cyanide, special precautions are required to avoid exposure to hydrogen cyanide gas. Contact your supervisor prior to adding acid. Always open these samples and add the acid in a hood.

Use spill pillows to absorb large acid spills (small spills are cleaned with wet paper towels.) Use SPILL-X-A powder or equivalent to neutralize any remaining acid and then rinse the area thoroughly with water. Spill pillows and SPILL-X-A are stored on the prep room shelf.

Dispose of acid waste properly. Collect all acid digestions, waste solutions, and expired reagent solutions in waste containers. When the acid waste containers are full, a designated acid waste handler transfers the waste to the acid neutralization tank.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and a documented Demonstration of Capability.

Initially, each employee performing the digestion must work with an experienced employee for a period of time until they can independently perform digestions. Proficiency is measured through documented audits of the tasks listed as well as an IDOC.

The IDOC and the DOC consists of four laboratory control samples that are carried through all steps of the analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Refer to 1-P-QM-QMA-9015390 for specific requirements, a DOC is performed annually and is maintained in the employee training records.

Sample Collection, Preservation, and Handling:

Aqueous samples are collected in plastic containers, preserved to a pH of <2 with nitric acid. The pH is checked upon receipt and adjusted as necessary by Sample Support; samples that are pH adjusted at the laboratory must not be digested for a minimum of 24 hours. If samples fail to maintain a pH of <2 the Client Representative is notified for further direction. Samples are stored at 0 to 6°C, not frozen, prior to digestion. Samples must be digested within 28 days of collection for SW-846 Methods 7470A.

Drinking Water samples are collected in 1-L plastic or glass containers, preserved to a pH of <2 with nitric acid. The pH is checked upon receipt and adjusted as necessary by Sample Support; samples that are pH adjusted at the lab must not be digested for a minimum of 24 hours. If samples fail to maintain a pH of <2 the Client Representative is notified for further direction. Samples are stored at 0 to 6°C, not frozen, prior to digestion. Samples must be digested within 28 days of collection for EPA 245.1

Dissolved Mercury: Samples to be analyzed for soluble mercury requiring filtration at the lab must be submitted unpreserved. The sample is run through a 0.45 micron filter within 5 days of receipt and then preserved to a pH of <2 with HNO_3.

Digested samples are stored in plastic bottles at room temperature. Store samples, standards, and digested samples separately.

Apparatus and Equipment:

1. 50-ml polypropylene containers and covers (digestion vessels for block digestion) – certified clean and Class A equivalent

2. Environmental Express HotBlock (block digester) – adjustable and capable of maintaining a sample temperature of 95°C.

Reagents and Standards:

For reagent preparation, shelf life, and storage conditions, see Form 1-P-QM-FOR-9008921.

A. Store all standards and reagents in polyethylene bottles at room temperature. Label the bottle with the solution name, lot number, date prepared, the expiration date, the initials of the person preparing the solution, and the storage conditions.

NOTE: Standard/ spiking concentration and reagent vendors are subject to change without notification.

B. Reagents use the following or equivalent:

1. Nitric acid, 70.0% to 71.0% HNO_3, Fisher Trace Metal Grade reagent, 1.428 g/ml; Store in glass container at room temperature. Follow manufacturer's expiration date.

2. Sulfuric acid, 95.0% to 98.0%, H_2SO_4, 36 N, Fisher reagent, ACS, 1.84 g/ml; Store in glass container at room temperature. Follow manufacturer's expiration date.

3. Potassium permanganate, $KMnO_4$, Baker Analyzed reagent, ACS. Store in glass container at room temperature. Follow manufacturer's expiration date.

4. Potassium persulfate, $K_2S_2O_8$ Baker Analyzed reagent, ACS. Store in glass container at room temperature. Follow manufacturer's expiration date.

5. Sodium chloride, NaCl, J.T. Baker, Certified ACS. Store in plastic container at room temperature. Follow manufacturer's expiration date.

6. Hydroxylamine hydrochloride, $NH_2OH{\bullet}HCl$, J.T. Baker, Certified ACS. Store in plastic container at room temperature. Follow manufacturer's expiration date.

7. Reagent Water

8. Stannous chloride, SnCl, Baker Analyzed reagent, ACS. Store in plastic container at room temperature. Follow manufacturer's expiration date.

9. Hydrochloric acid, HCl, 36.5% to 38.0%, Fisher Trace Metal Grade reagent, 1.194 g/ml or equivalent. Store in glass container at room temperature. Follow manufacturer's expiration date.

C. For initial preparation of Method Blanks, LCSs, Matrix Spikes and General Solutions follow instructions listed in Form 1-P-QM-FOR-9008921.

Calibration:

Not applicable to this procedure

Procedure:

A. Manual hot block digestion

1. Turn block digester on and allow block to reach the Control Point setting that provides 95° ± 1°C sample temperature. The temperature is checked with a calibrated thermometer and recorded in the logbook.

2. Print labels with the LLI Sample ID and batch number from LLENS and place on sample digestion containers.

3. Shake sample well.

4. Transfer 40 ml of well-mixed sample (or an aliquot diluted to 40 ml) into the polypropylene container. If a different final volume is necessary, adjust reagent volumes accordingly.

5. See **Quality Assurance/Quality Control** section for required batch Quality Control.

6. See Form 1-P-QM-FOR-9008921 for instructions on preparing batch Quality Control.

7. See Form 1-P-QM-FOR-9008921 for concentration levels of batch Quality Control.

8. See **Quality Assurance/Quality Control** section for required instrument Quality Control.

9. See Form 1-P-QM-FOR-9008921 for instruction for preparing instrument Quality Control and Calibration.

10. See Form 1-P-QM-FOR-9008921 for concentration levels of instrument Quality Control and Calibration.

11. Add 2 ml of H_2SO_4 and mix.

12. Add 1 ml of HNO_3 and mix.

13. Add 6 ml of 5% $KMnO_4$ solution and mix.

14. Allow the sample to stand for 15 minutes and then check sample for purple color.

    a. If the purple color does not persist for at least 15 minutes, perform a dilution on the sample beginning with a DF5.

    b. Continue diluting in increments of 5 or 10 until the purple color persists for at least 15 minutes.

15. Add 3.2 ml of 5% $K_2S_2O_8$ solution and mix.

16. Place containers in block digester.

17. Place a calibrated thermometer in method blank container.

18. Put a polypropylene cover on each container. Remove after the samples reach 95° ± 1°C.

19. Heat for 2 hours in the block digester at 95° ± 1°C. The temperature is checked with a calibrated thermometer and recorded in the logbook.

20. Remove samples from block digester and cool.

21. Screw on disposable cap.

22. Prior to analysis, add 2.4 ml of 12% sodium chloride/hydroxylamine hydrochloride solution to reduce excess permanganate (color change is from purple to colorless). If the solution is not colorless, add reductant in 1-ml increments until KMnO4 is completely reduced.

23. Adjust the volume to 40 ml with reagent water and mix. Reserve for analysis.

    NOTE: that the block temperature is different than the temperature of the liquid being digested.

B. Block Digester Instructions:

1. Turn block digester on by pressing rocker switch located on the cord.

2. Wait about 8 seconds until controller display indicates current block temperature.

3. Press and hold STAR (*) key.

4. The display shows the Set Point Temperature.

5. The digits can be changed to the desired value by pressing the up and down arrow keys while holding the (*) key.

6. Confirm Control Point temperature is set to the block temperature that provides 95°C.

NOTE: See HotBlock Control Point Temperature Logbook to obtain control point temperature setting for the HotBlock being used for digestion. If necessary, adjust Control Point temperature to the proper setting.

NOTE: Polypropylene containers must not be heated above 130°C.

Calculations:

Not applicable

Statistical Information/Method Performance:

Not applicable

Quality Assurance/Quality Control:

A. For 7470A, each digestion batch (up to 20 samples) must contain a method blank, LCS, and either an US, D, MS, MSD or an LCS/LCSD.

B. For 245.1, each digestion batch (up to 10 samples) must contain a method blank, LCS, and either an US, D, MS or an LCS/LCSD.

Eurofins Document Reference	1-P-QM-WI -9015161	**Revision**	18
Effective Date	Aug 28, 2014	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 5711, 10638		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Debra Bryan
Reviewed and Approved by	Robert Strocko;Review;Tuesday, August 12, 2014 2:34:04 PM EDT Kathryn Brungard;Approval;Thursday, August 14, 2014 9:42:25 AM EDT

Revision Log:

Revision: 18		**Effective Date:**	This version
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Document Title	Clarification		Removed Fish from the title so that the word Tissue is not limited to only fish.
Sample Collection, Preservation, and Handling	No longer applicable. Laboratory is not supporting CLP work.		Deleted holding time of 26 days for CLP
Procedure 2	Clarification		Removed Fish from the tissue section and included or other tissue samples are used.
Procedure 6	Clarification		Added the word about. To read: …adding about 5 ml of aqua regia
Purpose	Clarification		Removed the word fish so that the word tissue is not limited to only fish.

Revision: 17		**Effective Date:**	May 23, 2014
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Reagents and Standards D.2	Correction		Changed expiration date to 1 week from preparation date.
Block Digestor Instructions	Reflect current procedure		Deleted control point temperature adjustment for control panel grey buttons

Reference:

1. Test Methods for Evaluating Solid Wastes, SW-846 Method 7471A Modified, September 1994.

2. Test Methods for Evaluating Solid Wastes, SW-846 Method 7471B, February 2007

3. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
Analysis #0259, 0159	Mercury in Aqueous, Solid and Tissue Samples by Cold Vapor AA
1-P-QM-FOR-9008921	Working Instructions for Preparation of Mercury Solutions and Standards

Purpose:

This digestion procedure is used to prepare soil, sediment, sludge, oil, and tissue samples for measurement of mercury by atomic absorption cold vapor technique following SW-846 protocol.

Scope:

This method is approved for measuring total mercury (organic and inorganic) in soils, sediments, bottom deposits, sludge-type materials, and concrete. All samples must be subjected to an appropriate dissolution step prior to analysis. If this dissolution procedure is not sufficient to dissolve a specific matrix type or sample, then this method is not applicable for that matrix. Samples that require additional homogenization are addressed on a case-by-case basis and homogenized by the Sample Support Group (Department 6055).

Basic Principles:

Samples are digested with aqua regia and potassium permanganate to oxidize mercury compounds to mercuric ions and eliminate possible interference from sulfide. Samples high in chlorides require additional permanganate. At the time of analysis, excess permanganate is reduced with sodium chloride/hydroxylamine hydrochloride. Mercuric ions are reduced to mercury metal using stannous chloride. Mercury measurement is performed using mercury cold vapor technique.

Reference Modifications:

To increase efficiency, polypropylene containers are used in place of BOD bottles. Prior to analysis (after excess potassium permanganate is reduced with sodium chloride/hydroxylamine hydrochloride solution) samples are adjusted to 100 mL in volumetric flasks. This allows aliquots to be taken as required for analysis; aliquots cannot be taken when BOD bottles are used. No impact on the quality of the data generated using this modification has been observed.

Definitions:

1. ACS – American Chemical Society
2. Calibration Blanks – includes ICBs and CCBs
3. CCB – Continuing Calibration Blank
4. CCV – Continuing Calibration Verification
5. D – Sample Duplicate
6. DOC – Demonstration of Capability
7. Dummy tubes - purchased weighted tubes filled with ballast
8. ICB – Initial Calibration Blank

9. ICV – Initial Calibration Verification

10. IDOC – Initial Demonstration of Capability

11. LCS/LCSD – Laboratory Control Sample/ Laboratory Control Sample Duplicate

12. LCSW– Laboratory Control Sample Water

13. LLENS - the computer program that integrates a PC with an analytical balance to collect data directly from the balance. The program organizes the data and transmits the readings to the LIMS.

14. LIMS – Laboratory Information Management Systems

15. ELLE Sample ID – unique 7-digit number assigned to a client sample.

16. LOQ – Limit of Quantitation

17. MDL – Method Detection Limit

18. MS (R) – Matrix Spike

19. MSD (M) – Matrix spike duplicate

20. PB/PBW–Preparation Blank/ Preparation Blank Water

21. QC – Quality Control

22. Method Blank - equivalent to a Preparation Blank. A designated sample designed to monitor for sample contamination during the analysis process. A volume of reagent laboratory water is typically used to monitor water sample analysis, while solids blanks consist of a purified solid matrix or just the reagents used in the test. The blank demonstrates that no artifacts were introduced during the analysis process.

23. SOP- Standard Operating Procedure

24. U or US – unspiked background sample

Interferences:

Not applicable to this procedure.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

Preparing samples for inorganic analysis involves working with concentrated acids and other chemicals which are dangerous if not handled carefully:

Nitric acid (HNO_3) – This acid can cause skin burns. Add nitric acid to samples in a hood or use the designated dispensing equipment to avoid exposure to toxic fumes.

Hydrochloric acid (HCl) – This acid can cause skin burns. Never mix HCI with concentrated H_2SO_4 to avoid a violent reaction. Always use in a fume hood or use the designated dispensing equipment.

When diluting strong acids, never add water to acid; always add acid to water.

Store concentrated acids in the prep room acid lockers. Only acids are to be stored in these lockers. (Store solvents in the flammable liquid storage cabinet.) Some concentrated acids are kept in the acid reagent bottles on prep room counters. Fill reagent bottles in an operating fume hood using caution to avoid spills.

Perform acid digestions in hoods that are turned on and have active alarms. Notify a supervisor immediately if the hood is malfunctioning or the alarm sounds.

Samples that contain dust may be hazardous. Open in a fume hood.

When a hazardous flag is added indicating possible cyanide, special precautions are required to avoid exposure to hydrogen cyanide gas. Contact your supervisor prior to adding acid. Always open these samples and add the acid in a hood.

Use spill pillows to absorb large acid spills (small spills are cleaned with wet paper towels.) Use SPILL-X-A powder or equivalent to neutralize any remaining acid and then rinse the area thoroughly with water. Spill pillows and SPILL-X-A are stored on the prep room shelf.

Dispose of acid waste properly. Collect all acid digestions, waste solutions, and expired reagent solutions in waste containers. When the acid waste containers are full, a designated acid waste handler transfers the waste to the acid neutralization tank.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and a documented Demonstration of Capability (DOC) for this or an equivalent procedure.

Initially, each employee performing this digestion procedure must work with an experienced employee for a period of time until they can independently set up batches and perform the necessary steps outlined in this procedure. Proficiency is measured through documentation of the critical steps in this procedure, over checking of data as well as an IDOC.

The IDOC and the DOC consists of four laboratory control samples that are carried through all steps of the analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation.

Sample Collection, Preservation, and Handling:

Samples are collected in either glass or plastic containers with no preservatives. They must be stored at 0 to 6°C, not frozen and digested and analyzed within 28 days of collection.

Digested samples are stored in plastic containers at room temperature. Store samples, standards, and digested samples separately.

Apparatus and Equipment:

1. Polypropylene containers (digestion vessels) - Certified clean and Class A equivalent

2. Balance, capable of reading 0.1 mg

3. Polypropylene covers, (digestion vessel covers)

4. Chemware Ultra-Pure PTFE boiling stones, or equivalent

5. Environmental Express Hotblock (block digestor), adjustable and capable of mainaining a temperature of 95º ± 1°C

6. Computer and software LLENS (Lancaster Laboratories Electronic Notebook System)

Reagents and Standards:

For reagent preparation, shelf life, and storage conditions, see form 1-P-QM-FOR-9008921

A. Store all standards and reagents in polyethylene bottles at room temperature. Label the bottle with the solution name, lot number, date prepared, the expiration date, the initials of the person preparing the solution, and the storage conditions.

B. Standard/ spiking concentration and reagent vendors are subject to change without notification.

C. Reagents, use the following or equivalent:

1. Hydrochloric acid, HCl, 36.5% to 38.0%, Fisher Trace Metal Grade reagent, 1.194 g/mL or equivalent. Store in glass container at room temperature. Follow manufacturer's expiration date.

2. Nitric acid, 70.0% to 71.0% HNO_3, Fisher Trace Metal Grade reagent, 1.428 g/mL or equivalent. Store in glass container at room temperature. Follow manufacturer's expiration date.

3. Potassium permanganate, $KMNO_4$, Baker Analyzed reagent, ACS, or equivalent. Store in glass container at room temperature. Follow manufacturer's expiration date.

4. Sodium chloride, NaCl, J.T. Baker, Certified ACS, or equivalent. Store in plastic container at room temperature. Follow manufacturer's expiration date.

5. Hydroxylamine hydrochloride, $NH_2OH{\bullet}HCl$, J.T. Baker, Certified ACS, or equivalent. Store in plastic container at room temperature. Follow manufacturer's expiration date.

6. 1000 mg/L Hg standard solution, Baker analyzed reagent, or equivalent. Stored in plastic container at room temperature. Follow manufacturer's expiration date.

7. Reagent Water

D. Prepare all standards and spikes solutions following Form 1-P-QM-FOR-9008921.

1. Hg intermediate standard (10 mg/L). Stored in glass container at room temperature. Expires 6 months from date of preparation.

2. Hg intermediate standard (1.0 mg/L). Stored in plastic container at room temperature. Expires 1 week from date of preparation.

E. Prepare all General solutions following Form 1-P-QM-FOR-9008921.

1. Potassium permanganate solution (5%). Stored in glass container at room temperature. Expires 6 months from date of preparation.

2. Aqua regia. Prepare immediately before use.

3. Sodium chloride/hydroxylamine hydrochloride solution. Stored in glass container at room temperature. Expires 6 months from date of preparation.

F. Adjust all additions according to final solution volume if larger or smaller volumes are needed. Thoroughly mix the solution after diluting to volume.

Calibration:

Not applicable to this procedure.

Procedure:

1. Turn block digestor on and allow block to reach the Control Point setting that provides 95° ± 1°C sample temperature. (The block temperature setting is not necessarily the sample temperature.) See below for Block Digestor instructions.

2. Weigh three 0.2000-g aliquots taken from three different areas (combined 0.6000 to 0.6500 g to the nearest 0.0001 g) of a well mixed, as-received sample into a polypropylene digestion vessel. Add 0.6000g to 0.6499g of Chemware Ultra-Pure PTFE boiling stones to the vessel for the method blank and LCS. Enter the blank weight as 0.6000 to 100.0000 final volume and the LCS weight as 1.0000 to 100.0000 final volume in the LLENS.

NOTE: For samples of liquid consistency, increase weight to 1 g (1.0000 to 1.0500 g).

NOTE: For oil samples weigh 0.2000g to 0.2500g (to the nearest 0.0001 g) of sample and add 0.2000g to 0.2499g of Teflon Chips to the blank and LCS container. Enter the blank weight as 0.2000 to 100.0000 final volume and the LCS weight as 1.0000 to 100.0000 final volume in the LLENS.

NOTE: When fish tissues, or other tissue samples are digested by this method, spike the LCS, LCSD in the same manner as the R, and M (Refer Form 1-P-QM-FOR-9008921). Digest tissue samples in their own batch.

3. See Quality Assurance/Quality Control section for required batch Quality Control.

4. See Form 1-P-QM-FOR-9008921for instructions on preparing batch Quality Control. All spiking must be performed prior to starting the digestion procedure.

5. See Form 11-P-QM-FOR-9008921for concentration levels of batch Quality Control.

6. Add about 5 mL reagent water and about 5 mL of aqua regia solution.

7. Place sample containers in block digestor and heat approximately 2 minutes.

8. Remove sample containers from block and allow to cool.

9. Add 50 mL of reagent water and 15 mL of 5% $KMnO_4$ solution and mix. Add additional portions of 5% $KMnO_4$ solution (in 5-mL increments, up to as much as 25mL), if necessary, until the purple color persists for at least 15 minutes. Add the same amount of $KMnO_4$ solution to entire digestion batch. If the maximum amount of 25mL of 5% KMnO4 solution was added and the purple color did not persist for at least 15 minutes, then contact group leader, further dilutions are required. A comment must be placed on the batch sheet documenting the reason for the dilution.

10. Transfer sample containers to block digestor.

11. Place a calibrated thermometer in batch blank container.

12. Put a polypropylene cover on each container.

13. When the thermometer indicates 95° ± 1°C, continue heating for 30 minutes.

14. Remove sample containers from digestion block and allow to cool. Seal container with screw cap.

15. The sample is now ready for analysis.

Block Digestor Instructions:

1. Turn block digestor on by pressing rocker switch located on the cord.

2. Wait about 8 seconds until controller display indicates current block temperature.

3. PRESS and hold STAR (*) key.

4. The display shows the Set Point Temperature.

5. The digits can be changed to the desired value by pressing the up and down arrow keys while holding the (*) key.

6. Confirm Control Point temperature is set to the block temperature that provides 95° ± 1°C sample temperature.

   NOTE: See HotBlock Control Point Temperature Logbook to obtain control point temperature setting for the HotBlock being used for digestion. If necessary, adjust Control Point temperature to the proper setting.

Calculations:

Not applicable to this procedure.

Statistical Information/Method Performance:

Not applicable to this method. See analysis method.

Quality Assurance/Quality Control:

Each digestion batch (up to 20 samples) must contain a method blank, LCS and either an US, D, MS, MSD or an LCS/LCSD.

For sample batch quality control requirements see Analysis #0259, 0159.

Eurofins Document Reference	1-P-QM-WI -9015149	**Revision**	12
Effective Date	Apr 26, 2016	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 4731		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Kerrie Freeburn
Reviewed and Approved by	Heidi Roberts;Review;Friday, March 11, 2016 1:06:09 PM EST Richard Karam;Review;Tuesday, April 12, 2016 4:27:20 PM EDT Ruth Callaghan;Approval;Tuesday, April 12, 2016 4:36:53 PM EDT

Revision Log:

Revision: 12		**Effective Date:** This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Cross Reference	Reflects current process Waste dilution document referenced in this procedure	Removed turbovap reference Added reference to waste dilution procedure
Definitions	Common terms defined in higher level document	Removed section and defined first use of each acronym in text
Personnel Training and Qualifications	Reflects current process	Revised text relating to IDOCs and DOCs
Sample Collection, Preservation, and Handling	Reflects current process	Clarified temperature storage requirements for samples and extracts
Reagents and Standards	Reflects current process Reflects current process	Added the word approximately relative to the baking temperature of sodium sulfate Revised the temperature storage requirement for extraction fluid
Procedure	Enhancement	Added note referencing waste dilution procedure
Procedure 9	Clarification	Added step for visual confirmation of adequate phase separation during shake
Procedure 15	Reflect current process	Added use of hand held bulb to squeeze excess methylene chloride from sodium sulfate column
Procedure 18	Reflects current process	Removed reference to the turbovap. It is no longer used in the prep.
Procedure 16	Enhancement	Added language describing the concentration of extracts
Procedure 21	Reflects current process	Revised the temperature storage requirement for extracts

Revision: 11		**Effective Date:** Aug 20, 2015
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout Document	Reflect re-identification of documents in EtQ	Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Document Title	Enhancement	Change title to include 3580. Separatory Funnel Extraction (Method 3510C) or Waste Dilution (Method 3580A) of Base Neutrals and Acid Extractables in Leachates
Reference	Valid referenced method in LIMS for this procedure	Added Method 3580A.
Basic Principles	Clarification	Clarified pH adjustment to >11 and <2.
Procedure 5.	Clarification	Clarified pH adjustment to >11
Procedure 12.	Clarification	Clarified pH adjustment to <2

Reference:

1. Test Methods for Evaluating Solid Wastes, SW-846 Method 3580A, July 1992

2. Test Methods for Evaluating Solid Wastes, SW-846 Method 3510C, December 1996.

3. *Federal Register*, Friday, June 29, 1990, pp. 26986-26998.

4. *Chemical Hygiene Plan,* current version.

Cross Reference:

Document	Document Title
Analysis #0949, 1309, 1476, 1536, 1946, 1947, 1953, 2035, 2395, 4615, 4678, 4688, 6387, 6397, 7804, 7805, 10032, 10723, 10724, 10727, 10728, 13615, 13618	Semivolatile Organic Compounds, Including DRO/ORO, by Method 8270C in Aqueous and Non-Aqueous Matrices Using GC-MS
1-P-QM-WI-9015150	Waste Dilution Procedure for the Determination of Acid Extractables and Base-Neutrals in a Non-Water Soluble Leachate Matrix
1-P-QM-PRO-9015475	Glassware Cleaning for Organic Extractions
1-P-QM-PRO-9015490	Organic Extraction Standards Storage and Handling

Scope:

This method is for the extraction of semivolatile organic compounds (base neutral and acid extractables) from the toxicity characteristic leachate (TCLP) of liquid, solid, or multi-phase wastes.

Basic Principles:

A 200-mL portion of sample to be analyzed is placed into a 2-L separatory funnel. Surrogate standards are added to each sample to monitor recovery. The pH of the sample is then adjusted to >11 and the sample is serially extracted with methylene chloride. The pH is then adjusted to <2 and the sample is again extracted with methylene chloride. The solvent fractions are combined, and the extract is dried and concentrated to 1.0 mL.

Reference Modifications:

Acid compounds are added at a concentration of 100 ppm in the matrix spiking and laboratory control sample (LCS) solutions so that their concentrations in the extract are within calibration range.

Surrogate and matrix spiking solutions are not added before the transfer to the separatory funnel for several reasons:

1. Samples must be poured from the amber bottles to determine the matrix and volume of sample to use for each extraction.

2. Many sample bottles have no headspace and there is no room to add surrogate to the sample in the bottle.

3. Due to the volume of samples extracted, a separate graduated cylinder for each sample is unrealistic.

4. To maintain consistency with all extractions, no samples are spiked in the bottle or graduated cylinders.

Interferences:

High levels of organic compounds in the sample lead to interferences with normal detection limits.

Impurities in solvents, reagents, glassware, or other hardware used in sample processing lead to interferences with the method. All glassware must be rinsed with solvent before use. A method blank is performed with each batch of samples to demonstrate that the extraction system is free of contaminants.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined. Therefore, each chemical compound must be treated as a potential health hazard. Exposure to these chemicals must be reduced to the lowest possible level by whatever means available such as fume hoods, lab coats, safety glasses, and gloves.

Extracts are concentrated on a steam bath; caution must be exercised while working around this apparatus.

All solvent waste generated from this preparation must be collected for recycling (if applicable) or disposed of in the designated containers. These are transferred to the lab-wide disposal facility. Any solid waste material (disposable pipettes, broken glassware, pH paper) is disposed of in the normal solid waste collection containers.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC) which is maintained in the employees training records.

Initially, each technician performing the extraction must work with an experienced employee for a period of time until they can independently perform the extraction. Proficiency is measured through a documented Initial Demonstration of Capability (IDOC).

The IDOC consists of four laboratory control samples that are carried through all steps of the extraction and analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Various options are available for a DOC and can include four laboratory control samples, or one blind sample.

Sample Collection, Preservation, and Handling:

Samples are collected in amber glass bottles with PTFE-lined lids and stored at 0° to 6°C, not frozen, prior to extraction. Samples must be extracted within 7 days of completion of the leachate. The extract is stored in an amber autosampler vial in the freezer at ≤-10 °C for up to 40 days prior to analysis.

Apparatus and Equipment:

1. 2-L separatory funnel for extracting organic components from an aqueous matrix

2. Kuderna-Danish (K-D) assembly with appropriate ampule for extracting the solvent used during the extraction

3. Steam bath – WVR/LLI Model #1127 or equivalent

4. Graduated Cylinders – Class A, assorted sizes

5. Pipettes – Class A, assorted sizes

6. Pipettes – Disposable

7. Solvent pumps – Beckman or equivalent

8. Balance – Capable of weighing to 0.01g

9. Automatic shaker – Capable of holding 2 L separatory funnels

10. Centrifuge – Beckman GS-6 or equivalent

11. Sodium sulfate columns with extra course frits

12. Micro-snyder columns

13. Wash bottles – Teflon™

14. Vials – assorted sizes

15. Teflon™ boiling chips

Reagents and Standards:

1. Methylene chloride (CH_2Cl_2) – Pesticide grade or equivalent. Store at room temperature for up to 1 year.

2. 10N Sodium hydroxide (NaOH) – Lab Chem or equivalent. Store at room temperature for up to 1 year.

3. Sulfuric acid (H_2SO_4) – ACS grade or equivalent. Store at room temperature for up to 1 year.

4. Sodium sulfate (Na_2SO_4), reagent grade or equivalent – Bake at approximately 400°C for a minimum of 4 hours in a shallow pan prior to use to remove organic contaminants. After baking, store in a glass jar at room temperature for up to 1 year.

5. Extraction Fluid – Prepared and delivered by Department 4028. Store refrigerated in an amber glass bottle at 0° to 6°C, not frozen for up to seven days.

6. All QC standards added during extraction process are prepared by Department 4036 using instructions generated by the standards database. Detailed instructions can be found in the corresponding Analysis #0949, 1309, 1476, 1536, 1946, 1947, 1953, 2035, 2395, 4615, 4678, 4688, 6387, 6397, 7804, 7805, 10032, 10723, 10724, 10727, 10728, 13615, 13618

Preparation of Glassware:

See 1-P-QM-PRO-9015475 (SOP-OE-001).

Calibration:

Not applicable to this procedure.

Procedure:

NOTE: If sample would be an oil and needs a waste dilution, refer to 1-P-QM-WI-9015150.

1. If the sample bottle contains 1 L of sample:

    a. Shake the bottle vigorously.

    b. Use a clean graduated cylinder to measure 200 mL of sample and pour it into a 2-L separatory funnel.

    c. Add 800 mL of reagent water.

    d. Rinse the graduated cylinder with methylene chloride and add the rinseate to the separatory funnel.

    e. Record the initial sample volume and any comments about the sample in the extraction log.

2. The background (BKG), matrix spike (MS), and matrix spike duplicate (MSD) are performed on three separate aliquots of a field sample.

    a. If an MS or MS/MSD is required for the sample and 1 L of sample is available, use 200 mL for each. Follow Procedure steps A.1-A.5.

    b. If an MS or MS/MSD is required for the sample and there is <600 mL of sample, evenly split half of the volume available between the sample and spikes.

        (1) Add enough reagent water to bring the volume in the separatory funnel to 1 L.

        (2) Rinse the graduated cylinder with methylene chloride and add the rinseate to the separatory funnel.

        (3) Record the initial volume and any comments about the sample on the extraction log.

3. The blank, LCS, and laboratory control sample duplicate (LCSD) (if applicable) are prepared using 200 mL of extraction fluid measured into the separatory funnel.

4. Use pipettes to add surrogate and spiking solutions

    a. Ensure the standard drips directly into the aqueous sample without touching the glass side of the separatory funnel to avoid poor recoveries.

    b. Surrogates – 1.0 mL of BNA surrogate to all samples, blanks, and spikes.

    c. Spiking solutions – 1.0 mL of LCS matrix spiking solution is added to the LCS, LCSD (if applicable), MS, and MSD.

(1) If the sample requires any compounds in addition to the priority pollutant semivolatile compounds, 1.0 mL of 100-ppm spike of the compound is added at this time.

(2) See analysis 0949 for spike details.

(3) See 1-P-QM-PRO-9015490 (SOP-OE-017) for storage and handling of spikes.

5. Add10 N sodium hydroxide with a disposable pipette to adjust the pH to >11.

6. Use a solvent pump to measure 60 mL of methylene chloride and add the solvent directly to the separatory funnel.

7. Cap the funnel, invert it, and vent immediately. Handshake and vent frequently until the pressure is stable.

8. Place the separatory funnel on the automatic shaker and shake at the designated speed for 2 minutes with the stopcocks closed.

   NOTE: Shaker speeds vary greatly between instruments so the proper setting is marked on each.

9. Place the separatory funnel on the rack and allow it to sit undisturbed for approximately 10 minutes.

   a. The time required for extracts to set undisturbed is based upon visual confirmation that the layers are adequately separated. Additional time may be necessary for samples with unusual high density (i.e. high salt content).

   b. If an emulsion forms and is >⅓ of the volume of the solvent layer, mechanical techniques such as stirring and centrifugation must be employed to complete the separation.

10. Turn the stopcock and remove the solvent layer (bottom layer) and allow it to flow through approximately 10 cm of sodium sulfate into a K-D apparatus containing a Teflon™ boiling chip.

11. Use a solvent pump to add 60 mL of methylene chloride to the separatory funnel and repeat Procedure Steps 7 through 10 venting only as necessary. The acid extract is also added to this K-D.

12. Add sulfuric acid with a disposable pipette to adjust the sample pH to <2.

13. Using three 60-mL aliquots of methylene chloride, serially extract the sample as described in Procedure Steps 7 through 10 venting only as necessary and collect the solvent in a K-D setup.

14. Rinse the metal beaker with approximately 20 mL of methylene chloride and pour into the sodium sulfate column.

15. Use a wash bottle to rinse the sodium sulfate column with approximately 20 mL of methylene chloride. Use a hand held bulb to squeeze excess methylene chloride from the sodium sulfate column.

16. Attach a 3-ball Snyder column to the K-D, wet with solvent, and concentrate the extract to approximately 1 mL on a water bath at 80° to 90°C. At the proper rate of distillation, the balls of the column will actively chatter, but the chambers will not flood. Adjust the vertical position of the apparatus and the water temperature as needed to complete the concentration in 10 - 20 min.

17. Allow the sample to cool for 10 minutes.

18. Attach a microsnyder to the ampule and concentrate to slightly below 1 mL.

19. Determine the final volume (1.0mL) by placing the extract into an amber-autosampler vial and comparing the level in the vial to a vial containing the targeted final volume.

Add methylene chloride to the extract using a disposable pipette until exactly the same level is in both vials.

20. If too much solvent is added to the sample vial, remove the extract from the vial and concentrate it to slightly less than the targeted final volume and rebottle.

21. Cap the vial securely and store at in the freezer at ≤-10 °C. Record the final volume in the extraction log.

Calculations:

See analysis method.

Statistical Information/Method Performance:

See analysis method.

Quality Assurance/Quality Control:

A batch is defined as the samples to be extracted on any given day but not to exceed 20 field samples. If more than 20 samples are prepared in a day, an additional batch must be prepared.

Each extraction batch must contain a method blank, an LCS, and any matrix type spike samples that are specified on the TCLP nonvolatiles batch sheet must be prepared. In addition, one of the matrix spike samples specified on the TCLP nonvolatile batch sheet must be extracted as MS/MSD. If no matrix spike samples are designated on the TCLP nonvolatile batch sheet, an LCSD must be prepared instead.

If the batch contains only field or equipment blank samples, the LCS/LCSD QC pairing should be used.

If any client, state, or agency has more stringent QC or batching requirements, these must be followed instead.

Eurofins Document Reference	1-P-QM-WI -9015079	**Revision**	18
Effective Date	Apr 13, 2016	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 6654, 10241, 11112, 11113, 11114, 11116, 11117, 11118, 11119, 11120, 11121, 11123, 11126, 11960, 12026, 12822, 13086, 13093, 13183, 13187		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	David Hershey
Reviewed and Approved by	Heidi Roberts;Review;Tuesday, March 29, 2016 1:54:07 PM EDT Susan Goshert;Review;Tuesday, March 29, 2016 5:05:46 PM EDT Ruth Callaghan;Approval;Wednesday, March 30, 2016 8:12:59 AM EDT

Revision Log:

Revision: 18		**Effective Date:** This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Apparatus and Equipment	Reflects current process	Added Turbo Vap tubes and Turbo Vap
Procedure 13	Reflects current process	Added 13.b for analyses that require Turbo Vap concentration
Procedure 18	Reflects current process	Added 18.b for analyses that require Turbo Vap concentration
Procedure 19	Reflects current process	Added 19.b, 19.c, and19.d to differentiate between which steps require Turbo Vap concentration and which steps require steam bath concentration.

Revision: 17		**Effective Date:** Feb 1, 2016
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout document	Reflects current scans that pertain to this procedure	Added Analysis 13092
Reference	Enhancement	Added revision number to SW-846 Method
Definitions	Common terms defined in a higher level document	Removed section and defined first use of acronym in document
Personnel Training and Qualifications	Reflects current process	Revised language regarding IDOCs and DOCs
Sample Collection, Preservation, and Handling	Reflects current process	Revised temperature storage for extracts
Reagents and Standards	Reflects current process Reflects current process	Added the word approximately in regards to the temperature at which sodium sulfate is baked Replaced the word deionized with reagent in the description of reagent water
Procedure 12	Clarification	Added step for visual confirmation of adequate phase separation during shake
Procedure 14, 15, 16	Clarification	Differentiated between the 1 L and 250 mL prep
Procedure 17	Reflect current process	Added use of hand held bulb to squeezed excess methylene chloride through sodium sulfate column
Procedure 18 and 19.b.5	Reflects current process	Added text to describe the rate of extraction
Procedure 19	Reflects current process	Revised final volume accuracy to 0.0 ml

Reference:

1. Test Methods for Evaluating Solid Wastes, SW-846 Method 3510C, Rev. 3, December 1996.

2. USEPA, 40 CFR Part 136, Appendix A, Method 608.

3. USEPA, 40 CFR Part 136, Appendix A, Method 622.

4. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
Analysis #0177, 0950, 0180, 1954	Pesticides in Water by Method 8081A using GC-ECD
Analysis #2257, 2253	Captan and Captafol by Method 8081A in Waters and Solids using GC-ECD
Analysis #5366, 10410, 10593, 12144, 13182, 13186	Organophosphorous Pesticides by Methods 8141A/8141B/622 in Aqueous Samples using GC-NPD
Analysis #6030, 10227	Polychlorinated Biphenyls (PCBs) by Method 608 or 8082 in Waters
Analysis #7572	Pesticides in Aqueous Samples by Method 608
Analysis #10589, 10647	Pesticides in Water by Method 8081B using GC-ECD
Analysis #10591, 13092	Analysis of Polychlorinated Biphenyls (PCBs) by 8082A in Aqueous Samples using GC-ECD
Analysis #12013, 12686	Low Level PCBs in Water by Method 8082/8082A using GC-ECD
1-P-QM-PRO-9015407	Pesticide Extract Cleanup Using Gel Permeation Chromatography
1-P-QM-PRO-9015475	Glassware Cleaning for Organic Extractions
1-P-QM-PRO-9015477	Cleanup Procedures for the Extraction of Pesticides and Polychlorinated Biphenyls (PCBs)
1-P-QM-PRO-9015490	Organic Extraction Standards Storage and Handling

Purpose:

The purpose of this SOP is to provide clear instructions for performing the separatory funnel extraction procedure on samples that are to be analyzed for pesticides and PCBs.

Scope:

This procedure is for the extraction of organochlorine and organophosphorous pesticides and PCBs from wastewaters.

Basic Principles:

An aliquot of the sample is placed into a separatory funnel. The volume of sample extracted is adjusted (if appropriate) depending on the physical appearance of the sample and the volume sent for analysis. A surrogate standard is added to the sample to monitor recovery. The sample is then extracted with methylene chloride. The extract is dried, concentrated, and exchanged to hexane. Several cleanup procedures are available to eliminate matrix interferences before the sample is analyzed. They include sulfuric acid treatment, copper treatment, florisil, and Gel-Permeation Cleanup (GPC).

Reference Modifications:

1. Surrogate and matrix spiking solutions are not added before the transfer to the extractor. For several reasons:

    a. Samples must be poured from the amber bottles to determine the matrix and volume of sample to use for each extraction.

    b. Many sample bottles have no headspace and there is no room to add surrogate to the sample in the bottle.

    c. Due to the volume of samples extracted, a separate graduated cylinder for each sample is unrealistic.

d. To maintain consistency with all extractions, no samples are spiked in the bottle or graduated cylinders.

2. In Procedure Step 19 the joint of the KD is not rinsed with fresh solvent when the ampule is removed. Quad and MDL studies have shown that this step is unnecessary.

Interferences:

Impurities in solvents, reagents, glassware, or other hardware used in sample processing interfere with the method. All glassware must be rinsed with solvent before use. A method blank is performed with each batch of samples to demonstrate that the extraction system is free of contaminants.

Safety Precautions and Waste Handling:

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined. Each chemical compound must be treated as a potential health hazard. Exposure to these chemicals must be reduced to the lowest possible level by whatever means available, such as fume hoods, lab coats, safety glasses, and gloves.

Extracts are concentrated on a steam bath; caution must be exercised while working around this apparatus.

All solvent waste generated from this preparation must be collected for recycling (if applicable) or disposed of in the designated containers. These are transferred to the lab wide disposal facility. Any solid waste material (disposable pipettes, broken glassware, pH paper) is disposed of in the normal solid waste collection containers.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC) which is maintained in the employees training records.

Initially, each technician performing the extraction must work with an experienced employee for a period of time until they can independently perform the extraction. Proficiency is measured through a documented Initial Demonstration of Capability (IDOC).

The IDOC consists of four laboratory control samples that are carried through all steps of the extraction and analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Various options are available for a DOC and can include four laboratory control samples, or one blind sample.

Sample Collection, Preservation, and Handling:

Samples are collected in amber glass bottles with PTFE-lined lids, preserved with sodium thiosulfate, and stored refrigerated at 0 - 6°C, not frozen. Sample extraction must be started within 7 days of collection. Extracts are stored frozen at ≤-10°C.

Apparatus and Equipment:

1. Separatory funnel for extracting organic components from an aqueous matrix

2. Kuderna-Danish (K-D) assembly with appropriate ampule for extracting the solvent used during the extraction

3. Water bath – VWR/LLI Model #1127 or equivalent

4. Sodium sulfate column with extra course frit

5. Nitrogen evaporation (N-Evap) with nitrogen supply – Organomation Associates or equivalent

6. pH paper – Wide range

7. Automatic shaker – Glass Col or equivalent, capable of holding 2-L separatory funnels

8. Pipettes – Class A, assorted sizes

9. Graduated cylinders – Class A, assorted sizes

10. Pipettes – Disposable

11. Solvent dispenser – Brinkmann, adjustable or equivalent

12. Balance – Capable of weighing to 0.01 g

13. Centrifuge – Beckman GS-6 or equivalent

14. Micro-Snyder columns

15. Wash bottles – Teflon

16. Vials – Assorted sizes

17. Teflon boiling chips

18. Syringes - Assorted sizes

19. Micro-pipetter

20. Turbo Vap – Zymark Turbo Vap II concentration station or equivalent

21. Turbo Vap tubes- 250ml Zymark tubes or equivalent

Reagents and Standards:

1. Methylene chloride (CH_2Cl_2) – Pesticide grade or equivalent. Store at room temperature for up to 1 year.

2. Acetone – Pesticide grade or equivalent. Store at room temperature for up to 1 year.

3. Hexane – Pesticide grade or equivalent. Store at room temperature for up to 1 year.

4. 10N Sodium hydroxide (NaOH) – Lab Chem or equivalent. Store at room temperature. Follow manufacturer's expiration date.

5. Sulfuric acid (H_2SO_4) – ACS grade or equivalent. Store at room temperature. Follow manufacturer's expiration date.

6. Sodium Sulfate (Na_2SO_4) – Reagent grade or equivalent. Bake at approximately 400°C for a minimum of 4 hours in a shallow pan to remove organic contaminants. Store in a glass jar at room temperature for up to 1 year after baking.

7. Reagent water – water in which an interferent is not observed at or above the reporting limit for parameters of interest. In general, the reagent water supplied at the taps in the laboratory meets this criterion. If the reagent water does not meet the requirements, see your supervisor for further instructions.

8. Extraction fluid – Prepared and delivered by the leachate department. Store refrigerated at 0-6^{o}C, not frozen, in a glass container with a PTFE-lined lid.

9. All QC standards added during extraction process are prepared by Organic Extractions using instructions generated by the standards database. Detailed instructions can be found in the corresponding analytical
Analysis #0177, 0950, 0180, 1954; Analysis #2257, 2253;
Analysis #5366 10410, 10593, 12144, 13182, 13186; Analysis #6030, 10227;
Analysis #7572; Analysis #10589, 10647; Analysis #10591, 13092; and
Analysis #12013,12686.

Calibration:

Not applicable to this procedure.

Preparation of Glassware:

See SOP 1-P-QM-PRO-9015475.

Procedure:

1. Determine the volume of sample to be used for each extraction. Typically, this is 1L for routine extractions or 250mL for 250mL extractions.

    a. If uncertain of the volume to extract for any sample, ask your supervisor.

    b. Use one full bottle for all analysis scans (with the exception of scan #0950) unless the matrix is poor (thick, lots of sediment, extremely foul odor).

        (1) If using reduced volume due to matrix, take as much as possible while trying to minimize matrix problems. Document why the reduced volume was used.

        (2) Reduced volume aliquots due to matrix are typically are 500, 200, or 100 mL.

c. For analysis 0950:

(1) If the sample bottle contains at least 500 mL of sample, measure 200 mL.

(2) If the sample bottle contains <500 mL of sample, use 1/2 of the available volume or 10 mL, whichever is greater.

(3) If a matrix spike (MS) or MS/matrix spike duplicate (MSD) is required for the sample, use 200 mL each.

d. The background, MS, and MSD are performed on three separate aliquots of a field sample.

2. Prepare the blank, laboratory control sample (LCS), laboratory control sample duplicate (LCSD) (if applicable) with 1 L of reagent water (or 250mL for 250 mL extractions) measured into the separatory funnel.

   Exception: For Analysis #0950 - The blank, LCS, and LCSD (if applicable) are prepared using 200 mL of extraction fluid measured into the separatory funnel.

3. For samples using 1 entire bottle:

   a. Etch the outside of the bottle with a scriber at the meniscus.

   b. Shake the bottle vigorously and then pour the contents into a separatory funnel.

4. For all samples requiring a specified volume:

   a. Shake each bottle vigorously.

   b. Use a clean graduated cylinder to measure the desired volume.

c. Use a wash bottle to rinse the graduated cylinder with methylene chloride and add the rinsate to the separatory funnel.

d. If <1000 mL (or <250mL for 250mL extractions) of sample is used, use a graduated cylinder to add enough reagent water to bring the volume in the extractor to 1-L (or 250mL for 250mL extractions).

5. Record any comments about the sample and the initial volume, if known at this time, on the extraction sheet.

6. Use pipettes to add surrogate standards and spiking solutions to the aqueous sample in the separatory funnel.

a. Be certain the standard drips directly into the aqueous sample without touching the glass side of the separatory funnel to avoid poor recoveries.

b. Surrogates – Surrogates are added to all samples, blanks, and spikes.

The type of surrogate is determined by the analysis scan number. Typically they are as follows:

(1) For analyses 0177, 0180, 0950, 1954, 2257, 6030, 7572, 10589, 10591, 13092, 10647, 13092 – 1.0 mL SW-846 Surrogate (or 1.0 mL of Mini Sep SW846 Surrogate for 250mL extractions).

(2) For analysis 5366, 10593, 10410, 12144, 13182, 13186 – 1.0 mL NP Surrogate

(3) For Analysis #12013, 12686 – 0.1 mL of SW-846 Surrogate

(4) For Analysis #10227 – If entered for prep 11117 use 1.0 mL of SW846 Surrogate (1.0mL of Mini Sep SW846 for 250mL extractions). If entered for prep 13086 use 1.0 mL of 2mL SW846 Surrogate.

c. Spiking Solutions – Spiking solutions are added to the LCS, LCSD (if applicable), MS, and MSD.

(1) The type of spike is determined by an analysis number. Typically they are as follows:

(a) For analysis 6030, 10591, 13092 – 1.0 mL PCB Spike (or 1.0 mL of Mini PCB spike for 250mL extractions)

(b) For analysis 10227 – If entered with prep 11117 use 1.0 mL of PCB spike. If entered with prep 13086 use 1.0 mL of 2mL PCB spike.

(b) For analysis 7572, 10589, 0177 – 1.0 mL SW-846 Spike (or 0.25 mL of SW846 Spike for 250mL extractions)

(c) For analysis 0950 & 10647 – 1.0 mL TCLP Pesticides Spike regardless of initial volume

(d) For analysis 5366 – 1.0 mL Triazine Herb Spike

(e) For analyses 10593 and 10410 – 1.0 mL OPPA Spike (or 1.0 mL of OPPA Mini Spike for 250mL extractions)

(f) For analysis 2257 – 1.0 mL Captan/Captafol Spike

(g) For analysis 0180 – 1.0 mL of Chlordane spike (or 0.25 mL of Chlordane Spike for 250mL extractions)

(h) For analysis 1954 – 1.0 mL of SW846 spike and an additional LCS/LCSD with 1.0 mL of Alaclor

(i) For Analysis #12013 – 0.1 mL of PCB Spike

(j) For Analysis 13093 – 1.0 mL of PCB Spike and prepare a separate LCS/LCSD using 1.0 mL of 5442 Arochlor Spike (or 1.0 mL of Mini PCB spike and separate LCS/LCSD using 1.0 mL of Mini 5442 Arochlor Spike for 250mL extractions)

(k) For Analysis 13182 and 13186 – 1.0mL of Appendix IX Water Spike (or 0.25 mL of Appendix IX water Spike for 250mL extractions).

(2) Spike details can be found in the corresponding analytical SOP(s)

(3) This is changed to accommodate specific-client requirements, if appropriate.

(4) If a sample requires any special compounds in addition to the standard list, an appropriate spike containing those compounds is added at this time.

(5) See SOP 1-P-QM-PRO-9015490 for storage and handling of spikes.

7. Measure and record the pH of the sample using wide-range pH paper.

a. If necessary, adjust the pH to between 5 and 9 using 10N NaOH (to bring up the pH) or concentrated H_2SO_4 (to lower the pH).

b. To adjust the pH, add a few drops of the appropriate solution with a disposable pipette, shake the separatory funnel and re-check the pH.

c. If the pH now falls between 5 and 9, record the adjusted pH on the extraction sheet.

d. If the pH is still out of range, continue adding small aliquots of base or acid, shaking and checking the pH until it is within the specified range.

e. Record the adjusted pH.

NOTE: Any samples from North Carolina require that the volume of acid or base added to the sample to adjust the pH to be recorded on the extraction sheet.

8. If the original sample bottle is empty:

a. Use a solvent pump to measure 60 mL (15 mL for 250 mL extractions) of methylene chloride. Add the methylene chloride to the sample bottle. Then cap the bottle and invert several times. Add the solvent to the separatory funnel.

b. Fill the bottle to the marked level with water and transfer the water to a graduated cylinder to determine the initial volume.

c. Alternatively, for all analyses **except Analysis #7572, and analysis 6030 (Method 608)** weigh the empty bottle and tare the balance.

(1) Fill the bottle to the marked level with water and place the bottle onto the tared balance.

(2) This weight rounded to a whole number is the initial sample volume.

d. Record the initial volume on the extraction sheet.

9. If the sample container is not empty, measure 60 mL (15 mL for 250mL extractions) of methylene chloride and add the solvent directly to the separatory funnel.

10. Cap the funnel, invert it, and vent immediately.

11. Place the sample on the automatic shaker and shake at the designated speed for 2 minutes with the stopcocks closed.

    NOTE: Shaker speeds vary greatly between instruments so the proper setting is marked on each.

12. Place the separatory funnel on the rack and allow it to sit undisturbed for approximately 10 minutes.

    a. The time required for extracts to set undisturbed is based upon visual confirmation that the layers are adequately separated. Additional time may be necessary for samples with unusually high density (i.e. high salt content).

    b. If an emulsion forms and is greater than 1/3 of the volume of the solvent layer, mechanical techniques such as stirring and centrifugation must be employed to complete the separation.

13 Remove the solvent layer.

    a. Remove the solvent layer by opening the stopcock and collecting the solvent in a metal beaker for 1L extractions (the solvent layer from 250mL extractions goes directly into the sodium sulfate column) then pour through approximately 10cm of sodium sulfate into a K-D apparatus containing a Teflon boiling chip.

    b. For analyses 5366, 10593, 10410, 12144, 13182, and 13186, remove the solvent layer by opening the stopcock and collecting the solvent in a metal beaker. The solvent layer is then poured into a sodium sulfate column and collected in a Turbo Vap tube.

NOTE: Do not use more than the recommended quantity of sodium sulfate and take care not to transfer water into the column. Excessive sodium sulfate and/or water in the column results in low aldrin recovery.

14. Use a solvent pump to add 60 mL (15mL for 250mL extractions) of methylene chloride to the separatory funnel and repeat Procedure Steps 10 through 13, venting only as necessary.

15. Again, use a solvent pump to add 60 mL (15 mL for 250mL extractions) of methylene chloride to the separatory funnel and repeat Procedure Steps 10 through 13, venting only as necessary.

16. For 1L extractions only, rinse the metal beaker that was used for solvent collection with approximately 20 mL of methylene chloride. Pour into salt column.

17. Rinse salt column with approximately 20 mL (5mL for 250mL extractions) of methylene chloride. Use a hand held bulb to squeeze through any excess methylene chloride.

18. Concentrate the extract.

    a. Attach a 3-ball Snyder column to the K-D, wet with solvent, and concentrate the extract to approximately 3 to 5 mL on a steam bath at 85° to 99°C. Adjust the vertical position of the apparatus and the water temperature, as required, to complete the concentration in 10-20 minutes. At the proper rate of distillation the balls of the column will actively chatter, but the chambers will not flood. This steam bath temperature ensures concentration in a reasonable length of time.

    b. For analyses 5366, 10593, 10410, 12144, 13182, and 13186, place the Turbo Vap tubes in a Turbo Vap with the temperature set between 45°and 50°C.

    To avoid loss of analytes do not allow the ampule or Turbo Vap tube to go dry

19. Allow the sample to cool for 10 minutes.

    a. If the sample does not require GPC and a steam bath concentration is required.

        (1) Use a graduated cylinder to add approximately 50 mL of hexane directly to the K-D through the Snyder column.

        (2) Concentrate until a volume of 3 to 5 mL is achieved.

        (3) Remove the sample from the bath and allow the sample to cool for 10 minutes.

        (4) Remove the ampule and use a wash bottle to adjust the final volume to exactly 10.0 mL with hexane in a calibrated ampule

            Exception:

            (a) If samples are scheduled for Prep 12026, remove the ampule and place on an N-evap until the volume is below 5 mL. Adjust the final volume to 5 mL with hexane in a calibrated ampule.

            (b) If samples are scheduled for Prep 13093 or are 250mL preps, remove the ampule and place on an N-evap until the volume is below 2mL. Adjust the final volume to 2mL with Hexane in a calibrated ampule.

        (5) Mix thoroughly with a disposable pipette.

    b. if the sample does not require GPC and a Turbo Vap concentration is required.

        (1) Use a graduated cylinder to add approximately 50ml of hexane directly to the Turbo Vap tube.

(2) Concentrate until a volume of <2 ml is achieved.

(3) Remove the sample from the Turbo Vap. Quantitatively transfer the extract with hexane into a calibrated ampule and bring to a final of 10ml for 1liter preps and to 2ml for 250ml preps.

(4) Mix thoroughly with a disposable pipette.

c. If the sample requires GPC and a steam bath concentration is required.

(1) Remove the ampule and adjust the final volume to exactly 10.0 mL with methylene chloride.

(2) Mix thoroughly with a disposable pipette.

(3) Perform GPC cleanup following SOP 1-P-QM-PRO-9015407.

(4) Once the GPC cleanup is completed, place the extract in a K-D containing a Teflon boiling chip.

(5) Attach a 3-ball Snyder column to the K-D, wet with solvent, and concentrate the extract to approximately 3 to 5 mL on a steam bath at 85° to 99°C. Adjust the vertical position of the apparatus and the water temperature, as required, to complete the concentration in 10-20 minutes. At the proper rate of distillation the balls of the column will actively chatter, but the chambers will not flood.

(6) Allow the sample to cool for 10 minutes.

(7) Use a graduated cylinder to add approximately 50 mL of hexane directly to the K-D through the Snyder column.

(8) Concentrate until a volume of 3 to 5 mL is achieved.

(9) Remove the sample from the bath and allow the sample to cool for 10 minutes.

(10) Remove the ampule and use a wash bottle to adjust the final volume to exactly 5.0 mL with hexane.

(11) Mix thoroughly with a disposable pipette.

d. If the sample requires GPC and Turbo Vap concentration is required.

(1) Remove the Turbo Vap tube from the Turbo Vap. Quantitatively transfer the extract into a calibrated ampule and bring to a final volume of 10ml with methylene chloride.

(2) Mix thoroughly with a disposable pipette.

(3) Perform GPC cleanup following SOP 1-P-QM-PRO-9015407.

(4) Once the GPC cleanup is completed, place the extract in a Turbo Vap tube.

(5) Place the Turbo Vap tube in a Turbo Vap with the temperature set between 45° to 50°C. Concentrate the extract to approximately 3 to 5ml.

(6) Use a graduated cylinder to add approximately 50ml of hexane directly into the Turbo Vap tube and concentrate to approximately 2ml.

(7) Remove the sample from the Turbo Vap. Quantitatively transfer the extract into a calibrated ampule using hexane to bring to a final volume of 5ml.

20. Complete Procedure Steps 21 through 24 as needed.

21. If the extract is scheduled for analysis 6030, 10227 or 12013 treat the extract with sulfuric acid as described in SOP 1-P-QM-PRO-9015477.

22. If the extract is scheduled for Analysis #7572 florisil the sample 2 mL to 2 mL as described in the Pesticide Florisil section of SOP 1-P-QM-PRO-9015477.

    Pesticide florisil is also being performed for analysis 0177, 0950, 2257 and 10589 if required due to matrix or client request.

23. If the extract is scheduled for analysis 6030, 10227 or 12013 florisil the extract following the PCB Florisil section of SOP 1-P-QM-PRO-9015477.

24. If the extract has a sulfur odor, perform copper cleanup of the extract as described in SOP 1-P-QM-PRO-9015477 for analysis 6030 only. Other samples are cleaned up with GPC.

Calculations:

See analysis method as listed in the Cross Reference section.

Statistical Information/Method Performance:

See analysis method as listed in the Cross Reference section.

Quality Assurance/Quality Control:

A batch is defined as the samples to be extracted on any given day, but not to exceed 20 field samples. If more than 20 samples are prepared in a day, an additional batch must be prepared. Exception: For analyses referencing Methods 608 or 622 (i.e. 7572, 6030, 11119 or 11123) batches cannot exceed 10 field samples.

For each batch of samples extracted a blank, an LCS, an MS and an MSD must be extracted. For method 608, the laboratory must, on an ongoing basis, spike at least 10% of the samples, if enough sample volume is received, to assess accuracy. If there is limited sample preventing the preparation of the MS/MSD, an LCSD must be prepared instead. If the batch contains only field or equipment blank samples, the LCS/LCSD QC pairing must be used.

If any client, agency, or state has more stringent QC or batch requirements, these must be followed instead.

Eurofins Document Reference	1-P-QM-WI -9015104	**Revision**	7
Effective Date	Dec 3, 2015	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 10497, 11140, 13100		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Heidi Roberts
Reviewed and Approved by	Susan Goshert;Review;Tuesday, October 6, 2015 12:17:32 PM EDT Richard Karam;Review;Wednesday, November 18, 2015 3:51:56 PM EST Barbara Reedy;Approval;Thursday, November 19, 2015 9:15:32 AM EST

Revision Log:

Revision: 7		**Effective Date:**	This version
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Historical/Local Document Number	Added new analysis to procedure		Add 13100 to historical document number.
Procedure	Updated to current process		Added information about sample aliquot

Revision: 6		**Effective Date:**	Sep 29, 2014
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Throughout Document	Reflect re-identification of documents in EtQ		Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Document Title	Enhancement		Added Method 3546
Cross Reference	Deactivated		Removed analysis 1216, 5108, 2033, 10885.
Sample Collection, Preservation, and Handling	Reflects current industry standards		Updated refrigeration conditions from $4^{o} \pm 2^{o}C$.
Reagents and Standards 5.	Deactivated LIMS scans		Removed analysis 1216, 5108, 2033, and 10885.
Procedure 8.	Enhancement		Added information on temperature of microwave and documentation

Reference:

1. Test Methods for Evaluating Solid Wastes, SW-846 Method 3546, Revision 0, February 2007.

2. *Chemical Hygiene Plan*, current version.

3. MARS Operation Manual, Revision 2, February 2006.

Cross Reference:

Document	Document Title
Analysis #0042, 1030, 6011, 7512, 10225, 10736, 10906, 12800, 13236	Polychlorinated Biphenyls (PCBs) by Method 8082 in Solids and Wipes
Analysis #2487	Food and Tissue Preparation
1-P-QM-PRO-9015407	Pesticide Extract Cleanup Using Gel Permeation Chromatography
1-P-QM-PRO-9015475	Glassware Cleaning for Organic Extractions
1-P-QM-PRO-9015477	Cleanup Procedures for the Extraction of Pesticides and Polychlorinated Biphenyls (PCBs)
1-P-QM-PRO-9015490	Organic Extraction Standards Storage and Handling

Purpose:

The purpose of this SOP is to clearly outline the steps taken to extract solid samples for analysis of PCB compounds using microwave technology.

Scope:

This procedure is applicable for the extraction of PCBs from soils or solid wastes.

Basic Principles:

A portion of sample to be analyzed is placed in an extraction vessel. Surrogate standards are added to each sample to monitor recovery. The vessel is then loaded into the microwave and extracted. The organic compounds present in the sample dissolve in the solvent, which is then removed. The sample is then concentrated and bottled.

Several cleanup procedures may be required to eliminate matrix interferences before the sample can be analyzed. They include: sulfuric acid treatment, florisil, copper, and gel-permeation cleanup (GPC).

Reference Modifications:

The KD is not removed from the steam bath and cooled before adding hexane. The Snyder column is not removed for the solvent addition; therefore, the KD does not have to be cool.

Double volumes of surrogates and matrix spiking solutions are not added when a sample requires gel-permeation cleanup. Instead, the extract is concentrated to one-half the normal final volume after GPC to make up for the loss on GPC and maintain the limit of quantitation.

The Joint of the K-D is not rinsed with fresh solvent when the ampule is removed. Quad and MDL studies have shown that this step is unnecessary.

Definitions:

1. GPC – Gel Permeation Cleanup

2. Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) – A sample of known composition analyzed with each batch of samples to demonstrate laboratory accuracy. The samples either naturally contain the analytes of interest or are clean samples fortified with known concentrations. Used to demonstrate laboratory accuracy. A duplicate is a second aliquot of a sample that is treated identically to the original to determine precision of the test.

3. Matrix spike/matrix spike duplicate (MS/MSD) – A sample created by fortifying a second aliquot of a water or soil sample with some or all of the analytes of interest. The concentration added is known and compared to the amount recovered to determine percent recovery. Matrix spike recoveries provide information about the accuracy of the method in light of the matrix analyzed. A duplicate is a second aliquot of a sample that is treated identically to the original to determine precision of the test.

4. Surrogates – Organic compounds which are similar to the analytes of interest but are not naturally occurring in environmental samples. Surrogates are spiked into all standards and every field and QC sample prior to extraction and analysis to provide information regarding the effects of the sample

Interferences:

Method interferences may be caused by impurities in solvents, reagents, glassware, or other hardware used in sample processing. All glassware is rinsed with solvent before use and a method blank is performed with each batch of samples to demonstrate that the extraction system is free of contaminants.

Safety Precautions and Waste Handling:

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound must be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available, such as fume hoods, lab coats, safety glasses, and gloves.

Since the extracts are concentrated on a steam bath, caution must be exercised while working around this apparatus.

All solvent waste generated from this preparation must be collected for recycling (if applicable) or must be disposed of in the designated containers. These will then be transferred to the lab-wide disposal facility. Any solid waste material (disposable pipettes, broken glassware, pH paper) may be disposed of in the normal solid waste collection containers.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC) which is maintained in the technicians training records.

Initially, each technician performing the extraction must work with an experienced employee for a period of time until they can independently perform the extraction. Proficiency is measured through a documented Initial Demonstration of Capability (IDOC).

The IDOC and the DOC consists of four laboratory control samples (or alternatively, one blind sample for the DOC) that are carried through all steps of the procedure and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation.

Sample Collection, Preservation, and Handling:

Samples are collected in wide-mouth glass jars with PTFE-lined lids and stored under refrigeration at 0º to 6º C, not frozen, prior to extraction. Samples must be extracted within 14 days of collection. Extracts are stored in the freezer at -10° to -15°C.

Apparatus and Equipment:

1. MARS Xpress – CEM Corp. or equivalent

2. Kuderna-Danish (K-D) assembly with appropriate ampule for concentrating the solvent used during concentration

3. Steam bath, VWR/LLI Model #1127 or equivalent
4. N-Evap with nitrogen supply
5. Beakers – Stainless steel, assorted sizes
6. Pipettes – Class A, assorted sizes
7. Graduated cylinders – Class A, assorted sizes
8. Pipettes – Disposable
9. Balance – Capable of weighing to 0.01 g
10. Teflon®-wash bottles
11. Vials – Assorted sizes
12. Teflon®-boiling chips
13. Forceps
14. Scoop
15. TurboVap II concentration workstation w/appropriate concentration tubes – Zymark or equivalent
16. Funnels – stainless steel or Teflon®
17. Extraction vessels
18. Frits – Various
19. Sodium Sulfate Columns

Reagents and Standards:

1. Hexane – Pesticide grade or equivalent. Fisher Optima grade or equivalent, stored in a FisherPak at room temperature for one year after receipt

2. Acetone – Pesticide grade or equivalent. Fisher Optima grade or equivalent, stored in a FisherPak at room temperature for one year after receipt

3. Methylene Chloride (CH_2Cl_2) – Pesticide grade or equivalent. Fisher Optima grade or equivalent, stored in a FisherPak at room temperature for one year after receipt

4. Sodium Sulfate (Na_2SO_4) – Reagent grade or equivalent. Bake at 400°C for a minimum of 4 hours in a shallow pan prior to use to remove organic contaminants. After baking, store in a glass jar at room temperature for up to 1 year.

5. All QC standards added during extraction process are prepared by Organic Extractions using instructions generated by the standards database. Detailed instructions can be found in the corresponding Analysis #0042, 1030, 6011, 7512, 10225, 10736, 10906, 12800, 13236.

Preparation of Glassware:

See 1-P-QM-PRO-9015475 (SOP-OE-001).

Calibration:

Not applicable to this procedure

Procedure:

1. Sample aliquot

    a. If Sample Registration has pre-weighed the sample into a glass jar, add 5g of sodium sulfate, mix and proceed.

    b. If the sample is not pre-weighed, weigh 30.0 - 30.5 g of sample into a labeled stainless steel beaker.

        (1) Record the initial weight and any comments about the sample in the extraction log.

        (2) Alternative sample weights may be used to meet certain reporting limits. However, if sample weight <30.5 is used the sample must be divided among multiple vessels and the extracts combined.

    c. Process all tissues by Analysis #2487 prior to extraction.

    d. Add 5 g of sodium sulfate to each sample and mix.

        (1) If the sample has high water content or is a clay-like soil, add an additional 10 g of sodium sulfate.

        (2) Mix the sodium sulfate and sample until a free-flowing consistency is reached.

    e. The Blank, LCS, and LCSD (if applicable) are prepared by filling a Teflon® extraction vessel with 35.0 g of sodium sulfate.

        Record 30.0 g on the extraction log. (The sodium sulfate used for the QC samples is measured out as 35.0 grams to account for the 30 gram “sample” plus the 5 grams of sodium sulfate.)

2. Carefully place each sample into its clearly marked corresponding extraction vessel. A funnel is be used to prevent spillage and loss of sample.

3. Use pipettes to add surrogate standards and spiking solutions.

    a. Surrogates – 1.0 mL of SW846 surrogate is added to all samples (including QC).

    b. Spiking solutions – 1.0 mL of PCB spiking solution is added to the LCS, LCSD if applicable, MS, and MSD.

    c. This may change to accommodate specific client requirements.

    d. See 1-P-QM-PRO-9015490 (SOP-OE-017) for storage and handling of spikes.

4. Add 30 mL of 50% acetone in methylene chloride to each vessel.

5. Cap each vessel according to manufacturer's guidelines.

6. Invert each vessel to ensure mixing of sample and solvent.

7. Place the vessels into the carousel. When all samples are loaded, place the carousel into the microwave.

8. Run Program "LL1". See Table I for Instrument conditions. Verify that the run reached 100°C and document on the batchlog.

9. Uncap the cooled vessel. Pour the extract and sample into a column filled with approximately 10cm of sodium sulfate on top of a Kuderna-Danish (K-D) assembly containing a Teflon®-boiling chip. Rinse the vessel with 10-20 mL of hexane from a wash bottle.

10. Place a 3-ball Snyder column on the K-D set-up, wet the column with hexane, and concentrate over a steam bath which is at 85° to 99°C.

    This steam bath temperature ensures concentration in a reasonable length of time.

    If the sample requires GPC, skip step 11.

11. When the apparent volume is 3 to 5 mL, using a graduated cylinder, add approximately 50 mL of hexane directly to the KD through the Snyder column.

    Do not allow the ampule to go dry since loss of analytes will result.

12. When the apparent volume again reaches 3 to 5 mL, remove from the steam bath and allow to cool for 10 minutes. Remove the ampule and using a wash bottle adjust the final volume to exactly 10 mL with hexane in a calibrated ampule.

    NOTE: If the sample requires GPC, N-Evap to approximately 1 mL, then adjust the final volume to exactly 10 mL with methylene chloride instead of hexane. N-Evap if necessary. Mix thoroughly with a disposable pipette.

13. If the sample requires GPC, perform GPC cleanup following 1-P-QM-PRO-9015407 (MC-OE-004). When GPC cleanup is complete, concentrate the extract as described above including Step 11. However, in Step 12, adjust the final volume to exactly 5 mL with hexane instead of 10 mL.

14. Treat the 10 mL extract with sulfuric acid as described in 1-P-QM-PRO-9015477 (SOP-OE-004).

15. Florisil the extract following the PCB Florisil section of 1-P-QM-PRO-9015477

16. Perform copper cleanup of the extract as described in 1-P-QM-PRO-9015477

17. Bottle twice in an appropriately labeled crimp-top autosampler vial, and place the remaining extract in an appropriately labeled screw-cap vial.

18. All extracts are stored in the freezer.

Calculations:

See analysis method.

Statistical Information/Method Performance:

See analysis method.

Quality Assurance/Quality Control:

A batch is defined as the samples to be extracted in any given day but not to exceed 20 field samples. If more than 20 samples are prepared in a day, an additional batch must be prepared.

For each batch of samples extracted, a blank, LCS, MS, and MSD must be extracted. If insufficient volume of sample is available for MS/MSD, then an LCSD must be prepared instead.

If any client, state, or agency has more stringent QC or batching requirements, these must be followed.

Table I

Power:	1600W
Ramp Temperature:	100°C
Ramp Time:	30 minutes
Hold Time:	10 minutes
Cool Down Time:	20 minutes

Eurofins Document Reference	1-P-QM-WI -9015086	**Revision**	11
Effective Date	Feb 1, 2016	**Status**	Effective
Historical/Local Document Number	Analysis DOD - 0947, 1339		
Local Document Level	Level 3		
Local Document Type	TEST - Testing Document		
Local Document Category	ANALYSIS-ES - Analysis-Environmental Science		

Prepared by	Darin Wagner
Reviewed and Approved by	Richard Karam;Review;Monday, January 18, 2016 1:56:16 PM EST Ruth Callaghan;Approval;Monday, January 18, 2016 4:04:33 PM EST

Revision Log:

Revision: 11		**Effective Date:** This version
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout Document	Reflects re-identification of documents in EtQ	Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Personnel Training and Qualification	Reflects current process	Added paragraph discussing the performance of IDOCs and DOCs
Sample Collection, Preservation, and Handling	Reflects current process	Revised temperature storage condition for samples
Reagents and Standards	Reflects current process Reflects current process Referenced documents are higher level documents	Added temperature storage conditions and expiration date information to reagents Replaced the word deionized with reagent regarding the description of reagent water Deleted step to label prepared reagents
Procedure A.14 and C.7	Reflects current process	Revised temperature from 77 to 77.0 °C
Procedure B. 10. and C. 3.	Reflects current process	Removed references to temperature range.
Table 1	Reflects current bottle codes in use	Replaced bottle code 31 with 43 for pesticides

Revision: 10		**Effective Date:** Apr 14, 2011
Section	**Justification**	**Changes**
Revision Log	Formatting requirements per LOM-SOP-LAB-201	Removed revision logs up to the previous version.
Personnel Training and Qualifications	Formatting requirements per LOM-SOP-LAB-201	Added required text
Reagents and Standards	Enhancement Reflects current practices No longer used	Added reagent water with definition. Added the abbreviation Hac for glacial acetic acid since this is the abbreviation used in the prep log Added storage conditions and expiration date. Remove reference to 5N nitric acid
Calibration	Formatting requirements per LOM-SOP-LAB-201	Added required section
Preliminary Solids Determination and Procedure	Reflects current practices	Broadened the sample weighing tolerance.

Reference:

1. *Test Methods for Evaluating Solid Wastes*, SW-846 Method 1311, July 1992.

2. *Chemical Hygiene Plan*, current version.

Cross Reference:

Document	Document Title
1-P-QM-PRO-9015525	Glassware Cleaning for Leachate Extractions
1-P-QM-PRO-9015526	Leachate Blank Evaluations
1-P-QM-PRO-9015527	Subsampling and Preservation of Leachates

Scope:

This method is designed to determine the mobility of organic and inorganic nonvolatile contaminants in potentially hazardous waste. The extraction is performed over an 18 hour period.

Basic Principles:

For liquid wastes (containing <0.5% solids), the TCLP extract is defined as the filtrate resulting from filtration of the waste through a 0.6- to 0.8-µm glass fiber filter.

For wastes containing ≥0.5% solids (and some liquid), the waste is filtered through a glass fiber filter and the filtrate is stored for later use. The alkalinity of the solid portion is determined and the result indicates which extraction fluid is to be used. The solid is then extracted with a volume of extraction fluid 20× the weight of the solid. Following the extraction, the leachate is filtered through a glass fiber filter and the final and initial filtrates are combined.

For wastes which will obviously yield no liquid when subjected to pressure filtration, the sample is analyzed for alkalinity and extracted with a volume of appropriate extraction fluid at 20× the sample weight. The extract is then filtered and the leachate is defined as the filtrate.

Interferences:

Any potential interferences are discussed in the individual analytical methods.

Safety Precautions and Waste Handling:

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state and local laws and regulations.

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

Follow routine safety steps. Special care must be taken when mixing the acid solution. Wear gloves, lab coat, and safety glasses when preparing the solution and handling samples. Read all lab notes and follow instructions carefully. Avoid skin contact or breathing the vapors from any of the reagents or samples. Use the appropriate ventilation system (bench top or hood) when instructed, if the sample looks suspicious (plating waste contains cyanide), or is particularly odoriferous.

If the sample fumes or reacts in any way when the acid is added during the extraction procedure, vent the sample periodically until the reaction is no longer evident.

Discard or send for repair any glassware that is chipped, flawed, or broken.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding and agreeing to follow the current version of this SOP and an annual documented Demonstration of Capability (DOC) which is maintained in the technicians training records.

Initially, each technician performing the extraction must work with an experienced employee for a period of time until they can independently perform the extraction. Proficiency is measured through a documented Initial Demonstration of Capability (IDOC).

The IDOC consists of four laboratory control samples that are carried through all steps of the sample preparation and analysis and meet the defined acceptance criteria. The criteria include the calculation of mean accuracy and standard deviation. Various options are available for a DOC and can include four laboratory control samples, or one blind sample.

Sample Collection, Preservation, and Handling:

Samples must not be preserved and are stored at ≤ 6°C, not frozen.

Samples for organic analysis must be collected in glass containers with PTFE-lined lids.

The holding time is from time of collection to time the leachate extraction starts. The holding time is:

14 days for semivolatile or pesticide/herbicide analysis.

28 days for mercury analysis.

180 days for metals analysis, other than mercury.

Evaluate the solid waste for particle size. The material must be able to pass through a 9.5-mm sieve or have a diameter of <1 cm with visual inspection. If the particle size does not meet this criteria, have the sample subcontracted for pulverization (if it is a stone-like material) or cut the material into smaller pieces if possible.

Apparatus and Equipment:

1. Agitation apparatus (tumbler) – This must be an EPA-approved device which is capable of rotating the extraction vessels at 30 ±2 rpm in an end-over-end manner.

2. Extraction vessel – The extraction vessel must be a jar large enough to contain the volume of extraction fluid required (within the limitation of tumbler space). The vessel must be made of Borosilicate glass, Teflon, or polyethylene.

3. Filtration device – The Millipore Hazardous Waste Filtration system is suitable (also known as pressure filters).

4. Vacuum filtration system – Consisting of a vacuum flask, filter holder, and hose.

5. Glass fiber filters (0.6- to 0.8-µm pore size) – Assorted sizes

6. Beakers – Assorted sizes

7. Stirring hot plates

8. Thermometer – Capable of reading temperatures up to 70°C

9. pH meter – Orion Model 210 or equivalent – Capable of 0.01 pH unit display

10. Watch glasses

11. Graduated cylinders – Class A, assorted sizes

12. Glass jar for combining extracts

13. Glass bottles – Assorted sizes

14. Jug for preparing extraction fluid

15. Gooch crucible

16. Pipettes – Class A, assorted sizes

17. Balance – Capable of weighing to 0.01 g

18. Dispensette® Bottle-top Dispenser

19. 1 mm sieve

Reagents and Standards:

1. Reagent water – water in which an interferent is not observed at or above the reporting limit for parameters of interest. In general, the reagent water supplied at the taps in the laboratory meets this criterion. If the reagent water does not meet the requirements, see your supervisor for further instructions.

2. Concentrated hydrochloric acid (HCl) - ACS reagent grade; stored at room temperature per manufacturer's expiration date

3. Glacial acetic acid (CH_2COOH) – reagent grade, abbreviated as Hac in prep logbook, stored at room temperature per manufacturer's expiration date

4. 10 N sodium hydroxide (NaOH) – reagent grade, purchased, stored at room temperature per manufacturer's expiration date

5. Concentrated nitric acid (HNO_3) - ACS reagent grade, stored at room temperature per manufacturer's expiration date

6. Metals Spike A – VHG Labs ZLANLABCM#1 or equivalent.

   This is stored at room temperature for up to one year.

7. Metals Spike B – VHG Labs ZLANLABCM#2 or equivalent.

   This is stored at room temperature for up to one year.

8. 1 N hydrochloric acid (HCl)

    a. Use a graduated cylinder to slowly add 83 mL of concentrated HCl to approximately 500 mL reagent water in a 1000-mL volumetric flask.

    b. Dilute the solution to volume with reagent water. Remake every 6 months.

    c. Store in a glass bottle at room temperature.

9. Extraction Fluid #1

    a. Use a graduated cylinder to add 57 mL of glacial acetic acid to approximately 5000 mL reagent water in a 10 L jug.

    b. Use a graduated cylinder to add 65 mL of 10 N NaOH.

    c. Dilute with the solution to volume with reagent water.

    d. The pH of this fluid must be 4.93 ±0.05.

    e. Record the preparation and the pH of the extraction fluid in the appropriate logbook.

    f. This solution must be prepared daily.

    g. It is acceptable to prepare this solution in other volumes as long as the ratio of acetic acid and NaOH to final volume is maintained.

10. Extraction Fluid #2

    a. Use a graduated cylinder to add 57 mL of glacial acetic acid to approximately 5000 mL reagent water in a 10 L jug.

    b. Dilute the solution to volume with reagent water.

c. The pH of this fluid must be 2.88 ±0.05.

d. Record the preparation and the pH of the extraction fluid in the appropriate logbook.

e. This solution must be prepared daily.

e. It is acceptable to prepare this solution in other volumes as long as the ratio of acetic acid to final volume is maintained.

11. 1 N nitric acid (HNO_3)

a. Use a graduated cylinder to slowly add 64 mL of concentrated HNO_3 to approximately 500 mL reagent water in a 1000-mL volumetric flask.

b. Dilute the solution to volume with reagent water.

c. Remake every 6 months.

d. Store in a glass bottle at room temperature.

12. Acid washed filters - Used if the leachate is to be analyzed for metals. Prewashed filters are purchased.

Alternatively, prepare the filter as follows:

a. Assemble the filtration apparatus with the filter in place.

b. Cover the filter with 1 N nitric acid by pouring the acid from the bottle.

c. Apply vacuum or pressure (whichever is appropriate) until the filter is dry.

d. Using a graduated cylinder, pour a minimum of 100 mL reagent water into the apparatus.

e. Apply vacuum or pressure until the filter is dry.

f. If a vacuum apparatus was prepared, discard the waste acid/water mixture and rinse the flask several times with reagent water.
If a pressure filter was prepared, discard the waste acid/water mixture.

Glassware Cleaning:

See 1-P-QM-PRO-9015525 (SOP-TL-001).

Determining the Amount of Extract to Prepare:

1. Look up the leachate sample in LIMS, under the sample data program.

2. Note the analyses requested. Information about sample requirements is found in Table I.

3. Add up the sample volume required and divide by 20 to determine how much sample must be extracted.

4. Perform an additional extraction if the volume from a single TCLP extraction is not anticipated to be sufficient to perform all the required analyses.
The leachates from multiple extractions are combined and then divided for analysis.

Preliminary Solids Determination:

If the waste appears to be liquid and seems to contain a very low percentage of solids, perform the solids determination. The *Federal Register* TCLP method defines percent solids as that fraction of a waste sample from which no liquid is forced out by an applied pressure.

1. Preweigh the filter in a gooch crucible and record the weight in the percent solids determination section of the nonvolatile prefilter spreadsheet (see Figure 1).

2. Weigh out a subsample of the waste.

   a. Weigh out 100g to 101g of sample into a graduated cylinder (if there is adequate sample for the leachate and other analyses required. If not, use proportionally less). Record the sample number and the weight of the sample plus the graduated cylinder on the spreadsheet.

   b. Pour the sample into the vacuum filter apparatus and slowly apply vacuum until no liquid flows through the filter.

   c. Reweigh the graduated cylinder. Record the weight of the graduated cylinder and residue adhered to the cylinder. The spreadsheet calculates the weight of sample filtered.

3. The material in the filter holder is defined as the solid phase (sludge cake and filter) of the waste and the liquid phase is the filtrate.

4. Weigh the sludge cake and filter and record the weight on the spreadsheet.

5. The spreadsheet determines the percent solids using the calculation listed below:

$$\%\ Solids = \frac{Weight\ of\ solid\ recovered}{Weight\ of\ sample\ filtered} \times 100$$

6. If the percent solids is <0.5%, print spreadsheet and go to Procedure Section A of this document.

7. If the percent solids is between 0.5% and 2.0%, dry the filter and solid at 100° ±20°C until two successive weighings yield the same value within ±1%. Record each weight on the spreadsheet. The percent dry solids are determined using the following calculation:

$$\%\ Dry\ Solids = \frac{Weight\ of\ dried\ solid\ recovered}{Weight\ of\ sample\ filtered} \times 100$$

8. If the percent dry solids is <0.5%, print the spreadsheet and go to Procedure A. If the percent dry solids is ≥0.5%, go to Procedure Section B of this document.

Calibration:

Not applicable to this procedure

Procedure:

A. If the sample contains <0.5% solids

1. Filter the waste through glass fiber filter (0.6 to 0.8 µm). The filter must be acid washed if the leachate is to be analyzed for metals. The filtrate is defined as the TCLP extract.

2. Determine and record the pH of this extract in the logbook.

3. Change the analysis from 0947 to 1339 in LIMS. Enter the appropriate comments and preserve the subsamples as per 1-P-QM-PRO-9015527 (SOP-TL-003) and Table I.

B. If the sample contains ≥0.5% solids and has a standing liquid phase

1. Weigh the filter paper to be used for the prefilter. Record the weight of the filter in the prefilter section of the nonvolatile prefilter spreadsheet (see Figure 1).

2. Weigh a minimum of 100g to 101g of sample in a graduated cylinder. Record the weight of the sample and cylinder on the spreadsheet.

3. Pour the sample into the pressure filter. Weigh the empty cylinder and record the weight on the spreadsheet.

4. Slowly apply vacuum to the pressure filter assembly beginning with 10 psi. As the rate of filtration decreases, increase the pressure by 10-psi increments. Continue to slowly increase the pressure until the maximum pressure of 50 psi is reached. Stop the filtration when no filtrate appears over a 2-minute interval or when air is being forced through the filter.

5. If the layer of liquid in the solid is organic and does not mix with water, a large quantity of sample must be filtered. This is because each layer of the final leachate (Procedure B.19.) must be analyzed separately and enough solids must be collected to generate enough extraction fluid for the assigned analyses.

6. When filtration is complete, transfer the solids and filters into a tared beaker and weigh. Record the weight on the spreadsheet.

7. Use a graduated cylinder to measure the volume of the initial filtrate and record this figure on the spreadsheet.

8. Reduce a portion of the solid to a particle size of ≤1 mm in diameter, if necessary, using a sieve. When a sieve is used for reducing particle size, a sieve blank test must be performed. To perform the test, pour the extraction fluid to be used for the batch blank through the sieve and into the blank vessel to check for cleanliness. Document that the sieve test was performed on the batch sheet. Transfer 5.0 to 5.1 g of the solid phase to a 150- or 250-mL beaker.

9. Use a graduated cylinder to add 96.5 mL reagent water and stir for 5 minutes. Measure and record the pH. If the pH is <5, go to Procedure B.12. and use Extraction Fluid #1. If the pH is ≥5 go to Procedure B.10.

10. Use a pipette or bottle-top dispenser to add 3.5 mL 1 N HCl to the beaker, cover with a watch glass, and heat on a hot plate to 50°C. The temperature must then be maintained at 50° for 10 minutes. Record the thermometer ID in the logbook.

11. Allow the slurry to cool to room temperature. Measure the pH and record. If the pH is <5, Extraction Fluid #1 must be used for the leaching procedure. If the pH is ≥5, Extraction Fluid #2 must be used.

12. Quantitatively transfer the remaining pre-weighed solids along with the filter or the weight necessary for leaching to an extraction vessel.

13. Use a graduated cylinder to slowly add the appropriate extraction fluid at a volume 20× the weight of the solid.

14. Close the extraction bottle tightly and place in a tumbler (rotating 30 ±2 rpm) for 18 ±2 hours. Record the ID of the tumbler and the start time in the leachate extraction logbook. Ambient temperature must be maintained at 23° ±2°C (69.8° to 77.0°F) during the extraction period.

15. Following the 18 ±2 hour extraction, filter the solution through a glass fiber filter, again taking care to increase the pressure by 10-psi increments and not exceed 50 psi if using the pressure filter. Change the filter if necessary. The filter(s) must be acid washed if the extract is to be analyzed for metals. If multiple jars of the sample were leached, combine the extracts.

16. Record the volume of extraction fluid recovered from the sample.

17. The spreadsheet calculates the amount of initial filtrate to add back, using the following calculation:

$$\text{Volume of initial filtrate to be added} = \frac{\text{Volume of extraction fluid collected (mL)}}{\text{Volume of extraction fluid (mL) added}} \times \frac{\text{Weight of sample extracted (g)}}{\text{weight of sample recovered}} \times \text{mL of initial filtrate}$$

18. Print the spreadsheet.

19. If the initial filtrate does not mix (is not miscible) with the extraction fluid, do not mix the two together. Contact the group leader and technical services. Each phase must be analyzed separately; therefore each phase must be entered as a sample.

20. Determine and record the pH of the leachate in the logbook.

21. Use pipettes to add the appropriate matrix spikes to metals samples. In order to give the correct spike levels, 8 mL of each spike (A and B) are added to 400 mL of leachate.

22. Subsample and preserve the leachate for the appropriate analyses as per 1-P-QM-PRO-9015527 (SOP-TL-003) and Table I.

C. If the sample has no freestanding liquid

1. Reduce a portion of the solid to a particle size of ≤1 cm in diameter, if necessary, using a sieve. When a sieve is used for reducing particle size, a sieve blank test must be performed. To perform the test, pour the extraction fluid to be used for the batch blank through the sieve and into the blank vessel to check for cleanliness. Document that the sieve test was performed on the batch sheet. Weigh out 5 to 5.1 g of the solid into a 150- or 250-mL beaker.

2. Use a graduated cylinder to add 96.5 mL reagent water and stir for 5 minutes. Measure and record the pH. If the pH is <5, go to Procedure C. 5. and use Extraction Fluid #1. If the pH is ≥5, go to Procedure C. 3.

3. Use a pipette or bottle-top dispenser to add 3.5 mL 1 N HCl to the beaker, cover with a watch glass, and heat on a hot plate to 50°C. The temperature must then be maintained at 50° for 10 minutes. Record the thermometer ID in the logbook.

4. Allow the slurry to cool to room temperature. Measure the pH and record. If the pH is <5, use Extraction Fluid #1. If the pH is ≥5, use Extraction Fluid #2.

5. Weigh out a minimum of 100 to 101 g of the waste (more if a large volume of leachate is required for analysis).

6. Use a graduated cylinder to slowly add the appropriate extraction fluid at a volume 20× the weight of the solid.

7. Close the extraction bottle tightly, and place in a tumbler (rotating 30 ±2 rpm) for 18 ±2 hours. Record the ID of the tumbler and the start time in the leachate extraction logbook. Ambient temperature must be maintained at 23° ±2°C (69.8° to 77.0°F) during the extraction period.

8. Following the 18 ±2 hours' extraction, filter the solution through a pressure filter assembled with two stacked glass fiber filters of the same pore size (one 125-mm and one 150-mm), again taking care to increase the pressure by 10-psi increments and to not exceed 50 psi if using the pressure filter. Change the filter if necessary. The filter(s) must be acid washed if the extract is to be analyzed for metals. If multiple jars of the sample were leached, combine the extracts.

9. Measure and record the pH of the extract in the logbook.

10. Use pipettes to add the appropriate matrix spikes to metals samples. In order to give the correct spike levels, 8 mL of each spike (A and B) are added to 400 mL of leachate.

11. Subsample and preserve the leachate for the appropriate analyses in accordance with 1-P-QM-PRO-9015527 (SOP-TL-003) and Table I.

Calculations:

A. Percent solids:

$$\%\ Solids = \frac{Weight\ \ of\ \ solid\ \ recovered}{Weight\ \ of\ \ sample\ \ filtered} \times 100$$

B. Percent dry solids:

$$\%\ Dry\ Solids = \frac{Weight\ of\ dried\ solid\ recovered}{Weight\ of\ sample\ filtered} \times 100$$

C. Initial filtrate to add back to leachate:

$$\begin{array}{c} Volume\ of\ initial \\ filtrate\ to \\ be\ added \end{array} = \frac{\begin{array}{c} Volume\ \ of \\ extraction\ fluid \\ collected\ (mL) \end{array}}{\begin{array}{c} Volume\ of\ extraction \\ fluid\ (mL)\ added \end{array}} \times \frac{\begin{array}{c} Weight\ of \\ sample \\ extracted\ (g) \end{array}}{\begin{array}{c} weight\ of\ sample \\ recovered \end{array}} \times \begin{array}{c} mL\ of \\ initial \\ filtrate \end{array}$$

Statistical Information/Method Performance:

See specific analysis method.

Quality Assurance/Quality Control:

1. A new matrix batch must be prepared each day samples are leached. Batches must not be continued. Therefore, each matrix is a new batch each day.

2. An extraction fluid tumble blank must be prepared for each extraction fluid used per day. A blank must be started for each 20 samples with the same fluid type. A sieve test must be performed on a blank if any of the samples on a batch are sieved. When filtering the blank after tumbling, if any samples associated with that blank are pressure filtered, the blank must be pressure filtered also to check for cleanliness of the apparatus.

3. A blank must be performed after every 20 times an individual extraction vessel is used. A logbook of vessel usage is kept. Each time a vessel is used, record the date and the sample number. After 20 uses, prepare a blank in that vessel and record the blank number in the logbook. Every blank must be evaluated for contamination using the guidelines in 1-P-QM-PRO-9015526 (SOP-TL-002).

4 Record all the sample numbers in the batch logbook. One sample in the batch must be designated as the waste type spike and spiked as per the notes in Table I. Choose the first sample in the batch that has sufficient volume. Each subsample type in the batch must have a spike. Record the lot number of the spike solution used on the batch sheet. Photocopy the sheet and deliver the photocopies to each department involved in the analyses. Enter the appropriate leachate information in Parallax.

5. Extraction of the solid phase must be initiated as soon as possible after initial filtration.

6. All instruments used in this procedure (i.e., pH meter and balance) must be calibrated according to an approved laboratory plan.

7. All quality control measures described in the appropriate analytical methods must be followed.

Figure 1

Sample # 1234567
Date:
Technician:

Percent Solids Determination

Liquid/Solid Separation	
Weight of filter paper and gooch (g)	1.00
Weight of sample and grad	1.00
Weight of grad and residue	1.00
Weight of sample filtered	0.00
Weight of solid plus filter/gooch (g)	1.00
Weight of solid recovered (g)	0.00
Percent Solids	#DIV/0!
Weight of dried sample and filter	1.00
Weight of dried sample and filter	1.00
Weight of dried sample and filter	1.00
Weight of dried sample	0.00
Percent of dried solids	#DIV/0!

Non-Volatile Leachate Prefilter

Liquid/Solid Separation	
Weight of filter paper (g)	1.00
Weight of sample and grad	1.00
Weight of grad and residue	1.00
Weight of sample (total)	0.00
Weight of solid plus filter (g)	1.00
Weight of solid recovered (g)	0.00
Percent Solids	#DIV/0!
Weight of sample extracted (g)	-5.00
Volume of ext. fluid to add (mL)	-100
Volume of initial filtrate (mL)	1
After Tumble	
Volume of ext. fluid collected (mL)	1
Volume of initial filtrate to add (mL)	#DIV/0!

Table I

Leachate Scheduling/Preservation			
Prep Analysis/Name	817/Pest	813/3337/7807 Semi	5705 Metals
Bottle Code	43	43	8
Preferred Vol	2000	2000	500
Minimum Vol	1000	1000	200
Preservation	None	None	HNO_3
Departments	4036/4024	4036/4026	4022

NOTES: Client-Specific metals – BKG 500 mL, spike 400 mL for sample QC
Semi spike (matrix) – 4 × 1000 mL
Pest spike – 4 × 1000 mL
Metals spike – 400 mL

eurofins | Lancaster Laboratories

Toxicity Characteristic Leaching Procedure
TCLP Zero Headspace Leachates, Method 1311

Approvals:

Prepared by: Dain Wagner Date: 2/29/12
Chemist

Approved by: 1975 Date: 3/1/12
Leachate Preparation Management

Approved by: Kathryn A. Brungard 2623 Date: 03/05/12
Quality Assurance

Revision Log:

Revision: 11	Effective Date: This version	
Section	**Justification**	**Changes**
Revision Log	Formatting requirements per LOM-SOP-LAB-201	Removed revision logs up to the previous version.
Title	Enhancement	Added Method 1311 to the title.
Entire Document	Enhancement	Changed deionized water to reagent water.
Personnel Training and Qualifications	Formatting requirements per LOM-SOP-LAB-201	Replaced first sentence with exact wording of required text.
Reagents and Standards	Enhancement	Added reagent water with definition.
Procedure	Reflects current procedure	Broadened the sample weighing tolerances.

Revision: 10	Effective Date: 02/14/11	
Section	**Justification**	**Changes**
Header	No print analysis	Removed 1339 from header.
Revision Log	Formatting requirements per LOM-SOP-LAB-201	Removed revision logs up to the previous version.
Basic Principles	Formatting requirements per LOM-SOP-LAB-201	Added required section
Calibration	Formatting requirements per LOM-SOP-LAB-201	Added required section
Entire document	Enhancement	Reformatted as needed.

09462573_11.DOC
022212

Reference:

1. Method 1311, *Test Methods for Evaluating Solid Waste*, SW-846, USEPA, July 1992.

2. *Chemical Hygiene Plan,* Lancaster Laboratories, current version.

Cross Reference:

Document	Document Title
SOP-TL-001	Glassware Cleaning for Leachate Extractions
SOP-TL-002	Leachate Blank Evaluations

Purpose:

This method is used to determine the amount of extractable volatile contaminants in a sample.

Scope:

This method is used to determine the mobility of volatile organic contaminants in potentially hazardous waste.

Basic Principles:

For liquid waste containing <0.5% solids, the TCLP extract resulting from the filtration of the waste through a 0.6- to 0.8-µm glass fiber filter in a zero headspace extractor (ZHE) is defined as the filtrate. This extraction is performed over an 18-hour period.

For waste containing >0.5% solids and some liquid, the waste is filtered through a glass fiber filter in the ZHE and the liquid is collected and stored in a Tedlar® bag for later use. The solid left in the ZHE is then extracted with a volume of extraction fluid at 20× the weight of the solid. After the extraction the leachate is filtered through the glass fiber filter in the ZHE into the Tedlar® bag combining the initial liquid and final filtrate.

For waste containing >0.5% solids which yield no liquid, 25 g of the sample is extracted with a volume of extraction fluid at 20× the weight of the sample in the ZHE. The sample is then extracted and filtered through the ZHE and the leachate is defined as the filtrate.

Glassware Cleaning:

See SOP-TL-001.

Interferences:

Any interferences encountered during analysis are discussed in the individual analytical methods.

Safety Precautions and Waste Handling:

See *Chemical Hygiene Plan* for general information regarding employee safety, waste management, and pollution prevention.

All laboratory waste is accumulated, managed, and disposed of in accordance with all federal, state, and local laws and regulations.

Lab coats, gloves, and safety glasses must be worn all times when working with samples or reagents. Avoid skin contact or breathing the vapors from any reagents or samples. If samples are odorous or contain hazardous material, use a ventilation hood.

Discard or send for repair any glassware that is chipped or broken.

When working on the ZHE, use the ratchet wrench or cordless drill to prevent any wrist strain or injury. In case of injury notify your supervisor.

Personnel Training and Qualifications:

All personnel performing this procedure must have documentation of reading, understanding, and agreeing to follow the current version of this SOP and a documented Demonstration of Capability.

Technicians using this method must have documentation of training by a qualified person and perform these procedures at least twice in that person's presence before they are considered qualified.

Sample Collection, Preservation, and Handling:

Samples must be collected in glass with **NO** headspace and stored at 4° ± 2°C and extracted within14 days from the date of collection.

Certain state or QAPP specific requirements require samples to be collected in Encore sampling devices. If this is the case, samples must be frozen within 48 hours of collection, and extracted within 14 days from the date of collection.

Apparatus and Equipment:

1. Tumbler – Capable of rotating the extraction vessel at 30 ± 2 RPM in an end-over-end manner

2. Zero headspace extractor (ZHE)

3. Glass fiber filter (0.6- to 0.8-µm pore size; 90 mm in diameter)

4. Tedlar® bag – 0.5 or 1.2-L or equivalent

5. Vacuum filtration system (vacuum flask, filter holder [gooch], hose)

6. 48-lb. torque wrench (± 4 lbs.)
7. Poly extraction fluid transfer bag
8. Graduated cylinders – Class A, assorted sizes
9. Gooch crucibles
10. Drill
11. Ratchet wrench
12. Balance – Capable of weighing to 0.01 g
13. pH Meter – Orion Model 210A or equivalent – Capable of 0.01 pH unit display
14. Jug for preparing extraction fluid
15. Volumetric flasks – Class A, assorted sizes
16. Aluminum weighing pans
17. Ruler
18. 40-mL vials
19. Septa for 40-mL vials – modified to allow a Teflon®- outlet tube to pass through

Reagents and Standards:

1. 10 N Sodium Hydroxide (NaOH) – Lab Chem or equivalent

2. Glacial acetic acid (HAC) – ACS grade

3. Extraction Fluid #1

Acetic acid	57 mL
10 N NaOH	65 mL

   a. Use graduated cylinders to add 57 mL acetic acid and 65 mL 10 N NaOH to approximately 5 L of reagent water in a 20-L jug.

   b. Dilute to 10 L with reagent water and swirl until the solution is thoroughly mixed.

   c. This solution can be made in larger or smaller volumes as long as the ratio of acetic acid and NaOH to final volume is maintained.

   d. The pH of this solution must be 4.93 ± 0.05.

   e. Record the preparation and the pH of the extraction fluid in the reagent logbook.

   f. This solution must be prepared daily.

4. Reagent water

   Water in which an interferent is not observed at or above the reporting limit for parameters of interest. In general, the deionized water supplied at the taps in the laboratory meets this criterion. If the reagent water does not meet the requirements, see your supervisor for further instructions.

Calibration:

Not applicable to this procedure

Preliminary Solids Determination:

If the waste appears to be liquid and seems to contain a very low percentage of solids, perform the solids determination. The *Federal Register* TCLP method defines percent solids as that fraction of waste from which no liquid may be forced out by an applied pressure.

NOTE: If the total solids determination was performed on the sample for the nonvolatile leachate, those values are used.

1. Preweigh a filter in a gooch crucible and record the weight in the percent solids determination of the volatile prefilter spreadsheet (see Figure 1).

2. Weigh out 25 g to 26 g of the sample into a graduated cylinder and record the sample number and weight including the graduated cylinder on the spreadsheet.

3. Pour the sample into the vacuum filter apparatus and slowly apply vacuum until no liquid flows through the filter.

4. Reweigh the graduated cylinder. Record the weight of the graduated cylinder and residue adhered to the cylinder.

   The spreadsheet calculates the weight of sample filtered.

5. The material in the filter holder is defined as the solid phase (sludge cake and filter) of the waste and the liquid phase is the filtrate.

6. Weigh the sludge cake and filter and record the weight on the spreadsheet.

7. The spreadsheet determines the percent solids using the calculation used below:

$$\%\ Solids = \frac{Weight\ of\ sample\ recovered}{Weight\ of\ sample\ filtered} \times 100$$

8. If the percent solids is <0.5%, print the spreadsheet and go to Procedure A.

9. If the percent solids is between 0.5% and 3.0%:

   a. Dry the filter and solid at 100° to 120°C until two successive weights yield the same value to within ± 1%.

   b. Record each weight on the spreadsheet.

   c. The percent dry solids is determined using the following calculation:

$$\%\ Dry\ Solids = \frac{Weight\ of\ dried\ solid\ recovered}{Weight\ of\ sample\ filtered} \times 100$$

10. If the percent dry solids is <0.5%, print the spreadsheet and go to Procedure A. If the percent dry solids is >0.5%, go to Procedure B.

Procedure:

A. If the sample contains <0.5% solids

1. Assemble the ZHE and add enough sample to fill three 40-mL vials after filtration (analysis 0946).

2. Filter the sample through glass fiber filters (0.6- to 0.8-µm) and collect the sample in the vials with **NO** headspace unless the sample is from California (analysis 2573). In that case, collect the final filtrate into a single labeled Tedlar® bag and deliver to the appropriate department. This filtrate is defined as the TCLP volatile extract.

   NOTE: If any sample is from California, the blank must be collected in a Tedlar® bag.

3. Change the analysis 0946 or 2573 to 1339 and add the appropriate comment in Parallax.

B. If the sample contains >0.5% solids and has a standing liquid phase

1. Assemble the ZHE extractor.

2. Preweigh an empty Tedlar® bag and record the weight on the volatile prefilter spreadsheet (see Figure 1).

3. Weigh out a minimum of 25 g of sample into an aluminum weighing pan and record the weight o the spreadsheet.

4. Pour the sample into the ZHE extractor.

   a. Re-weigh the aluminum pan used to weigh out the initial sample and record the weight of the residue and cup.

   b. The spreadsheet calculates the weight of the sample.

5. Attach the Tedlar® bag to the ZHE extractor and filter the sample through the ZHE into the Tedlar® bag until the liquid stops flowing.

   a. Reweigh the Tedlar® bag with the liquid and record the weight.

b. The spreadsheet calculates the weight of the liquid in the bag and the weight of the solid in the extractor.

NOTE: If the filter in the ZHE gets clogged **DO NOT** change it. Any sample left in the ZHE extractor is considered to be the solid. If the liquid is not water-soluble a larger amount of sample must be filtered; both layers must be analyzed separately. Verify that you have enough solids to complete the TCLP analysis on the sample.

6. Record the weight of the solids under "weight of sample extracted" in the data log.

7. The necessary volume of extraction fluid (20× the weight of the sample to be extracted) must be measured into the fluid holding bag using a graduated cylinder.

   a. Connect the fluid holding bag to the ZHE and open the valves on both the transfer line and the ZHE.

   b. Slowly add Extraction Fluid 1 by turning the ZHE piston downward with a drill.

8. Once the entire volume of extraction fluid has been transferred from the bag to the ZHE, close the valve on the ZHE and hand crank the piston with the 48-lb. torque wrench until it clicks.

   a. Slowly open the valve to release any air that was trapped in the extractor.

   b. Close the valve when the liquid appears.

9. Again crank the piston with the 48-lb. torque wrench until it clicks.

10. Place the extractor on the tumbler and rotate at 30 ± 2 rpm for 18 ± 2 hours.

11. Record the tumbler ID in the data log.

12. Ambient temperature must be maintained at 23° ± 2°C (69.8° to 77°F) during the extraction.

13. When the extraction is complete, connect the Tedlar® bag containing the initial filtrate to the ZHE unit and slowly open the valve on the bag. Quickly open and close the valve of the extractor while listening for an escape of gas. If no gas escapes, the extractor had a leak during the extraction and the sample must be repeated.

    a. In addition, the extractor must be checked for leaks by pressurizing it to 50 psi and submerging it in water.

    b. Check for air bubbles coming from any of the fittings. If air bubbles are present, check all fittings and inspect O-rings and replace them if necessary.

    c. Reassemble and pressurize the extractor and repeat the submersion leak check. If the extractor continues to leak, remove it from service and contact the manufacturer.

14. Filter the entire sample extract through the filter already in the ZHE and into the Tedlar® bag unless the filtrate is not water-soluble.

    a. If the initial filtrate is not water-soluble, DO NOT try to mix them together. They must be analyzed separately. Notify your supervisor to contact the appropriate person(s).

    b. If the sample is scheduled for analysis 0946, collect the final filtrate into three 40-mL glass vials with no headspace.

c. If the sample is from California (analysis 2573) collect the final filtrate into a single labeled Tedlar® bag and deliver to the appropriate department.

NOTE: If any sample is from California, the blank must be collected in a Tedlar® bag.

C. If the sample is >0.5% solid and contains no liquid

1. Weigh out 25 g to 26 g of sample into an aluminum weighing pan and record the weight in the data log under sample weight.

2. Pour the sample into the ZHE extractor.

3. Fill the fluid holding bag with Extraction Fluid 1.

4. Add 500 mL of extraction fluid to the extractor by connecting the transfer line from the bag to the extractor.

   a. Open the valves on the extractor and the line.

   b. Slowly turn down the piston of the extractor using a drill.

   NOTE: If less than 25.0 g of sample is used for the extraction, the exact volume of extraction fluid needed (20 × the weight of sample) for the sample must be measured into the fluid holding bag. See Procedure B.7.

5. When the piston reaches the bottom of the extractor close the valves on the extractor and the bag.

   a. Detach the transfer line and slowly crank the piston upwards using a 48-lb. torque wrench until it clicks.

b. Slowly open the valve and release any air trapped in the extractor. Close the valve when the liquid appears.

c. Again, crank the piston with the 48-lb. torque wrench until it clicks.

6. Verify that 500 mL of fluid was added to the extractor by measuring the length of the rod protruding from the bottom of the extractor using a ruler.

   a. At least 4 3/8" of the rod must be visible or the extractor does not contain 500 mL of fluid.

   b. If the required length is not visible, add additional fluid following Procedure Steps C.4. to C.5. until the extractor contains 500 mL of extraction fluid.

NOTE: This step is only performed if 25 g to 26 g of sample was weighed in step C.1.

7. Place the extractor on the tumbler and rotate at 30 ± 2 rpm for 18 ± 2 hours. Record the tumbler ID in the data log.

8. Ambient air temperature must be maintained at 23° ± 2°C (69.8° to 77°F) during the extraction.

9. When the extraction is complete, attach a Teflon®- tube to the outlet valve of the extractor.

   a. If the sample is scheduled for analysis 0946, place the tube through a modified septum and into a 40-mL vial.

   b. If the sample is from California (analysis 2573) attach the tube to a Tedlar® bag. Quickly open and close the valve of the extractor while listening for an escape of gas. If no gas escapes, the extractor lost pressure during the extraction and the sample must be repeated.

(1) If the extractor has leaked it must be checked for leaks while empty by pressurizing it to 50 psi and submerging it in water.

(2) Check for air bubbles coming from any of the fittings. If air bubbles are present, check all fittings and inspect O-rings and replace them if necessary.

(3) Reassemble and pressurize the extractor and repeat the submersion leak check.

(4) If the extractor continues to leak, remove it from service and correct the source of the leak.

10. Using a ratchet turn the piston and filter the remaining sample through the filter already in place in the ZHE. If you suspect that internal filters have ruptured, place an on-line filter on the outlet tube from the ZHE.

    a. If the sample is scheduled for analysis 0946, filter the remaining sample into at least three 40-mL glass vials with **NO** headspace.

    b. If the sample is from California (analysis 2573), collect the final filtrate into a single labeled Tedlar® bag and deliver to the appropriate department.

    NOTE: If any sample is from California, the blank must be collected in a Tedlar® bag.

Calculations:

1. Calculation for % solids

$$\%\ Solids = \frac{Weight\ of\ sample\ recovered}{Weight\ of\ sample\ filtered} \times 100$$

2. Calculation for % dry solids

$$\%\ Dry\ Solids = \frac{Weight\ of\ dried\ solid\ recovered}{Weight\ of\ sample\ filtered} \times 100$$

Statistical Information/Method Performance:

Not applicable to this method.

Quality Assurance/Quality Control:

1. A minimum of one blank must be performed for every 20 samples extracted in a day. This blank is not the same as the vessel blank.

2. A vessel blank must be performed after every 20 times an individual ZHE is used. A logbook of vessel usage is kept. Each time a vessel is used, record the date and sample number. After 20 uses, prepare a blank in that vessel and record the blank number in the logbook. Every blank must be evaluated for contamination using the guidelines in SOP-TL-002.

3. Record all sample numbers and the batch blank number in the batch logbook.

4. All instruments used in this procedure must be calibrated according to an approved laboratory plan.

5. All quality control measures described in the appropriate analytical methods must be followed.

Figure 1

Sample # 1234567
Date:
Technician:

Percent Solids Determination

Liquid/Solid Separation	
Weight of filter paper	1.00
Weight of sample and grad	1.00
Weight of grad and residue	1.00
Weight of sample filtered	0.00
Weight of solid plus filter	1.00
Weight of solid recovered (g)	0.00
Percent Solids (Wet)	#DIV/0!
Weight of dried sample and filter	1.00
Weight of dried sample and filter	1.00
Weight of dried sample and filter	1.00
Weight of dried sample	0.00
Percent Solids (Dry)	#DIV/0!

Volatile Leachate Prefilter

Liquid/Solid Separation	
Weight of Tedlar bag (g)	1.00
Weight of sample and cup (g)	1.00
Weight of residue and cup (g)	1.00
Weight of sample (total) (g)	0.00
Weight of bag and liquid (g)	0.00
Weight of liquid in the bag (g)	-1.00
Weight of sample in vessel (g)	1.00
Volume of ext. fluid to add (mL)	20

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260C
Acrylonitrile	EPA 8260C
Ethyl methacrylate	EPA 8260C
Methyl acrylonitrile	EPA 8260C
Methyl methacrylate	EPA 8260C
Amines	
1,2-Diphenylhydrazine	EPA 8270D
1,4-Phenylenediamine	EPA 8270D
1-Naphthylamine	EPA 8270D
2-Naphthylamine	EPA 8270D
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4,4'-Methylenebis(2-chloroaniline)	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
5-Nitro-o-toluidine	EPA 8270D
a,a-Dimethylphenethylamine	EPA 8270D
Aniline	EPA 8270D
Carbazole	EPA 8270D
Diphenylamine	EPA 8270D
Methapyrilene	EPA 8270D
Pronamide	EPA 8270D
Benzidines	
3,3'-Dichlorobenzidine	EPA 8270D
3,3'-Dimethylbenzidine	EPA 8270D
Benzidines	
Benzidine	EPA 8270D
Carbamate Pesticides	
Aldicarb	EPA 8318A
Aldicarb Sulfone	EPA 8318A
Carbofuran	EPA 8318A
Characteristic Testing	
Corrosivity	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311
Chlorinated Hydrocarbon Pesticides	
2,4'-DDD (Mitotane)	EPA 8081B
4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
Chlorobenzilate	EPA 8270D
delta-BHC	EPA 8081B

Serial No.: 53970

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Chlorinated Hydrocarbon Pesticides

Diallate	EPA 8270D
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Isodrin	EPA 8270D
Kepone	EPA 8081B
	EPA 8270D
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Pentachloronitrobenzene	EPA 8270D
Simazine	EPA 8141B
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
1,2,4-Trichlorobenzene	EPA 8270D
1-Chloronaphthalene	EPA 8270D

Chlorinated Hydrocarbons

2-Chloronaphthalene	EPA 8270D
Hexachlorobenzene	EPA 8270D
Hexachlorobutadiene	EPA 8270D
Hexachlorocyclopentadiene	EPA 8270D
Hexachloroethane	EPA 8270D
Hexachloropropene	EPA 8270D
Pentachlorobenzene	EPA 8270D

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
Pentachlorophenol	EPA 8151A

Dioxins and Furans

1,2,3,4,6,7,8,9-Octachlorodibenzofuran	EPA 8290A
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-diox	EPA 8290A
1,2,3,4,6,7,8-Heptachlorodibenzofuran	EPA 8290A
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxi	EPA 8290A
1,2,3,4,7,8,9-Heptachlorodibenzofuran	EPA 8290A

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Dioxins and Furans

1,2,3,4,7,8-Hexachlorodibenzofuran	EPA 8290A
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	EPA 8290A
1,2,3,6,7,8-Hexachlorodibenzofuran	EPA 8290A
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	EPA 8290A
1,2,3,7,8,9-Hexachlorodibenzofuran	EPA 8290A
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	EPA 8290A
1,2,3,7,8-Pentachlorodibenzofuran	EPA 8290A
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	EPA 8290A
2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 8290A
2,3,4,7,8-Pentachlorodibenzofuran	EPA 8290A
2,3,7,8-Tetrachlorodibenzofuran	EPA 8290A
2,3,7,8-Tetrachlorodibenzo-p-dioxin	EPA 8290A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270D
4-Bromophenylphenyl ether	EPA 8270D
4-Chlorophenylphenyl ether	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 8270D
Bis(2-chloroethyl)ether	EPA 8270D

Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthene Low Level	EPA 8270D SIM
Acenaphthylene Low Level	EPA 8270D SIM
Anthracene Low Level	EPA 8270D SIM
Benzo(a)anthracene Low Level	EPA 8270D SIM
Benzo(a)pyrene Low Level	EPA 8270D SIM
Benzo(b)fluoranthene Low Level	EPA 8270D SIM

Low Level Polynuclear Aromatic Hydrocarbons

Benzo(g,h,i)perylene Low Level	EPA 8270D SIM
Benzo(k)fluoranthene Low Level	EPA 8270D SIM
Chrysene Low Level	EPA 8270D SIM
Dibenzo(a,h)anthracene Low Level	EPA 8270D SIM
Fluoranthene Low Level	EPA 8270D SIM
Fluorene Low Level	EPA 8270D SIM
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D SIM
Naphthalene Low Level	EPA 8270D SIM
Phenanthrene Low Level	EPA 8270D SIM
Pyrene Low Level	EPA 8270D SIM

Metals I

Barium, Total	EPA 6010C
	EPA 6020A
Cadmium, Total	EPA 6010C
	EPA 6020A
Calcium, Total	EPA 6010C
	EPA 6020A
Chromium, Total	EPA 6010C
	EPA 6020A
Copper, Total	EPA 6010C
	EPA 6020A
Iron, Total	EPA 6010C
	EPA 6020A
Lead, Total	EPA 6010C
	EPA 6020A

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Metals I	
Magnesium, Total	EPA 6010C
	EPA 6020A
Manganese, Total	EPA 6010C
	EPA 6020A
Nickel, Total	EPA 6010C
	EPA 6020A
Potassium, Total	EPA 6010C
	EPA 6020A
Silver, Total	EPA 6010C
	EPA 6020A
Sodium, Total	EPA 6010C
	EPA 6020A
Strontium, Total	EPA 6010C
	EPA 6020A
Metals II	
Aluminum, Total	EPA 6010C
	EPA 6020A
Antimony, Total	EPA 6010C
	EPA 6020A
Arsenic, Total	EPA 6010C
	EPA 6020A
Beryllium, Total	EPA 6010C
	EPA 6020A
Chromium VI	EPA 7196A
	EPA 7199

Metals II	
Lithium, Total	EPA 6010C
Mercury, Total	EPA 7471B
Selenium, Total	EPA 6010C
	EPA 6020A
Vanadium, Total	EPA 6010C
	EPA 6020A
Zinc, Total	EPA 6010C
	EPA 6020A
Metals III	
Cobalt, Total	EPA 6010C
	EPA 6020A
Molybdenum, Total	EPA 6010C
	EPA 6020A
Silica, Dissolved	EPA 6010C
Thallium, Total	EPA 6010C
	EPA 6020A
Tin, Total	EPA 6010C
	EPA 6020A
Titanium, Total	EPA 6010C
	EPA 6020A
Miscellaneous	
Boron, Total	EPA 6010C
	EPA 6020A
Cyanide, Total	EPA 9012B
Formaldehyde	EPA 8315A

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Miscellaneous	
Organic Carbon, Total	Lloyd Kahn Method
	EPA 9060A
Perchlorate	EPA 6850
Phenols	EPA 9066
Specific Conductance	EPA 9050A
Nitroaromatics and Isophorone	
1,2-Dinitrobenzene	EPA 8270D
1,3,5-Trinitrobenzene	EPA 8270D
	EPA 8330A
1,3-Dinitrobenzene	EPA 8270D
	EPA 8330A
1,4-Dinitrobenzene	EPA 8270D
1,4-Naphthoquinone	EPA 8270D
2,4,6-Trinitrotoluene	EPA 8330A
	EPA 8330B
2,4-Dinitrotoluene	EPA 8270D
	EPA 8330A
	EPA 8330B
2,6-Dinitrotoluene	EPA 8270D
	EPA 8330A
	EPA 8330B
2-Amino-4,6-dinitrotoluene	EPA 8330A
2-Nitrotoluene	EPA 8330A
3,5-Dinitroaniline	EPA 8330B
3-Nitrotoluene	EPA 8330A

Nitroaromatics and Isophorone	
4-Amino-2,6-dinitrotoluene	EPA 8330A
4-Dimethylaminoazobenzene	EPA 8270D
4-Nitrotoluene	EPA 8330A
Hexahydro-1,3,5-trinitro-1,3,5-triazine	EPA 8330A
Isophorone	EPA 8270D
Methyl-2,4,6-trinitrophenylnitramine	EPA 8330A
Nitrobenzene	EPA 8270D
	EPA 8330A
Nitroglycerine	EPA 8330B
Nitroquinoline-1-oxide	EPA 8270D
Octahydro-tetranitro-tetrazocine	EPA 8330A
Pentaerythritol tetranitrate	EPA 8330B
Pyridine	EPA 8270D
Nitrosoamines	
N-Nitrosodiethylamine	EPA 8270D
N-Nitrosodimethylamine	EPA 8270D
N-Nitrosodi-n-butylamine	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 8270D
N-Nitrosodiphenylamine	EPA 8270D
N-nitrosomethylethylamine	EPA 8270D
N-nitrosomorpholine	EPA 8270D
N-nitrosopiperidine	EPA 8270D
N-Nitrosopyrrolidine	EPA 8270D
Organophosphate Pesticides	
Azinphos methyl	EPA 8141B

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Organophosphate Pesticides	
Bolstar	EPA 8141B
Carbophenothion	EPA 8141B
Chlorpyriphos	EPA 8141B
Coumaphos	EPA 8141B
Demeton-O	EPA 8141B
Demeton-S	EPA 8141B
Diazinon	EPA 8141B
Dichlorvos	EPA 8141B
Dimethoate	EPA 8270D
Disulfoton	EPA 8141B
	EPA 8270D
EPN	EPA 8141B
Ethion	EPA 8141B
Ethoprop	EPA 8141B
Famphur	EPA 8141B
	EPA 8270D
Fensulfothion	EPA 8141B
Fenthion	EPA 8141B
Malathion	EPA 8141B
Mevinphos	EPA 8141B
NALED	EPA 8141B
Parathion ethyl	EPA 8141B
	EPA 8270D
Parathion methyl	EPA 8141B
	EPA 8270D
Phorate	EPA 8141B

Organophosphate Pesticides	
Phorate	EPA 8270D
Ronnel	EPA 8141B
Sulfotepp	EPA 8270D
Thionazin	EPA 8270D
Tokuthion	EPA 8141B
Trichloronate	EPA 8141B
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
	EPA 8015C
Gasoline Range Organics	EPA 8015D
	EPA 8015C
Oil and Grease Total Recoverable (HEM)	EPA 9071B (Solvent:Hexane)
Phthalate Esters	
Benzyl butyl phthalate	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 8270D
Diethyl phthalate	EPA 8270D
Dimethyl phthalate	EPA 8270D
Di-n-butyl phthalate	EPA 8270D
Di-n-octyl phthalate	EPA 8270D
Polychlorinated Biphenyls	
PCB 1	EPA 1668 A
PCB 10	EPA 1668 A
PCB 100	EPA 1668 A
PCB 101	EPA 1668 A

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Polychlorinated Biphenyls		Polychlorinated Biphenyls	
PCB 102	EPA 1668 A	PCB 126	EPA 1668 A
PCB 103	EPA 1668 A	PCB 127	EPA 1668 A
PCB 104	EPA 1668 A	PCB 128	EPA 1668 A
PCB 105	EPA 1668 A	PCB 129	EPA 1668 A
PCB 106	EPA 1668 A	PCB 13	EPA 1668 A
PCB 107	EPA 1668 A	PCB 130	EPA 1668 A
PCB 108	EPA 1668 A	PCB 131	EPA 1668 A
PCB 109	EPA 1668 A	PCB 132	EPA 1668 A
PCB 11	EPA 1668 A	PCB 133	EPA 1668 A
PCB 110	EPA 1668 A	PCB 134	EPA 1668 A
PCB 111	EPA 1668 A	PCB 135	EPA 1668 A
PCB 112	EPA 1668 A	PCB 136	EPA 1668 A
PCB 113	EPA 1668 A	PCB 138	EPA 1668 A
PCB 114	EPA 1668 A	PCB 139	EPA 1668 A
PCB 115	EPA 1668 A	PCB 14	EPA 1668 A
PCB 116	EPA 1668 A	PCB 140	EPA 1668 A
PCB 117	EPA 1668 A	PCB 141	EPA 1668 A
PCB 118	EPA 1668 A	PCB 142	EPA 1668 A
PCB 119	EPA 1668 A	PCB 143	EPA 1668 A
PCB 12	EPA 1668 A	PCB 144	EPA 1668 A
PCB 120	EPA 1668 A	PCB 145	EPA 1668 A
PCB 121	EPA 1668 A	PCB 146	EPA 1668 A
PCB 122	EPA 1668 A	PCB 147	EPA 1668 A
PCB 123	EPA 1668 A	PCB 148	EPA 1668 A
PCB 124	EPA 1668 A	PCB 149	EPA 1668 A
PCB 125	EPA 1668 A	PCB 15	EPA 1668 A

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Polychlorinated Biphenyls		Polychlorinated Biphenyls	
PCB 150	EPA 1668 A	PCB 174	EPA 1668 A
PCB 151	EPA 1668 A	PCB 175	EPA 1668 A
PCB 152	EPA 1668 A	PCB 176	EPA 1668 A
PCB 153	EPA 1668 A	PCB 177	EPA 1668 A
PCB 154	EPA 1668 A	PCB 178	EPA 1668 A
PCB 155	EPA 1668 A	PCB 179	EPA 1668 A
PCB 156	EPA 1668 A	PCB 18	EPA 1668 A
PCB 157	EPA 1668 A	PCB 180	EPA 1668 A
PCB 158	EPA 1668 A	PCB 181	EPA 1668 A
PCB 159	EPA 1668 A	PCB 182	EPA 1668 A
PCB 16	EPA 1668 A	PCB 183	EPA 1668 A
PCB 160	EPA 1668 A	PCB 184	EPA 1668 A
PCB 161	EPA 1668 A	PCB 185	EPA 1668 A
PCB 162	EPA 1668 A	PCB 186	EPA 1668 A
PCB 163	EPA 1668 A	PCB 187	EPA 1668 A
PCB 164	EPA 1668 A	PCB 188	EPA 1668 A
PCB 165	EPA 1668 A	PCB 189	EPA 1668 A
PCB 166	EPA 1668 A	PCB 19	EPA 1668 A
PCB 167	EPA 1668 A	PCB 190	EPA 1668 A
PCB 168	EPA 1668 A	PCB 191	EPA 1668 A
PCB 169	EPA 1668 A	PCB 192	EPA 1668 A
PCB 17	EPA 1668 A	PCB 193	EPA 1668 A
PCB 170	EPA 1668 A	PCB 194	EPA 1668 A
PCB 171	EPA 1668 A	PCB 195	EPA 1668 A
PCB 172	EPA 1668 A	PCB 196	EPA 1668 A
PCB 173	EPA 1668 A	PCB 197	EPA 1668 A

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Polychlorinated Biphenyls		Polychlorinated Biphenyls	
PCB 198	EPA 1668 A	PCB 32	EPA 1668 A
PCB 199	EPA 1668 A	PCB 33	EPA 1668 A
PCB 2	EPA 1668 A	PCB 34	EPA 1668 A
PCB 20	EPA 1668 A	PCB 35	EPA 1668 A
PCB 200	EPA 1668 A	PCB 36	EPA 1668 A
PCB 201	EPA 1668 A	PCB 37	EPA 1668 A
PCB 202	EPA 1668 A	PCB 38	EPA 1668 A
PCB 203	EPA 1668 A	PCB 39	EPA 1668 A
PCB 204	EPA 1668 A	PCB 4	EPA 1668 A
PCB 205	EPA 1668 A	PCB 40	EPA 1668 A
PCB 206	EPA 1668 A	PCB 41	EPA 1668 A
PCB 207	EPA 1668 A	PCB 42	EPA 1668 A
PCB 208	EPA 1668 A	PCB 43	EPA 1668 A
PCB 209	EPA 1668 A	PCB 44	EPA 1668 A
PCB 21	EPA 1668 A	PCB 45	EPA 1668 A
PCB 22	EPA 1668 A	PCB 46	EPA 1668 A
PCB 23	EPA 1668 A	PCB 47	EPA 1668 A
PCB 24	EPA 1668 A	PCB 48	EPA 1668 A
PCB 25	EPA 1668 A	PCB 49	EPA 1668 A
PCB 26	EPA 1668 A	PCB 5	EPA 1668 A
PCB 27	EPA 1668 A	PCB 50	EPA 1668 A
PCB 28	EPA 1668 A	PCB 51	EPA 1668 A
PCB 29	EPA 1668 A	PCB 52	EPA 1668 A
PCB 3	EPA 1668 A	PCB 53	EPA 1668 A
PCB 30	EPA 1668 A	PCB 54	EPA 1668 A
PCB 31	EPA 1668 A	PCB 55	EPA 1668 A

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Polychlorinated Biphenyls		Polychlorinated Biphenyls	
PCB 56	EPA 1668 A	PCB 8	EPA 1668 A
PCB 57	EPA 1668 A	PCB 80	EPA 1668 A
PCB 58	EPA 1668 A	PCB 81	EPA 1668 A
PCB 59	EPA 1668 A	PCB 82	EPA 1668 A
PCB 6	EPA 1668 A	PCB 83	EPA 1668 A
PCB 60	EPA 1668 A	PCB 84	EPA 1668 A
PCB 61	EPA 1668 A	PCB 85	EPA 1668 A
PCB 62	EPA 1668 A	PCB 86	EPA 1668 A
PCB 63	EPA 1668 A	PCB 87	EPA 1668 A
PCB 64	EPA 1668 A	PCB 88	EPA 1668 A
PCB 65	EPA 1668 A	PCB 89	EPA 1668 A
PCB 66	EPA 1668 A	PCB 9	EPA 1668 A
PCB 67	EPA 1668 A	PCB 90	EPA 1668 A
PCB 68	EPA 1668 A	PCB 91	EPA 1668 A
PCB 69	EPA 1668 A	PCB 92	EPA 1668 A
PCB 7	EPA 1668 A	PCB 93	EPA 1668 A
PCB 70	EPA 1668 A	PCB 94	EPA 1668 A
PCB 71	EPA 1668 A	PCB 95	EPA 1668 A
PCB 72	EPA 1668 A	PCB 96	EPA 1668 A
PCB 73	EPA 1668 A	PCB 97	EPA 1668 A
PCB 74	EPA 1668 A	PCB 98	EPA 1668 A
PCB 75	EPA 1668 A	PCB 99	EPA 1668 A
PCB 76	EPA 1668 A	PCB-1016	EPA 8082A
PCB 77	EPA 1668 A	PCB-1221	EPA 8082A
PCB 78	EPA 1668 A	PCB-1232	EPA 8082A
PCB 79	EPA 1668 A	PCB-1242	EPA 8082A

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Polychlorinated Biphenyls	
PCB-1248	EPA 8082A
PCB-1254	EPA 8082A
PCB-1260	EPA 8082A
PCB-1262	EPA 8082A
PCB-1268	EPA 8082A
Polynuclear Aromatic Hydrocarbons	
2-Acetylaminofluorene	EPA 8270D
3-Methylcholanthrene	EPA 8270D
7,12-Dimethylbenzyl (a) anthracene	EPA 8270D
Acenaphthene	EPA 8270D
Acenaphthylene	EPA 8270D
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 8270D
Benzo(a)pyrene	EPA 8270D
Benzo(b)fluoranthene	EPA 8270D
Benzo(ghi)perylene	EPA 8270D
Benzo(k)fluoranthene	EPA 8270D
Chrysene	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270D
Dibenzo(a,j)acridine	EPA 8270D
Fluoranthene	EPA 8270D
Fluorene	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270D
Naphthalene	EPA 8270D
Phenanthrene	EPA 8270D
Polynuclear Aromatic Hydrocarbons	
Pyrene	EPA 8270D
Priority Pollutant Phenols	
2,3,4,6 Tetrachlorophenol	EPA 8270D
2,4,5-Trichlorophenol	EPA 8270D
2,4,6-Trichlorophenol	EPA 8270D
2,4-Dichlorophenol	EPA 8270D
2,4-Dimethylphenol	EPA 8270D
2,4-Dinitrophenol	EPA 8270D
2,6-Dichlorophenol	EPA 8270D
2-Chlorophenol	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 8270D
2-Methylphenol	EPA 8270D
2-Nitrophenol	EPA 8270D
3-Methylphenol	EPA 8270D
4-Chloro-3-methylphenol	EPA 8270D
4-Methylphenol	EPA 8270D
4-Nitrophenol	EPA 8270D
Pentachlorophenol	EPA 8270D
Phenol	EPA 8270D
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Semi-Volatile Organics	
2-Picoline	EPA 8270D
4-Amino biphenyl	EPA 8270D
Acetophenone	EPA 8270D
Aramite	EPA 8270D
Benzaldehyde	EPA 8270D
	EPA 8315A
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270D
Caprolactam	EPA 8270D
Dibenzofuran	EPA 8270D
Ethyl methanesulfonate	EPA 8270D
Isosafrole	EPA 8270D
Methyl methanesulfonate	EPA 8270D
O,O,O-Triethyl phosphorothioate	EPA 8270D
Phenacetin	EPA 8270D
Safrole	EPA 8270D
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C
1,4-Dichlorobenzene	EPA 8260C
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C

Volatile Aromatics	
Benzene	EPA 8260C
	EPA 8021B
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C
Ethyl benzene	EPA 8260C
	EPA 8021B
Isopropylbenzene	EPA 8260C
	EPA 8021B
m/p-Xylenes	EPA 8260C
Naphthalene, Volatile	EPA 8260C
	EPA 8021B
n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
o-Xylene	EPA 8260C
	EPA 8021B
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260C
	EPA 8021B
Total Xylenes	EPA 8260C
	EPA 8021B
Volatile Chlorinated Organics	
Benzyl chloride	EPA 8260C

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Volatile Chlorinated Organics	
Epichlorohydrin	EPA 8260C
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C
1,1,2-Trichloroethane	EPA 8260C
1,1-Dichloroethane	EPA 8260C
1,1-Dichloroethene	EPA 8260C
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C
1,2-Dichloropropane	EPA 8260C
1,3-Dichloropropane	EPA 8260C
2,2-Dichloropropane	EPA 8260C
2-Chloro-1,3-butadiene (Chloroprene)	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260C
3-Chloropropene (Allyl chloride)	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
Bromoform	EPA 8260C
Bromomethane	EPA 8260C
Carbon tetrachloride	EPA 8260C

Volatile Halocarbons	
Chloroethane	EPA 8260C
Chloroform	EPA 8260C
Chloromethane	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260C
Dibromochloromethane	EPA 8260C
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260C
Methyl iodide	EPA 8260C
Methylene chloride	EPA 8260C
Tetrachloroethene	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260C
trans-1,4-Dichloro-2-butene	EPA 8260C
Trichloroethene	EPA 8260C
Trichlorofluoromethane	EPA 8260C
Vinyl chloride	EPA 8260C
Volatile Organics	
1,4-Dioxane	EPA 8260C
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C
2-Nitropropane	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260C
Acetone	EPA 8260C

Serial No.: 53970

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DUANE LUCKENBILL
EUROFINS LANCASTER LABORATORIES
ENVIRONMENTAL LLC
2425 NEW HOLLAND PIKE
LANCASTER, PA 17601-5994

NY Lab Id No: 10670

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Volatile Organics	
Acetonitrile	EPA 8260C
Carbon Disulfide	EPA 8260C
Cyclohexane	EPA 8260C
Ethyl Acetate	EPA 8260C
Ethylene Glycol	EPA 8015C
Isobutyl alcohol	EPA 8260C
Isopropanol	EPA 8260C
Methyl acetate	EPA 8260C
Methyl cyclohexane	EPA 8260C
Methyl tert-butyl ether	EPA 8260C
	EPA 8021B
n-Butanol	EPA 8260C
o-Toluidine	EPA 8270D
Propionitrile	EPA 8260C
tert-butyl alcohol	EPA 8260C
Vinyl acetate	EPA 8260C

Sample Preparation Methods

EPA 5035A-L
EPA 5035A-H
EPA 3010A
EPA 3005A
EPA 3050B
EPA 3550C
EPA 3540C
EPA 3020A

Sample Preparation Methods

EPA 3546
EPA 5035
EPA 3060A

Serial No.: 53970

Eurofins Document Reference	1-P-QM-GDL-9015377	**Revision**	14
Effective Date	Dec 31, 2015	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Barbara Reedy, Christiane Sweigart, and Kathryn Brungard
Reviewed and Approved by	Robert Strocko;Review;Wednesday, November 18, 2015 10:39:07 AM EST Duane Luckenbill;Review;Sunday, December 13, 2015 10:34:22 PM EST Dorothy Love;Approval;Thursday, December 17, 2015 3:54:23 PM EST

Environmental Quality Policy Manual

Eurofins Lancaster Laboratories Environmental, LLC

2425 New Holland Pike
Lancaster, PA 17601
Phone: 717-656-2300
Fax: 717-656-2681

Reviewed and Approved by:
Vice-President/Technical Director
Microbiology Technical Director
Quality Assurance Director
(as documented on page 1)

Table of Contents

Revision Log:

Revision: 14	**Effective Date:** This version	
Section	**Justification**	**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356	Removed revision logs up to the previous version
Throughout document	Title change	Update QA Manager references to be QA Director
Throughout document	Clarification	General rewording for better clarity and flow of information
Section 1.3	Reflect current version	Revised mission statement
Section 1.4	Enhancement	Revised display of information
Section 2.4	Additional scope of document	Added service centers associated with Lancaster to the scope of this document
Section 2.6	Process change	Remove reference to quarterly reports as this information is communicated to management through different means
Section 2.11.1	Process change	Added “Note” regarding training for seasonal and temporary staff
Section 2.16	Unnecessary statement	Removed reference to Eurofins sister laboratories
Section 2.17	Clarification/Process change	Clarified that the Ethics Statement is signed annually Changed Ethics Committee to Ethics hotline service
Section 3.1	Changes to campus	Updated description of campus to reflect current state
Section 3.3	Clarification	Added IT systems to the areas addressed by disaster recovery
Section 3.4	Added information	Clarified actions taken if there are adverse environmental conditions in the facility
Section 4.2	Clarification	Added explanation for applying signatures electronically to document through the document control interface
Section 5.1	Added information	Revised to include information on the bottle lot checks
Sections 5.4 & 5.5	Enhancement	Added explanations of the bar code reading process used in sample tracking and the individual bottle code tracking
Sections 5.4, 6.1 & 6.3	Added information	Specified that samples and standards/reagents are stored separately.
Section 6.3	Updated requirement	Added information regarding the need for ISO Guide 34 and ISO 17025 approved materials.
Section 6.4.4	Clarification	Added notation for reporting noncompliant data when approved by the client and comments added to the report.
Section 6.5.1.2	Added information	Specified that passwords must adhere to the Eurofins Password Policy and must be “strong: passwords
Section 6.5.2	Enhancements	Added information on the software change request, periodic reviews and retirement documents. Generalized the explanation on validation plans.
Section 8.1	Reflects current process	Changed the listing of services to current offerings and updated the website link for certification
Section 10.1	Enhancement	Added Bottle orders and clarified to reflect current flow
Section 11.1	Clarification	Added ability of QA to stop work for critical internal audit issues
Section 11.2	Process change	Added electronic means of routing documents; removed quarterly report reference
Section 11.5	Unnecessary statement	Removed the need to stamp documents as confidential
Section 12.1	Clarification	Explanations added regarding actions for noncompliant QC data; removed quarterly report reference
Section 12.2	Updated process	Information on the ICAR process was revised to reflect the current practice using Jira
Section 12.3	Clarification	Added information regarding QA trend evaluation of client concerns and routing of the client satisfaction survey

Revision: 14		Effective Date:	This version
Section 12.4	Process change		Revised to remove references to the Ethics Committee and add information on the Ethics Hotline service; removed quarterly report reference
Section 12.4	Enhancement		Added information about use of Project Cycle to proactively ensure meeting the needs of the client
Section 13.4	Process change		Removed reference to subcontract warranty statement and added Laboratory Analytical Services Subcontract form
Appendices A-F and J-I	Updated for current information		Updated to reflect current SOPs, personnel, methods, etc.

Revision: 13		Effective Date:	Aug 8, 2014
Section	**Justification**		**Changes**
Revision Log	Formatting requirement per 1-P-QM-QMA-9017356		Removed revision logs up to the previous version
Throughout Document	Reflect re-identification of documents in EtQ		Replaced all prior Level 1, 2, 3, and 4 document numbers (analyses excluded) with EDR numbers
Title Page	Regulatory compliance		Added text for address, phone, reviewer/approver titles (previously listed on hardcopy covers and pre-EtQ versions)
Section 1	Updated training requirements		Removed requirement for all employees to read the appendices, they are available as resources; required for dept. 4052 only.
Section 1.2	Regulatory compliance		Inserted additional ISO17025 text at opening and closing of Quality Policy Statement
Section 2.1.1	New Section		Summarize processes to ensure business continuity and contingency plans
Section 2.2	Reflect current structure		Moved summation of technical director and QA manager to this section; changed employee responsible for daily operation from COB to VP. Throughout document, clarified management structure to include VP.
Section 2.6	Added process		Added ability for management and/or QA to issue a stop work notice.
Section 2.16	Regulatory compliance		Inserted additional ISO17025 text regarding ensuring impartiality, operation integrity, etc.
Section 3	Added building		Added building D
Section 4.2	Clarification		Noted that interim amendments to controlled procedures are not allowed.
Section 5.5	Added information		Noted that minimum sample retention period is 2 weeks form reporting
Section 6.4	Clarification		Standardized use or the terminology for equipment (supporting units) vs instruments (data producing units)
Section 6.5.1.9	New section		Added to address passwords and audit trails for systems used to process electronic data
Section 6.5.2	Clarification		Clarified SDLC processes
Section 8.1	Added information		Added reference to laboratory website for all current accreditation records
Section 10.2	Added information		Added information regarding electronic data, signatures, and audit trails
Section 10.4	Regulatory compliance		Added DoD reporting requirements for DL, LOD, LOQ
Section 10.5	Clarification		Clarified process and intent of data review
Section 10.7	Updated process		Added process for identification of accreditation status Noted use of LlabWeb for secure data transfer
Section 12.1	Added process		Added ability for management and/or QA to issue a stop work notice.

Revision: 13		**Effective Date:**	Aug 8, 2014
Section 12.4	Clarification, new process		Clarified processes that address preventive action; changed “PPI” to “Lean”
Section 13.2	Clarification		Added detail on project evaluations
13.4	Added detail		Added information regarding the subcontractor warranty and the need to ensure subcontractor can meet accreditation requirements
Appendices A-J	Updated for current information		Updated to reflect current SOPs, personnel, methods, etc.

INTRODUCTION

This *Quality Policy Manual* is based upon Eurofins Lancaster Laboratories Environmental LLC's (herein referred to as the laboratory) overall business and management philosophies, mission, and goals. This manual is written to present the policies employed by the laboratory as well as the support departments that serve the environmental laboratories and to comply with the requirements of the National Environmental Laboratory Accreditation Program, ISO 17025, and the Department of Defense (DoD). These policies define the "what" we do with emphasis on management's responsibilities and commitment to quality. Governing SOPs are in place within the organization, to ensure the proper execution of this policy document (refer to Appendix A). This manual is required reading for laboratory personnel. The appendices are available resources to all personnel but are not required reading for all employees. The most recent and up-to-date *Quality Policy Manual* and all referenced documents are available to all laboratory personnel who work in or support the laboratory. The laboratory actively strives for continuous improvement of its quality systems to better serve our clients.

1.1. Mission Statement

The laboratory offers analytical and consulting services in the chemical and biological sciences with comprehensive expertise in environmental laboratory applications. The company mission statement describes the corporate philosophy:

At Eurofins Lancaster Laboratories, Environmental LLC we are people working together to serve the health and environmental needs of society through science and technology. We strive to be the recognized leader in all that we do.

Our mission is to provide independent laboratory services in the chemical and biological sciences with excellent quality and service. As a corporate community, we:

- Deliver quality by fully understanding and always meeting the requirements of those we serve.
- Live our values by relating to our clients, coworkers, shareholders, suppliers, and community in a fair and ethical manner.
- Manage our growth and financial resources so we can serve our clients well, provide a satisfactory return to shareholders, and maintain our meaningful and enriching workplace.

1.2. Quality Policy

The Executive Management Group recognizes quality as a key element of the laboratory's standard of service. The group supports the laboratory's commitment to quality as defined by NELAP, ISO 17025, DoD, and other regulatory agencies (i.e. states) through the strict adherence to the Quality Policy Statement. The Quality Assurance Director wrote the Quality Policy Statement, with final approval from the laboratory Vice-President. The policy cannot be revised without their approval.

The Quality Policy Statement gives employees clear requirements for the production of analytical data. Employees are trained on the components of the Quality Policy Statement during their first day of orientation. Each employee signs the statement upon hire as agreement to implement the policy in all aspects of their work. Employee agreement to any subsequent revisions of the statement is obtained by documented reading and understanding of an agreement to follow the Quality Manual, which contains the current version of the statement. The statement is as follows:

As an organization, all personnel are committed to high quality professional practice, testing and data, and service to our clients.

We strive to provide the highest quality data achievable by:

- Following all documentation requirements; describing clearly and accurately all activities performed; documenting "real time" as the task is carried out; understanding that it is never acceptable to "back date" entries and should additional information be required at a later date, the actual date and by whom the notation is made must be documented.
- Providing accountability and traceability for each sample analyzed through proper sample handling, labeling, preparation, instrument calibration/qualification, analysis, and reporting; establishing an audit trail that identifies date, time, analyst, instrument used, instrument conditions, quality control samples (where appropriate and/or required by the method), and associated standard material.
- Emphasizing a total quality management process and commitment to continuous improvement which provides accuracy, and strict compliance with agency regulations and client requirements, giving the highest degree of confidence; understanding that meeting the requirements of the next employee in the work flow process is just as important as meeting the needs of the external client.
- Providing thorough documentation and explanation to qualify reported data that may not meet all requirements and specifications, but is still of use to the client; understanding this occurs only after discussion with the client on the data limitations and acceptability of this approach.
- Responding immediately to indications of questionable data, out-of-specification occurrences, equipment malfunctions, and other types of laboratory problems, with investigation and applicable corrective action; documenting these activities completely, including the reasons for the decisions made.
- Providing a work environment that ensures accessibility to all levels of management and encourages questions and expression of concern on quality issues to management.

We each take personal responsibility to provide this quality product while meeting the company's high standards of integrity and ethics, understanding that improprieties, such as failure to conduct the required test, manipulation of test procedures or data, or inaccurate documentation will not be tolerated. Intentional misrepresentation of the activities performed is considered fraud and is grounds for termination.

I understand the expectations and commit to implementation of all applicable policies and procedures and to providing quality data.

1.3. Statement of Values

Eurofins Lancaster Laboratories Environmental is a team of people who work together to serve the health and environmental needs of society through science and technology.

At Eurofins Lancaster Laboratories Environmental, our mission is to provide independent laboratory services in the chemical and biological sciences with excellent quality and service. We fulfill our mission by incorporating our values into our work every day.

As a corporate community, we embrace our heritage of integrity and strive to live by the following principles:

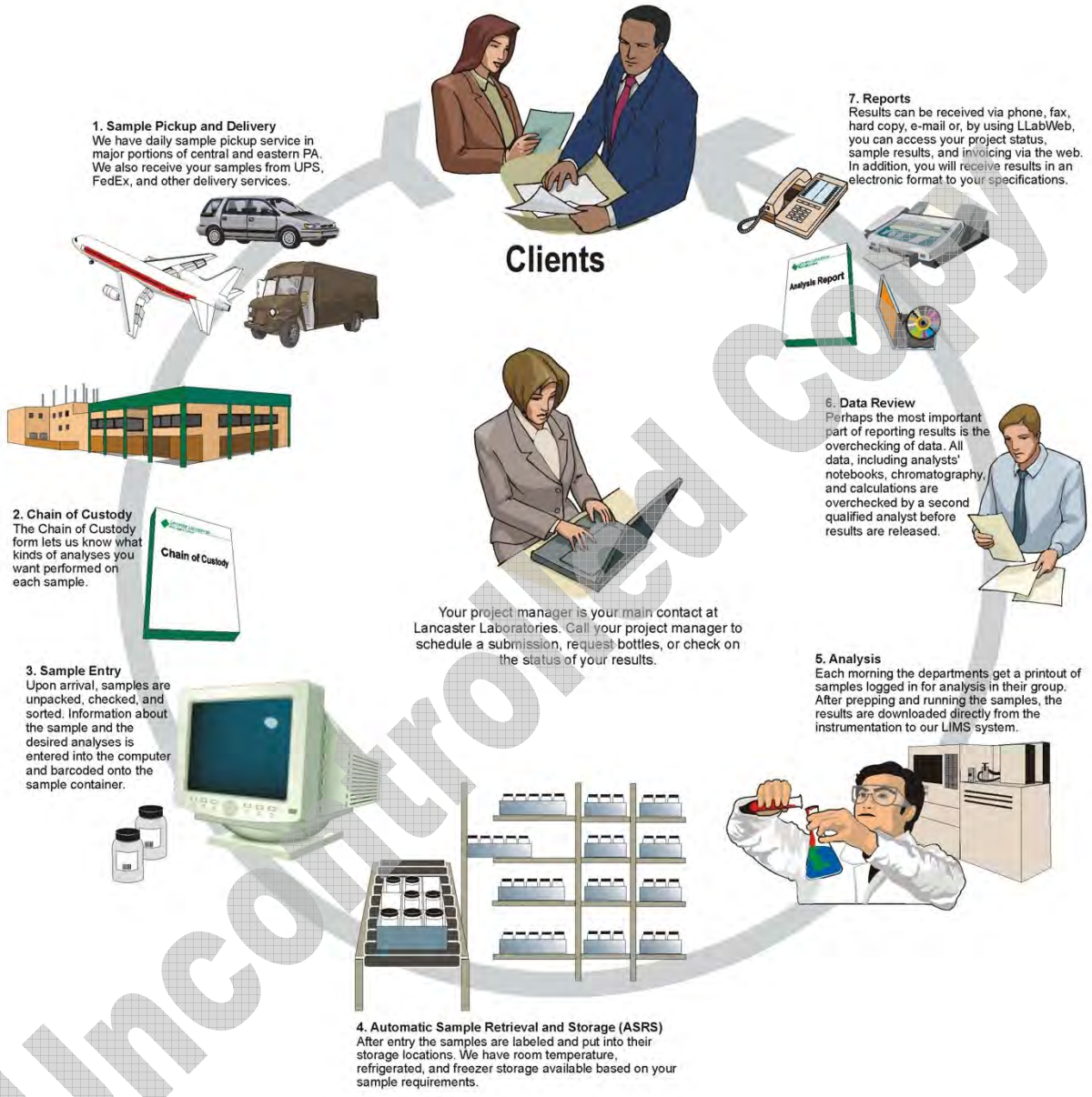
- Fairness and honesty in all our relationships
- Mutual trust
- A respect for ourselves and others
- A sense of caring that leads us to act responsibly toward each other and society, now and in the future
- Loyalty to our clients and one another
- A spirit of open-mindedness as we deal with all
- Dedication to service
- Good stewardship of our resources
- A commitment to flexibility and continuous improvement

We are committed to:

- Delivering quality by fully understanding and always meeting the requirements of those we serve.
- Living our values by relating to our clients, coworkers, shareholders, suppliers and community in a fair and ethical manner.
- Managing our growth and financial resources so we can serve our clients well, provide a satisfactory return to shareholders and maintain our meaningful and enriching workplace.

At Eurofins Lancaster Laboratories Environmental, we each take personal responsibility to live these values in all of our dealings, knowing full well that our pledge may involve difficult choices, hard work and courage.

1.4. Sample Flow-Through Diagram



1.5. Certifications, Accreditations, and Registrations

Accreditation/Certification is the process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications and/or standards. It is the one generally accepted method by which a laboratory such as ours can demonstrate its capability of generating acceptable, professional, quality test results in those areas in which it claims competence. To this end, we have actively sought accreditation by organizations offering it in those areas relevant to our technical expertise. We strive to ensure that the facilities, equipment, procedures, records, and methods used by the laboratory in the testing of environmental samples are in compliance with the requirements of these standards.

Although organizations offering accreditation differ somewhat in the details of their programs, they generally evaluate laboratories in four basic areas: personnel (adequate staffing, education, training, and experience), physical facilities, instrumentation/equipment, and quality assurance program. This evaluation is performed by one or more of the following procedures: periodic on-site inspections of the laboratory by assessors experienced in technical operations, quality systems, and management; periodic analysis of proficiency test samples; and periodic updating of the laboratory's file to reflect changes in personnel, equipment, or services offered. Some states offer reciprocity with other state programs.

Appendix B lists accreditations and registrations held by the laboratory in support of environmental work. Current copies of all scopes of accreditation are available on the laboratory website and are kept on file in the Quality Assurance Department.

2. ORGANIZATION AND PERSONNEL

2.1. Company Overview and History

The laboratory was founded in 1961 by Dr. Earl Hess in response to a need for high quality technical services by the agricultural and industrial communities in southeastern Pennsylvania. Nourished in a culture of quality and caring about all those associated with the business, the corporation became an industry leader known for innovative business practices and people-friendly policies. The company was independently owned until the retirement of Dr. Hess in 1995. At that time, the laboratory was acquired by a publicly held company, Thermo TerraTech, Inc., a Thermo Electron company. Ownership changed in September 2000, when the laboratory was acquired by Goldner, Hawn, Johnson, and Morrison, Inc. (GHJ&M), a private equity investment firm. In August 2005, the laboratory was acquired by Fisher Scientific under their BioPharma Division. On November 9, 2006, Thermo Electron and Fisher Scientific merged to form Thermo Fisher Scientific. In April 2011, Thermo Fisher Scientific sold the laboratory to Eurofins Scientific. Effective July 1, 2013, the Pharmaceutical and Environmental Divisions were split into separate business entities and the company name became Eurofins Lancaster Laboratories Environmental, LLC. The laboratory continues to operate as an independent laboratory and is incorporated by the State of Delaware.

The laboratory provides a wide array of laboratory services to clients working in environmental industries. We strive to offer high quality technical services in the chemical and biological sciences with personal attention to client needs. These services include chemical analyses, microbiological testing, and analytical method development. We are, therefore, a technical service company and do not manufacturer or distribute goods. Our "product" is accurate and timely technical information and our continued existence depends on the quality of the services we offer and efficiency with which we deliver them.

2.1.1 Business Continuity and Contingency Plans

Various policies and practices are in place to address continuity of business and contingency plans to ensure continued operations or minimal disruption in operations should unplanned events (natural disasters, unexpected management changes, etc.) occur.

Section 2.2 of this document explains the identification of deputies for key management positions. Section 3.3 discusses the disaster recovery plan. Section 6.5 addresses the security and backup of our computer systems. Section 10.8 addresses handling of client records should the company have a change in ownership or go out of business.

2.2. Organizational Structure

The laboratory Vice-President/Technical Director, Duane Luckenbill, is responsible for the daily operations of the laboratory.

The Executive Management Group is defined as the Eurofins Environment Testing US Chairman of the Board and President and Eurofins Lancaster Laboratories Environmental, LLC Vice-President.

The management staff includes directors, managers and group leaders. Organizational charts are presented in Appendix C. A list of key personnel is also provided. The Vice-President and Quality Assurance (QA) Director have identified deputies for all key management personnel.

2.2.1 Technical Director

The Technical Director ensures that the laboratory's policies and objectives for quality of testing services are documented in this quality manual. The Technical Director must assure that the manual is communicated to, understood, and implemented by all personnel concerned.

2.2.2. Quality Assurance Director

The Quality Assurance Director ensures that the quality system is followed at all times. The QA Director reports directly to the Vice-President thus ensuring corrective actions to quality issues are taken promptly and are separate from business decisions. The QA Director has no direct supervisory responsibility for the generation of technical data to avoid any conflict of interest in administrating the QA program. The QA Director has the final authority to stop work that compromises our integrity or data quality. The situation must be investigated and appropriate corrective action must be put in place before the QA Director will authorize the resumption of work. The specific duties of the QA Director are communicated in job plan format.

2.3. Management Responsibilities

Laboratory management duties are outlined for supervisory personnel using a job plan format, which details each individual's responsibilities along with expected results. Typically, management duties include, but are not limited to:

- Personnel hiring and training
- Supervision of personnel
- Providing resources to ensure a work environment free from commercial, financial, and other undue pressures that may adversely affect the quality of their work
- Providing resources to ensure a safe work environment
- Directing daily work operations, including scheduling of work
- Ensuring compliance with the TNI Standards, ISO 17025, Department of Defense Quality Systems Manual, state agency programs, analytical methods, and client requirements.
- Assessing laboratory capacity and workload
- Resource allocation
- Ensuring quality of data produced
- Contributing to the continuous improvement of the laboratory operation
- Ensuring that corrective actions are carried out in an appropriate and agreed upon time-frame.
- Communicating problems and concerns to Senior and Executive Management to enlist a higher level of support for corrections and continuous improvements.
- Maintaining awareness of technical developments and regulatory requirements

2.4. Overview of the Quality Assurance Program

Quality Assurance (QA) is responsible for developing planned activities whose purpose is to provide assurance to all levels of management that a quality program is in place within the laboratory, and that it is functioning in an effective manner that is consistent with the requirements of NELAP, ISO 17025, DoD, and any other regulatory agencies (i.e. states) in which we hold accreditation. Although the laboratory is a wholly owned subsidiary of Eurofins Scientific, the Quality Assurance and Quality Systems operations described in this manual are specific to the Lancaster site and associated service centers.

The administration of the QA program is the responsibility of the QA Director in cooperation with all levels of management.

The QA program, as directed by executive management, was established to:

- Ensure accountability, accuracy, and traceability of all analytical data generated.
- Ensure that current regulatory, agency, and client requirements are being met.
- Ensure that operating procedures are in place to minimize the possible loss, damage, and tampering with data, in addition to ensuring that raw data is stored in a secured area and is maintained by designated archivists and/or system administrators.
- Ensure that curriculum vitae (CVs) and training records are maintained to document that staff members have the necessary education, training, and experience to perform their job responsibilities and functions.
- Ensure that regulatory training is provided to applicable employees on a routine and ongoing basis.
- Ensure that all procedures are available, controlled, and current.
- Ensure that documentation demonstrates that procedures are carried out in a compliant and effective manner.
- Ensure that all equipment and instrumentation is qualified, maintained, and calibrated, as appropriate, in accordance with written standard operating procedures.

- Ensure that all significant laboratory problems are investigated, evaluated for root cause and corrective action is put in place as documented
- Ensure that an internal audit program is in place to provide on-going monitoring and confirm that laboratory personnel are adhering to standard operating procedures and applicable regulations.
- Ensure that quality issues are brought to the attention of management in a timely manner.

2.5 Quality Assurance Responsibilities

The QA Director assigns tasks with input from the company Vice President. The primary responsibilities of QA include, but are not limited to the following:

- Oversee the laboratories' internal audit program which consists of various audit types and applies to all laboratory activities (technical and administrative).
- Review and approve standard operating procedures and analytical methods.
- Review and approve validation documentation.
- Review non-conforming quality control data
- Perform tracking and trending of quality measurements and report the status and effectiveness of the quality system to management.
- Approve investigation and corrective action reports (ICARs) and audit responses to ensure that they are completed in a timely manner, evaluated for root cause, that corrective actions are implemented as needed and to monitor corrective action for effectiveness.
- Host client and regulatory agencies during facility audits and follow-up to any cited deficiencies.
- Provide regulatory guidance to the laboratory and support areas.
- Monitor Good Laboratory Practice (GLP) regulatory activities.
- Communicate quality issues to management in a timely manner
- Provide and/or coordinate on-going regulatory training (e.g., GLP).
- Participate in the vendor and supplier approval process, including subcontractors.
- Review analytical data for compliance with our procedures.
- Prepare and review QA project plans (QAPPs) as required by EPA and client projects.
- Maintain and update this *Quality Policy Manual*.
- Maintenance of the Laboratory's accreditations, including but not limited to, administration of the proficiency test sample programs, both single and double blinds.
- Communicate (within 30 days) to the relevant state authorities when there are management or facility changes that impact the laboratory. Changes in the technical director must be communicated within 20 days.

2.6. Communication of Quality Issues to Management

The QA Department is responsible for preparing reports to Management to keep them apprised of outstanding quality issues. Reports to management foster communication, review, and refinement of QA activities to ensure that the QA program is adequate to meet regulatory and the laboratory's quality objectives. The following reports are used to communicate quality issues and include, but are not limited to:

- Internal, client, and agency audit reports and corrective action plans
- Proficiency test reports
- Investigation and corrective action reports
- Monthly quality status reports
- Plans for corrective action

Upon review of quality issues, management and/or QA may issue a stop work notice if an issue indicates the potential for a problem on a broader scale with an analysis. The investigation would need to be completed and the issue resolved before work could continue. The information is tracked through our Investigation and Corrective Action Report (ICAR) process.

2.7. Personnel Qualifications and Responsibilities

Full resumes and responsibilities of key personnel are provided in Appendix D.

Due to the number of analysts on staff, entry level chemists, technicians, and support personnel are not included in the resume section. However, all employees have job plans that define their responsibilities. Duties for these personnel typically include:

- Sample storage
- Sample preparations
- Performance of tests
- Calibration, operation, and maintenance of instruments
- Data entry
- Standard and reagent preparation
- Glassware preparation
- Data deliverables preparation

2.8. Relationship of Functional Groups and the Quality Assurance Program

In addition to this *Quality Policy Manual*, aspects of the QA program are documented in a series of standard operating procedures that support the proper execution of this document. Technical operation procedures with required quality components are also in place. A list of the titles of relevant SOPs is provided in Appendix E. There are a variety of mechanisms used to communicate requirements and verify compliance with the QA program, including:

- Management requires that all employees read and be trained in the policies and SOPs that are pertinent to their jobs.
- Employee job plans define individual responsibilities. All job plans include QA aspects, and performance is reviewed annually.
- Laboratory audit findings are circulated to management and require a response and follow-up to items needing corrective action.

- Cross-functional meetings, including representatives from QA, Client Services, Marketing, management, and technical operations are held regularly to review specific projects and quality issues.

2.9. Balancing Laboratory Capacity and Workload

Evaluating laboratory capacity to perform specific projects is the responsibility of the Vice-President, laboratory directors and managers, and the Client Services director and manager. These responsibilities are documented in the individual job plans for these positions.

The laboratory facilities and staff size are very large compared to other laboratories serving the environmental industry. Many analysts are cross-trained to perform a variety of tests, and there is redundant equipment available in case of malfunctions. This minimizes the need to evaluate small and medium size projects against capacity available to complete them. Large projects are reviewed against capacity estimates before bids are submitted to ensure that the client's analysis schedule is met.

Regularly scheduled meetings are held with upper management, laboratory middle management, Client Services and QA personnel to review progress with current projects, as well as special requirements of new work scheduled for the laboratory.

Laboratory capacity and backlog is tracked on a continuous basis using information from the Laboratory Sample Information System (LIMS) including turnaround time, and work in-house.

2.10. Identification of Approved Signatories

All data is reviewed and verified prior to release to the client. Based on complexity or regulatory needs, some projects are designated for secondary (technical and/or QA) review of the Analysis Reports and/or data deliverables. Approved signatories for these secondary reviews are defined in the SOP on Data Entry, Verification, and Reporting. Directors, managers, group leaders, and other designated employees (such as QA, project managers, and senior technical staff) are designated to approve/release Analysis Reports. Request for approval of an employee to approve/release reports must be made through the QA Department. These authorized personnel are designated with an asterisk in the personnel list provided in Appendix C.

2.11. Personnel Training

The experience and training received by personnel is of great importance to our clients and regulatory agencies. Curricula Vitae (CVs) and on-going training documentation are available to demonstrate how personnel have been prepared for the tasks they routinely perform. To ensure the highest quality of services at the laboratory, training programs and plans are developed to match skills with job functions. Accurate training documentation is the responsibility of both the employee and their supervisor. On a routine basis, the supervisor reviews and approves training documentation to verify that it is complete and current.

Training requirements can be met through education, prior job experience, internal and external training classes, on-the-job training, TRN training modules, procedure reading, or any combination thereof, to enable the person to perform assigned job functions and meet regulatory compliance.

Each analyst training to perform a new analysis is required to perform an initial demonstration of capability and meet the requirements for accuracy and precision before working independently on the test method. Typically, this is accomplished by the successful analysis of four known samples. However, there are certain tests performed that are not required by the mandated test method or regulation to perform the above procedure (i.e., EPA 1010, 9095). In this case, the analyst's documentation of proficiency is satisfied by the sign-off of having read, understood, and agreed to follow the SOP as written, on-the-job training and observation by a senior analyst.

Management personnel are responsible for planning ongoing professional growth and development activities for an employee through on-the–job training and/or internal and external training courses so an employee can maintain a current skill set to match job responsibilities.

An annual performance review based on job accountabilities, objective measures, and pre-defined standards is completed by management personnel for each employee. This assessment is documented and maintained. Input is obtained from other managerial personnel as needed.

2.11.1. New Hire Training

New employees are oriented as part of a year-long process that is designed to make the employee feel welcome and comfortable by defining our culture, traditions, philosophies, and work practices. During the orientation process an employee learns about personnel and safety policies and business strategies in addition to quality, ethics, and customer satisfaction expectations through a formal process administered by our Human Resources Department.

New employees are required to attend "core" technical orientation, as applicable, which can entail the participation in training module exercises, short session attendance, and/or other skill training specific to their assigned department or job function. Additional job-specific training required for an employee is based upon their assigned duties and is identified by their supervisor. Technical orientation occurs during the first few weeks of employment.

Note: Seasonal and temporary employees have reduced "core" training requirements based on the assigned tasks and as defined by QA, Safety, and the assigned department management.

The orientation process is designed to enable employees to initiate and take responsibility for their personal and professional career growth at the laboratory. The orientation process is conducted without regard to employee race, color, creed, national origin, sex, age, or disability in accordance with the laboratory's Employee Equal Opportunity (EEO) policy.

2.11.2. Ongoing Training

Refresher and ongoing training occurs through various means, which include but are not limited to, training in or independently review new/updated standard operating procedures and TRN training procedures; on-going regulatory training; in-house or off-site classes or seminars. The goal of this training is to ensure that employees remain current with changes to laboratory systems and practices, as applicable to their job function. Retraining and re-qualification activities occur as directed by procedures or regulations. Employees are retrained if an issue or investigation warrants that retraining is a necessary corrective action. Management directs when employee re-training is required, and the extent of the re-training.

2.12. Regulatory Training

The QA Department is responsible for coordinating and conducting initial and ongoing regulatory training (i.e., GLP) for all applicable laboratory and support personnel. It is the responsibility of management within each department to ensure that personnel attend the required training sessions.

The choice of training format and topics covered for ongoing regulatory training is left to the discretion of QA and the trainer. All training sessions reinforce the concepts in the regulations as they are relevant to the laboratory.

Whenever possible, after training is completed, a demonstration of proficiency of the training topic is given. The demonstration of proficiency is generally in the form of a quiz although other demonstrations of proficiency are acceptable depending on the scope and content of the training. If necessary, training is presented and/or repeated one-on-one with individuals who do not demonstrate proficiency in the training topic. This is performed by QA in conjunction with applicable laboratory management personnel.

2.13. Employee Safety

The laboratory, being mindful of its responsibilities as an employer and active corporate citizen, has established the following objectives of its safety program:

- Provide a safe environment for its employees, visitors, and the community surrounding its place of business.
- Provide ongoing safety training for employees.
- Provide all necessary facilities and equipment to ensure the safety of its employees and to minimize all chemical exposure during the normal performance of their required tasks, and to take all necessary precautions to safeguard the surrounding environment.
- Provide periodic health physicals for employees.
- Foster and encourage safe operations and a proper safety attitude on the part of our employees through general operations and systems, training, and the *Chemical Hygiene Plan* (CHP).

The CHP addresses various aspects of our safety program in greater detail.

A Safety Committee works to enhance our overall safety program. The committee meets on a routine and ongoing basis and its specific responsibilities are detailed below:

- Review accident and incident reports. Make recommendations for methods of prevention to eliminate further accidents.
- Promote safety awareness and distribute safety information by various means (e.g., posters, videotapes, pamphlets, and books). Use internal communication channels to promote safety awareness.
- Enhance and recommend safety-training programs for all employees, as necessary.
- Maintain up-to-date information on employee concerns that are safety related. Offer input and information to the Chemical Hygiene Officer and/or Safety Officer, as needed.

2.14. Client Services/Project Management Responsibilities

Members of the laboratory Client Services/Project Management Group are responsible for organizing and managing client projects. Clients are assigned a project manager (a.k.a. "CSR") who serves as their primary contact at the laboratory. It is the project manager's responsibility to act as the client advocate by communicating client requirements to laboratory personnel and ensuring that clients provide complete information needed by the laboratory to meet those requirements. All client verbal communications are documented by the project manager in a controlled notebook. In addition to information management, Project Management responsibilities include:

- Coordinating and preparing proposals in conjunction with technical staff.
- Confirming certification status.
- Hosting client visits and audits.
- Coordinating and communicating turnaround time (TAT) requirements for high priority samples/projects.
- Answering common technical questions, facilitating problem resolution.
- Providing clients with sample status report or results (partial reports) prior to receipt of the final Analysis Reports (e.g., fax, e-mail, phone).
- Scheduling sample submissions, sample containers, and sample pick-up via the laboratory courier service.
- Informing the client of deviation from their contract.

2.15. Confidentiality

Strict confidentiality is maintained in all of our dealings with clients. Confidentiality agreements, therefore, are willingly provided.

All employees are required to protect company technical data, including client names and test results from disclosure to any third party. This policy, as described in the *Eurofins Lancaster Laboratories Employee Handbook*, is provided and presented to employees during their orientation period and whenever revisions are made.

Intellectual property associated with the testing that we perform under contract for a client is the property of the client.

In an attempt to ensure the confidentiality of our systems and procedures within our laboratory, it is our policy to restrict the distribution of our internal procedures to clients. Clients are permitted to review our procedures while on-site as part of an audit or visit. Based on this policy, we would request that any documents viewed would not be shared or made available to any third parties without the permission of the laboratory.

2.16. Business Conduct

Our business conduct policy applies to all operations of the company. All employees must avoid involvement in any activities that would diminish confidence in their competence, impartiality, judgment, or operational integrity. All employees must further avoid any relationship with other individuals or organizations that might impair, or even appear to impair, the proper performance of their company-related responsibilities. Employees must avoid any situation that might affect their independence of judgment with respect to any business dealings between the company and any other organization or individual. Any employee who believes that they have such a conflict, whether actual or potential, or who is aware of any conflict involving any other employee must report all pertinent details to the Vice-President or President of the company. The company's management vigorously enforces this policy and takes prompt and appropriate action, including termination, against any employee found to be in violation.

2.17. Operational Integrity

All employees review and sign the Employee Ethics Statement on their first day of employment and annually thereafter. Employees responsible for generating, handling, or reviewing laboratory data understand that the laboratory mission is to perform all work with the highest level of integrity. Under no circumstances are shortcuts or generating results to suit a client's purpose rather than good scientific practice considered acceptable. Any violation of the laboratory ethics policy results in a detailed investigation that could lead to termination.

All levels of management consider the following activities unacceptable:

- Knowingly recording inaccurate data.
- Fabrication of data without performing the work needed to generate the information. This includes creating any type of fictitious data or documentation.
- Time travel or adjusting clocks on computerized systems to make it appear that data was acquired at some time other than the actual time.
- Manipulation of data for the express purpose of passing system suitability or quality control criteria.
- Selective use of data generated, or not using data that was legitimately generated and has an impact on the outcome of the test.
- Executing significant deviations from approved test methods and procedures without prior approval from the laboratory management and/or the client.

If an issue does arise which could compromise data integrity, personnel are instructed to perform the following activities:

- Clearly document the situation and maintain all data generated. There is a big difference between poor judgment and fraud. Fraud usually involves intent to conceal an action taken. Therefore, the more documentation that is maintained, the less likely an action is considered fraudulent if further scrutinized.
- When out-of-specification results or quality type issues are detected, all supporting data and relative background information must be documented and presented for management review. Problem resolution and client contact, as applicable, must also be documented.
- Review any questionable situations and decisions with a supervisor.

- Bring a questionable or uncomfortable issue directly to the QA Director or a member of the QA Department as part of our QA open door policy.
- Utilize the company's anonymous Ethics hotline service. See Section 12.4 of this manual.

3. BUILDINGS AND FACILITIES

3.1. Facility

The laboratory is located at 2425 New Holland Pike, Lancaster PA. The facility consists of two campuses with multiple buildings located on the North and South sides of Route 23. The two campuses are connected by a pedestrian bridge that spans Route 23.

Building A resides on a commercial plot measuring 13.6 acres on the north side of Route 23. Building A is a three-story building of concrete and steel construction which houses both laboratory space and administrative offices. It is approximately 108,000 square feet and consists of approximately 47,000 square feet of laboratory space; 29,000 square feet of office space; and 32,000 square feet of storage, mechanical, and common areas. On this parcel, adjacent to Building A, sit two chemical storage buildings (Buildings I and L) with a total space of 2500 square feet. In addition, a 10,500 square foot storage building houses stability chambers (Building J). The bottles packing area, which includes preservation of bottles being sent to clients for sampling, is located in a separate 3100 square foot building (Building K). In addition, there are two other buildings (Buildings G and H) with a total square footage of 20,000 square feet that host recycling, storage, workshop and facilities maintenance areas.

The remaining buildings reside on a commercial plot measuring 35.7 acres on the south side of Route 23. These building are connected to the north campus buildings via a pedestrian walkway over the highway.

Building B is a three-story building of steel and concrete construction. It is approximately 56,000 square feet and consists of approximately 17,000 square feet of laboratory space; 14,000 square feet of office space; and 25,000 square feet of storage, mechanical, and common areas.

Building C resides between buildings B and D and consists of a three-story building of steel and concrete construction. It is approximately 47,000 square feet and consists of approximately 25,000 square feet of laboratory space; 6,900 square feet of office space; and 15,100 square feet of storage, mechanical, and common areas. The first floor houses the main lobby and visitor's entrance.

Building D is connected to building C. It is a 78,000 square foot, four-story building of steel and concrete construction and provides approximately 35,000 square feet of laboratory space, 19,000 square feet of office space, and 24,000 square feet of storage, mechanical, common area.

Two small support buildings (Buildings E and F) with a combined space of approximately 800 square feet are used for chemical and waste storage on the south campus.

The Lancaster campus also utilized an adjacent parcel for a technical training center. This space is approximately 6,500 square feet.

There is an automatic fire alarm and security system hooked up at the facility. This system is monitored offsite by Choice Security. The entire campus and all exterior doors are monitored by video surveillance.

This facility is serviced by public sewer. Drinking water comes from a private well while the facility sprinkler system is fed by the public water supply. The closest surface water is the Conestoga Creek.

3.2. Security

The laboratory is considered a secure facility. All outside doors except the main lobby entrance are locked during normal business hours to prevent unauthorized entry. An attendant monitors this entrance at all times.

During evenings, weekends, and holidays, all doors are locked and Security personnel are on site to prevent unauthorized entry into the building. Video cameras are utilized by Security personnel to monitor the facility grounds.

Every employee is issued a photo ID badge which also serves as a building access card. This badge must be worn at all times while on laboratory property so that employees are easily identified. Access to secured/designated areas within the building is limited to only applicable employees through the building security system. This system is administered by Security staff.

All visitors must register with the lobby attendant and are issued a visitor badge. A staff person must accompany visitors while in the facility. Additional visitor rules are outlined in the *Visitor Security and Safety Rules* pamphlet which is provided to all guests.

Building access cards are issued on a temporary basis to contractors or service technicians (e.g., electricians and plumbers) who need access to the building to work on a project. These cards provide the contractor with limited access during the normal workday and must be returned when the work is complete.

3.3. Disaster Recovery

A disaster recovery plan is in place to provide direction for situations where normal operations of the laboratory are not possible. In the event that the building or information technology (IT) systems would be severely challenged, a designated disaster recovery team, which includes Physical Services, Maintenance, Safety, Corporate Management, Public Relations, IT, QA and other applicable personnel depending on the scope of the disaster, would assemble at a designated area to assess the situation and formulate a plan.

The plan addresses, in general terms, how to approach the following issues: electrical failures, heating/air conditioning failures, fire/building evacuation, computer failures, hazardous material spills, injury to employees, pandemic flu, disruption of phone service, and stability chamber failures.

3.4. Environmental Monitoring

The air handling system for the main laboratory is specially designed to protect sensitive instruments from harmful vapors to ensure that samples are not contaminated. The Physical Services/Maintenance Group is responsible for maintaining the HVAC and exhaust hood systems. This is particularly important in our instrumentation rooms and computer center where a controlled environment, positive pressure system is maintained.

Most refrigerators, freezers, incubators, and ovens used for analysis are monitored by a computerized system equipped with stationary thermometer temperature probes linked to a master panel that is accessed through a computer. If a unit is outside of a predefined temperature range for a specified period of time, the system alarms. Units not on the computerized system must be monitored manually by recording thermometer temperature readings twice daily.

The laboratory is set up so that there is effective separation between neighboring areas in which there is potential for contamination. Laboratory storage blanks are also used to evaluate conditions under which samples for volatile analysis are stored to monitor for cross-contamination potential. QA provides oversight of the environmental monitoring system.

QA and technical management, in consultation with facilities management as needed, evaluate any issues with environmental conditions that could have adverse effects on data to determine if alternative operational plans (moving testing to alternate laboratories, temporary shutdowns, etc.) need to be employed.

3.5. Water Systems

Well water and the public sewer system service the facility. The water system is monitored to meet the permit requirements of the Pennsylvania Department of Environmental Protection.

Reagent water is available to analysts for sample preparation (including dilution) and glassware cleaning. Two reverse-osmosis deionized water systems deliver highly purified water to a sealed fiberglass storage tank. From the storage tank the water is delivered to an ion-exchange-carbon filter system for further polishing. The water is also exposed to an in-line ultraviolet sterilization lamp before being circulated to taps throughout the laboratory.

Daily monitoring and preventive maintenance for the system is the responsibility of the Physical Services Department. Monthly and annual testing is performed as required by regulatory guidance. QA provides oversight of the water system monitoring. In addition, method blanks are tested with each batch (≤20) of samples.

3.6. Housekeeping/Cleaning

The laboratory is dedicated to providing a clean workplace. A third party professional cleaning service provides routine cleaning of “common areas” that include lavatories, drinking fountains, floors, and windows. Technical staff are responsible for the cleaning (or the contract of cleaning) of specific laboratory work areas.

Detergents used for cleaning contain no to very low levels of metals, pesticides/herbicides/ fungicides, or volatile solvents.

3.7. Insect & Rodent Control

Steps are taken to prevent, monitor, and control insect and rodent infestation. The coordination of this program is the responsibility of the Physical Services Department under the direction of QA. An outside service firm is contracted to perform routine and ongoing monitoring of the facility to ensure that preventive measures which are in place are effective and are working as intended.

No insect or rodent control chemical agents in a liquid or vapor form are applied or sprayed in any laboratory building, unless there is no other option, in which case department management must be contacted for approval.

3.8. Emergency Power Supply

The laboratory is located at the junction of two power grids that supply electrical service to the facility. If one of the power grids fails, we have the ability to work with the power company to have service switched to the other grid. Various types of diesel and natural gas generators are also available on a standby basis to supply power to selected areas of the laboratory in case of a power outage.

To reduce spikes and spurious line voltage changes to laboratory instruments that can affect results or damage electronic equipment, "conditional power" is fed to these sensitive instruments. All essential computer systems are on uninterrupted power supply (UPS) which is a battery system that provides continuous conditional power for a limited time period in the event of a short power outage.

3.9. Facility Changes

Procedures are in place to manage change, ensure communication, and to minimize negative consequences through active participation of personnel involved in a facility change. The goal is to ensure that physical and environmental condition changes are adequately evaluated for impact and reduction of risk to quality, safety, health, employee, environment, property, analytical services, and business operations before and after the change is implemented.

4. DOCUMENT CONTROL

The administration of the document control system including tracking, filing, updating, and archiving of historical copies is the responsibility of the Office Services (OS) Department.

It is our policy to restrict the distribution of our internal procedures to clients and we discourage the distribution of company confidential documents outside of the facility. Clients are permitted to review our procedures while on-site as part of an audit or visit. Any documents that are distributed are only sent with the approval of QA.

The goals of the document control process are:

- Format documents according to consistent and defined standards
- Review and approve new documents
- Schedule review of existing documents
- Control of document versions and effective dates
- Review and approval of document changes
- Control document distribution and removal of obsolete documents
- Archive and protect obsolete documents

4.1. Hierarchy of Internal Operating Procedures

The hierarchy of controlled procedures at the laboratory is defined. These procedures and documentation are made available to promote consistency throughout the organization and to meet regulatory requirements. A list of relevant methods and procedures is located in Appendix E. The development of new procedures and the updating and reclassification of current procedures is an ongoing project.

4.1.1. Level 1 – *Quality Policy Manual* and Company Policies

The intent of these documents is to define "what" we do with emphasis on Executive and Management's responsibility for quality.

The purpose of the *Quality Policy Manual* is to provide a framework to outline the quality systems at the laboratory. Organizational charts, list of SOPs, a list of equipment, instrumentation, and personnel resumes are included as attachments to this manual.

- Executive Management is responsible for ensuring that adequate personnel, resources, and support are available to carry out the requirements of this *Quality Policy Manual*.
- Management is responsible for ensuring that SOPs or other appropriate documents are written and available to personnel to define the practices and systems which support these policies.
- All employees are responsible for conducting business in a manner which is compliant with quality and company policies and associated SOPs or other appropriate documents. Review of these policies and procedures must be documented.

Additional company policies are written to support and expand upon this *Quality Policy Manual*. These policies contain more detailed information about a subject with approval signatures executed at the Executive and/or Management level.

4.1.2. Level 2 – Standard Operating Procedures

The intent of these standard operating procedures is to define "who, what, where, and when." These procedures provide specific information for a process or topic so that the requirements outlined in this *Quality Policy Manual* and company policies can be achieved. The review and approval of these SOPs is performed at the director/manager/group leader level, including QA review and signoff, and the responsibility of these SOPs lies with the area or person directing the operation.

SOPs can apply to site-wide operations, the entire company, across multiple departments, or a specific operating area.

4.1.3. Level 3 – Work Instructions (at a departmental level)

The intent of these procedures or documents is to define in greater detail the specific "how to". The level of detail in these documents must be sufficient so any appropriately trained person can perform the task accurately. Examples include, but are not limited to standard operating procedures (SOPs); maintenance and calibration procedures; and the laboratory analytical methods. Departmental level procedures/documents are reviewed and approved at the manager or group leader level including QA review and signoff.

4.1.4. Level 4 – Quality Records

The intent of these documents is to provide documented evidence to support our quality systems and operations. Examples include but are not limited to, data notebooks/logbooks, and preformatted data recording forms.

4.2. Document Approval, Issue, Control, and Maintenance

The document control process ensures that documents are approved and adequate for use. It ensures that documents are readily available to personnel and at locations where essential operations are performed.

Procedures are available in electronic form on the company's intranet site through our document management system. The Document Control Group maintains this system in a current and accurate state. These procedures can be printed from this system for reference by employees as the corresponding task is being performed. Prior to using a printed document, the employee must ensure that it is the current version.

Each procedure is uniquely identified and includes effective date, revision identification, and page numbering (total number of pages). All documents are searchable and uniquely identified in the document management system.

Controlled policies, procedures, and work instructions are reviewed and approved by appropriate individuals and are formally issued and administered through the Office Services Group. The review and approval signatures are applied as electronic signatures through the document control interface. Application of the signature is through secure log-in and password and can only be applied by those designated for the review or approval of the individual document.

Word versions of each procedure can be accessed within the document management system by designated personnel within the Document Control group. A PDF copy is maintained on a separate limited access server as a back up to the system.

Procedures undergo scheduled periodic review to ensure that they are accurate, current, and compliant. The frequency of review is either annual or biennial, depending on the procedure. QA is the final signature on procedures which gives QA the authority to implement the procedure; the exception is the Quality Assurance procedures for which the Vice President or his designee is the final signature. Upon the effective date of new or updated documents, all copies of obsolete documents are removed from service. The original historical copy of each outdated/obsolete procedure is clearly identified as a historical version and maintained in a permanent archive file separate from any current versions. (Note: OH EPA is required to review all revised documents applicable to its certification prior to the document being made effective).

Interim amendments to procedures are not allowed. Any needed changes require a revision to the document.

4.3. Client-Supplied Methods and Documentation

Client documentation to support environmental testing at the laboratory is maintained in a centralized area. This information is organized by client/project in the Client Services/Project Management Group. Client documentation includes the following information depending on project size and scope:

- Client supplied analyte lists
- Client supplied project plans
- Client contract quality manuals with specified limits, QC criteria, etc.
- Communication/correspondence records which relate to testing requirements, interpretation of results, or reporting formats

4.4. Laboratory Notebooks, Logbooks, and Forms

Procedures are in place to ensure that all data is traceable, authentic, complete, and retrievable. The following general requirements outline our system for the issuing, control, and archival of laboratory notebook and logbooks.

- The administration of notebooks and logbooks is controlled by the Office Services Group. They maintain a master index to uniquely number and identify each book distributed.
- Notebooks and logbooks can contain blank or preformatted pages.
- Notebooks and logbooks are bound, uniquely identified and have sequentially pre-numbered pages.
- If notebooks or logbooks contain preprinted laboratory form pages:
    - A unique identification number is assigned to each form
    - Forms are approved by appropriate management personnel before they are put into use
    - Forms are reviewed on a routine basis to ensure they are still accurate and current
- Completed notebooks are returned to an archivist. Incomplete books are returned to Document Control:
    - Two years from the issue date
    - for employee specific notebooks – when the employee leaves the company
    - for project specific notebooks – when the project for which it was used is complete
- In specific situations, records are bound to create books at the time of archival (e.g., temperature charts).
- At the time of archival any page(s) in the notebook or logbook that does not contain data documentation is crossed-out or a statement is written on the last page used to note that the book is complete to prevent data from being entered at a later date.
- Notebooks and logbooks identified as requiring permanent archival are assigned a designated qualifier.

4.5. Control of External Documents

Hard copy versions of external documents are controlled through the form system.

External documents such as copies of the 40 CFR and ASTM methods are stored exclusively in the QA Department. QA also keeps applicable agency documents on file, these include, but are not limited to, the TNI (The NELAC Institute) and ISO 17025 standards.

Environmental methods from the EPA or Standard Methods are available in the QA Department, but the technical areas also have copies that pertain to the tests that they perform. Any external document that is maintained in these areas must be inventoried and listed on a controlled form. Some methods are available on-line and are accessed through the Internet.

It is the laboratory's understanding that the need to control external documents is to ensure that the most current version of a method is referenced or appropriate manual is being used. Regulatory methods are used as references by the laboratory and testing is performed as per written SOPs that fall under our existing document control system and have scheduled reviews. The scheduled review of SOPs is used to ensure that the proper version of a method is referenced. While using the most current version of an analytical method is our typical practice, there are specific client needs and accreditation rules that require previous versions of a method to be used.

The technical areas are responsible for ensuring that all manufacturers' manuals are current and available to analysts. The vendor provides instrument manuals when new equipment is purchased or existing instruments are updated. These manuals are kept with the instruments to which they are associated.

5. SAMPLE HANDLING

5.1. Sample Collection

It is the responsibility of the client to send us representative and/or homogeneous and properly preserved samples of the system from which they are drawn. The laboratory assumes that all multiple sample containers with the same designator/description and bottle type contain a homogeneous, representative sample. We also assume that it is acceptable to deplete one container and move to the next, without implications unless otherwise indicated by the client.

The laboratory provides the appropriate sample containers, required preservative, chain-of-custody (COC) forms, shipping containers, labels, and custody seals. The laboratory also provides trip blanks and analyte-free water for field blanks. Preparation of methanol containers for field preservation of volatile soil samples is available.

Sample containers are purchased pre-cleaned by the supplier. For pre-preserved bottles, each lot of preservative is checked for contaminants before use. This also serves as a check on the associated containers. An annual bottle lot check is performed to evaluate the cleanliness of any containers not already covered by the preservative checks. The evaluation is to assess cleanliness to the laboratories' detection limits. These checks are processed through the LIMS as samples. Results are documented through the LIMS Analysis Report.

The laboratory provides instructions with all bottle orders that define how to sample, preserve, store, and ship the samples prior to their delivery at the laboratory. These instructions inform the client of the importance of proper sampling and advise them that non-compliant samples are rejected or reported with a qualifier.

If samples are collected by the laboratory personnel, applicable sampling methods are in place to perform the sampling operation.

As samples are analyzed at the laboratory, there are times when additional sample volume is necessary to complete testing or perform retesting. If this situation arises, "additional sample" is requested by the laboratory and/or submitted by a client to supplement current work being performed within our facility. Additional sample received is either assigned a new laboratory sample ID number and/or a comment noted on the final report to state that additional sample was received, depending on the situation. It is our goal to provide accurate traceability between sample submission and when testing is performed.

5.2. Sample Receipt and Entry

5.2.1. Sample Receipt

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:

- The laboratory 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, and observing any safety hazards, and reporting any problems to Client Services for communication to the client. This receipt process is documented in the LIMS.

5.2.2. Sample Entry

As soon as practical after sample receipt, all samples are entered into our LIMS. Samples awaiting log-in are stored in temporary holding areas, at appropriate storage conditions to maintain sample integrity. Samples scheduled for Volatile analysis are stored separately. 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 is contacted and the conversation documented.

At the time of entry, the LIMS assigns a unique laboratory sample number to each sample. This number is sequentially assigned and a label is generated and is attached to the sample container.

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

A sample acknowledgement is generated from the LIMS per sample entry group. Upon request, a copy of the Acknowledgement may be sent to the client on the day following sample log-in to confirm sample receipt and entry. Internally, appropriate personnel audit all applicable sample entry and client paperwork.

5.2.3. Sample Preservation Check

Support personnel check and document preservation of non-volatile liquid samples after the samples have been entered into the LIMS and before they are placed into storage. Any checks of volatile samples are performed and documented at the time of analysis.

5.2.4. Sample Rejection Policy

Any time a sample is received in a condition that does not meet the method, regulatory, or client requirements, the condition of the sample is clearly documented through the LIMS on a sample administration documentation log or sample problem form. This information is forwarded to the CSR and the client is contacted to discuss the best course of action. The client is given the option to resample or have the sample analyzed and reported with a comment.

5.3. Sample Identification and Tracking

A sample label is generated for each sample and, in addition to the assigned unique sample number, the following information is displayed on the label: client name, sample identification assigned by the client, sample collection information, bottle code ID, analyses requested, and any applicable notes to laboratory personnel. The label includes a barcode that is used to track this information about the sample/container and to trace each container's storage location.

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 is also used to identify additional containers of the sample that are created during sample preparation and analysis (e.g., subsamples, extracts, digests). Each container for a sample is tracked through the bottle code and an A.B.C… designator when there are multiple containers of the same type received. The link of the bottle code and sample number is used to identify which specific container was used for testing.

Routine sample tracking is documented using the Laboratory Sample Analysis Record (LSAR) which captures the date, time and analyst for each sample preparation and analysis. The information is compiled in the LIMS using electronic record tracking from the data upload and entry functions. This displays, per sample, on each Analysis Report.

5.4. Sample Storage

After sample entry, samples are placed in an assigned and identified storage location until needed for analysis. Room temperature, refrigerated, and frozen storage are available and samples are stored in accordance with regulatory, method, or client direction. The LIMS is used to assign storage locations, which assists in the orderly storage of samples. Sample storage locations are secured and monitored for accurate temperature control. Samples are stored separately from standards and reagents.

The central locked storage facility contains 3430 square feet of refrigerated space, including 2740 square feet equipped for automated sample retrieval. Samples are stored in the laboratory's automated storage and retrieval system (ASRS) or other assigned storage locations (separate volatiles areas) within the laboratory until completion of all analytical work.

When a sample is scheduled for analysis, the analyst requisitions it through the LIMS from the storage area. Barcode readers are used for LIMS documentation of the movement of the samples between storage and the laboratories. To maintain the integrity and security of the sample(s), the aliquot needed for analysis is removed and the sample(s) returned to storage as soon as possible

5.5. Sample Return/Disposal

Samples remain in the storage area following analysis until the testing results have been verified and the analysis report has been generated. On a regular basis, a list is generated from the LIMS that summarizes samples that can be removed from the storage area. At a minimum, water samples are held for 1 week and soil samples for 2 weeks after reporting before they would be eligible for disposal. Samples are either returned to the client or disposed of in accordance with local, state, and federal regulations. Removal of the containers from storage for permanent discard is also documented in the LIMS using the barcode reader.

Due to the variety of waste generated at the laboratory, several general categories of wastes and waste streams have been identified. Identification of waste occurs through information provided by the client, historical information, and/or analytical testing. The laboratory uses a sophisticated, computerized LIMS, which includes programming to assist in the identification of hazardous wastes at time of discard.

For reasons of environmental liability, client confidentiality, proprietary product formulation protection, etc., wastes generated by the laboratory are disposed of via incineration at EPA licensed facilities. The three exceptions include bulk neutralized acid waste, COD analysis waste, and lab pack waste containing mercury. None of these exceptions involve containers with client information.

5.6. Legal Chain of Custody

Samples being tested for litigation require locked storage and documentation of the time and personnel responsible when the sample was not in storage. This level of documentation is available upon client request and procedures to define these activities are in place and include the following:

- A chain-of-custody document is initiated for each bottle type submitted by the client.
- The chain of custody is signed each time the sample is stored, removed from storage, or changes hands.
- Clients requesting internal chain-of-custody documentation receive the completed forms after the analysis is complete.

5.7. Representativeness of Samples

Each analytical method provides specific procedures for ensuring that a representative aliquot of the sample is used for testing. These procedures include shaking water samples and mixing solid samples prior to removing an aliquot for testing. Analysts are also instructed in sampling techniques that prevent contamination of samples.

6. TECHNICAL REQUIREMENTS – TRACEABILITY OF MEASUREMENTS

6.1. Reagents and Solvents

The reliability of our analytical results can be directly affected by the quality of reagents used in the laboratory. Procedures are in place to address labeling, storage, and evaluation of these materials. Reagents and solvents include acids, bases, indicators, buffer solutions, colorimetric solutions (CS), test solutions (TS), and volumetric solutions (VS). The *Chemical Hygiene Plan* provides safety information in regard to the storage and handling of laboratory chemicals. All reagents are stored separately from samples.

Each analytical method includes a list of reagents needed to perform the test. Reagents/solvents are fully described, including chemical name, purity, and description of preparation. Where applicable, shelf life and storage conditions are also listed. The laboratory is responsible for checking that new supplies meet the method requirements. These checks are documented and maintained.

Departmental management ensures that an adequate inventory of reagents needed to perform testing is maintained. Reagents received at the laboratory funnel through the Shipping and Receiving Department and deliveries are verified and labeled with the date of receipt. Large volume reagents (e.g., solvents, acids) are stored in a building outside of the laboratory until needed for use.

In addition to the name and concentration of the reagent, all reagents are labeled with the manufacturer/vendor, storage conditions, the date opened, and an expiration or re-evaluation date. Before using any reagent, the analyst must ensure that the material was properly stored and labeled. If a reagent has passed its expiration date or shows signs of deterioration, the material is not to be used in the laboratory and must be discarded or segregated as expired. In some method development or research work, expired reagents may be used. These must be labeled as such or stored in a designated location.

If a re-evaluation date is reached before a reagent is completely consumed, the reagent will be inspected by physical observation for signs of degradation. Physical signs include, but are not limited to, color changes, clumping or other texture changes for solids and formation of precipitate in solutions. This evaluation is performed by an experienced chemist or microbiologist.

Subsequent reagent solutions or mixtures prepared at the laboratory are fully documented in a logbook and labeled to include: unique name, concentration, date prepared, name of analyst who prepared the reagent, storage conditions or reference to the logbook containing these details, and expiration/re-evaluation date. The information recorded allows these solutions to be traced to the original stock solution. The reference to the logbook is intended for use on containers that are too small to clearly document all of the information.

All reagent certificates and MSDSs are retained by the laboratory.

6.2. Media

Within the microbiology laboratory, procedures are in place to address preparation, labeling, storage, expiration, documentation, and quality/sterility evaluation requirements for these materials. These procedures are described in Appendix K.

6.3. Calibration Standards

Written calibration procedures are required, where applicable, for all instruments and equipment used in the laboratory. The source and accuracy of standards used for calibration purposes are integral to obtaining quality data. Requirements for calibration are provided in each analytical method including specifications for the standards used. Where available and practicable, calibration measurements made by the laboratory must be traceable to national standards of measurement (e.g., NIST). Certificates of Analysis (C of As) are maintained for each material, as applicable.

The laboratory's ISO 17025 and DoD accreditations require calibration materials to be certified and purchased from a reference material producer accredited to ISO Guide 34 and ISO 17025, when available. A list of accredited suppliers is maintained by QA. This is applicable to the tests under these scopes of accreditation and can be met through the stock standards used for calibration; a standard processed under the calibration such as an ICV or LCS; or comparison to a separate reference material at a frequency defined by at the test level (i.e. annually).

Standards are usually purchased from commercial supply houses either as neat compounds or as solutions with certified concentrations. Upon receipt at the laboratory, the material must be labeled with the date of receipt. The accuracy and quality of these purchased standards is documented on a C of A and these certificates are maintained on file in the laboratory. .

Most solutions and all neat materials require subsequent dilution to an appropriate working range. Records of all standard preparations include the dilution(s) made and a reference to the original and any intermediate mixtures. Solutions are labeled according to laboratory procedures and assigned unique names or code numbers that provide traceability to the original components.

All standards are stored separately from samples and in conditions as stipulated by the method or vendor (refrigerator, freezer, room temperature, etc.).

Each new preparation of standard is tested for integrity by comparison to standards from another source or previously prepared solutions. Standards are not used for sample analyses in the laboratory past their expiration date. In some method development or research work, expired standards may be used. These must be labeled as such or stored in a designated location.

6.4. Equipment and Instrumentation

The laboratory is equipped with all equipment and instrumentation required for testing the scope of work which it supports. All equipment and instrumentation is maintained in proper working order. A master list of our equipment and instruments is maintained by our accounting department and includes the date received and the condition at receipt (new v. used). Our major equipment and instrumentation capabilities are summarized in Appendix F. In addition, we have numerous other instruments including pH meters along with support equipment such as ovens, incubators, centrifuges, balances, etc.

6.4.1. General Requirements

- Equipment/instrumentation is assigned a unique designation. This unique number or system identification is used to track the equipment or instrument within data documentation.
- A maintenance logbook is established in conjunction with installation and is readily available to document all incidents and/or routine maintenance processes that pertain to the equipment or instrument as they occur. The corrective action taken, the date that the equipment/instrument is returned to service, and performance checks performed is documented.
- All test, measuring, and inspection of laboratory systems, equipment, and instrumentation used at the laboratory is routinely calibrated and maintained in accordance with applicable standard operating procedures.
- A member of the technical group, or designated individual, performs routinely scheduled maintenance and calibration of laboratory equipment and instruments as required by laboratory procedures. These activities are documented.
- If appropriate standards or expertise for calibration or maintenance are not available in-house, the operation is conducted by an outside service firm, with appropriate accreditation. Certificates or other data generated by the service firm are reviewed by applicable the laboratory personnel to verify acceptability. This information is maintained on file.

- All equipment or instruments taken out of service are tagged “DO NOT USE”. The following minimum information is documented on the tag:
  - Date taken out of service
  - Employee who took the equipment/instrument out of service
  - Reason for tag-out

6.4.2. Standard Operating Procedures

Information regarding operation, maintenance, and calibration of equipment and instrumentation is found in the respective SOPs. The procedures include, where applicable, a routine schedule for preventive maintenance and calibration along with acceptance criteria and remedial action to be taken in the event of failure. These procedures are maintained in the document control system and reviewed on a regular basis to verify they remain current and accurate. Vendor supplied manuals are also available to provide additional information in regard to operation and maintenance.

6.4.3. Maintenance

- Instrument and equipment maintenance is performed as either a preventive or corrective operation.
- Preventive maintenance procedures and schedules are developed for each instrument or piece of equipment, where applicable. Preventive maintenance operations are performed by an analyst, equipment maintenance specialist, or contracted (manufacturer’s representative or service firm personnel). Documentation is maintained in the associated maintenance log for the procedure(s) performed as part of the preventive maintenance operation. It is the responsibility of departmental management to ensure that a preventive maintenance schedule is addressed by a procedure where appropriate and is followed.
- Corrective maintenance is performed by an analyst, equipment maintenance specialist, or contracted (manufacturer’s representative or service firm personnel) in response to indications of equipment or instrument malfunctions. The unit must be clearly tagged as out of service. All corrective actions taken to bring the unit back into service are documented in the associated maintenance log. After repair, further notation is made in the log regarding the functional status. Calibration activities are performed, as applicable, and documented in the log before the unit is placed back into service.
- A supply of commonly needed replacement parts is maintained by the laboratory.
- A preventive maintenance schedule for major instruments is given in Appendix G. Maintenance of equipment used in microbiological testing is documented in Appendix K.

6.4.4. Calibration

- Calibration is the establishment of, under specified conditions, the relationship between the values/response indicated by a measuring instrument or system and the corresponding known/certified values associated with the standards used. Some types of calibrations are performed with a set frequency (e.g. daily) while others provide intermediate checks to ensure that the instrument response has not changed significantly.
- All measuring and testing instruments and equipment having an effect on the accuracy, precision, or validity of calibrations and tests are calibrated and/or verified on an on-going and routine basis. Methods for calibration of instruments and equipment vary widely with the nature of the device and the direction given by analytical procedures, departmental procedures, manufacturer recommendations, or regulatory requirements. Frequency of calibration can also depend on additional factors including ruggedness of the instrument or equipment and the frequency of use.
- Departmental management is responsible for developing or acquiring written calibration procedures for the types of instruments and equipment employed within their area, as applicable. Procedures address the following aspects: description of the calibration method, frequency/schedule for calibration, acceptance criteria, and corrective actions if failure occurs.
- Calibration information is recorded in a logbook that is associated with the instrument/equipment and/or a calibration certificate is maintained and/or data is generated and filed to document the activity.
- Calibration measurements are traceable to national standards of measurement (e.g., NIST) where available. Physical standards, such as NIST certified weights or thermometers are re-certified on a routine basis. Calibration certificates are maintained on file, where applicable, to indicate the traceability to national standards of measurement. These physical standards are used for no other purpose than calibration.
- Calibration failures are documented in the associated logbook and/or within the data generated from the instruments or equipment. Management personnel perform an evaluation and review of failures and assess any potential impact the failure might have on previously generated data. The laboratory utilizes “real-time” controls to ensure the accuracy of the data. These controls are used to assist in assessing the impact of the situation.
- After repair, adjustments, or relocation that could affect instrument response, calibration/verification activities are performed, as applicable, before the unit is returned to service.
- Analytical data is not reported from instrumentation or equipment with noncompliant calibration unless the client has agreed to receipt of the data and appropriate comments are applied to the final Analysis Report.
- A summary of the calibrations for most major instruments and equipment is given in Appendix H.
- Procedures for calibration of equipment used in microbiological testing are documented in Appendix K.

6.5. Computerized Systems and Computer Software

6.5.1. Computer Usage

The laboratory provides computer equipment for employees to use as a tool in performing their work. Computer equipment is the property of the laboratory and used in accordance with defined terms and conditions. Our goal is to provide standard hardware and software that meets the needs of the user. The majority of desktop PCs in use are standardized using cloning software.

6.5.1.1. Physical security of computer systems – It is company policy to protect computer hardware, software and data documentation from misuse, theft, unauthorized access and environmental hazards. The corporate computer area and computer "Hot-Site" is locked and requires identification/building card access. All vendors, contractors, or other visitors must be escorted into this area. Controlled access of the laboratory buildings is outlined in Section 3.2.

6.5.1.2. Passwords – Passwords are important for the security of company data and resources. The laboratory's primary network operating system is Windows and each employee must have a user ID and password combination to access the system. Other computer systems also require a user ID password combination for access. The following procedures apply regardless of which system(s) is being utilized:

- Passwords must be created as strong passwords in accordance with Eurofins Password Policy and must be kept confidential.
- Users must log-out of a system when not in use to prevent unauthorized access. In addition, the network access will automatically timeout after a set period of inactivity, requiring a user to log-in to access the system.
- Forgotten passwords can only be reset by the IT Department or by an appropriate System Administrator.
- Network and LIMS passwords automatically expire every 90 days. The computer prompts a user to change the password when the expiration date nears.

6.5.1.3. Computer viruses – The laboratory centrally and continuously monitors the computer network for computer viruses. Employees are prohibited from using the company's computer equipment to propagate any virus. Anti-virus software is employed to detect viruses on the Windows network. A notification is sent when there is a particularly dangerous or virulent data destructive program that employees need to be aware of. However, employees are instructed to always be cautious and observant even if there are no current warnings. Employees must report any virus concerns to the anti-virus administrator or IT Management as soon as possible. Employees who share files between their home computer and the laboratory should install anti-virus software on their home computer. If an employee does not have such software, the laboratory can suggest various no-cost anti-virus software products.

6.5.1.4. Internet and e-mail system – The e-mail system is used primarily for the laboratory's business purposes. The *Eurofins Lancaster Laboratories' Employee Handbook* provides additional information in regard to system usage. Employee access to the internet is restricted to those employees who have a business need for it. All employees have access to e-mail. Access to the internet is configured through a user's Windows network account. All internet and e-mail activity is subject to monitoring. All messages created, sent or received over the internet are company property and can be regarded as public information. E-mail and website filtering software is utilized.

6.5.1.5. The laboratory's Intranet (LabLinks) – The Intranet is designed to be a useful tool for employees to acquire company information and to provide a company communication system. The *Eurofins Lancaster Laboratories' Employee Handbook* provides additional information in regard to usage.

6.5.1.6. Software policy

- Copyright laws protect software, and the laboratory's intent is to abide by all software agreements.
- Software purchases must be formally requested and approved by management and/or validation personnel, as necessary.
- All software is used in accordance with applicable license agreements.
- Employees are not to install any software on computer(s) unless authorized by the IT Department.
- Software upgrades must occur in accordance with applicable change control procedures.
- Employees must not give software to outsiders (e.g., clients, contractors), unless approval is granted by management.
- Users must not make copies of any licensed software or related documentation without permission. Any user that illegally reproduces software is subject to civil and criminal penalties including fines and imprisonment.

6.5.1.7. Computer system backup, data restoration, and data archival – Mission critical data is stored on several computers throughout the laboratory. These computers are connected through the local area network. Selected files on these computers are backed up using an enterprise-level backup software program. The objective of this backup is to have the ability to restore data after a total loss (e.g., theft, fire, natural disaster). Procedures are in place to perform data backups and restores.

6.5.1.8. Remote access to computer systems – Employees are able to remotely connect to the laboratory computer systems through an encrypted (SSL) login. When logging in, users are authenticated with their Windows Active Directory account and password.

6.5.1.9. Electronic data – Instrument software used for processing data must, when available, have password access and audit trails enabled. All data processed through the LIMS includes tracking features to document who and when data was entered and/or changed.

6.5.2. System and Software Verification – The laboratory LIMS is an in-house developed program. The design and updates to the system are written following typical Software Development Life Cycle (SDLC) processes for initial planning through testing and implementation. Before a new computer system/program or significant modification of an existing system/program is implemented in our laboratory, it is necessary to generate a plan to specify the level of documentation required for the new or updated application. Developers, affected area management, and QA personnel review and approve the documentation.

The following are the typical documents that are compiled for these updates:

- System Change Request document – used for documenting/tracking changes in the programming
- Requirements documents – Describe the required system functionality and specifications
- Design documents – System overview, screen design, report layout, data description, system configuration, file structure and module design
- Testing documentation for system development/verification – Structural testing of the internal mechanisms and user testing of the installation and system qualification
- Periodic Review documents – periodic retesting of the programs is performed to ensure that the systems remain in a validated state.
- Retirement documents – used for documenting when a program is taken out of service
- Standard operating procedures and/or manuals

6.6. Change Control

Procedures are in place to define how to maintain facilities, processes, instrumentation, equipment, computerized systems, and computer software in a validated or controlled state through a plan of change control. Successful changes require a thorough evaluation and testing for potential consequences prior to implementation. Planning, authorizing, testing, and reviewing of proposed changes are documented throughout the change process. Changes are planned or could be made in response to an emergency situation. The following “general” elements apply to changes, as appropriate:

- Request to perform a change
- Evaluation of a change
- Authorization of a change request
- Preparation for an authorized change
- Execution and testing of the change
- Documentation of the change
- Approval of the change
- Change implementation and follow-up (Formal approval of the change is performed by designated responsible individuals and QA.)

6.7. Labware Cleaning

Dedicated washroom personnel support the laboratory operations in regard to labware preparation, washing, rinsing, and drying. Labware can include, but is not limited to glassware, plastic ware, utensils, and pipettes. Procedures are in place to outline the washing process for each type of labware. Most labware is cleaned using a Miele glass washing machine. Some labware is still washed by hand and either air-dried or dried in specifically designed ovens.

Most of the labware used in the laboratory is "common or non-dedicated" labware (common to a department), but some of the labware used in the laboratory may be identified as "dedicated" labware and exclusively used for certain analyses. Examples of dedicated labware include glassware used for high resolution mass spectrometer (HRMS) and low level mercury testing. This labware is isolated and cleaned only with "like" labware.

All glassware is class A and 100% visually inspected for breakage (e.g., cracks, chips), cleanliness, and dryness before being returned to the laboratory for use.

Generally, each test has controls in place to ensure that results are not adversely affected by unclean labware. These controls include blanks to detect positive interferences and recovery controls to detect negative interferences.

7. PURCHASING EQUIPMENT AND SUPPLIES

7.1. Procurement

It is the responsibility of management personnel within each department to ensure that the appropriate supplies are available and/or ordered with sufficient lead-time to perform analytical testing or to provide support to the testing areas. The individual technical departments have trained personnel who enter the supply order into the company's requisition software system. The selection of these products is based on technical input at the analyst level and authorized by technical departmental management. The Purchasing Department maintains an ordering system in which purchase requisitions are managed. Common laboratory items (e.g., beakers, flasks, reagents) are ordered directly through the Purchasing Department. Purchase orders over a specified dollar amount require verification from the appropriate member(s) of the Executive Management Group before an order can be placed.

Upon receipt of an order, the Purchasing Department checks the order to ensure that all items were received as specified. Products that have specific storage requirements are taken to the technical area upon receipt. It is the technical area's responsibility to ensure that the product is stored in the appropriate manner. Any checks on the quality of the materials received for use in a specific test are the responsibility of the laboratory using them. This is based upon the experience of the laboratory with the usability of the product. Generally, each test has controls in place to ensure that test results are not adversely affected by the materials.

Any problems encountered when using a material in the laboratory must be brought to the attention of the Purchasing Department and/or Quality Assurance, as applicable, to ensure that follow-up and corrective action occur.

7.2. Supplier Evaluation

Procedures are in place to evaluate vendors who supply us with: new equipment, instrumentation, computerized systems and computer software; commercially purchased glassware, including sample bottleware, reagents, chemicals, solvents, gases, media, and standards; and contracted and subcontracted services.

The laboratory strives to ensure that our suppliers continually improve their quality systems and we reserve the right to purchase from suppliers of our choice in order to best fulfill the needs of our clients and our business. When directed by a client to purchase from a specific supplier, we will do so. In this instance it is the client's responsibility to "qualify" the specified supplier. We attempt to purchase from businesses that we have an established purchase history or have previously acquired information regarding the supplier's quality programs.

The laboratory does not evaluate every supplier. Risk assessment is taken into consideration when making this decision. The risk assessment analysis includes system, material, services, and number of samples or operations the purchase may affect or support. Evaluations are not required for computer operating systems, utilities, toolsets, or systems software. They also are not required for any off-the-shelf configurable software package that has an extensive market performance history (e.g., Microsoft Word, Excel, Access).

Additional quality systems are also in place within the laboratory to further verify and support the materials used:

- C of A for every lot of purchased prepared microbiological media and for purchased chemicals, where available, are reviewed and maintained on file.
- For most chemical analyses a blank and a recovery check are routinely analyzed and serve as real time suitability testing of the reagent being used.
- Microbiological testing often employs positive and negative controls, which serve as real time control checks.

8. ANALYTICAL METHODS

8.1. Scope of Testing

Samples are analyzed in accordance with official published methods, standard methods, client-supplied methodology, or validated in-house methods. We recognize the importance of providing verifiable results and, therefore, use methods accepted and approved by a broad range of federal and state regulatory agencies. In order to meet the needs of our clients as well as regulatory agencies, the laboratory sometimes needs to support different versions of the same method (i.e. SW-846 8081A and 8081B). The laboratory can also assist in developing and validating analytical methods for specific products and matrices. All methods submitted for our review, as well as all analytical results, are considered confidential.

The laboratory performs a wide variety of environmental testing in support of the Safe Drinking Water Act (SDWA); Clean Water Act (CWA); Resource Conservation and Recovery Act (RCRA); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA/Superfund); and the Clean Air Act (CAA). Methods approved by ASTM are also used in testing. Potable water, wastewater, soil, sediment, sludge, oils, biota, tissue, soil gas, and air are among the matrices typically analyzed.

Our areas of expertise include:

Standard Services	Specialty Services
• Volatiles • Semivolatiles • Metals • Pesticides/PCBs/Herbicides • Petroleum Analysis • Waste Characterization • Non-potable Water Testing • Drinking Water • Soil and Surface Water Testing • Vapor and Air Analysis • Sediment and Tissue Testing • Method Development • Shale Oil & Gas Analysis •	• Low-Level Mercury • Dioxins & Furans • Hydrazines and NDMAs • Perchlorate • 1,4-Dioxane • Pharmaceutical Manufacturing Industry (PMI) Wastewater • EPA Method 25D • PCB Congeners • Explosives • Alkyl PAHs, Alkanes, Biomarkers • PFC (PFOA) • Organic Acids • Aldehydes •

A list of tests covered under the laboratory's NELAP accreditation can be found in Appendix I. All current certificates and scopes of accreditation are available on the laboratory's website at http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/. A complete list of the tests routinely performed by the laboratory can be found in the *Schedule of Services*.

8.2. Analytical Test Methods

Each laboratory is required to establish and maintain analytical procedures for all the methods referenced in standard testing. The sources for these methods include the most recent versions of these compendia:

- Test Methods for Evaluating Solid Waste, SW-846
- Standard Methods for the Examination of Water and Waste
- Code of Federal Regulations, Chapter 40
- EPA 100 through 600 and 1600 series methods
- ASTM

The test methods used are re-written into a laboratory standard format, which provides consistency in content and allows the analysts to locate the information they need quickly. Procedures are in place to define the format, required approvals, and the control system for these method documents. Elements to address in SOPs are based on TNI and DoD required sections. The format requirements include, but are not limited to, the following:

- Uniquely assigned method number, which is used extensively for scheduling and documentation purposes.
- Reference to the original source of the method (e.g. SW-846)
- Scope
- Basic Principles
- Apparatus and Reagents
- Personnel Training and Qualifications
- Safety and Waste Disposal
- Detailed procedure (including any method modifications)
- Calculations
- QA/Quality Control
- Revision Log
- Approval signatures from technical management and QA personnel

Analytical methods are maintained as controlled documents to ensure that analysts are always working with the most current version and are reviewed periodically for accuracy.

8.3. Client Supplied Methods

Most of the client-supplied method requirements presented to us involve achieving specific quality control criteria, limits of quantitation (LOQ), and/or method detection limits (MDL) using standard EPA methods. These requirements are communicated to the appropriate technical groups prior to the project start up. Each technical group evaluates the scope of work and the requirements to ensure the criteria can be met using the standard EPA method. The data is monitored to ensure the criteria are met throughout the project. The CSR notifies the client if there is a more appropriate method available or if the client's criteria cannot be achieved on a certain sample matrix (i.e., due to matrix or dilutions).

Occasionally, we are asked to transfer a non-standardized method from a client into our lab or to develop a new method, when one is not available. In the case of a method transfer, we set up the client's method and perform some initial evaluation. After the initial evaluation, we may make recommendations on how to improve method performance. If the method appears to be adequate, we determine linearity, specificity, precision, accuracy, MDL, and LOQ by performing calibrations, analyzing method blanks, and carrying out method detection limit and quad studies.

In the case of method development, we work with the client and/or data user to determine the level of validation required ensuring that the method meets its intended purpose. In addition to the elements above, we also determine standard and sample stability and robustness depending on the scope of the project. Typically, a standard operating procedure is written and submitted to the client with the results of the validation. These steps are completed prior to analysis of field samples. Data related to the setup of the method are archived.

8.4. Method Validation

Before new or revised analytical methods are authorized for routine use in the laboratory, validation data is required to demonstrate that the method as performed in our laboratory and analysts performing it are capable of meeting data quality objectives for precision and accuracy. A procedure is in place to outline this process.

Many methods published by USEPA include instructions for performing an initial demonstration of capability, which typically consist of determining the method detection limit and analyzing fortified samples in quadruplicate. This demonstration is performed and compared to acceptance limits for precision, accuracy, and detection limits, when available.

Methods that do not include specific validation requirements are validated by analyzing fortified samples or standard reference materials in replicate. The results of these analyses are used to assess accuracy and precision. Results of validation studies are documented and subject to review and approval by technical and QA management.

8.5. Procedural Deviations

Analysts are required to follow a documented method for all tests performed. Procedures are in place to ensure that deviations from analytical methods are documented, approved, and justified in an appropriate and consistent manner (Note: Deviation from the OH EPA approved SOPs is not permitted). We classify method deviations as either being a planned deviation or an unplanned deviation. In general, the following information is captured to document both types of situations:

- Description of the deviation
- Reason or justification for the deviation
- Impact the deviation had on the testing
- Signature/date of analyst performing the test
- Signature/date of Quality Assurance and Laboratory Management approving the deviation
- Signature/date of client approval, if necessary

Deviations to written procedures are documented in raw data records or through the ICAR (Investigation and Corrective Action Report) system. Both types of documentation require management and QA review and approval.

9. INTERNAL QUALITY CONTROL CHECKS

9.1. Laboratory Quality Control Samples and Acceptance Criteria

Quality control (QC) samples are analyzed with each batch of samples to demonstrate that all aspects of the analysis are in control within established limits of precision and accuracy. Management is responsible for ensuring that QC is analyzed as required by the referenced method. Each analytical SOP specifies (or cross-references another procedure) the type of QC sample, frequency of analysis, acceptance criteria for QC sample results, and corrective action to be taken if QC sample results fall outside of the acceptable range.

QA staff, at the direction of the technical department, must program the LIMS with the acceptance criteria for each QC type (other than blanks). The acceptance criteria are based on statistically generated limits from historical laboratory data, on method defined limits, government agency recommendations, or on client/project specific limits.

These limits are used to flag samples that are out of specification.

The types of QC samples and the information each provides are discussed in the following paragraphs.

Quality control checks used for microbiological tests can be found in Appendix K.

9.1.1. Blanks - A blank is a designated sample designed to monitor for sample contamination during the analysis process. The blank consists of a clean matrix (i.e. reagent water, Ottawa sand, glass beads, Teflon chips) taken through the entire sample preparation and analysis process. The blank and field samples are treated with the same reagents, internal standards, and surrogate standards. Ideally, blanks demonstrate that no artifacts were introduced during the analysis process. The specific acceptance criteria for each test are usually based on the required reporting limit (MDL or LOQ).

9.1.2. Surrogates - Surrogates are organic compounds, which are chemically similar to the analytes of interest but are not naturally occurring in environmental samples. When required by the analytical method, surrogates are spiked into all the field and QC samples to monitor analytical efficiency by measuring recovery on an individual sample basis. The percent recovery is determined and compared to the acceptance criteria.

9.1.3. Matrix Spikes - A matrix spike sample is created by fortifying a second aliquot of a water or soil sample with some or all of the analytes of interest. Blanks are not used for matrix spike QC. The concentration added is known and compared to the amount recovered to determine percent recovery. Matrix spike recoveries provide information about the potential matrix effects on the data. Matrix effects can cause results to be outside of the acceptance criteria.

9.1.4. Laboratory Control Samples - Laboratory control samples (LCS) are samples of known composition that are analyzed with each batch of samples to demonstrate laboratory accuracy. Laboratory fortified blank (LFB) is another term used to describe a LCS. The samples are clean samples fortified with known concentrations. Percent recovery is calculated and compared to acceptance criteria.

9.1.5. Duplicates and Matrix Spike Duplicates and Laboratory Control Sample Duplicates - A duplicate is a second aliquot of a sample that is treated identically to the original to determine precision of the test. To compare the values for each analyte, the relative percent difference (RPD) is calculated by dividing the difference between the numbers by their average. Precision for analytes that are not typically found in environmental samples (i.e., organic contaminants) is determined by analyzing a pair of matrix spike duplicates, defined as two spiked samples and comparing the RPD for the spiked compounds. The acceptance criteria are described as a maximum for the RPD value.

9.1.6. Internal Standards - Internal standards are organic compounds, which are chemically similar to the analytes of interest but are not naturally occurring in environmental samples. When required by the method, internal standards are added to every field and QC sample after extraction but prior to analysis. Comparison of the peak areas of the internal standards is used for quantitation of target analytes. Internal standard peak area and retention time also provide a check for changes in the instrument response. The acceptance criteria are stipulated in the analytical method.

9.1.7. Serial Dilutions - A serial dilution is the dilution of a sample with sufficiently high concentration by a factor of five to check for the influence of interferents. This QC check is performed for inorganics analyzed by ICP or ICP-MS. When corrected by the dilution factor, the diluted sample result must agree with the original sample within method specified limits.

9.1.8 Interelement Correction Standard – Analyzed 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 analytical run or a minimum of twice per 8 hours.

9.1.9. Second Source Check - A second source check is analyzed using either the LCS and/or an Initial Calibration Verification (ICV). 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 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 tests use the continuing calibration verification standards as a second source from the initial calibration.

9.2. Quality Control Sample Frequency and Corrective Action

Each analytical method defines the frequency for the required QC samples and the corrective action required when a QC result fails to meet the acceptance criteria. A summary is provided in Appendix J.

The QC acceptance criteria are available to analysts in the laboratory. If the method reference requires the use of specific limits then the laboratory uses the published limits that are documented as part of the analytical method. Many methods require that each laboratory determine their own acceptance criteria based on statistical data obtained from performance of the method. In these cases, the limits are available to the analysts and are entered into the LIMS described below. Statistically determined acceptance criteria are subject to change as the laboratory recalculates its control limits. Due to their dynamic nature, acceptance criteria are not included in this manual.

The results of all quality control samples are entered into the LIMS in the same way as the results of client samples. The LIMS compares the individual values with the acceptance limits and identifies quality control sample results that are out of specification. If the results are not within the acceptance criteria, corrective action suitable to the situation must be taken. This includes, 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.

Each month, a summary of all QC entries (except blanks and surrogates) is generated from the LIMS. This summary is reviewed by QA staff and evaluated for changes in data that may indicate that an analysis is trending towards an out-of-control situation. The technical department is notified if a trend is observed.

The laboratory allows for marginal exceedances based on the number of analytes in the LCS. The exceedances are carefully monitored so that any systemic problems would be identified and corrective action taken. If the LCS is being reported based on the marginal exceedance allowance, a comment is added to the analytical report. Note: The use of marginal exceedance is not allowed for OH VAP work.

9.3. Quality Control Charts

The LIMS quality control system is used to report QC data to clients, to collect data for assessment of precision and accuracy statistical limits, and to generate control charts. Control charts are accessible to all employees through the LIMS interface. The system charts results from blanks, surrogates, matrix spike/matrix spike duplicates, duplicates, and laboratory control samples/laboratory control samples duplicate. These charts provide a graphical method for monitoring precision and bias over time. They can be used to detect quality problems by observation of patterns. QA staff uses the charts in conjunction with a LIMS generated monthly QC trend report to evaluate potential data trends.

9.4. Measurement 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 is evident through the LCS results. LCSs are performed with every batch of samples where appropriate for the method. Tests that do not have LCSs (i.e. TCLP; paint filter test), are evaluated on a case-by-case basis by taking into account the uncertainty of each of the steps taken to perform the test.

Measurement Uncertainty reports are generated by each technical department on an annual basis using a LIMS program and submitted to QA. Measurement Uncertainty is calculated as two times the standard deviation of the LCS recoveries for the group and date range of data points selected for all applicable methods. This is reported as a percentage. It is not necessary to apply or report the uncertainty value with sample results. When a client requests the measurement uncertainty it is applied by multiplying the determined analyte concentration by the uncertainty percentage.

10. ASSURING QUALITY OF TEST RESULTS

10.1. Data Management

At a minimum, data management is initiated when the laboratory receives the samples from the client. More often the process begins with client communication of their needs and requirements for a specific project and/or testing. When requested, bottle orders for the client’s sampling efforts are generated through the LIMS by the CSR. The CSRs are responsible for entering the information in the sample set up function of the LIMS. Upon receipt of the samples a unique tracking number for the sample group and the samples within the group is generated based on this information. At this point, the LIMS becomes an integral part of tracking the samples through laboratory operations. The flow of data from the time samples enter the laboratory until the data is reported is summarized in the following table:

Sample and Data Flow

Action	Personnel Involved
Bottle orders generated upon request • Bottles packed and shipped to the client under chain of custody documentation	Client Service Representative Bottles Preparation
Sample received at Lancaster Labs • Unpacked and reconciled against the client paper work or COC • Sample Entry Documentation log completed	Sample Registration
Sample is entered into the LIMS • Lab ID number assigned • Analyses entered • Storage location assigned • Electronic record of sample number • Labels generated • Acknowledgement printed (record of samples received and analyses entered)	Sample Registration
Preservation checks performed Sample stored in assigned location (refrigerator, freezer, etc.) • Electronic record of sample #, bottle code, and location	Sample Registration
Acknowledgment sent to client (when requested)	Sample Registration
Samples requisitioned and removed from storage for analysis • Electronic requisition of sample number by bottle code • Necessary aliquot taken • Remaining sample returned to storage	Sample Registration Technical Personnel
Analysis is performed according to selected analytical method • Raw data recorded • Data Reviewed • Data uploaded to the LIMS from the instrument or manually entered by the analyst* (This is tracked by the unique sample number and batch number.)	Technical Personnel
LIMS performs calculations as programmed according to methods	Data Processing
Designated analyst or supervisor verifies raw data	Technical Personnel
Generation/release of reports (automated through LIMS)	Billing and Reporting Group
Data package deliverables are assembled, reviewed and released to client Electronic copy saved in the LIMS	Data Package Group
Electronic Data Deliverables (EDDs) are generated	EDD Group
Designated Data packages are overchecked by QA prior to release	QA
Hard copy of batch raw data is archived Electronic files are backed up and archived	Technical Personnel, Data Package Personnel, Office Services, IT

*Analyses requiring the analyst's interpretation may involve manual data reduction before entry into the LIMS.

10.2. Data Documentation

Analytical data generated in the laboratory is collected from the instruments or associated data system or is manually documented in bound notebooks. Analysts review data as it is generated to determine that the instruments/systems are performing within specifications. If any problems are observed during an analytical run or the testing process, corrective action is taken and documented.

Procedures are in place to ensure that all data is traceable, authentic, and complete. Electronic data records are maintained and tracked through the LIMS, requiring authorized, password protected user access. The following general requirements outline our system for notebook, logbook, and documentation recording:

- Observations, data, and calculations are recorded at the time they are made and are identifiable to the specific task.
- Entries must be legible, signed, and dated. The signature may be a wet or electronic signature.
- Errors are corrected in a manner that does not obliterate the original entry, initialed and dated, and coded with an explanatory identifier. Changes to electronic data are tracked through audit trail functions.
- Blank pages or substantial portions of pages which are left blank are crossed-out to eliminate the possibility of data entry at a later date.
- Notebook pages and instrument printouts are signed/dated to indicate second party data review; this may be a wet or electronic signature.
- At periodic intervals a supervisor or data reviewer checks equipment/instrument logbook entries and temperature recordings for completeness, legibility, and conformance to procedures.
- At a minimum, the following information is recorded as part of data documentation:
    - Date of analysis/operation
    - Signature/date of analyst performing test/operation
    - Identification of client sample(s) and material(s) analyzed
    - Materials, reagents, standards used to perform the testing/operation
    - Method used to perform testing/operation (including version number and/or effective date)
    - Equipment/instrumentation used to perform testing/operation
    - Calculations and how they were derived
    - Departures, planned or unplanned, from the analytical method
    - Signature/date of person reviewing data documentation
- For computer generated data, the following information is recorded:
    - Sample(s) analyzed/operations performed
    - Date of analysis/operation
    - Unique instrument identification
    - Name/date of person operating the instrument
    - Name/date of person reviewing data
    - Any manual notations or interpretations made on instrument printouts are signed, dated, and reviewed

10.3. Data Calculations

Most instruments either include or are connected to a data system programmed to perform calculations to reduce the raw data to a reportable form. All calculations are maintained in the instrument manuals and/or as part of the analytical method.

In many cases, the data from the local instrument system are uploaded directly to the LIMS for review and reporting. This direct upload eliminates the need to retype data and an associated source of transcription errors from the analytical scheme.

Some instruments report data that require application of additional factors before the data is in final form. For example, an extract concentration may be reported by the instrumental data system, but additional dilution and preparation factors may be needed before the result represents the concentration of analyte in the sample. Analysts input these additional factors into the LIMS, where final calculations are performed.

Analysts manually enter collected data, such as titration data, into the LIMS, which is programmed to perform calculations for final reporting. Documentation of the programming for each calculation performed by the LIMS is maintained.

10.4. Reporting Limits

It is important to ascertain the limit of quantitation (LOQ) 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 LOQs can be extrapolated. This process is summarized in a laboratory procedure.

MDLs are verified or determined annually on each instrument and are the basis for the LOQ used in the default reporting format. Because MDLs change each time they are re-evaluated, they are not included in this manual, but are available in each laboratory and available to clients upon request.

The reporting limit used to determine whether a result is significant and reported as detectable is dependent upon agency and client requirements. A variety of formats are available and include use of the MDL, LOQ, method specified limits, and project specific limits. The MDL and LOQ for each analyte are programmed into the LIMS for reporting purposes.

Under the DoD program, the laboratory must establish a Detection Limit (DL) and Limit of Detection (LOD). As defined by the DoD program, the DL is the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration with 99% confidence. The laboratory determines the DL using the calculated value from the MDL Study. The DL can be derived from pooled MDL values obtained across instruments. The LOD is the smallest amount of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. It is established by spiking a quality system matrix at a concentration of 2-4 times the DL. The LOD must be verified on a quarterly basis or with each batch of samples.

10.5. Data Review

Final review and verification of the data are performed by designated employees using the sample results, quality control information, method criteria and Project Notes entered into the LIMS. Data are initially evaluated by the analyst and then a second designated employee knowledgeable in the test, other than the employee responsible for performing the test, reviews the data. The reviews include checks for correct transcription, calculations, passing calibrations, compliant quality control results, holding time compliance, and project specific requirements. Any issues or errors identified during this stage are addressed, corrected, and reviewed with the responsible person.

After determining that all necessary requirements for valid data and for the project are met, the reviewer electronically approves the data by changing the LIMS status of the data from "complete" to "verified". The LIMS is programmed with a list of approved reviewers for each test, and the system is password protected to ensure that only qualified individuals verify the data.

10.6. Data Qualification

Data qualifiers are used to provide additional information about the results reported. The most typical use for data qualifiers is for results that fall below the quantitation limit, in the region where it becomes more difficult to distinguish a positive result from the background instrument signal. The data systems used to generate and report results are programmed to flag values in this range as estimates.

Other qualifiers are applied to advise data users of any validation issues associated with the data. The laboratory makes every effort to meet all of the requirements for generation of data. Occasionally, generation of data that does not meet all the method requirements occurs due to sample matrix or other analytical problems. If the test cannot be repeated or reanalysis would not yield better quality data, qualified data is reported. Qualifiers can be in the form of comments on the analytical report or flags applied to the results.

10.7. Data Reporting

When all analyses are completed, reviewed and verified, a report is generated by the LIMS. The client receives a copy of the report containing the results of the analysis, associated QC data, and where necessary, explanatory comments to address non-conformances. To avoid ambiguity in interpreting results, a summary page that contains an explanation of all symbols and units used in reporting data is included with the Analysis Report submitted to clients. Some regulatory agencies also require the laboratory accreditation identification on the Analysis Reports. Where required, this information is added. The current list of agencies can be accessed in the LIMS. Copies of reports and associated supporting raw data are retained in our archives. The report contains the signature of the assigned client service representative who is the key contact for any questions concerning the results. Personnel authorized to review, sign, and release Analysis Reports are noted in the key personnel list provided in Appendix C.

The laboratory offers a variety of data reporting .levels and formats, from a basic report of sample and QC results only, to a comprehensive data package of QC/calibration information and raw data. The client and any agency involved direct the selection of report type. A summary of report formats and data packages types is provided in the laboratory *Schedule of Services*. Various electronic formats are also available formatted to client-specified file structure and sent via e-mail, direct upload, web-site access (LLabWeb), or common courier. LLabWeb is used for clients that require secure transfer of electronic data.

Client confidentiality of LLabWeb data is ensured by the use of a secured firewall internet environment coupled with the use of a user ID and password to gain login access to the system. User accounts are configured to only allow access to specific data associated with the user's business account number.

Amendments to a final report after issue are in the form of an additional document or data transfer and include a reference to the original report. When a completely new final report is required, it is uniquely identified and includes a reference to the original report it replaces.

10.7.1. Reporting the Results

Analytical reports are generated with a cover page that summarizes all samples in that group. This page lists the laboratory assigned sample number and the corresponding client description. The cover page identifies the laboratory contact person's name and phone number if there is a question about the report. Within this package, each page is uniquely identified and paginated. Analytical test results for methods listed on the laboratories' accreditation scope meet all requirements of NELAP accreditation and ISO 17025 unless noted otherwise. Ohio EPA VAP requires that a signed, notarized affidavit accompany each analytical report.

10.8. Data Storage, Security, and Archival

The laboratory has documented procedures and instructions for the identification, collection, access, indexing, filing, storage, maintenance, and disposition of data records. Records are in the form of paper records, electronic data files, magnetic tape, and CD-ROMs.

All data records are maintained in a confidential manner in an environment to minimize deterioration or damage and to prevent loss. Some records are stored in off-site facilities, in such a way that they are readily retrievable. Retention time for records is in accordance with specific procedures or instructions. Prior to the destruction of data/records, and if requested by a client or agency, the laboratory will notify the client/agency that their data is scheduled for destruction so arrangements can be made to have the original data sent to the client.

If specified in client contract(s), archived records are transferred according to their instructions in the event of a change in laboratory ownership or if the laboratory goes out of business. If not specified by the client, the sale agreement must require that archived records be maintained as scheduled by the new owners. In the case of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records must be followed.

The laboratory maintains all documentation which is necessary for historical reconstruction of data:

- Analysis reports
- Data notebooks
- Data logbooks
- Instrument output
- Correspondence and client files
- Instrument and equipment logbooks
- QA records
- Corporate documents
- Electronic records

11. AUDITS AND INSPECTIONS

11.1. Internal Quality Assurance Audits

The QA Department, which is independent of laboratory activities, performs routine and on-going system, traceability, and observation audits to objectively review current systems, operations, and procedures as well as automated data integrity audits of electronic data records. The goal of the audits is to ensure that the quality system activities are effective and in compliance with regulatory programs, including NELAP. ISO 17025, DoD, and state agencies, as well as internal policies and procedures. Audits are documented and tracked in a QA database.

Audits are scheduled and conducted following a predefined schedule, based on criticality of operation and prior audit results, with the goal of evaluating systems and technologies across the operation. If warranted, additional audits are performed to follow up on promised corrective action or areas of concern.

Results of an audit are documented in a report format and distributed to applicable management personnel responsible for the area(s) under audit. Management is responsible to address all non-conformances found during an audit with root cause analysis and application of a corrective action plan.

Audit reports and responses are circulated to Management to communicate the outcome of the audit and the proposed plan(s) for corrective action, if warranted. If any of the audit findings cast doubt on the validity of the results, the clients must be notified within three business days of the investigation. Should an audit issue present a major concern regarding validity of laboratory methods, QA personnel can issue a stop work notice.

All records maintained as part of an audit are kept on file for three years.

On an annual basis, an audit of the QA Department is performed as directed by the laboratory's Executive Management. The auditors assigned to carry out this operation are qualified staff members independent of the QA Department.

The specific content and findings of internal audits are considered company confidential and are not shared with clients.

11.2. Review of the Quality Assurance Program

All levels of management are continually updated on the status of quality and compliance by circulation of pertinent documents. Management review is documented by signatures on the documents, electronic records of each person's review, along with any comments or request for additional follow-up. The types of documents circulated real-time include:

- Internal, client, and agency audit reports and responses
- Proficiency test results
- Investigation and corrective action reports
- Monthly QA status reports

Executive management reviews the elements of the total QA program on an annual basis to ensure its continuing suitability and effectiveness in meeting the stated objectives outlined in Section 2.4 of this manual. The evaluation entails review of reports to management, all audit findings, client complaints, laboratory investigations, staff adequacy and training, and projected growth in workload. Patterns or trends in any of these areas are reviewed as a means to continually improve the quality system. This review also includes an evaluation of any audit findings resulting from the audit of the QA Department. At the conclusion of this quality system review, executive management determines the need to introduce changes or improvements into the quality systems at the laboratory. The minutes from the meeting and any recommendations for improvement are documented and a copy is forwarded to the QA staff for review and follow-up.

11.3. Good Laboratory Practice Critical Phase Inspections

Any project that is subject to Good Laboratory Practice (GLP) regulations is audited by the QA Department, as required by the regulations, at intervals adequate to ensure the integrity of the study. Inspections of a GLP project include direct observation of analysts as they perform various phases of the study. Data documentation is reviewed as part of the inspection. The purpose of this type of audit is to ensure that there are no deviations from written methods, procedures, or study protocols.

Results of inspections are documented in a report format and distributed to applicable management personnel responsible for the area(s) under audit. Management is responsible to address all non-conformances found during an inspection. Inspection reports and responses are circulated to applicable laboratory management and an off-site study director, as applicable, to communicate the outcome of the inspection and the proposed plan(s) for corrective action, if warranted.

All records maintained as part of an inspection are kept on file.

11.4. Client Audits

Because clients place great importance on compliance with applicable regulations, data quality, and project requirements, they may audit our facility as assurance that their objectives are being met. QA, management staff, CSRs, and the analytical laboratories play a key role in these audits. Visits by clients can range anywhere from a tour (to verify laboratory facilities and instrumentation) to an intensive inspection of technical operations, procedures, regulatory compliance, and/or review of specific project(s).

- Audits are scheduled directly with the CSR or QA. The request to audit is communicated to all applicable laboratory departments.
- In accordance with our policy on client confidentiality, a client is permitted to review only data and results that apply to their work, or which have been approved by laboratory management.
- An escort (designated laboratory employee) remains with an auditor at all times.

Responsibilities are assigned to the following groups in regard to client audits:

11.4.1. QA Department

- Research previous audit reports and laboratory responses to past deficiencies.
- Follow-up with the applicable analytical laboratory areas to ensure action items were completed from the last audit, as necessary.
- Work with client to set audit agenda.
- Function as an escort during the audit
- Answer questions the auditor has in regard to laboratory and quality systems.
- Take notes of areas where corrective action or suggestions are recommended during the audit.
- Communicate audit issues to management at the completion of the audit.
- Respond to client audit reports.
- Ensure follow-up to cited items are addressed in a timely manner.

11.4.2. CSRs

- Gather and organize relevant information (e.g., client correspondence, analysis/project requests, copies of analytical data from archives).
- Be knowledgeable about client-specific project requirements and issues.
- Function as an escort during the audit.
- Communicate issues/problems to appropriate personnel.

11.4.3. Laboratories

- Gather and organize laboratory data and documentation in preparation for client review.
- Assure corrective action was implemented from past audit findings, if necessary.
- Be prepared to discuss project data/testing results during the audit.
- Be familiar with client-specific project requirements and be prepared to answer client questions.
- Be familiar with the location of routine laboratory information and equipment (e.g., SOPs, data notebooks, calibration data, etc.).
- Be prepared to answer specific technical questions in regards to laboratory procedures and instrumentation within the area.
- Functions as an audit escort within the department during the audit.
- Laboratory managers may function as an escort during the audit

11.5. Agency Inspections

It is laboratory policy to cooperate to the fullest extent and maintain cordial relations with all government agencies. The QA Department is assigned the responsibility of hosting and working with agency representatives. Their role includes, escorting the investigator(s); ensuring all questions are answered promptly and accurately; making note of all unresolved issues; informing management of the audit status and outcome; responding to the audit report and ensuring that appropriate corrective action is completed.

Inspections can be performed by investigators or auditors from the EPA, states, third-party accreditation bodies (i.e. A2LA, United States Department of Agriculture (USDA), or other regulatory agencies.

Government agencies have the right to investigate and inspect the laboratory during normal business hours and permission to inspect is granted by Executive Management.

Designated members of the QA Department are primary contacts for announced inspections. The QA Director is the primary contact for all unannounced agency inspections. If the QA Director is unavailable, Executive Management is notified, in addition to a member of the QA Department. The QA Director, or their designee, must obtain evidence of the investigator's authority either in the form of a letter or examination/explanation of credentials.

Inspections include the examination of records or the inspection of facilities. Investigators are usually concerned only with the records relating to their responsibilities. As a general rule, they are given copies of records and documents, if requested. The laboratory must have a record of all items provided to an investigator.

Investigators must be escorted through the laboratory. The laboratory is not obligated to show an investigator the following types of information: sales, financial or pricing information, or any personnel data other than training or qualification documentation. On a case-by-case basis, internal QA audit reports and investigation reports are made available for agency review. Any questions or concerns about a request made by an investigator in regard to recording devices or photographs must be reviewed with legal counsel.

The laboratory personnel are not permitted to sign affidavits. If an affidavit is presented during an inspection, all personnel are directed not to sign it, read it, nor listen to it being read. The only document that is acceptable to sign is an acknowledgement that an inspection report has been received. If there is any doubt as to what should be signed, legal counsel must be consulted.

11.6. Proficiency Testing

Many of the organizations that certify our laboratory to perform various analyses require proof of our competency. Laboratory performance is checked regularly by participation in a variety of proficiency testing (PT) programs. When available, blind samples are obtained from vendors that are accredited to provide PT samples under the TNI and/or ISO 17025 standards for all test and matrices routinely tested at the laboratory. In addition, some individual certification programs require analysis of specific sets of proficiency samples. The laboratory also chooses to participate in a double blind program.

Generally, the PT programs consist of samples or ampulated spiking solutions used to fortify laboratory samples. The laboratories analyze the samples in the same manner as a client sample and the data is sent to the agency or vendor for evaluation. After the study results are returned to the laboratory, any data falling outside the acceptance criteria is investigated, root cause is identified, and corrective action is implemented, if needed. Results are circulated to management. No PT samples or portion of a PT sample are sent to another laboratory for analysis.

Double blind samples are submitted to the laboratories by the Client Services Department using a fictitious client name so that the analysts are not aware that the samples are PTs. The samples are submitted quarterly and include a cross-section of organic and inorganic tests. The acceptance criteria for these double blind samples are developed statistically using data from participating laboratories, providing a source of inter-laboratory comparison. Results are reviewed, investigated as needed, and circulated to management.

If a trend in PT failures is identified, additional blind samples are ordered for that specific test as corrective action.

Clients routinely submit blind and double blind samples to evaluate the laboratory's performance. If a report is issued to the laboratory, it is handled in the same manner as a scheduled PT study evaluation and follow-up.

12. CORRECTIVE AND PREVENTIVE ACTION

12.1. Laboratory Investigations and Corrective Action

Due to the technical nature of laboratory work and the broad scope of our QA program, a wide variety of laboratory issues can require investigation, root cause analysis, documentation, and corrective action. Prompt investigation and implementation of corrective action ensure that only data of known quality are reported and prevent the recurrence of errors. The following list provides "examples" of the type of issues that warrant investigation:

- Noncompliant QC results*
- Failed PT samples
- Reporting incorrect results
- Contamination issues
- Client technical complaints
- Procedural errors
- Missed holding times
- Systematic problems that compromise the accuracy or compliance of the data generated
- Problems with instrumentation and equipment which could compromise the data generated

These investigations must include the following:

- Identification of the problem
- Steps taken to investigate the problem
- Explanation of probable root cause(s) of the problem
- Steps taken to prevent future occurrence
- Determination of samples or systems affected by the problem

*Note: individual QC noncompliance does not require in depth investigation. Actions are taken as defined in the corresponding method and documented in the data. An adverse trend with noncompliance would be investigated.

Management is informed of problem situations. The QA staff track documentation, the status of the investigation activities, evaluates investigations for completeness and appropriateness, and monitors corrective action for follow-up/closure. Technical management and/or QA may issue a stop work notice if issues indicate the potential for problems on a broad scale or present a critical concern regarding the validity of the laboratory methods. The goal is to identify root cause, have the corrective action implemented promptly, and to the degree appropriate for the magnitude and risk of the problem. Tracking and trending of laboratory issues is performed by QA staff and reported to management on a monthly basis or immediately upon detection of a trend with potential for putting the laboratory or our clients at risk.

12.2. Investigation Processes

All results from quality control (QC) samples are logged into the LIMS quality control system, which is programmed to alert analysts to unacceptable results. Analysts are required to review the results and determine the source of the problem. The source of the problem and proposed corrective action must be documented. Corrective action may include, but is not limited to, re-analysis, re-extraction or re-digestion, instrument maintenance, or re-calibration. If these actions do not yield compliant data within the required hold time, a Nonconformance Form is initiated to document actions and communication with the client. The original form is archived with the associated raw data. Nonconformance Forms are reviewed by the technical department's management, or designee. A copy of the form is reviewed by QA.

Missed holding times are investigated and documented using a Missed Holding Time form. The form includes documentation of the affected samples, reason the hold was missed and corrective actions taken, if applicable. Each form also has documented review and approval by the department manager, department director and the QA Director. Clients are informed of any problems involving holding time.

Other types of problems having potential impact on data quality or involve deviations to our processes are investigated and documented using an Investigation and Corrective Action Report (ICAR). This process was developed to ensure that laboratory problems are investigated, evaluated for root cause, corrective action is put into place to prevent recurrence, laboratory management review and QA approval occurs, and all steps are documented. These investigations are initiated and managed through a workflow interface (Jira). Any employee can initiate an ICAR through this system to document a laboratory problem. The investigation must be completed by designated members of management and approved/closed by QA. Each investigation has a unique tracking number assigned by Jira. Closed investigations are routed to the laboratory Vice-President, associated laboratory Director and the QA Director. Follow-up to ensure effective corrective action is managed by QA staff.

If a laboratory error is identified from the outcome of the investigation that impacts validity of client data, the client must be immediately notified in writing of the situation and corrected data provided as soon as possible. If the root cause of the problem has affected any other client sample results, all affected clients are notified immediately of the problem.

12.3. Client Feedback

The laboratory is in the business of providing high quality analytical testing services. The data that we supply to our clients must be technically complete, accurate, and compliant with applicable regulations. Complaints can be received via letter, phone call, e-mail, or face-to-face meeting.

When a complaint is received, it is our responsibility to determine, to the best of our ability, the extent of the issue and what data is in question. The person receiving the complaint documents this information and promptly forwards it to the appropriate management personnel where the work in question was performed. If a data reporting error is discovered, the final report and/or data must be regenerated with the correct value(s).

The CSR is responsible for entering client concerns into the LIMS and an automated summary report is sent to QA on a weekly basis for review. In some cases, an ICAR is initiated to address and document the situation. While an individual issue may not warrant a formal investigation, QA monitors these issues for potential trends and will issue an ICAR if a trend is evident.

On an annual basis, the laboratory sends a client satisfaction survey to all clients. The results of these surveys are compiled, routed to the laboratory Vice-President, technical and operations directors and the QA Director, and used to identify areas of improvement for the laboratory.

12.4. Preventive Actions

All employees are empowered and encouraged to use the concept of Preventive Action to avoid a problematic situation. The company supports, embraces and drives the process for continuous quality improvement by several means, such as: Ethics Hotline, the Suggestion Box (accessible to all employees on the company's Intranet 'LabLinks'), and training classes that include "Making Quality a Science" and Ethics. If an employee identifies a potential problem or an area of concern or it should be brought to the attention of his/her supervisor, Human Resources, QA Director or the Ethics Hotline.

The laboratory also utilizes a formal program to encourage preventive action through development of lean processes. The goal of this program is to optimize processes to ensure efficiency and operational improvements while maintaining compliance. The efficiency gains are inherently coupled with minimizing errors and rework. Teams of employees learn the tools and techniques to evaluate a process, identify potential sources of errors, delays or problems in an operation, determine system changes that will minimize these and work to implement the improvements. Each project includes thorough documentation of the evaluation, measurement, and implementation phases. The process is continually monitored to ensure that the anticipated results are sustained.

Employees are also encouraged to communicate to their supervisor any area(s) or operation(s) that they believe could be streamlined, make their job easier, would provide a quality improvement, or could provide a cost savings to the company.

Described below are some of the systems available to employees to assist with building quality and efficiency into their daily jobs. They stress a proactive approach/environment to problem solving and to review quality systems and operational efficiencies.

- "Making Quality a Science" is an introductory total quality management (TQM) course required for all employees to teach why quality is important and to explain the laboratory's quality philosophy and processes, and how to apply quality thinking and techniques on the job. Topics discussed include: communication, teamwork, serving the client, measurement, quality tools, and continuous process improvement. To foster continuous improvements of laboratory systems, process improvement teams are formed, as needed, if an employee needs help in solving a problem or addressing an issue. The goal of these groups is to have representation from various areas of the laboratory work together to look at a problem, evaluate the need for a temporary fix, brainstorm root causes, plan process improvement, implement the process improvement, evaluate and follow-up to the corrective action.

- "Putting our Values to Work" (Ethics) is a seminar required for all employees to teach the laboratory's Statement of Values by examining how it translates to our everyday jobs and ethical decision making. Topics discussed include: Statement of Values, ethical paradigms, and ethical decision making. Mandatory ethics training refresher seminars are offered on an annual basis.

- The laboratory has contracted with an Ethics Hotline to provide an anonymous means of reporting ethics concerns or issues. The issue is forwarded by the service to the QA Director who will communicate internally with those who need to address the issue. All communication and actions are documented in a secure web interface managed by the hotline service company.

- The QA staff prepares monthly program status reports for management. The reports include a variety of metrics and graphs which are used to evaluate trends in laboratory performance across all quality and compliance areas. Management responds to any negative trends by developing a corrective action plan.

- The laboratory uses a Project Cycle process (further described in section 13.2) to proactively review and prepare for client projects in an effort to ensure full understanding by all laboratory staff of the client's needs and resolve any concerns in advance of receiving the work.

13. SERVICE TO CLIENTS

13.1. Service to Clients

We value our client relationships and support these partnerships through the following principles:

- Honesty and Fairness – Our corporate culture is founded on the principles of professionalism and high ethical standards in dealing with our clients. This may mean declining to provide the service requested (if we are convinced that to do so would be meaningless) or it may mean referring clients outside of our laboratory if we believe that another company can better meet their needs.

- Complete Service – We will give our clients full value on every service provided. We will provide detailed information on our methods, procedures, and QA programs if requested, and take a personal interest and initiative in helping solve our client's problems within the area of our professional expertise.

- Trustworthiness – All data and information developed for a client will be held confidential and not disclosed to a third party except on written request of the client. If information is subpoenaed, we must, by law, release it, but the client will be informed of the release.

- Commitment to Quality – We constantly strive to improve our service in quality, flexibility, and dependability, to keep our competitive edge. We will achieve this through: meeting the requirements of those we serve, staying apprised of regulatory and industry expectations, and providing prompt responses to client concerns.

- Basics of Superlative Service – Our focus is on our client's success. Through proactive collaborative communication, our leadership ensures we understand our client's expectations and strives to exceed them. We foster a service culture in our training, reward and recognition, and performance management process so each employee takes ownership to deliver superlative service to our clients. Feedback from clients, whether positive or negative, is an important part of our continuous improvement system. Ways in which feedback is gathered can include, but is not limited to, customer satisfaction surveys, client audits, and the customer complaint system, which is described within section 12.3.

We also view our fellow employees as our clients since they frequently receive the results of our labor. Meeting the requirements of the next employee in the workflow process is just as important as meeting the needs of an external client.

13.2. Review of Work Requests, Tenders, and Contracts

The laboratory places great importance on understanding and meeting client requirements for a project. We ensure, to the best of our ability, that client/project requirements are identified and communicated through the laboratory. Project evaluation can be achieved in various ways, including the review of analytical methods, protocols, business contracts, and quality project plans (QAPPs). The project review encompasses our Project Cycle process and individual topics to be evaluated for a project include, but are not limited to: scope of testing; required accreditations (i.e. individual state agencies, NELAP, DoD, and ISO 17025) held by the laboratory; appropriate and current testing methods; ability to meet project required reporting limits and QC (if applicable); inconsistencies clarified; and nonstandard work requests.

Project kick-off meetings can be arranged through the CSR or Business Development Group. These meetings allow the client and key technical personnel to discuss project issues and requirements prior to project initiation. Any differences between laboratory processes and the project requirements are discussed and addressed with the client and the laboratory staff before the project is accepted and samples arrive. Testing that cannot be performed at the laboratory may be subcontracted to another laboratory (see 13.4).

A key client contact, the CSR, is assigned to oversee the project. Communication between the client and laboratory staff is available and is coordinated through the CSR.

As a project continues, the CSRs provide continuous communication and status reports (if requested) about the project to the client. The CSR relays any project changes or modifications to the technical groups. If the client submits revised project documents (QAPPs, etc.) then the Project Cycle review process is repeated. The CSR also communicates any issues encountered by the technical laboratories back to the client and vice-versa.

13.3. Timely Delivery

Evaluating laboratory capacity and ability to perform specific projects is a joint responsibility between the Technical Director, Business Development, and the laboratory managers. We recognize that one of the most important aspects of the service we offer is turnaround time.

Many analysts are cross-trained to perform a variety of tests, and there is redundant equipment available in the laboratory area creating operation flexibility for routine work. Larger projects are reviewed against capacity estimates before bids are submitted to ensure that the client's schedule is met. Turnaround time is continually measured.

Regularly scheduled meetings are held with technical and support management, and project management personnel to review progress with current projects, as well as special requirements of new work scheduled for the laboratory.

Management receives a daily report of the status of all samples in the lab, including those with priority status or those that have exceeded a preset turnaround time. This enables the planning and organizing of the workload through efficient scheduling.

Any changes to the established timeline by the client or the laboratory must be communicated to the client or laboratory as soon as possible. Upon communication of changes, a new timeline is established and agreed upon by both parties. If a client requires a change in the scope of the project (e.g., number of samples submitted, change in analyses, revised protocol) the laboratory must be informed in writing and a new timeline and cost estimate is be provided.

13.4. Subcontracting

The laboratory may subcontract tests to other laboratories if the requested testing is not routinely performed in our laboratory. To a lesser extent, samples may need to be subcontracted to an overflow laboratory to ensure hold times and/or turn-around-times (TAT) are met.

Testing is only subcontracted with the client's knowledge and approval. The CSR must notify the client in writing when any of their requested analyses will be subcontracted to another lab. Client approval must be obtained in writing before samples are shipped.

Subcontract laboratories are selected based on their qualifications and accreditations. The subcontractor is requested to sign a Laboratory Analytical Services Subcontract. See form 9033100 to review details of the contract terms and information requested from the subcontract laboratory. If projects require a specific agency certification (i.e. individual state agencies, National Environmental Laboratory Accreditation Program (NELAP), Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP), and ISO 17025), only an appropriately accredited laboratory is used. The client may also have a list of laboratories to be used for subcontracting. In these cases, the evaluation of the subcontract laboratory is made by the client.

Data obtained from subcontract laboratories is clearly marked as such when reported by the laboratory. The data are submitted to the client in the format obtained from the subcontractor.

13.5. Use of NELAP and A2LA logo

It is not laboratory policy to use these logos on any company letterhead, including analytical reports.

Eurofins Document Reference	1-P-QM-GDL-9015378	**Revision**	4
Effective Date	Jan 18, 2016	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix A		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Kathryn Brungard
Reviewed and Approved by	Robert Strocko;Review;Friday, January 15, 2016 1:14:50 PM EST Duane Luckenbill;Review;Monday, January 18, 2016 2:46:15 PM EST Dorothy Love;Approval;Monday, January 18, 2016 2:56:16 PM EST

Procedure Cross Reference List

NOTE: SOPs and Forms are indicated in the table with the unique Document Control Database number starting with "90…". The topic of the document is given in parentheses.

Section #	Title	Procedure(s)
1	Introduction	
1.1.	Mission Statement	Employee Handbook
1.2.	Quality Policy	9007879 (Quality Statement) Employee Handbook
1.3.	Statement of Values	Employee Handbook
1.5.	Certifications, Accreditations, and Registrations	9007852 (Cert Summary) Company website
2	Organization and Personnel	
2.1.1	Business Continuity and Contingency Plans	9017347 (Incident Response Plan) 9017681 (Preparedness, Contingency) 9017358 (Archiving SOP) 9021762 (Deputies form)
2.2.	Organizational Structure	Organization Charts
2.3.	Management Responsibilities	PQDs (job descriptions) PMDs (individual job plans)
2.4.	Overview of the Quality Assurance Program	Dept 4052 SOP Series
2.5.	Quality Assurance Responsibilities	Dept 4052 SOP Series
2.6.	Communication of Quality Issues to Management	9020717 (QA Reports)
2.7.	Personnel Qualifications and Responsibilities	9017379 (Employee Training) PQDs (job descriptions) PMDs (individual job plans) Task Specific Training
2.8.	Relationship of Functional Groups and the Quality Assurance Program	Quality Orientation TQM Training PMDs (individual job plans) Dept 4052 SOP Series 9017338 (Project Cycle)
2.9.	Balancing Laboratory Capacity and Workload	PMDs (individual job plans) LIMS reports for mgt
2.10.	Identification of Approved Signatories	9017322 (Date Entry, Verification and Reporting)
2.11.	Personnel Training	9017379 (Employee Training) 9015390 (DOCs) PQDs (job descriptions) PMDs (individual job plans) Task Specific Training
2.12.	Regulatory Training	9022322 (GLP)

Section #	Title	Procedure(s)
2.13.	Employee Safety	Analytical Methods Chemical Hygiene Plan 9017681 (Preparedness) Dept 6098 SOP Series PMDs (individual job plans)
2.14.	Client Services/Project Management Responsibilities	Dept 4039 SOP Series 9017338 (Project Cycle)
2.15.	Confidentiality	Employee Handbook 9017360 (E-mail System) 9022134 (Client and Agency Audits)
2.16.	Business Conduct	Employee Handbook
2.17.	Operational Integrity	9017675 (Manual Integration) 9017333 (Chromatographic Integration) 9017679 (Ethics Policy) 9007879 (Quality Statement)
3	Buildings and Facilities	
3.1.	Facility	Floor Plans
3.2.	Security	9017366 (Building Security)
3.3.	Disaster Recovery	9017347 (Incident Response Plan)
3.4.	Environmental Monitoring	9017311 (VOA Storage) 9021509 (ETM)
3.5.	Water Systems	9017368 (Reagent Water)
3.6.	Housekeeping/Cleaning	9017373 (Housekeeping)
3.7.	Insect & Rodent Control	9017367 (Insect & Rodent Control)
3.8.	Emergency Power Supply	9017347 (Incident Response Plan)
3.9.	Facility Changes	9017364 (Facility Change Control) 9028515 (Change Control)
4	Document Control	
4.1.	Hierarchy of Internal Operating Procedures	9017356 (Writing SOPs)
4.2.	Document Approval, Issue, Control, and Maintenance	9017357 (Document Control) 9017329 (Method Validation)
4.3.	Client-Supplied Methods and Documentation	9021833 Analytical Decision Making) 9022599 (QA review of QAPPs) 9017338 (Project Cycle) 9015436 (Auditing Paperwork)
4.4.	Laboratory Notebooks, Logbooks, and Forms	9017357 (Document Control) 9021767 (Notebooks)
4.5.	Control of External Documents	9017357 (Document Control) Departmental “Controlled Documents” forms

Section #	Title	Procedure(s)
5	Sample Handling	
5.1.	Sample Collection	Dept 4031 SOP Series
5.2.	Sample Receipt and Entry	Dept 6042 SOP Series
5.3.	Sample Identification and Tracking	Dept 6042 SOP Series 9017318 (LSAR)
5.4.	Sample Storage	Dept 6055 SOP Series
5.5.	Sample Return/Disposal	9015512 (Sample Discard) 9017352 (Hazardous Wastes - Lab) 9017756 (Hazardous Wastes – Storage)
5.6.	Legal Chain of Custody	9017335 (Legal COC)
5.7.	Representativeness of Samples	Analytical Methods 9017334 (Representative Solid Samples)
6	Technical Requirements - Traceability of Measurements	
6.1.	Reagents and Solvents	9017328 (Reagents and Standards) Analytical Methods
6.3.	Calibration Standards	9017328 (Reagents and Standards) Analytical Methods
6.4.	Equipment and Instrumentation	9017325 (Inst. & Equip M&C) 9015389 (Balance, Syringe, Pipette Verification)
6.5.	Computerized Systems and Computer Software	9028515 (Change Control) 9017361 (Network Accounts) 9017360 (E-mail System) 9017710 (Computer Backup) Employee Handbook 9017712 (Computer Viruses)
6.6.	Change Control	9028515 (Change Control)
6.7.	Labware Cleaning	Departmental Procedures
7	Purchasing Equipment and Supplies	
7.1	Procurement	9021705 (Procurement) 9018236 (Receipt of Lab Supplies)
7.2	Supplier Evaluation	9021705 (Procurement) 9017310 (Subcontracting) 9017328 (Reagents and Standards) 9015516 Preservative Checks)

Section #	Title	Procedure(s)
8	Analytical Methods	
8.1.	Scope of Testing	Schedule of Services Company website
8.2.	Analytical Test Methods	9017329 (Method Validation) 9023483 (Writing Procedure Guidance)
8.3.	Client Supplied Methods	9017329 (Method Validation)
8.4.	Method Validation	9017329 (Method Validation)
8.5.	Procedural Deviations	9017331 (ICARs)
9	Internal Quality Control Checks	
9.1.	Laboratory Quality Control Samples and Acceptance Criteria	9017313 (QC Limits) Analytical Methods
9.2.	Quality Control Sample Frequency and Corrective Action	9017315 (Noncompliant Data) Analytical Methods
9.3.	Quality Control Charts	9018253 (End of Month QC Reports)
9.4.	Measurement Uncertainty	9017313 (QC Limits)
10	Assuring Quality of Test Results	
10.1.	Data Management	9021767 (Notebooks)
10.2.	Data Documentation	9021767 (Notebooks) 9017322 (Date Entry, Verification and Reporting) 9007879 (Quality Statement)
10.3.	Data Calculations	9017322 (Date Entry, Verification and Reporting) Analytical Methods
10.4.	Reporting Limits	9017309 (MDLs & LOQs)
10.5.	Data Review	9021767 (Notebooks) 9017322 (Date Entry, Verification and Reporting)
10.6.	Data Qualification	9017315 (Noncompliant Data)
10.7.	Data Reporting	9017322 (Date Entry, Verification and Reporting) 9017330 (MCL Exceedance)
10.8.	Data Storage, Security, and Archival	9017358 (Data Archiving) 9017710 (Computer Backup)
11	Audits and Inspections	
11.1.	Internal Quality Assurance Audits	9020535 (Internal Audits) 9022322 (GLP) 9008821 (Internal Audit Checklist)
11.2.	Review of the Quality Assurance Program	9020535 (Internal Audits) 9020717 (QA Reports)
11.3.	Good Laboratory Practice Critical Phase Inspections	9022322 (GLP)
11.4.	Client Audits	Employee Handbook 9022134 (Client and Agency Audits)

Section #	Title	Procedure(s)
11.5.	Agency Inspections	Employee Handbook 9022134 (Client and Agency Audits)
11.6.	Proficiency Testing	9017321 (PT Program) 9018237 (PT Entry)
12	Corrective and Preventive Action	
12.1.	Laboratory Investigations and Corrective Action	9017315 (Noncompliant Data) 9017331 (ICARs) 9017332 (Client Complaints)
12.2.	Investigation Processes	9017326 Missed Hold Procedure) 9007810 (Missed Hold form) 9017331 (ICARs)
12.3.	Client Feedback	9017332 (Client Complaints) Annual Client Survey
12.4.	Preventive Actions	Corporate Training Lean Projects 9017338 (Project Cycle) 9028515 (Change Control) 9020535 (Internal Audits)
13	Service to Clients	
13.1.	Service to Clients	Employee Handbook Ethics Statement 9007879 (Quality Policy) TQM Training
13.2.	Review of Work Requests, Tenders, and Contracts	9015436 (Client Paperwork) 9017338 (Project Cycle) 9018254 (QAPP Review)
13.3.	Timely Delivery	9015434 (Tracking Rush Samples) 9015437 (Scheduling Rush Samples) Departmental LIMS reports
13.4.	Subcontracting	9033100 (Subcontractor Checklist) 9017310 Subcontracting) 9017338 (Project Cycle)

Eurofins Document Reference	1-P-QM-GDL-9015379	**Revision**	4
Effective Date	Dec 31, 2015	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix B		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Barbara Reedy
Reviewed and Approved by	Duane Luckenbill;Review;Sunday, December 13, 2015 10:18:02 PM EST Dorothy Love;Approval;Thursday, December 17, 2015 3:55:34 PM EST

eurofins | Lancaster Laboratories Environmental

Document Title:
Certifications, Accreditations, Registrations and Contracts

Eurofins Document Reference: 1-P-QM-FOR-9007852	Revision: 23	Historical Reference: Form 2528
Effective date: Oct 12, 2015		Status: Effective

Agency	Parameter	Applicable Matrices	Lab ID No.
Federal Programs:			
American Association for Laboratory Accreditation (A2LA)	Organics, inorganics, dioxin per ISO 17025 and DoD QSM 5.0, KY UST, WY Storage Tank Program, Food and Feed, and PFAAs	Potable water, nonpotable water, solid and hazardous waste, air, tissue and tobacco	0001.01
USDA Quarantine Soil Permit	All	Solid	PCIP-14-00703
State Programs:			
State of Alaska, Department of Environmental Conservation	Organics, inorganics, UST analysis	Nonpotable water, solid and hazardous waste	UST-061
State of Arizona, Department of Health Services	Dioxin	Potable water, nonpotable water, solid and hazardous waste	AZ0780
State of Arkansas, Department of Environmental Quality	Organics, inorganics, dioxin	Nonpotable water, solid and hazardous waste	88-0660
State of California, Department of Health ELAP	Organics, inorganics, dioxin	Potable water, nonpotable water, solid and hazardous waste	2792
State of Colorado, Department of Public Health and Environment	Organics, inorganics, dioxin	Potable water	None
State of Connecticut, Department of Public Health	Organics, inorganics, dioxin, micro	Potable water, nonpotable water, solid and hazardous waste	PH-0746
State of Delaware, Health and Social Services	Organics, inorganics, dioxin, micro	Potable water	None
[3]State of Florida, Department of Health	Organics, inorganics, dioxin, micro	Air and emissions, potable water, nonpotable water, solid and chemical materials	E87997
[3]State of Hawaii	Organics, inorganics, dioxin	Potable water	None
[3]State of Illinois, Environmental Protection Agency	Organics, inorganics, dioxin	Nonpotable water, solid and chemical materials	200027
State of Iowa, Department of Natural Resources	Organics, inorganics, UST analysis	Nonpotable water, solid and hazardous waste	361
[3]State of Kansas, Department of Health and Environment	Organics, inorganics, dioxin	Potable water, nonpotable water, solid and chemical materials	E-10151
Commonwealth of Kentucky, Department of Environmental Protection, Drinking Water Certification Program	Organics, inorganics, dioxin	Potable water	90088
Commonwealth of Kentucky, Department of Environmental Protection, Wastewater Certification Program	Organics, inorganics, dioxin, micro	Nonpotable water	90088
[4]Commonwealth of Kentucky, Department for Environmental Protection – UST Branch	Organics, metals, UST analysis	Nonpotable water, solids	89
[1, 3, 5] State of Louisiana, Department of Environmental Quality	Organics, inorganics, dioxin	Air emissions, biological tissue (direct accreditation), nonpotable water, solid chemical materials	30729 02055
State of Maryland, Department of the Environment	Organics, inorganics, dioxin, micro	Potable water	100
Commonwealth of Massachusetts, Department of Environmental Protection	Organics, inorganics	Nonpotable water	M-PA009

eurofins | Lancaster Laboratories Environmental

Document Title:
Certifications, Accreditations, Registrations and Contracts

Eurofins Document Reference: 1-P-QM-FOR-9007852	Revision: 23	Historical Reference: Form 2528
Effective date: Oct 12, 2015	Status: Effective	

Agency	Parameter	Applicable Matrices	Lab ID No. Certificate No.
State of Michigan, Department of Environmental Quality	Organics, inorganics, dioxin	Potable water	9930
State of Missouri, Department of Natural Resources	Organics, inorganics	Potable water	450
State of Montana, Department of Public Health and Human Services	Organics, inorganics, dioxin	Potable water	CERT0098
State of Montana, Department of Environmental Quality	Organics, UST analysis	Nonpotable water, solid and chemical materials	None
[3]State of Nevada, Division of Environmental Protection	Organics, inorganics, dioxin	Potable water, nonpotable water, solid and chemical materials	PA00009
[3]State of New Hampshire, Department of Environmental Services	Organics, inorganics, micro	Potable water, nonpotable water, solid and chemical materials	2730
[3]State of New Jersey, Department of Environmental Protection (NJDEP)	Organics, inorganics, dioxin, micro	Air and emissions , potable water, nonpotable water, solid and chemical materials,	PA011
[3]State of New York, Department of Health	Organics, inorganics, dioxin, micro	Air, nonpotable water, potable water, solid and chemical materials	10670
State of North Carolina, Department of the Environment and Natural Resources	Organics, inorganics	Nonpotable water	521
State of North Carolina, Department of Health and Human Services	Organics, micro	Potable water	42705
State of North Dakota, Department of Health	Organics, inorganics, dioxin	Potable water, nonpotable water	R-205
State of Ohio, Environmental Protection Agency (Voluntary Action Program)	Organics, inorganics	Nonpotable water, solid and hazardous waste	CL0070
State of Oklahoma, Department of Environmental Quality	Organics, inorganics, dioxin	Nonpotable water, solid and hazardous waste	9804
[3]State of Oregon, Public Health Laboratory	Organics, inorganics, dioxin	Air, nonpotable water, solid and chemical materials	PA200001
[4]Commonwealth of Pennsylvania, Department of Environmental Protection (Bureau of Laboratories)	Organics, inorganics, dioxin, micro	Potable water, nonpotable water, solid and chemical materials (direct accreditation)	36-00037
State of Rhode Island, Department of Health	Organics, inorganics	Potable water, nonpotable water	LAO00338
State of South Carolina, Department of Health and Environmental Control	Organics, inorganics, dioxin	Potable water, nonpotable water, solid and hazardous waste	89002 89002002
State of Tennessee, Department of Environment & Conservation	Organics, inorganics, dioxin	Potable water	TN02838
[3],[4]State of Texas, Commission on Environmental Quality	Organics, inorganics, dioxin, micro	Air and emissions, potable water, nonpotable water, solid and chemical materials, biological tissue (direct accreditation)	T104704194
[3]State of Utah, Department of Health	Organics, inorganics, dioxin	Potable water, nonpotable water, solid and hazardous material	PA00009

eurofins | Lancaster Laboratories Environmental

Document Title:
Certifications, Accreditations, Registrations and Contracts

Eurofins Document Reference: 1-P-QM-FOR-9007852	Revision: 23	Historical Reference: Form 2528
Effective date: Oct 12, 2015	Status: Effective	

Agency	Parameter	Applicable Matrices	Lab ID No. Certificate No.
State of Vermont, Department of Health Laboratory	Organics, inorganics, dioxin, micro	Potable water	VT 36037
[3] Commonwealth of Virginia, VELAP	Organics, inorganics, dioxin, micro	Air, Potable water, nonpotable water, solid and chemical materials	460182
State of Washington, Department of Ecology	Organics, inorganics, dioxin	Air, Potable water, Nonpotable water, solid and chemical materials	C457
State of West Virginia, Department of Health and Human Resources	Organics, inorganics	Potable water	9906C
State of West Virginia, Department of Environmental Protection	Organics, inorganics, dioxin, micro	Nonpotable water, solid and chemical materials, hazardous waste	055
State of Wisconsin, Department of Natural Resources	Organics, inorganics, dioxin	Nonpotable water, solid and hazardous waste	998035060
State of Wyoming and all Tribal Public Water Systems in Region 8	Organics, inorganics, dioxin, micro	Potable water	8TMS-L
[4] State of Wyoming – UST Branch	Organics, metals, UST analysis	Nonpotable water, solids and hazardous waste	None

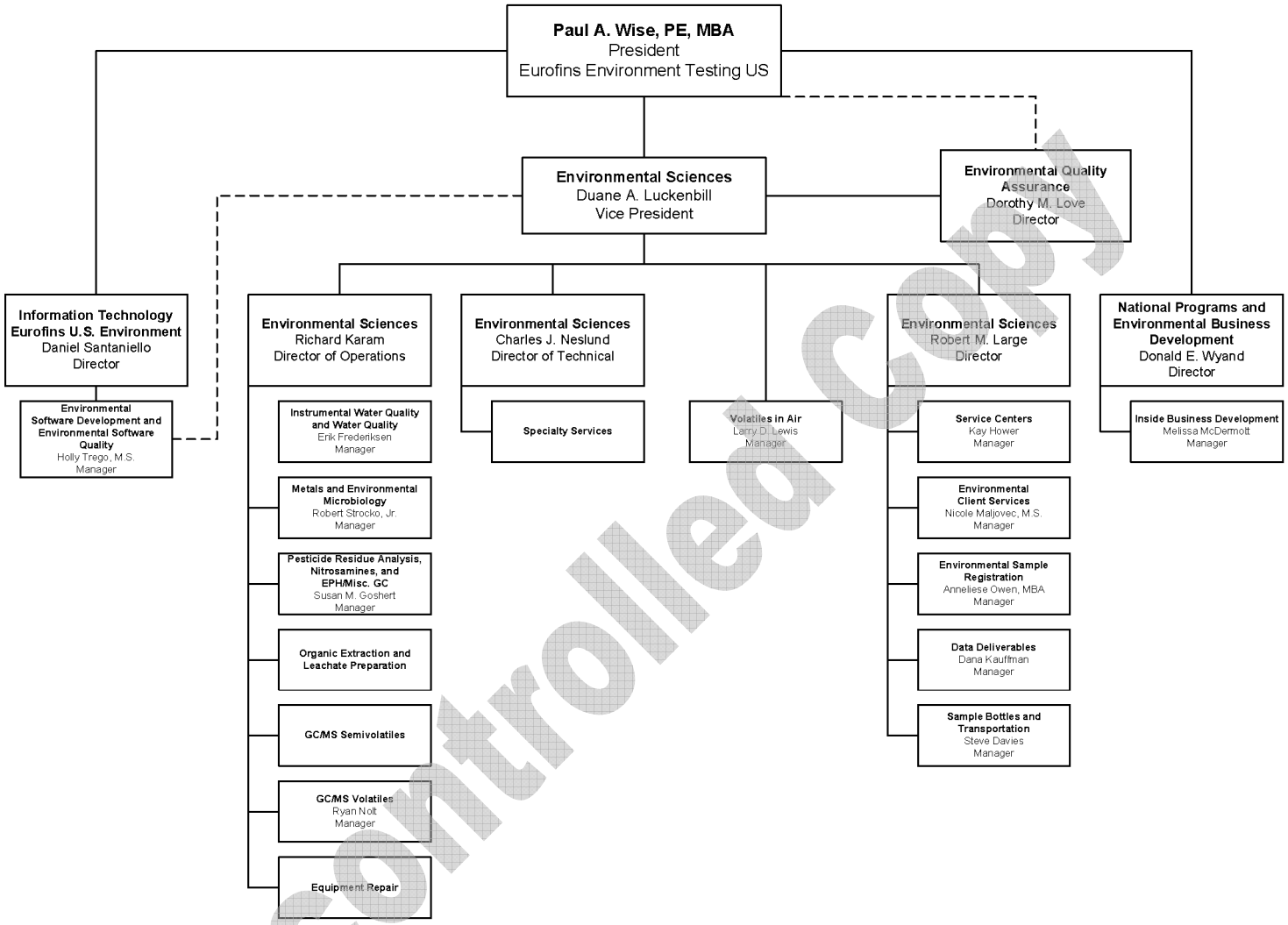
[1] NELAP Primary AB: Air and Emissions
[2] NELAP Primary AB: Potable Water, Nonpotable water, solid and chemical materials
[3] NELAP Secondary AB
[4] Approval for UST work by A2LA
[5] NELAP Primary AB: Biological Tissue

NOTE: This list accurately reflects the certifications, accreditations, registrations, and contracts held at the time of publication and is subject to change. Check with your account manager on the status of any certification needed for a specific project. Our current scopes of accreditation can be viewed at http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/ .

Eurofins Document Reference	1-P-QM-GDL-9015380	**Revision**	4
Effective Date	Oct 31, 2015	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix C		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Christiane Sweigart
Reviewed and Approved by	Duane Luckenbill;Review;Tuesday, September 29, 2015 8:51:39 PM EDT Dorothy Love;Approval;Wednesday, October 14, 2015 10:25:01 AM EDT

Eurofins Lancaster Laboratories Environmental



Name	Degree	Title
Quality Assurance		
Dorothy Love*	B.S.	Director Scientific Support
Barbara Reedy*	B.S.	Senior Specialist
Christiane Sweigart	B.S.	Senior Specialist
Kathryn Brungard*		Senior Specialist
Environmental Sciences		
Duane Luckenbill	B.S.	Vice President
Donald Wyand	B.S.	Director Sales
Robert Large*	B.S.	Director Operations Support
Richard Karam*	B.S.	Director Scientific
Charles Neslund*	B.S.	Director Scientific
Allon Hull	B.S.	Sr Account Manager
Christine Jampo	M.S.	Sr Account Manager
David Velasquez		Sr Account Manager
Irene Dodd*	M.S.	Operations Sup Pr Specialist I
Jane Huber	B.S.	National Sales Manager
Jenifer Lewis	B.S.	Pr Account Manager
Jeremy Young	B.S.	Sr Account Manager
Joseph Garzio	M.S.	Sr Account Manager
Kevin Moran	M.B.A.	Sr Account Manager
Laura Caulfield	B.S.	Operations Support Spec I
Laura Jovanovic	B.A.	Pr Account Manager
Marianne Bragg*	B.S.	Operations Sup Pr Specialist I
Melissa McDermott*	B.A.	Inside National Sales Manager
Susan Wike	A.S.	Specialist II
Tara Laroche	M.S.	National Sales Manager
Tara Spaide*		Operations Support Sr Spec I
Environmental Client Services and Inside Business Development		
Nicole Maljovec*	M.S.	Manager Operations Support
Wendy Kozma*	B.S.	Principal Specialist Group Leader
Alison Bainbridge	B.A.	Operations Support Spec I
Angela Miller*	B.S.	Operations Support Spec I
Barbara Weyandt*	M.S.	Operations Support Spec I
Deanna Wyand	B.S.	Specialist I
Kaitlin Plasterer*	B.S.	Operations Support Sr Spec I
Katherine Klinefelter*	M.S.	Operations Sup Pr Specialist I
Loran Carter*	B.S.	Operations Support Spec I
Lynn Frederiksen*	B.S.	Operations Sup Pr Specialist I
Lyssa Longenecker*	B.S.	Operations Support Sr Spec I
Megan Moeller*	B.S.	Operations Support Sr Spec I
Melanie Duszynski*		Operations Support Spec I
Nancy Bornholm*	B.S.	Operations Sup Pr Specialist I
Natalie Luciano*	B.A.	Operations Support Sr Spec I
Stacy Butt*	B.S.	Operations Support Spec I

Name	Degree	Title
Taylor Luckenbill	B.A.	Specialist I
Teresa Cunningham*	B.S.	Operations Sup Pr Specialist I
Additional support personnel in this group: 1		
Data Deliverables		
Dana Kauffman*		Manager
F. Bradley Ayars		Principal Scientist GL
Grace Salm		Specialist I
Audrey McClune		Specialist I
Betty Umble		Specialist I
Grace Salm		Specialist I
Jessica Baron		Specialist I
Judi Brown		Specialist I
Kathy Fair		Specialist I
Lydia Steinke	B.S.	Specialist I
M Susan Kreider		Specialist II
Patricia Madrigal-Kauffman	A.S.	Specialist I
Tina McNeil		Specialist I
Tracy Pang-Ward		Specialist I
Additional support personnel in this group: 5		
Service Centers		
Kay Hower*	B.A.	Manager Operations Support
Larry Starkey		Sr Project Manager GL
Ana Spencer*	B.S.	Project Manager
Cassandre Revell*	B.S.	Project Manager
Karen Lopez		Project Manager
Stefanie Mielnicki*	B.S.	Project Manager
Stephen Gordon*	B.S.	Project Manager
Additional support personnel in this group: 2		
Environmental Microbiology		
Robert Strocko*	B.S.	Manager
Hannah Cottman	B.S.	Scientist
Extractable Petroleum Hydrocarbons (EPH)/Miscellaneous GC		
Susan Goshert*	B.S.	Manager
Michele Hamilton*	B.S.	Senior Scientist Group Leader
Christine Dolman	B.S.	Scientist
Heather Williams	B.S.	Senior Scientist
Nicholas Rossi	B.S.	Senior Scientist
Tracy Cole*		Senior Specialist
Tyler Griffin	B.S.	Scientist
Additional support personnel in this group: 1		
Field Sampling		
Samuel Huber	B.S.	Manager
Jeffrey Allen		Courier/Sample Support Spe GL
Timothy Hauck		Courier/Sample Support Spec

Name	Degree	Title
GC/MS Semivolatiles		
Richard Karam*	B.S.	Director
Rachel Cochis*	B.A.	Senior Specialist Group Leader
Ankitaben Patel	M.S.	Scientist
Beth Rubino	B.S.	Senior Specialist
Brian Graham	B.A.	Senior Scientist
Catherine Bachman	B.S.	Scientist
Holly Ziegler	B.S.	Senior Scientist
Joseph Gambler	B.S.	Principal Scientist
Linda Hartenstine	B.A.	Senior Scientist
Mark Ratcliff*	B.A.	Senior Specialist
Matthew Barton*	B.S.	Senior Specialist
William Saadeh	B.S.	Scientist
GC/MS Volatiles		
Ryan Nolt	B.S.	Manager
Kathrine Muramatsu	B.S.	Senior Scientist Group Leader
Kenneth Boley*	B.S.	Senior Scientist Group Leader
Roy Mellott	B.S.	Senior Scientist Group Leader
Amanda Richards		Scientist
Angela Sneeringer	B.S.	Senior Scientist
Anita Dale		Scientist
Brett Kenyon	B.S.	Scientist
Chad Moline*	B.S.	Senior Specialist
Chelsea Stong	B.S.	Senior Specialist
Christine Dulaney*	B.S.	Senior Specialist
Christopher Torres	B.S.	Scientist
Daniel Heller	B.S.E.	Senior Scientist
Jason Long	B.S.	Senior Scientist
Jeremy Giffin	B.S.	Scientist
Kelly Keller		Scientific Support Spec I
Kerri Legerlotz	B.S.	Senior Scientist
Kevin Sposito	B.S.	Senior Scientist
Linda Pape	B.A.	Senior Scientist
Marie Beamenderfer	B.S.	Senior Scientist
Marla Brewer*	B.S.	Senior Specialist
Robin Runkle*	B.S.	Senior Specialist
Sara Johnson	B.S.	Senior Scientist
Sarah Guill	B.S.	Scientist
Stephanie Selis	B.S.	Senior Scientist
Additional support personnel in this group: 6		

Instrumental Water Quality		
Erik Frederiksen*	B.A.	Manager
Nicole Veety		Senior Scientist Group Leader
Clinton Wilson	B.A.	Scientist
Drew Gerhart	B.S.	Scientist
James Mathiot		Scientist
Joseph McKenzie		Scientist
Sandra Miller		Scientist
Additional support personnel in this group: 4		
Metals		
Robert Strocko*	B.S.	Manager
Nina Haller*		Senior Specialist Group Leader
Choon Tian	B.A.	Scientist
Damary Valentin		Scientist
Deborah Krady	B.S.	Scientific Support Spec I
Debra Bryan		Operations Support Spec I
Eric Eby	B.S.	Senior Scientist
Jennifer Moyer	B.S.	Senior Specialist
Katlin Cataldi	B.S.	Scientist
Parker Lindstrom	B.S.	Senior Scientist
Suzanne Will	B.S.	Scientist
Tara Snyder	B.S.	Scientist
Additional support personnel in this group: 7		
Organic Extraction		
Richard Karam*	B.S.	Director
Joseph Feister		Senior Scientist Group Leader
Wanda Oswald		Senior Scientist Group Leader
Darin Wagner	B.A.	Scientist
David Hershey		Scientist
David Schrum		Technician II
Heidi Roberts*	B.S.	Senior Scientist
Jessica Velez	B.S.	Scientist
JoElla Rice		Technician II
Joseph Feister		Senior Scientist Group Leader
Justin Bukeavich		Technician
Kailah Ortiz		Technician
Robert Vincent	B.S.	Principal Scientist
Ryan Schafran	B.S.	Scientist
Shawn McMullen	B.A.	Scientist
Additional support personnel in this group: 20		

Pesticide Residue Analysis		
Susan Goshert*	B.S.	Manager
James Place	B.S.	Senior Scientist
Jamie Brillhart	B.S.	Senior Scientist
Jessica Miller	B.S.	Senior Scientist
Lisa Reinert	B.S.	Scientist
Monica Souders	B.S.	Scientist
Richard Shober	B.S.	Principal Scientist
Valerie Tomayko*	B.S.	Pr Scientific Sup Spec I
Additional support personnel in this group: 1		
Specialty Services Group		
Charles Neslund*	B.S.	Director
Christine Ratcliff	B.S.	Pr Scientific Sup Spec I GL
Brett Weidman	B.S.	Scientist
Deborah Zimmerman		Scientist
Ginelle McQuaid		Scientist
Joseph Anderson	B.S.	Senior Scientist
Meng Yu	M.S.	Principal Scientist
Michael Ziegler	B.S.	Senior Scientist
Michele Smith*	B.S.	Senior Specialist
Paul Cormier	B.A.	Pr Scientific Sup Spec I
Robert Brown		Principal Scientist
Timothy Trees	A.S.	Principal Scientist
Additional support personnel in this group: 3		
Volatiles in Air		
Larry Lewis	B.S.	Manager Scientific
Jeffrey Smith	B.A.	Senior Scientist Group Leader
Jacob Bailey	B.S.	Scientist
Additional support personnel in this group: 1		
Water Quality		
Erik Frederiksen*	B.A.	Manager Scientific
Kenneth Bell*	B.S.	Principal Scientist GL
Hannah Royer	B.A.	Scientist
Michele Graham	B.S.	Scientist
Michelle Lalli		Scientist
Robert Heisey*	B.A.	Senior Specialist
Susan Engle		Scientist
Susan Hibner	B.S.	Scientist
Yolunder Bunch		Scientist
Additional support personnel in this group: 6		

Environmental Software Development		
Holly Trego	B.S.	Manager IT Support
Andrew Strebel		IT Development Pr Spec II
Bret Winey	B.S.	IT Development Sr Specialist
Catherine Holt	B.S.	IT Development Pr Spec II
Chadwick Hershey	B.S.	IT Development Sr Specialist
Christopher Stauffer	B.S.	IT Development Sr Specialist
Diana Holmes	M.S.	IT Development Sr Specialist
Eric Walker		IT Development Specialist
John Riggs	B.S.	IT Development Sr Spec GL
Joshua Peters	B.S.	IT Development Specialist
Tiffany Betz	B.S.	IT Development Pr Spec II
Timothy Weaver	B.A.	IT Development Sr Specialist
Environmental Sample Administration		
Anneliese Owen	M.B.A.	Manager Scientific Support
Carolyn Cyms	B.S.	Senior Specialist Group Leader
Tamara Helsel		Senior Specialist Group Leader
Christine Knoedler	B.A.	Scientific Support Spec I
Deborah Neslund		Specialist II
Katherine Metzger	B.A.	Scientific Support Spec I
Katie Hartlove		Scientific Support Spec I
Kristin Zeigler	B.S.	Scientific Support Spec I
Additional support personnel in this group: 5		
Equipment Maintenance & Repair		
Robert Allison		Facilities Specialist I
Training		
Beth DiPaolo	M.A.	Vice President of PSS & Recruiting/Organizational Development
Kimberly Davies	M.B.A.	Director
Lindsay Deibler-Wallace	M.S.	Senior Specialist Group Leader
Barbara Weaver	M.S.	Pr Scientific Sup Spec I
Harry Ward	PHD	Pr Scientific Sup Spec I
Julia Matesich	B.S.	Scientific Support Spec I
Michael Salgado	B.S.	Senior Specialist
Sample Bottles		
Steven Davies	B.S.	Manager
Karen Guito		Courier/Sample Support Spec
Samantha DeFalcis		Courier/Sample Support Spec
Sandra Muckle		Courier/Sample Support Spec
Additional support personnel in this group: 3		

Sample Support		
Anneliese Owen	M.B.A.	Manager Scientific Support
Chad Wettig		Senior Specialist Group Leader
Lisa Cooke		Scientist
Stephanie Sanchez		Scientist
Additional support personnel in this group: 10		
Transportation		
Steven Davies	B.S.	Manager Operations Support
Christopher Winters		Courier/Sample Support Spec
L Kenneth Miller		Courier/Sample Support Spec
Leon Wolf		Courier/Sample Support Spec
Timothy Miller		Courier/Sample Support Spec
Additional support personnel in this group: 17		
Safety		
Rachel Brady	B.S.	Senior Specialist Group Leader
Beth Rich		Operations Support Sr Spec I
Stephen Nowakowski	B.S.	Senior Specialist
Additional support personnel in this group: 7		

*Denotes those employees who are authorized to release Analysis Reports.

Eurofins Document Reference	1-P-QM-GDL-9015381	**Revision**	4
Effective Date	Dec 31, 2015	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix D		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Christiane Sweigart
Reviewed and Approved by	Duane Luckenbill;Review;Sunday, December 13, 2015 10:15:34 PM EST Dorothy Love;Approval;Thursday, December 17, 2015 3:56:12 PM EST

Jeffrey S. Allen, Courier/Sample Support Group Leader, Field Sampling
Information not available at time of printing

Joseph D. Anderson, B.S., Senior Chemist, Specialty Services Group
Education:
- B.S. General Science, Pennsylvania State University (2004)

Professional Experience:
- ALSI, GC GC/MS Analyst (2004-2010)
  - Responsibilities included preparing, running, and reviewing samples according to client and industry methods using various instrumentations including GC and GC/MS; performing analysis for various departments as determined by work volume and staffing needs; reviewing and reporting data within client specified criteria
- With Lancaster Laboratories since 2010
  - Senior Chemist, Flexible Staffing (2010)
    - Responsibilities included preparing, running, and reviewing samples according to client, compendia, and industry methods using various wet chemistry techniques and instrumentation, which may include but is not limited to, gas chromatography, liquid chromatography, IC, and TOC instrumentation; performing analysis for various departments as determined by work volume and staffing needs
  - Senior Chemist, Specialty Services Group (2012)
    - Responsibilities include maintaining instrumentation; tuning and calibrating instrument daily; analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality; evaluating current organizational and analytical systems; diagnosing complex problems and offering solutions with a high degree of independence; suggesting and implementing improvements to maximize quality and productivity; acting as technical resource for internal problems and projects; assisting in "brainstorming" client problems and projects; training new employees in all aspects of instrumentation; researching new and emerging technologies

F. Bradley Ayars, Principal Specialist Group Leader, Data Deliverables
Continuing Education:
- Environmental Law & Policy, Franklin & Marshall College (1991)

Professional Experience:
- With Eurofins Lancaster Laboratories since 1988
  - Client Services Specialist (1992)
  - Environmental Project Management (1994)
  - Senior Specialist Coordinator, Electronic Data Deliverables (1997)
    - Responsibilities included supervising EDD staff; developing and maintaining EDD formats; overchecking lab data for EDDs; primary contact for EDD issues
  - Senior Specialist Group Leader, Electronic Data Deliverables (2005)
    - Responsibilities included supervising EDD staff; developing and maintaining EDD formats; overchecking lab data for EDDs; primary contact for EDD issues
  - Principal Specialist Group Leader, Electronic Data Deliverables (2014)
    - Responsibilities include supervising EDD staff; developing and maintaining EDD formats; overchecking lab data for EDDs; primary contact for EDD issues

Duane A. Luckenbill, B.S., Vice President, Eurofins Lancaster Laboratories Environmental
Education:
- B.S. Chemistry, Clarion University of PA (1989)

Continuing Education:
- Introduction to Mass Spectral Interpretation, Hewlett-Packard (1995)
- Technical Training, OI Analytical (1995)

Professional Experience:
- ATEC Associates, Inc., GC/MS Analyst (1989)
- With Eurofins Lancaster Laboratories since 1989
  - Chemist (1991)
  - Chemist/Coordinator (1993)
  - Group Leader (1997)
  - Manager (2001)
    - Responsibilities included client satisfaction, safety and quality systems administration, and all aspects of financial, personnel, and operations management of the GC/MS Volatiles and GC/MS Semivolatiles groups
  - Director, Environmental Sciences (2005)
    - Responsibilities included client satisfaction, safety and quality systems administration, and all aspects of financial, personnel, and operations management of the GC/MS Volatiles, GC/MS Semivolatiles, Volatiles in Air, Organic Extraction, Leachate Preparation, Field Sampling, Pesticide Residue Analysis, Volatiles by GC, and EPH/Miscellaneous GC groups

Vice President, Eurofins Lancaster Laboratories Environmental (2013)
Responsibilities include all aspects of financial, personnel, and operations management of all Technical areas, Environmental Quality and Compliance, Computer Application/Development, and Environmental Support Services while continually focusing on client satisfaction, safety, and quality systems administration; collaborating with other Eurofins US environmental companies to expand national testing capabilities and grow market share in the US

Awards, Citations, Honorary Societies & Publications:

Undergraduate Award in Analytical Chemistry, American Chemical Society (1988)
Department of Chemistry Competitive Award, Clarion University (1988-1989)
Outstanding Senior Chemistry Award, American Institute of Chemists Foundation (1989)
Senior College Award for Chemistry, Society for Analytical Chemists of Pittsburgh (1989)
One publication on mass spectrometry

Matthew Rusty E. Barton, B.S., Senior Specialist, GC/MS Semivolatiles

Education:

B.S. Biochemistry, East Stroudsburg University (1991)

Professional Experience:

With Lancaster Laboratories since 1991
Senior Chemist (1998)
Senior Chemist/Coordinator (1999)
Responsibilities included: supervise personnel; schedule lab work; perform purge and trap gas chromatography testing; operate O.I. 4560/4551, Tekmar 3000, Archon 5100, and HP5890 Series II OC instruments; review and approve data; and developing and evaluating new methods.
Senior Chemist, Nitrosamines (2003)
Responsibilities included: Analysis of nitrites in tobacco samples
Senior Chemist, EPH/Misc. GC (2004)
Responsibilities include: Analysis of environmental samples for diesel range organics via gas chromatography
Senior Specialist, GC/MS Semivolatiles (2008)
Responsibilities include: audit and upload of departmental data

Marie D. Beamenderfer, B.S., Senior Chemist, GC Volatiles

Education:

B.S. Biology, The Pennsylvania State University (2006)

Professional Experience:

With Eurofins Lancaster Laboratories since 2006
Chemist, GC Volatiles (2006)
Responsibilities included maintaining GC instrumentation; calibrating instruments as needed; analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality; evaluating current organizational and analytical systems; suggesting and implementing the necessary corrective action to ensure the above can be performed in alignment with client and/or regulatory requirements; performing all duties with minimal supervision; training new employees; tracking inventory of instrument parts and standards and entering them into the standards database as received; verifying data on an as needed basis
Senior Chemist, GC Volatiles (2012)
Responsibilities include maintaining GC instrumentation; calibrating instruments as needed analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality; evaluating current organizational and analytical systems; suggesting and implementing the necessary corrective action to ensure the above can be performed in alignment with client and/or regulatory requirements; performing all duties with minimal supervision; training new employees; tracking inventory of instrument parts and standards and entering them into the standards database as received; working on special assignments; diagnosing complex problems and offering solutions with a high degree of independence; assisting in “brainstorming” client problems and projects; completing assigned projects on time; verifying data on an as needed basis

Kenneth A. Bell, B.S., Principal Chemist Group Leader, Water Quality

Education:

B.S. Chemistry, Millersville University (1997)

Professional Experience:

Johnsons Chemical, Laboratory Assistant (1989-1992)
- Responsibilities included collecting samples and performing testing on raw material

With Eurofins Lancaster Laboratories since 1994

Senior Laboratory Technician, Water Quality (1994)
- Responsibilities included routinely performing analytical testing using wet chemistry methods

Chemist/Coordinator, Water Quality (1994)
- Responsibilities included performing wet chemistry analyses, sample verification, and coordinating workflow

Senior Chemist/Coordinator, Water Quality (1994)
- Responsibilities included coordinating workflow, performing sample verification, back-up report signing, training new employees, revising standard operating procedures, writing annual job plans and reviews

Senior Chemist Group Leader, Water Quality (2005)
- Responsibilities included coordinating workflow, performing sample verification, back-up report signing, training new employees, revising standard operating procedures, writing annual job plans and reviews

Principal Chemist Group Leader, Water Quality (2014)
- Responsibilities include coordinating workflow, performing sample verification, back-up report signing, training new employees, revising standard operating procedures, writing annual job plans and reviews

Tiffany D. Betz, B.S., Principal Specialist, Environmental Software Development

Education:

B.S. Computer Science, Millersville University (2001)

Continuing Education:

Oracle Exam #1Z0-007, Introduction to Oracle 9i: SQL (May 17, 2004)
Oracle Exam #1Z0-147, Oracle 9i: Program with PL/SQL (August 4, 2004)

Professional Experience:

With Eurofins Lancaster Laboratories since 2000

Specialist, Computer Applications Development (2000)
- Responsibilities included performing computer applications development and maintenance.

Senior Specialist, Computer Applications Development (2006)
- Responsibilities included performing computer applications development and maintenance.

Principal Specialist, Environmental Software Development (2012)
- Responsibilities include analyzing, designing, developing, documenting, validating, and deploying custom software in a regulated environment; conforming to FDA guidelines and CFR Part 11 in all duties; strictly adhering to Lancaster Laboratories Software Development Lifecycle (SDLC) policies and procedures; preparing and executing software test plans for custom developed Laboratory Information Management System (LIMS) and other software in accordance with internal procedures; spending a large portion of time writing documentation in support of various software development stages and in accordance with SDLC procedures; spending some portion of time supporting and assisting users with new software applications; at times, conducting formal training sessions with a small group of users to familiarize them with a new computer system

Kenneth L. Boley, Jr., B.S., Senior Chemist Group Leader, GC/MS Volatiles

Education:

B.S. Chemistry, Messiah College (1995)

Professional Experience:

Heritage Custom Kitchens, Inc., Face Frame Assembler (1997–2001)
- Responsibilities included reading and interpreting job orders; overseeing daily production of department; performing various manufacturing duties daily; member of the safety committee, first aid team, and security team

With Lancaster Laboratories since 2001

Chemist, GC/MS Volatiles (2001)
- Responsibilities included analyzing samples and QC by purge and trap GC/MS; generating and reviewing raw data; performing maintenance on GC/MS, purge and traps, and various autosamplers; following methods and SOPs

Senior Chemist, GC/MS Volatiles (2005)
- Responsibilities included performing routine and non-routine analyses; diagnosing and solving technical problems; maintaining and troubleshooting instrumentation; writing and revising SOPs; training new analysts; auditing and uploading data as work load deems necessary

Senior Chemist Group Leader, GC/MS Volatiles (2009)

Responsibilities include maintaining GC/MS instrumentation; tuning and calibrating instrument daily; analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality; evaluating current organizational and analytical systems; suggesting and implementing corrective action and system improvements when necessary; performing all duties with minimal supervision; working on special assignments; diagnosing complex problems and offering solutions with a high degree of independence; assisting in "brainstorming" client problems and projects; completing assigned projects on time; researching new and emerging technologies; producing written and oral reports on research activities; performing both technical and personnel aspects of group operations; performing work within the department or other areas as required; acting as a technical resource, trainer, and troubleshooter to specific department; making recommendations for operational and/or technical improvements; communicating effectively within the group; coaching and developing direct reports; planning and monitoring workflow

Nancy J. Bornholm, B.S., Principal Specialist, Environmental Client Services

Education:

B.S. Chemistry (magna cum laude), Muhlenberg College (1981)

Continuing Education:

Instrumental Analysis of Paints and Polymers, FBI Academy (1984)
Analytical Chemistry of Contaminants in Surface and Groundwater, ACS Short Course (1986)

Professional Experience:

University of Connecticut Health Center, Laboratory Technician (1977-1980)
Institute for Cancer Research, Research Technician (1981)
Baltimore City Crime Laboratory, Mobile Crime Unit Trainee (1981-1982)
Maryland State Police Crime Laboratory, Forensic Chemist III (1982-1985)
With Lancaster Laboratories since 1985

Senior Specialist, Environmental Client Services (1987)

Responsibilities included project management; audit sample entries; answer client questions; communicate client requirements to lab areas; and schedule sample submissions and provide sampling containers

Principal Specialist, Environmental Client Services (2004)

Responsibilities include performing project management for large clients/projects; auditing sample entries for accuracy; providing price quotes; answering client questions; understanding and communicating client requirements to lab personnel; scheduling sample submissions; ordering sampling containers and providing pre-printed COCs; serving as a technical resource to both internal and external clients and notifying management of any client issues

Awards, Citations, Honorary Societies, and Publications:

Quarterly Impact Award (2008)
Superlative Service President's Award (2008)

Rachel A. Brady, B.S., Senior Specialist Group Leader, Safety

Education:

B.S. Environmental Biology, Millersville University (2002)

Professional Experience:

TIER Environmental, Lab Pack Chemist (2005-2006)

Responsibilities included preparing shipments/paperwork for hazardous/residual waste disposal

Clean Harbors, InSite Supervisor (2010-2014)

Responsibilities included overseeing Hazardous Waste disposal program; all residual waste; waste water treatment plant operations

With Eurofins Lancaster Laboratories since 2014

Specialist, Safety (2014)

Responsibilities included implementing and performing hazardous, biologic, and chemotherapeutic waste removal

Senior Specialist, Safety (2015)

Responsibilities include overseeing waste team; RSO; oversee all Environmental Programs

Marla S. Brewer, B.S., Senior Specialist, GC/MS Volatiles

Education:

B.S. Industrial Hygiene, Purdue University (2000)

Continuing Education:

OSHA 8-Hour (2000)
Comprehensive GC/MS Seminar, Restek (2002)
Practical Process Improvement Facilitator Training (2010)

Professional Experience:

ALCOA, Industrial Hygiene Intern (1999)
- Responsibilities included performing air sampling for a variety of substances; conducting noise survey including area and personal sampling; testing plant environment for heat stress and evaluated reports; assisting in formulation of written program

BP-Amoco Refinery/Orr Professional Services, Industrial Hygiene Technician (2000)
- Responsibilities included performing air sampling to reevaluate Benzene Exposure Surveillance Program; conducting noise surveys including area and personal monitoring to reevaluate Hearing Conservation Program

With Eurofins Lancaster Laboratories since 2000

Senior Technician, Volatiles by GC (2000)
- Responsibilities included performing prescreen analysis, sample prep, GC maintenance, and data review

Chemist, GC/MS Volatiles (2001)
- Responsibilities included analyzing samples and QC by purge and trap GC/MS; generating and reviewing raw data; performing maintenance on GC/MS, purge and traps, and various autosamplers

Senior Specialist, GC/MS Volatiles (2006)
- Responsibilities include performing GC/MS volatile data interpretation; reviewing and approving data; signing reports; analyzing samples; generating raw data; sample verification; SOP revisions and updates

Jamie L. Brillhart, B.S., Senior Chemist, Pesticide Residue Analysis

Education:

B.S. Physical Science, York College of Pennsylvania (2003)

Professional Experience:

B-H Laboratories Inc./Analytical Laboratory Services Inc., Inorganic Laboratory Technician/Inorganic Chemist (2003-2005)
- Responsibilities included performing wet chemistry testing on drinking waters and waste water; being responsible for analyses included fluoride, cyanide, phosphorus, nitrate/nitrite, cadmium reduction, and grease and oil testing when needed; prepping and analyzing for mercury on a mercury analyzer; analyzing for various metals on a graphite furnace; prepping leachates; prepping standards as needed

Hercon Laboratories, Inc., QC Analyst I (2005-2007)
- Responsibilities included performing Quality Control Testing on Transdermal Systems; performing assays, dissolutions, degradation, residual solvents, and raw material testing; prepping necessary standards and performing instrument maintenance as needed

With Lancaster Laboratories since 2007

Chemist, Pesticide Residue Analysis (2007)
- Responsibilities included analyzing soils for PPL Pesticides using 5890 and 6890 GCs with ECD detectors; performing instrument maintenance; prepping standards; auditing calibrations as necessary; being able to analyze for OPPAs, ACMOs, EDBs, PCBs, and Herbicides as needed

Senior Chemist, Pesticide Residue Analysis (2011)
- Responsibilities include analyzing soils for PPL Pesticides using 5890 and 6890 GCs with ECD detectors; performing instrument maintenance; prepping standards; auditing calibrations as necessary; being able to analyze for OPPAs, ACMOs, EDBs, PCBs, and Herbicides as needed

Marianne L. Bragg, B.S., Principal Specialist, Business Development, Environmental Sciences

Education:

B.S. Biology, Millersville University (1987)

Professional Experience:

With Eurofins Lancaster Laboratories since 1985

Coordinator

Group Leader (1990)

Principal Specialist (1994)

Responsibilities included advising clients on testing; providing price quotes and proposals; answering client questions; scheduling sample submissions and providing sampling containers; communicating client requirements to lab areas; assisting with client visits to the lab

Principal Specialist/Coordinator, Environmental Business Development (2002)

In addition to the responsibilities listed above, manage workload and workflow among business development staff

Principal Specialist/Group Leader, Environmental Business Development (2005)

In addition to the responsibilities listed above, manage workload and workflow among business development staff

Principal Specialist, Environmental Business Development (2007)

Responsibilities included advising clients on testing; providing price quotes and proposals; answering client questions; scheduling sample submissions and providing sampling containers; communicating client requirements to lab areas; assisting with client visits to the lab

Principal Specialist, Business Development, Environmental Sciences (2014)

Responsibilities include independently securing new business consistent with operational capabilities and business plan goals; collaborating efforts and activities with those of Outside Sales account managers as needed; focusing on proposal writing for major national accounts; attending face-to-face sales meetings with selected national accounts as needed and maintaining responsibility for their maintenance and growth

Robert Brown, Principal Chemist, Specialty Services Group

Education:

Attended 2.5 years at Pennsylvania State University towards B.S. in Microbiology (1988)

Completed 20 credits towards B.S. in Environmental Biology, Millersville University (1993)

Professional Experience:

With Eurofins Lancaster Laboratories since 1988

Chemist (1993)

Senior Chemist (1997)

Responsibilities included performing extractable petroleum testing; operating multiple Hewlett-Packard gas chromatograph (GC) instruments; data interpretation and entry; developing and evaluating new methods

Principal Chemist (2004)

Responsibilities included performing extractable petroleum testing; operating multiple Hewlett-Packard gas chromatograph (GC) instruments; data interpretation and entry; developing and evaluating new methods; serving as primary technical contact for client service representatives and their clients

Principal Chemist Group Leader, EPH/Misc. GC (2005)

Responsibilities included performing extractable petroleum testing; operating multiple Hewlett-Packard gas chromatograph (GC) instruments; data interpretation and entry; developing and evaluating new methods; serving as primary technical contact for client service representatives and their clients

Principal Chemist, Specialty Services Group (2011)

Responsibilities include: acting as technical resource within the environmental division; developing and validating analytical protocols; troubleshooting and solving analytical chemistry problems; optimizing instrument configuration and performance; evaluating and interpreting analytical results; writing SOPs; assisting in responding to and eliminating ICARs, assisting in optimizing procedures in prep lab; communicating effectively within department; performing routine work as required

Kathryn A. Brungard, Senior Specialist, Environmental Quality Assurance

Continuing Education:

Clinical Laboratory Science, Temple University (1984-1988)

Professional Experience:

Environmental Partners, Inc., Environmental Technician/Health and Safety Coordinator (2003-2005)

Responsibilities included determining personnel health and safety risks on each work site and determining appropriate measures to be taken for personal protection; maintaining and servicing sampling equipment; calibrating meters and analytical equipment; collecting and processing representative samples at each monitoring site following state mandated procedures; routinely measuring field water and soil quality parameters; performing product recovery as part of site remedial measures; evaluating and reporting upon trends and/or results that were out-of-range

Maxwell House Coffee/Kraft Foods, Quality Assurance Technician (2004-2005)

Responsibilities included conducting hourly audits on operating production lines which included weight of product, oxygen content, density, caffeine level by HPLC, moisture content, inspection for foreign or incidental materials, and packaging compliance; performing weekly water testing for level of chlorine and microbial contamination; producing result spreadsheets and accurate logs; notifying upper management of all results in a timely manner

Columbia Analytical Services, Inc, Quality Assurance Program Manager (2005-2009)

Responsibilities included being responsible for the overall coordination of the NELAP certified environmental laboratory program; monitoring laboratory quality systems through audits; identifying potential problem areas, recommending corrective actions, and providing technical assistance and training as necessary; informing management of potential problems and recommending remedial measures in a timely basis both orally and by written communication; maintaining performance evaluation records; maintaining accreditations for regulatory agencies and client programs; providing audit responses and initiating changes in procedures; maintaining the calibration of all weights, balances, and thermometers

With Eurofins Lancaster Laboratories since 2010

Senior Specialist, Environmental Quality Assurance (2010)

Responsibilities include ensuring quality of data being produced in the laboratories by performing data review, auditing laboratories, and reviewing written procedures; ensuring laboratory adherence to government regulations and client requirements; reviewing client and government documents for requirements outside our usual laboratory practices; setting up and testing new analysis in the laboratory sample management system as required by the departments

Memberships and Appointments:

Florida Society of Environmental Analysts (2005-2009)

Society of Women Environmental Professionals, SWEP (2012-present)

Rachel R. Cochis, B.A., Principal Specialist Group Leader, GC/MS Semivolatiles

Education:

B.A. Science, Pennsylvania State University (1992)

Continuing Education:

Introduction to Mass Spec Interpretation, Hewlett-Packard (1995)

Gas Chromatography Principles & Practices (1994)

Professional Experience:

With Eurofins Lancaster Laboratories since 1993

Chemist (1994), GC/MS Semivolatiles (1993)

Responsibilities included performing semvolatiles analysis on water and soil samples

Senior Chemist Coordinator, GC/MS Semivolatiles (1996)

Responsibilities included scheduling lab work; performing data interpretation and entry; reviewing and approving data; revising and updating SOPs and analytical methods; monitoring turnaround time; communicating client requirements to lab areas

Senior Specialist Group Leader, GC/MS Semivolatiles (2005)

Responsibilities included scheduling lab work; performing data interpretation and entry; reviewing and approving data; revising and updating SOPs and analytical methods; monitoring turnaround time; communicating client requirements to lab areas

Principal Specialist Group Leader, GC/MS Semivolatiles (2013)

Responsibilities include scheduling lab work; performing data interpretation and entry; reviewing and approving data; revising and updating SOPs and analytical methods; monitoring turnaround time; communicating client requirements to lab areas

Tracy A. Cole, Senior Specialist, EPH/Miscellaneous GC

Continuing Education:

- Gas Chromatography: Principles and Practice, LLU (1997)

Professional Experience:

- With Lancaster Laboratories since 1991
  - Laboratory Technician, Volatiles in Air (1991)
    - Responsibilities included preparing samples and standards; washing glassware; loading samples on instruments
  - Senior Technician, Volatiles in Air and EPH/Miscellaneous GC (1994)
    - Responsibilities included analyzing routine samples and QC by Gas Chromatography for DRO and miscellaneous organic compounds; preparing direct injection samples for analysis; preparing standards; reviewing chromatography data and uploading to the LIMS
  - Chemist, EPH/Miscellaneous GC (1999)
    - Responsibilities included analyzing routine and nonroutine samples and QC by Gas Chromatography for various organic analyses including DRO, TPH, and other petroleum related methods and miscellaneous organic compounds by direct injection; reviewing chromatography data and uploading to the LIMS; performing instrument maintenance; calibrating instruments for various methods
  - Senior Specialist, EPH/Miscellaneous GC (2008)
    - Responsibilities include reviewing/verifying data for technical correctness including raw chromatography data, initial calibrations, and analytical reports; ensuring that method and project requirements were followed and entry into the LIMS is correct; acting as a technical resource for the department; assisting in reviewing/writing SOPs and other technical documents

Paul R. Cormier, B.A., Principal Specialist, Specialty Services Group

Education:

- B.S. Microbiology, Virginia Tech (1984)
- B.A. Chemistry, Virginia Tech (1984)

Continuing Education:

- Hewlett-Packard GC/MS Advance Operations/System Manager Course (1990)
- Mass Spectral Interpretation, Finnigan MAT Institute (1991)
- Technical Training, OI Analytical (1995)

Professional Experiences:

- Environmental Testing & Certification (1985-1989)
- Analytikem, Inc. (1989-1990)
- With Lancaster Laboratories since 1990
  - Senior Chemist (1990)
    - Responsibilities included: operate GC/MS instruments; data interpretation; review and approve data; repairing instruments; and train other analysts.
  - Senior Specialist (2005)
    - Responsibilities included: operate GC/MS instruments; data interpretation; review and approve data; repairing instruments; and train other analysts.
  - Principal Specialist, GC/MS Volatiles (2006)
    - Responsibilities include: operate GC/MS instruments; data interpretation; review and approve data; repairing instruments; and train other analysts.
  - Principal Specialist, Specialty Services Group (2010)
    - Responsibilities include acting as technical resource within the environmental division; developing and validating analytical protocols; troubleshooting and solving analytical chemistry problems; optimizing instrument configuration and performance; evaluating and interpreting analytical results; writing SOPs; assisting in responding to and eliminating ICARs, assisting in optimizing procedures in prep lab; communicating effectively within department; performing routine work as required

Memberships & Appointments:

- American Chemical Society

Teresa L. Cunningham, B.S., Principal Specialist, Environmental Client Services and Inside Business Development

Education:

B.S. Biology, St. Joseph's University (1999)

Continuing Education:

Chemical Monitoring Assistance Program, Pennsylvania Rural Water Association (2000)
How to Deliver Exceptional Customer Service, Fred Pryor Seminars (2000)
Organizational Behavior, Penn State University (2005)

Professional Experience:

With Eurofins Lancaster Laboratories since 1999
- Specialist, Environmental Client Services (1999-2000)
- Senior Specialist, Environmental Client Services (2001)
- Senior Specialist Coordinator, Environmental Client Services (2001)
  - Responsibilities included serving as project manager for clients with petroleum-related testing accounts; coordinating client requests with laboratory groups to ensure that the client's needs are met; scheduling bottle shipments and sample pickups; preparing quotations; coordinating staff
- Senior Specialist Group Leader, Environmental Client Services (2005)
  - Responsibilities included serving as project manager for clients with petroleum-related testing accounts; coordinating client requests with laboratory groups to ensure that the client's needs are met; scheduling bottle shipments and sample pickups; preparing quotations; coordinating staff
- Manager, Environmental Client Services (2006)
  - Responsibilities included overseeing implementation of new projects; coordinating client requests with laboratory groups to ensure that the client's needs are met; coordinating staff
- Principal Specialist, Environmental Client Services and Inside Business Development (2008)
  - Responsibilities include performing project management; training new client service representatives; auditing sample entry; answering client questions; communicating client requirements to lab areas

Carolyn M. Cyms, B.S., Senior Specialist Group Leader, Environmental Sample Administration

Education:

B.S. Secondary Education/Chemistry, Bloomsburg University of Pennsylvania (1993)
Post Baccalaureate Certificate, Biology and MS Math, Millersville University (2002)

Continuing Education:

Accounting I, HACC (1996)
Introduction to the Internet, PC Focus (1996)
Self-Discipline & Emotional Control, Franklin-Covey (1997)
Child Growth & Development, HACC (1998)
Cell Biology, Millersville University (2000)
Botany; Genetics; Zoology; Biochemistry; Ecology, and Ecology Lab, Millersville University (2001)
Immunology; Animal Behavior; Teaching Biological Issues; Entomology, Millersville University (2002)
Introduction to Computer Programming, Millersville University (2003)

Professional Experience:

Lancaster Theological Seminary, Field Education Assistant-Special Project Coordinator (1996-1999)
- Responsibilities included assisting with mailings, organization of the field education program; creating and preparing a student field education manual for the ministerial studies program; acting as liaison between Field Ed Professor, Field Ed sites, and students; preparing all written correspondences for the field ed office; organizing and preparing materials for meetings; tracking student progress through the program; assisting with other special projects requiring computer skills of PageMaker, WordPerfect, Quattro Pro, and Envoy

Self-Employed, Tutor (1994-2005)
- Responsibilities included tutoring HACC students in Introduction to Chemistry, Chemistry, Biology, and Algebra

Millersville University – Biology Department, Assistant (2003)
- Responsibilities included preparing Power Point presentations for a stream restoration monitoring program; photographing various stages of the project

With Lancaster Laboratories since 1994
- Administrator III, Environmental Sample Administration (1994)
  - Responsibilities included receiving samples, entering samples, auditing, filing, noting discrepancies, and unpacking samples
- Administrator III/Coordinator, Environmental Sample Administration (1995)
  - Responsibilities included relaying technical/client information when it became available; answering questions from clients/technical areas when CSR was unavailable; coordinating/prioritizing entry; supervising and evaluating work of 2nd Shift Environmental Entry Staff; training new personnel in the entry/interpretation process; preparing Job Plans on an as-needed basis

Specialist I, Environmental Sample Administration (1996)
Responsibilities included receiving samples; entering samples; auditing; filing; noting discrepancies; unpacking samples; acting as project coordinator on an as-needed basis
Senior Specialist, Environmental Sample Administration (2000)
Responsibilities included receiving samples; entering samples; auditing; filing; noting discrepancies; unpacking samples; acting as project coordinator on an as-needed basis; training; preparing resource materials; working on special projects as needed
Senior Specialist Coordinator, Environmental Sample Administration (2004)
Responsibilities included receiving samples; entering samples; auditing; filing; noting discrepancies; unpacking samples; acting as project coordinator on an as-needed basis; training; preparing resource materials; working on special projects as needed
Senior Specialist Group Leader, Environmental Sample Administration (2005)
Responsibilities include receiving samples; entering samples; auditing; filing; noting discrepancies; unpacking samples; acting as project coordinator on an as-needed basis; training; preparing resource materials; working on special projects as needed

Awards, Citations, Honorary Societies & Publications:

Residential Life Award of Merit (1990)
Bloomsburg University Dean's List 6 of 8 semesters, graduated cum laude (1990-1993)
Kappa Delta Phi (National Co-Ed Honor Society) (1994)
Spirit of LLI (2001)

Memberships & Appointments:

Elizabethtown Fire Company (1993-present)
Safety Committee (1994-1998)
Alpha Phi Omega (National Co-Ed Service Fraternity) (1991-1993)
NSTA (2000-2008)
Kappa Delta Phi (1994, 2001-2003)

Steven C. Davies, B.S., Manager, Transportation and Sample Bottles

Education:

B.S. Elementary Education, Lancaster Bible College (1987)

Professional Experience:

With Lancaster Laboratories since 1990
Transportation Coordinator (1991)
Transportation Group Leader (1994)
Transportation and Sample Bottles Group Leader (1998)
Responsibilities included supervise personnel; schedule lab work; manage financial resources; answer client questions; communicate client requirements to lab areas; and schedule sample submissions and provide sampling containers.
Transportation and Sample Bottles Manager (2005)
Responsibilities include supervise personnel; schedule lab work; manage financial resources; answer client questions; communicate client requirements to lab areas; and schedule sample submissions and provide sampling containers.

Lindsay C. Deibler-Wallace, M.S., Senior Specialist Group Leader, Training

Education:

B.S. Chemistry, Lebanon Valley College (2002)
M.S. Secondary Science Education, George Mason University (2007)

Professional Experience:

Flint Hill School, Upper School Science Teacher (2002-2013)
Responsibilities included developing and implementing rigorous lessons, laboratory activities and assessments for Physics, Chemistry and Honors Chemistry; created video podcasts for all Chemistry lecture material that students study outside of class time according to the Flipped Learning style; proposed and developed the curriculum to teach a new elective course in Forensic Science; utilized various computer resources to promote interactive learning and to prepare students for future workforce by encouraging group work, problem solving, and critical thinking; differentiated instruction and customized instructional strategies to ensure that all students achieve at high levels; provided a safe and engaging learning environment that encourages student success; analyzed data from formal and informal assessments to improve instruction; chaired bi-weekly grade level faculty meetings
With Eurofins Lancaster Laboratories since 2014
Senior Specialist, Training (2014)
Responsibilities included facilitating Core and Elective training for new employees; conducting orientations, internal courses, and other learning experiences
Senior Specialist Group Leader, Training (2015)
Responsibilities include managing the resources of the technical training group; designing and delivering core and elective technical training

Christine M. Dulaney, B.A., Senior Specialist, GC/MS Volatiles

Education:

- B.A. Biology, Meredith College (1984)

Continuing Education:

- Waters Fundamentals of HPLC, Compuchem Laboratories (1989)

Professional Experience:

- Compuchem Laboratories (1984-1998)
  - Extraction Technician (1984-1986)
    - Responsibilities included performing extraction of various environmental matrices for pesticide GC analysis and semivolatile GC/MS analysis; extracting quarterly PE samples
  - GC Technician (1986-1989)
    - Responsibilities included performing analysis of environmental extracts for pesticides, PAHs, and volatile organic compounds using GC, HPLC, and purge and trap, respectively; performing routine instrument maintenance
  - Senior Chemist, Pesticide Review (1990-1995, 1996-1998)
    - Responsibilities included performing qualitative and quantitative review of pesticide, PAH, and volatile organic data; reviewing instrument maintenance and standard logbooks
- With Eurofins Lancaster Laboratories since 1998
  - Chemist, Pesticide Residue (1998)
    - Responsibilities included reviewing GC pesticide residue data packages; responding to client inquiries and ICARs
  - Project Management Specialist, Pharmaceutical Client Services (2003)
    - Responsibilities included managing details of various pharmaceutical client accounts using the laboratory information management system; acting as liaison between the client and internal laboratory personnel
  - Senior Specialist, GC/MS Volatiles (2005)
    - Responsibilities include auditing data for various GC and GC/MS volatile analyses; verifying data within the laboratory information management system, communicating and following up on outstanding data issues

Eric L. Eby, B.S., Senior Chemist, Metals

Education:

- B.S. Biology, Millersville University (1988)

Continuing Education:

- OSHA 40-hour Hazardous Waste Management, Phoenix Safety Associates (1991)
- DX500 Maintenance and Troubleshooting, Dionex (1996)
- The Chemistry Behind the Techniques, EAS, Inc. (1996)
- Cleaning Validation Strategies, Applied Analytical Industries, Inc. (1997)
- Gas Chromatography Practical Theory and Applications, Lancaster Laboratories (1998)

Professional Experience:

- With Lancaster Laboratories since 1988
  - Associate Chemist (1993)
    - Responsibilities included environmental wet chemistry testing and field sampling.
  - Chemist (1997)
  - Senior Chemist, Pharmaceutical Raw Materials (1998)
    - Responsibilities included IC, TOC analysis, IC maintenance, USP purified water testing, raw materials testing, USP <661> container closure testing.
  - Senior Chemist, Pharmaceutical Product Testing (2000)
    - Responsibilities included pharmaceutical product testing per client specific methods, IC and HPLC maintenance.
  - Senior Chemist, Metals (2005)
    - Responsibilities include ICP analysis for environmental testing and ICP instrument maintenance.

Joseph S. Feister, Senior Chemist Group Leader, Organic Extraction

Professional Experience:

With Eurofins Lancaster Laboratories since 1993

Laboratory Technician, Pesticide Residue Analysis (1993)

Responsibilities included prepping samples

Senior Technician, Organic Extraction (1996)

Responsibilities included prepping samples

Chemist Group Leader, Organic Extraction (2001)

Responsibilities included prepping samples; supervising employees

Senior Chemist Group Leader, Organic Extraction (2015)

Responsibilities include performing high level, difficult preps (with minimal supervision or guidance) following standard operating procedures (SOPs); self-train in new techniques; entering information into computer; training new or existing employees in extraction techniques or use of equipment; using knowledge to actively improve current processes; developing, enhancing, and validating new extraction methods; keeping work area clean and organized; preparing spikes; repairing equipment; updating departmental SOPs and training manual; disposing of wastes in approved manner; assisting in incident prevention and remediation when necessary; performing both technical and personnel aspects of group operations; performing work within the department or other areas as required; acting as a technical resource, trainer, and troubleshooter to specific department; making recommendations for operational and/or technical improvements; communicating effectively within the group; coaching and developing direct reports; planning and monitoring workflow

Erik J. Frederiksen, B.A., Manager, Water Quality and Instrumental Water Quality

Education:

B.A. Chemistry, University of Virginia (1990)

Continuing Education:

Infrared Spectral Interpretation (1993)

Professional Experience:

With Eurofins Lancaster Laboratories since 1990

Chemist/Coordinator (1993)

Group Leader, Water Quality Department (1994)

Responsibilities included supervising personnel; managing laboratory operations; project management; managing financial resources; reviewing and approving data

Manager, Water Quality and Instrumental Water Quality Departments (2005)

Responsibilities include supervising personnel; managing laboratory operations; project management; managing financial resources; reviewing and approving data

Lynn Frederiksen, B.S., Principal Specialist, Environmental Client Services

Education:

B.S. Conservation and Resource Development, University of Maryland (1981)

Professional Experience:

University of Missouri, Senior Research Lab Technician (1982 – 1984)

GPU Nuclear Corporation, Data Analyst (1985 – 1989)

With Eurofins Lancaster Laboratories since 1989

Senior Specialist (1989)/Team Leader, Environmental Client Services (2006)

Responsibilities included: consult with clients regarding testing needs; revise and update SOPs; provide price quotes; audit sample entry; answer client questions; communicate client requirements to lab areas; provide status reports, including results, to clients; schedule sample submissions and provide sampling containers; assist Group Leader with training of new employees and delegating new projects.

Senior Specialist Group Leader, Environmental Client Services (2007)

Responsibilities included: managing a team of client service representatives, training of new employees, setting up and delegating new projects, serving as primary project manager for several large petroleum clients and consultants.

Principal Specialist Group Leader, Environmental Client Services (2011)

Responsibilities included serving as the primary contact or back-up with the laboratory for a number of assigned clients requiring specialized testing or complex projects; understanding and communicating technical information and client requirements to laboratory personnel, helping to ensure that requirements are met; leading broad-based complex projects to a satisfactory conclusion according to client technical and schedule requirements; developing strong relationships with major accounts resulting in additional sales; advising and training other members of the department; serving as a technical resource both internally and externally; proactively assisting Outside Business Development with client visits, presentations, and internal audits for assigned clients; participating on PPI teams

Principal Specialist, Environmental Client Services (2015)

Responsibilities include serving as the primary contact or back-up with the laboratory for a number of assigned clients requiring specialized testing or complex projects; understanding and communicating technical information and client requirements to laboratory personnel, helping to ensure that requirements are met; leading broad-based complex projects to a satisfactory conclusion according to client technical and schedule requirements; developing strong relationships with major accounts resulting in additional sales; advising and training other members of the department; serving as a technical resource both internally and externally; proactively assisting Outside Business Development with client visits, presentations, and internal audits for assigned clients; participating on PPI teams

Joseph M. Gambler, B.S., Principal Chemist, GC/MS Semivolatiles

Education:

B.S. Chemistry, Millersville University (1996)

Professional Experience:

Wyeth, Biological Manufacturing Technician (1996)

With Eurofins Lancaster Laboratories since 1996

Senior Chemist, GC/MS Semivolatiles (1996)

Responsibilities included training new hires; maintaining GC/MS systems; preparing standards/stocks/spikes; maintaining Helium supply system; performing data interpretation; ordering supplies; auditing; cross trained in Pesticides Department

Principal Chemist, GC/MS Semivolatiles (2015)

Responsibilities include maintaining GC/MS instrumentation; tuning and calibrating instruments daily; analyzing quality control and client samples; reviewing and assembling this data in an efficient manner with a high degree of quality to meet client requirements; working on special projects, research, or IT needs for the group (at the direction of Group Leader or Manager) with little or no supervision

Stephen J. Gordon, B.S., Project Manager, Pittsburgh Service Center

Education:

B.S. Chemistry, Carnegie Mellon University (1996)

Professional Experience:

Alcoa, Inc, Senior Technician (1997-2000)

Responsibilities included analytical chemist specialized in PCB congener analysis by GC-ECD

Clark Laboratories, LLC, Project Manager (2000-2012)

Responsibilities included managing ASTM D02 interlaboratory crosscheck program and working as an analytical chemist

Environmental Data Services, Senior Technical Specialist (2012-2015)

Responsibilities included data validation, laboratory auditing, technical writing

With Eurofins Lancaster Laboratories since 2015

Project Manager, Pittsburgh Service Center (2015)

Responsibilities include serving as the primary contact for a number of assigned clients; understanding technical information and communicating client requirements to laboratory personnel; helping to ensure that requirements are met; managing large/complex projects according to client technical and schedule requirements; developing strong relationships with major accounts resulting in additional sales; training subordinates; delegating routine tasks; resolving issues when problems arise; participating in departmental process improvement; packing bottle orders and delivering bottles/picking up samples as needed

Susan M. Goshert, B.S., Manager, EPH/Miscellaneous GC, Pesticide Residue Analysis, Nitrosamines

Education:

B.S. Chemistry, Juniata College (1988)

Continuing Education:

Advanced Aquarius Report Training, Hewlett-Packard (1989)
How to Handle People with Tact and Skill, Harrisburg Area Community College (1992)
Positive Attitude and Peak Performance, Harrisburg Area Community College (1992)

Professional Experience:

With Lancaster Laboratories since 1988
Chemist (1990)
Senior Chemist Coordinator (1997)
Responsibilities included supervising personnel; reviewing and approving data; monitoring turnaround time
Senior Specialist Group Leader, EPH/Misc. GC (2005)
Responsibilities included supervising personnel; reviewing and approving data; monitoring turnaround time
Principal Specialist Group Leader, GC/MS Volatiles (2008)
Responsibilities included supervising personnel; reviewing and approving data; monitoring turnaround time
Manager, EPH/Miscellaneous GC, Pesticide Residue Analysis, Nitrosamines (2012)
Responsibilities include supervising personnel; managing laboratory operations and financial resources; project management; reviewing and approving data; consulting with clients regarding testing needs

Brian K. Graham, B.A., Senior Chemist, GC/MS Semivolatiles

Education:

B.A. Mathematics, Millersville University (1996)

Professional Experience:

With Lancaster Laboratories since 1989
Chemist, GC/MS Semivolatiles (1989-2006)
Senior Chemist, GC/MS Semivolatiles (2006)
Responsibilities include maintaining GC/MS Instrumentation; tuning and calibrating GC/MS; analyzing samples by GC/MS; reviewing and assembling all supporting GC/MS data; preparing standards for calibrations; training new analysts

Nina C. Haller, Senior Specialist Group Leader, Metals

Continuing Education:

State Dairy Lab Cert., State of PA (1993)
Butterfat Testing License, State of PA (1995)
Seminar ICP/ICPMS, Fisons Instruments (1995)
Three-day ICP Trace Training Course, Thermo Jarrell Ash, MA (1996)

Professional Experience:

Hazelton Research Products, Lab Technician (1981-1984)
Responsibilities included rabbit production facility, removal of ovaries, care, and maintenance
With Lancaster Laboratories since 1987
Technical Associate, Foods (1987)
Responsibilities included coordinating Listeria Testing Program; performing data entry and verification
Chemist, Metals (1993)
Responsibilities included performing daily tracking of rushes; operating and maintaining ICP instrumentation; reviewing and verifying of ICP data, data package review
Specialist Group Leader, Metals (2003)
Responsibilities included overseeing the ICP/ICPMS personnel and instrumentation workflow; verifying ICP/ICPMS/GFAA/Hg data
Senior Specialist Group Leader, Metals (2006)
Responsibilities included overseeing the ICP/ICPMS personnel and instrumentation workflow; verifying ICP/ICPMS/GFAA/Hg data
Senior Specialist Group Leader, Metals (2007)
Responsibilities include overseeing metals instrument and verification personnel and instrumentation workflow; verifying metals data

Michele D. Hamilton, B.S., Senior Chemist Group Leader, EPH/Misc. GC

Education:

B.S. Chemistry, Temple University (1990)

Continuing Education:

Gas Chromatography: Practical Theory and Applications for LL (1993)
Practice of Modern HPLC, LC Resources (1996)

Professional Experience:

With Eurofins Lancaster Laboratories since 1991
Senior Chemist (1997)
Senior Chemist Coordinator (2000)
Responsibilities included supervising personnel; coaching and developing new employees; sample tracking; reviewing rush request; communicating client requirements; operating GC and HPLC instruments; data interpretation and entry; calibrating; repairing instruments and verifying data
Senior Chemist Group Leader, Pesticide Residue Analysis (2005)
Responsibilities included supervising personnel; coaching and developing new employees; sample tracking; reviewing rush request; communicating client requirements; operating GC and HPLC instruments; data interpretation and entry; calibrating; repairing instruments and verifying data
Senior Chemist Group Leader, EPH Misc. GC (2011)
Responsibilities include supervising personnel; coaching and developing new employees; sample tracking; reviewing rush request; communicating client requirements; operating GC instruments; data interpretation and entry; calibrating; repairing instruments and verifying data

Linda M. Hartenstine, B.A., Senior Chemist, GC/MS Semivolatiles

Education:

B.A. Chemistry, Millersville University (1994)

Professional Experience:

With Lancaster Laboratories since 1994
Associate Chemist (1994)
Chemist (1997)
Senior Chemist, GC/MS Semivolatiles (1998)
Responsibilities include performing GC/MS semivolatiles testing; operating GC/MS instruments; data interpretation; developing and evaluating new methods; calibrating and repairing instruments; preparing standards; revising and updating SOPs and analytical methods; training other analysts

Robert G. Heisey, Jr., B.A., Senior Specialist, Water Quality

Education:

B.A. Chemistry, Millersville State College (1972)

Professional Experience:

RCA Corp., Engineering Technician (1972-1987)
With Lancaster Laboratories since 1988
Chemist Coordinator (1989)
Senior Chemist Coordinator (1997)
Responsibilities included: supervise personnel; schedule lab work; review and approve data; develop and evaluate new methods; prepare test standards.
Senior Chemist Group Leader (2005)
Responsibilities included: supervise personnel; schedule lab work; review and approve data; develop and evaluate new methods; prepare test standards.
Senior Specialist, Water Quality (2006)
Responsibilities include: review and approve data; develop and evaluate new methods; prepare test standards; order laboratory supplies; maintain department's chemical inventory.

Daniel H. Heller, B.A., Senior Chemist, GC/MS Volatiles

Education:

A.S.T. Machine Technology, Stevens State College (1998)
B.A. Secondary Education Biology, Millersville University (2003)

Professional Experience:

Tyco Electronics, Machinist B (1998-2004)
Responsibilities included machining various materials using various machines
Columbia Junior/Senior High School, Teacher (2005)
Responsibilities included teaching 9th and 10th grade biology
Penn State Cooperative Extension, Biologist (2005-2006)
Responsibilities included treating and surveying mosquito populations
With Lancaster Laboratories since 2006
Chemist, GC/MS Volatiles (2006)
Responsibilities included evaluating water samples for volatiles using GC/MS instrumentation
Senior Chemist, GC/MS Volatiles (2012)
Responsibilities include evaluating water samples for volatiles using GC/MS instrumentation

Tamara J. Helsel, Senior Specialist Group Leader, Environmental Sample Administration

Professional Experience:

Willow Valley Retirement Communities, Certified Nursing Assistant (2000-2001)
Responsibilities included assisting nursing home residents with their daily activities and personal hygiene
Bayada Nurses, Certified Nursing Assistant (2000-2001)
Responsibilities included assisting people with disabilities in their homes with their personal hygiene and daily activities
With Eurofins Lancaster Laboratories since 2001
Senior Administrator, Environmental Sample Administration (2001)
Responsibilities included performing sample receipt, interpretation, and entry
Specialist, Environmental Sample Administration (2001)
Responsibilities included performing sample receipt, interpretation, and entry
Senior Specialist, Environmental Sample Administration (2007)
Responsibilities included performing sample receipt, interpretation, and entry
Senior Specialist Group Leader, Environmental Sample Administration (2013)
Responsibilities include performing sample receipt, interpretation, and entry

Memberships and Appointments:

Lancaster Laboratories Safety Committee (2003-2007)

Chadwick J. Hershey, B.S., Senior Specialist, Environmental Software Development

Education:

B.A. Economics, Millersville University (2001)
B.S. Computer Science, Millersville University (2001)

Continuing Education:

Mastering Microsoft Visual Basic 6 Development, IntelliMark (2001)
Oracle Exam #120-007, Introduction to Oracle 9i: SQL (2004)

Professional Experience:

With Eurofins Lancaster Laboratories since 1999
Intern, Computer Applications Development (1999-2001)
Responsibilities included maintaining and developing departmental computer systems
Specialist, Computer Applications Development (2001)
Responsibilities included maintaining and developing departmental computer systems
Senior Specialist, Environmental Software Development (2006)
Responsibilities include maintaining and developing departmental computer systems

Catherine M. Holt, B.S., Principal Specialist, Environmental Software Development

Education:

B.A. Mathematics, Franklin & Marshall College (1984)
B.S. Computer Science, Millersville University (1987)

Continuing Education:

Novell Network Seminar, Novell (1989)
Clarion Database Management Seminar, Clarion Software (1991)
Operations Process Optimization, Penn State University (1992)
Fast Track to Powerbuilder Seminar, Actium (1997)
Mastering Visual Basic 6 Development, Microsoft Corporation (1999)
Introduction to Oracle9I: SQL, Online Testing (2004)
Programming with the Microsoft .NET framework using Microsoft Visual Studio 2005 (2008)
Windows Forms 3.5 Programming for Experienced VB .NET Programmers (2010)

Professional Experience:

R.R. Donnelley & Sons Company, Technician (1985-1987)
Responsibilities included scanning and developing photographs for use in catalogs
Shared Medical Systems, Programmer (1987-1989)
Responsibilities included customizing and installing software at hospitals
With Eurofins Lancaster Laboratories since 1989
Principal Specialist, Computer Applications Development (1989)
Responsibilities included developing and maintaining computer systems/programs for laboratory use
Principal Specialist/Coordinator, Computer Applications Development (1995)
Responsibilities included supervising personnel; developing and maintaining computer systems/programs for lab use; communicating with clients about disk requirements
Principal Specialist, Environmental Software Development (1997)
Responsibilities include developing and maintaining computer systems in VB6 and VB.net for use within Parallax shell

Diana G. Holmes, M.S., Senior Specialist, Environmental Software Development

Education:

B.A. Physics, Cornell University (1983)
M.S. Computer Science, Rensselaer Polytechnic Institute (1985)

Professional Experience:

AT&T Bell Laboratories, Technical Staff Member (1985-1986)
Responsibilities included developing software for testing software
Prime Computer, Software Engineer II (1986-1988)
Responsibilities included designing, implementing, and testing software for PRIMOS and mini-supercomputers
Banyan Systems, Principal Software Engineer (1988-1999)
Responsibilities included developing, enhancing, and maintaining suite of services for VINES mail service; worked with 3rd party developers; third line customer support
Progressive Systems/Cobalt Networks, Senior Software Engineer (1999-2000)
Responsibilities included managing and leading software releases; designed and implemented software features; third line customer support
Sun Microsystems, Project Manager (2000-2005)
Responsibilities included project manager for Linux Operation System releases
Innovative Emergency Management, Inc., Applications Systems Engineer (2005-2006)
Responsibilities included providing system administration support, development of software tools for deployment
Pennington Biomedical Research Center, IT Applications Developer III (2006-2013)
Responsibilities included analyzing, designing, developing, executing, documenting, and supporting software applications for the Basic Science labs
With Eurofins Lancaster Laboratories since 2013
Senior Specialist, Environmental Software Development (2013)
Responsibilities include providing technical support for maintenance of installed software applications and assistance with development, installation, and maintenance of new applications for general use; assistance in development, implementation, and maintenance of software intended to improve quality and efficiency of work performed

Kay G. Hower, B.S., Manager, ELLE Service Centers

Education:

B.S. Animal Science, University of Delaware (1988)

Professional Experience:

U.S. Fish and Wildlife Service, Research Assistant (1990-1991)
RMC Environmental Services, Biological Technician (1992-1994)
Lancaster Laboratories
- Senior Specialist, Project Manager, Environmental Client Services (1994-2001)
  - Responsibilities included managing client projects; auditing sample entry; communicating client requirements to lab areas; providing status reports, including results, to clients; scheduling sample submissions and providing sampling containers.
- Principal Specialist, Environmental Business Development (2001-2007)
  - Responsibilities included providing price quotes and proposals; advising clients on testing; assisting on client visits/audits; answering client questions; communicating client requirements to lab areas
- Principal Specialist, Pharmaceutical Client Services (2007-2008)
  - Responsibilities included acting as the pharmaceutical client liaison within the laboratory by communicating client's requirements to the technical staff by maintaining project-related documentation, communicating desired turnaround times, and managing information flow; other duties include facilitating and organizing client audits, visits, and conference calls; monitoring ongoing projects and providing status updates as needed; auditing client sample paperwork and resolving discrepancies; overseeing the general administration of pharmaceutical projects (issuing quotations, answering billing and reporting questions, and scheduling sample pickups)

Urological Associates of Lancaster, Surgical Coordinator (2010-2012)
- Responsibilities included coordinating surgical procedures for seven urologists at four facilities; meeting with patients to explain procedure details including pre-hospital testing, day-of timeline and post-op appointments and testing; obtaining insurance authorizations

With Eurofins Lancaster Laboratories since 2012
- Principal Specialist Group Leader, Bay Area Service Center (2012)
  - Responsibilities included serving as the primary contact with the laboratory for a number of assigned clients; communicating technical information and conveying client requirements to laboratory personnel, ensuring that those requirements are met; managing large/complex projects according to client technical and schedule requirements; developing strong relationships with major accounts resulting in additional sales; performing both technical and personnel aspects of group operations; performing work within the department or other areas as required; acting as a technical resource, trainer, and troubleshooter to specific department; making recommendations for operational and/or technical improvements; communicating effectively within the group; coaching and developing direct reports; planning and monitoring workflow
- Manager, ELLE Service Centers (2014)
  - Responsibilities include overseeing all managerial operations of the service centers; managing the service centers in an efficient and financially sound manner; providing leadership and coaching to assigned individuals; participating in long-term and short-term planning and goal-setting for the group; coordinating functions and responsibilities of assigned department members to provide consistent service; relaying corporate information appropriately; traveling to existing service centers on a quarterly basis and assisting in set-up and training as new centers are opened; serving as the primary contact with the laboratory for assigned clients; communicating technical information and conveying client requirements to laboratory personnel

Sara E. Johnson, B.S., Senior Chemist, GC/MS Volatiles

Education:

B.S. Chemistry, Biochemistry option, Millersville University (2006)

Professional Experience:

With Lancaster Laboratories since 2006
- Chemist, Flexible Staffing (2006)
  - Responsibilities included flexing to various departments as needed and performing analysis ranging from GC/MS to SDS-PAGE Electrophoresis with colloidal blue or silver staining
- Chemist, GC/MS Volatiles (2008)
  - Responsibilities included performing GC/MS analysis of water and soil samples along with other matrices by various analytical methods such as EPA 624, 8260B, and CLP; evaluating analytical data generated; calibrating and troubleshooting GC/MS instrumentation
- Senior Chemist, GC/MS Volatiles (2010)
  - Responsibilities include performing GC/MS analysis of water and soil samples along with other matrices by various analytical methods such as EPA 624, 8260B, and CLP; evaluating analytical data generated; calibrating and troubleshooting GC/MS instrumentation; assisting other employees with any questions that may arise and helping to train new employees

Laura A. Jovanovic, B.A., Principal Specialist Account Manager, Environmental Business Development/Sales

Education:

B.A. History/Russian, Indiana University (1986)

Professional Experience:

Environmental Services of America, Senior Account Manager (1991-1996)

Responsibilities included sales and management of Midwest Accounts for a treatment, storage and disposal facility; field supervisor and sampling

HazChem Environmental, Account/Project Manager (1997-2005)

Responsibilities included development and maintenance of industrial accounts, field sampling, project management and emergency response

TestAmerica, Senior Account Executive (2005-2014)

Responsibilities included Midwest Laboratory Sales for a nationwide environmental laboratory network

With Eurofins Lancaster Laboratories since 2014

Principal Specialist Account Manager, Environmental Business Development/Sales (2014)

Responsibilities include Field Sales for Illinois, Wisconsin, and Indiana

Richard H. Karam, B.A., Director of Operations, Eurofins Lancaster Laboratories Environmental

Education:

B.A. Environmental Studies, Green Mountain College (2000)

Professional Experience:

Severn Trent Laboratories

Analytical Chemist (2000-2005)

Responsibilities included analyzing environmental samples for various general chemistry parameters, metals by ICP/ICPMS, pesticides/PCBs/herbicides by GC, and semivolatiles by GC/MS

Project Manager (2005-2006)

Responsibilities included managing environmental projects; writing case narratives; project set up

With Eurofins Lancaster Laboratories since 2006

Group Leader, GC/MS Semivolatiles (2006)

Responsibilities included coordinating production in GC/MS Semivolatiles; reviewing and signing reports

Manager, GC/MS Semivolatiles (2007)

Responsibilities included ensuring the accuracy and acceptability of all data generated by the GC/MS Semivolatiles group; coordinating daily prioritization of workload and monitoring the holding time and turnaround time status of samples; responding to client questions regarding GC/MS Semivolatiles data and methods and communicating technical issues or concerns about samples to project managers for clarification or resolution with the client

Manager, Organic Extraction/Leachate Preparation/GC/MS Volatiles/GC/MS Semivolatiles (2008)

Responsibilities included ensuring the accuracy and acceptability of all data generated by the groups; coordinating daily prioritization of workload and monitoring the holding time and turnaround time status of samples; responding to client questions regarding data and methods and communicating technical issues or concerns about samples to project managers for clarification or resolution with the client

Director of Operations, Eurofins Lancaster Laboratories Environmental (2014)

Responsibilities include leading departments in accordance with vision, values, and strategic goals of company; overseeing and facilitating efficient operations and systems, sound business practices, consistent client service, and motivated staff

Dana M. Kauffman, Manager, Sample Support and Data Deliverables

Continuing Education:

- Introduction to Electronics, Lancaster County Career & Technology Center, Brownstown (1994)
- AC/DC Electronics, Lancaster County Career & Technology Center (1995)
- Entry Level Management (1997)
- Gas Chromatography: Principles and Practices, Lancaster Labs University (2003)
- Practical Process Improvement Facilitator Training (2009)
- Practical Process Improvement Process Manager Training (2011)

Professional Experience:

- With Lancaster Laboratories since 1994
  - Lab Technician (1995)
  - Senior Technician (1996)
  - Sample Support Coordinator (1997)
  - Group Leader, Sample Support (1999); Group Leader, Volatiles by GC (2002)
    - Responsibilities included supervising personnel; managing laboratory operations; project management; sample preparation; developing and evaluating new methods; reagent preparation; revising and updating SOPs; ordering supplies; training other analysts; running the automated storage and retrieval system; lab cleaning and maintenance; monitoring laboratory activities; performing internal audits; enforcing regulatory compliance requirements; maintaining required certifications; communicating client requirements to lab areas
  - Manager, Sample Support and Data Deliverables (2005)
    - Responsibilities include overseeing all upfront sample handling requirements including storage, preservation, homogenization, moisture determination, volatile prescreen, and volatile soil prep; supervising group leader personnel; project management; revising and updating SOPs; performing internal audits; enforcing regulatory compliance requirements; maintaining required certifications; communicating client requirements to lab areas; data package and EDD TAT monitoring; overseeing all data package processes including data assembly, review, and processing; Practical Process Improvement (PPI) process manager responsible for facilitating PPI project team training and PPI efforts within LLI

Katherine A. Klinefelter, M.S., Principal Specialist, Environmental Client Services

Education:

- B.S. Chemistry, Rutgers University (1983)
- M.S. Physiology, Rutgers University (1985)

Continuing Education:

- Additional graduate work in Physiology, Rutgers University (1985-1989)
- Practical Process Improvement (Team Member Training), Lancaster Labs University (2009)

Professional Experience:

- Rutgers University, Research and Teaching Assistant (1984-1989)
- M. S. Hershey Medical Center of Penn State University, Senior Research Technician (1990-1993)
- With Lancaster Laboratories since 1993
  - Environmental Project Management
  - Senior Specialist, Environmental Client Services (1993)
  - Senior Specialist/Coordinator, Environmental Client Services (1996)
  - Senior Specialist, Environmental Client Services (2000)
  - Principal Specialist, Environmental Client Services (2007)
    - Responsibilities include project management; training new client service representatives; auditing sample entry; answering client questions; communicating client requirements to lab areas

Awards, Citations, Honorary Societies & Publications:

- Dean's Graduate Student Dissertation Research Award, Rutgers University
- Dean's Graduate Student Travel Award, Rutgers University
- Steinetz Memorial Fund Award, Department of Biological Sciences, Rutgers University
- 10 abstracts and 3 scientific papers on membrane transport physiology
- 4 presentations on membrane transport physiology
- Quarterly Impact Award for Practical Process Improvement (2009)

Wendy A. Kozma, B.S., Principal Specialist Group Leader, Environmental Client Services

Education:

B.S. Environmental Science, Allegheny College (1991)

Professional Experience:

Roy F. Weston, Inc. (1992-1993)

With Lancaster Laboratories since 1993

Senior Specialist, Environmental Client Services (1996)

Responsibilities included performing project management; advising clients on testing; providing price quotes; monitoring turnaround time; auditing sample entries; answering client questions; communicating client requirements to lab areas; providing status reports, including results, to clients; scheduling sample submissions; ordering sampling containers

Principal Specialist, Environmental Client Services (2004)

Responsibilities included performing project management; advising clients on testing; providing price quotes; monitoring turnaround time; auditing sample entries; answering client questions; communicating client requirements to lab areas; providing status reports, including results, to clients; scheduling sample submissions; ordering sampling containers

Principal Specialist Group Leader, Environmental Client Services (2006)

Responsibilities include performing project management; advising clients on testing; providing price quotes; monitoring turnaround time; auditing sample entries; answering client questions; communicating client requirements to lab areas; providing status reports, including results, to clients; scheduling sample submissions; ordering sampling containers

M. Susan Kreider, Senior Specialist, Data Deliverables

Continuing Education:

Chemistry and Psychology courses, F&M College

Professional Experience:

General Cigar Co., R&D Center, Laboratory Technician (1963-1966)

Responsibilities included testing tobacco products; smoke analysis; nicotine and tar analysis; preparing samples for gas chromatography

Company F. Weaver, Inc., Laboratory Technician (1966-1967)

Responsibilities included performing microbiological testing of food products, both raw materials and finished products; training factory employees in sterile food handling

Microbiological Associates, Inc., Stock Line/Sterile Technician (1968-1969)

Responsibilities included performing cancer research; dissection of animal and human tissue for cell line production; freezing of live cells; all phases of sterile lab work

Warner Lambert Co., Assistant Microbiologist/Organic Chemistry Technician (1970-1975)

Responsibilities included performing microbiological and chemical testing of raw material and finished products

Julia Winifred & Co. (Jacks III), Sales Clerk (1982-1983)

Responsibilities included retail sales; preparing windows and displays in store

With Lancaster Laboratories since 1983

Laboratory Technician, ExpressLAB (1983)

Responsibilities included performing sample prep and analyses

Senior Technician, ExpressLAB (1986)

Responsibilities included performing sample prep and analyses

Chemist, ExpressLAB (1988)

Responsibilities included performing sample prep and analyses

Specialist, Pesticide Residue Analysis (1998)

Responsibilities included performing sample prep and analyses

Specialist, EPH/Misc. GC (2003)

Responsibilities included performing sample prep and analyses

Specialist, Data Deliverables (2005)

Responsibilities included validating and sending data deliverables

Senior Specialist, Data Deliverables (2006)

Responsibilities include validating and sending data deliverables

Robert M. Large, B.S., Director, Environmental Support Services: Client Services/Inside Business Development, Sample Administration, Data Deliverables, Sample Support, Transportation, Sample Kits, Various Service Centers

Education:

B.S. Zoology, Pennsylvania State University (1973)

Continuing Education:

Chromatography/Mass Spectral Interpretation, Finnigan MAT Institute (1981)
Foundations of Management, Gilbert Associates (1982)
M.B.A. Program, St. Joseph's University (1984-1987)
How to Market Professional Services, ACIL (1990)

Professional Experience:

Gilbert Associates, Inc., Program Manager (1977-1984)
Spotts, Stevens, & McCoy, Director of Client Services (1984-1990)
With Eurofins Lancaster Laboratories since 1990
Marketing Specialist, Environmental Client Services (1990)
Group Leader, Environmental Client Services (1994)
Manager, Environmental Client Services (1995)
Responsibilities included supervising personnel; project management; various office tasks; reviewed contract terms; interpreted QC implications to data quality; advised clients on testing; set up and managed the Bay Area Service Center in Richmond, CA (2001); managed Environmental Sample Administration (2002); managed Inside Business Development (2003)
Director, Environmental Support Services: Client Services, Inside Business Development, Sample Administration, Data Deliverables, Sample Support, Transportation, Sample Kits (2005)
Responsibilities included supervising personnel; project management; various office tasks; interpreting QC implications to data quality; advising clients on testing; assisting setting up Professional Scientific Staffing (PSS) for a major biotech client (2004); managing Data Deliverables and Sample Support (2010)
Director, Environmental Support Services: Client Services, Inside Business Development, Sample Administration, Data Deliverables, Sample Support, Transportation, Sample Kits, Various Service Centers (2012)
Responsibilities include supervising personnel; project management; various office tasks; reviewing contract terms; interpreting QC implications to data quality; advising clients on testing; setting up and managing service centers across the United States

Tara D. Laroche, M.S., National Program Manager, Business Development/Sales, Environmental Sciences

Education:

A.S. Science, Navarro College (1998)
M.S. Science - Biology, University of Texas at Arlington (2001)
B.S. Science, University of Louisiana at Monroe (2001)

Professional Experience:

Eichrom Technologies, Technical Sales Chemist (2008-2009)
Responsibilities included launching new product offering for a bio-assay for dioxin analysis to E/C firms and laboratories
AirToxics Laboratories, Technical Sales Representative (2009-2010)
Responsibilities included covering Great Lakes and East Coast calling on E/C firms
TestAmerica Laboratories, Account Executive (2011-2014)
Responsibilities included Covered Oklahoma, Colorado, Wyoming, and Utah calling on E/C firms and commercial/industrial clients.
With Eurofins Lancaster Laboratories since 2014
National Program Manager, Business Development/Sales, Environmental Sciences (2014)
Responsibilities include managing sales

Memberships and Appointments:

Colorado Oil & Gas Association
General Member (2011-present)
Rocky Mountain Association of Environmental Professionals
Vice President (2012-present)
Women's Energy Network
General Member (2014-present)
Marcellus Shale Coalition
Water Resources & Waste Management Committee member (2014-present)
Western Energy Alliance
Environmental & Regulatory Committee Member (2014-present)

Kerri E. Legerlotz, Senior Chemist, GC/MS Volatiles

Education:

B.S. Chemistry, Houghton College (2005)

Professional Experience:

Pfizer, Chemist (2005-2006)

Responsibilities included performing raw material, finished product, and stability testing; wet chemistry, pH, viscosity, IR, Karl Fischer, specific gravity

With Lancaster Laboratories since 2006

Chemist, GC/MS Volatiles (2006)

Responsibilities included testing for volatile compounds using GC/MS by purge and trap; preparing working standards from neat compounds

Senior Chemist, GC/MS Volatiles (2013)

Responsibilities include analyzing water and soil samples by purge and trap GC/MS; generating and reviewing raw data; performing maintenance on GC/MS, purge and traps, and various autosamplers; troubleshooting problems on GC/MS, purge and traps, and autosamplers; formulating and diluting analytical reference materials

Jenifer E. Lewis, B.S., Principal Specialist Account Manager, Environmental Business Development/Sales

Education:

B.S. Chemistry, University of Delaware (1984)

Continuing Education:

21 credits towards M.B.A., University of Delaware

Professional Experience:

J. M. Huber Corporation, Research Chemist (1984-1985)

With Eurofins Lancaster Laboratories since 1985

Chemist/Coordinator, Pesticide Residue Analysis (1989)

Group Leader, Pesticide Residue Analysis (1992)

Responsibilities included supervising personnel; managing laboratory operations and financial resources; project management; reviewing and approving data; consulting with clients regarding testing needs

Manager, Pesticide Residue Analysis (1992)

Responsibilities included supervising personnel; managing laboratory operations and financial resources; project management; reviewing and approving data; consulting with clients regarding testing needs

Manager, Pesticide Residue Analysis, EPH/Miscellaneous GC (1996)

Responsibilities included supervising personnel; managing laboratory operations and financial resources; project management; reviewing and approving data; consulting with clients regarding testing needs

Manager, Pesticide Residue Analysis, EPH/Miscellaneous GC, Nitrosamines (1998)

Responsibilities included supervising personnel; managing laboratory operations and financial resources; project management; reviewing and approving data; consulting with clients regarding testing needs

Manager, Pesticide Residue Analysis, EPH/Miscellaneous GC, Nitrosamines, Volatiles by GC (2005)

Responsibilities included supervising personnel; managing laboratory operations and financial resources; project management; reviewing and approving data; consulting with clients regarding testing needs

Manager, Pesticide Residue Analysis, EPH/Miscellaneous GC, Nitrosamines (2011)

Responsibilities included supervising personnel; managing laboratory operations and financial resources; project management; reviewing and approving data; consulting with clients regarding testing needs

Principal Specialist Account Manager, Environmental Business Development/Sales (2012)

Responsibilities include developing new business revenue for LL by performing account management duties for existing accounts and prospects in the commercial and DOD markets; identifying and securing sales opportunities through phone calls, sales visits, presentations, team selling, quotes, and proposals; generating new business opportunities consistent with our operational capabilities and capacity

Larry Lewis, B.S., Manager, Volatiles in Air

Information not available at time of printing

Parker D. Lindstrom, B.S., Senior Chemist Metrology, Metals

Education:

B.S. Chemical Oceanography, Millersville University (2002)

Continuing Education:

Comprehensive Gas Chromatography Seminar, RESTEK (2002)
Comprehensive GC/MS Seminar, RESTEK (2002)
Statistics at Lancaster Laboratories, LLU (2005)
24-hour HAZWOPER, LLU (2006)

Professional Experience:

Fred Fiorentino, Assistant Laborer (1997-2002)
Responsibilities included roofing, painting, general construction, clean-up, installation of windows, doors, stairs, decking
Dr. Kerper, Office Assistant (2000-2002)
Responsibilities included filing, cataloging children's books
Millersville University IMC/IMS, Media/Education Assistant (2000-2002)
Responsibilities included assisting teachers in creating media for the classroom, editing video and audio projects
With Eurofins Lancaster Laboratories since 2002
Associate Chemist/Senior Chemist, GC/MS Volatiles (2002)
Responsibilities included running purge and trap and GC/MS to analyze samples and QC for VOCs; performing purge and trap and GC/MS maintenance
Senior Chemist, Metals (2006)
Responsibilities included running ICP/MS; verifying samples; performing maintenance; prepping samples; general troubleshooting for metals department; installation, maintenance and operation of CVAF low level Mercury; maintenance and operation of AA Mercury; providing general computer help to Computer Services department
Senior Chemist Metrology, Metals (2009)
Responsibilities include helping the instrument (Metrology) group maintain and qualify HPLCs, GCs, and other pharmaceutical instruments; helping with other qualifications as needed (hoods, storage units, etc); for a short time in 2009 verifying data in Water Quality department

Memberships and Appointments:

Emergency Response Team (Spill Team), Lancaster Laboratories (2006)

Jason M. Long, B.S., Senior Chemist, GC/MS Volatiles

Education:

B.S. Chemistry, Shippensburg University (2004)

Professional Experience:

EA Engineering Science & Technology, Lab Tech (2004)
Responsibilities included setting up and running tests in toxicology lab; cleaning glassware used in performing tests; titrating for alkalinity and pH of water samples
With Lancaster Laboratories since 2004
Chemist, GC/MS Volatiles (2004)
Responsibilities included analyzing water and soil samples by purge and trap GC/MS; generating and reviewing raw data; performing maintenance on GC/MS, purge and traps, and various autosamplers
Senior Chemist, GC/MS Volatiles (2007)
Responsibilities include analyzing water and soil samples by purge and trap GC/MS; generating and reviewing raw data; performing maintenance on GC/MS, purge and traps, and various autosamplers; troubleshooting problems on GC/MS, purge and traps, and autosamplers

Lyssa M. Longenecker, B.S., Senior Specialist, Environmental Client Services

Education:

B.S. Biology, Millersville University of PA (2010)

Professional Experience:

With Eurofins Lancaster Laboratories since 2011

Specialist, Environmental Client Services (2011)

Responsibilities included serving as the primary laboratory contact to clients; communicating technical information to the client in a comprehensible manner; deciphering the clients' testing needs; conveying the clients' requirements to the laboratory; ensuring clients' requirements and needs are met

Senior Specialist, Environmental Client Services (2014)

Responsibilities include serving as the primary laboratory contact to clients; communicating technical information to the client in a comprehensible manner; deciphering the clients' testing needs; conveying the clients' requirements to the laboratory; ensuring clients' requirements and needs are met

Karen P. Lopez, B.S., Project Manager, Bay Area Service Center

Education:

B.S. Environmental Science, University of California Riverside (2005)

Professional Experience:

Eurofins Air Toxics, Inc.

Account Manager (2008-2010)

Responsibilities included generating quotes for clients by gathering critical project information and coordinating with the sales and project management to determine product offering and price point; follow-up on quotes to gather sales and market intelligence; schedule client visits for sales and management; facilitate conference details and follow-up as needed; provide back-up for the Project Management team during staff absences or times of high workload

Project Manager (2010-2015)

Responsibilities included performing all project liaison functions needed for goal achievement between the clients, sales team, laboratory, and finance team; project management from A to Z, including contract execution, project set-up, project execution, and result achieved evaluation; respond professionally and timely to client inquiries, handle simple to complicated technical explanations

With Eurofins Lancaster Laboratories since 2015

Project Manager, Bay Area Service Center (2015)

Responsibilities include serving as the primary contact for a number of assigned clients; understanding technical information and communicating client requirements to laboratory personnel; help to ensure that requirements are met; managing large/complex projects according to client technical and schedule requirements; developing strong relationships with major accounts resulting in additional sales

Dorothy M. Love, B.S., Director, ELLE and Eurofins Environment Testing US, Quality Assurance

Education:

B.S. Environmental Health, Indiana University of Pennsylvania (1981)

Professional Experience:

Sun Transport, Inc., Safety Assistant (1980-1981)
Texas A & M University, Research Assistant (1982-1984)
Texas Water Commission, Chemist (1984-1986)
GHR Analytical, Chemist (1986-1987)
Clean Harbors, Inc., Senior Chemist (1987-1989)
With Eurofins Lancaster Laboratories since 1989
Senior Specialist (1989)
Senior QA Specialist (1998) Coordinator (2000)
Principal Specialist/Coordinator, Quality Assurance (2003)

Responsibilities included supervising personnel; training other QA staff; revised and updated analytical methods; monitored laboratory activities and corrective action for quality issues; performed internal audits; worked with external auditors; reviewed lab data and procedures; enforced regulatory compliance requirements; reviewed/wrote client/lab Quality Assurance Project Plans (QAPP)

Principal Specialist Group Leader, Quality Assurance (2005)

Responsibilities included supervising personnel; training other QA staff; revised and updated analytical methods; monitored laboratory activities and corrective action for quality issues; performed internal audits; worked with external auditors; reviewed lab data and procedures; enforced regulatory compliance requirements; reviewed/wrote client/lab Quality Assurance Project Plans (QAPP)

Manager, Environmental Quality Assurance (2013)

Responsibilities included supervising the Environmental QA department; monitoring regulatory activities; reviewing procedures and data; interacting with clients and agencies; performing regulatory and client document review; enforcing regulatory compliance; quality improvement; staff training; QA policy development and maintenance

Director, ELLE and Eurofins Environment Testing US, Quality Assurance (2015)
Responsibilities include supervising the ELLE QA department; monitoring regulatory activities; reviewing procedures and data; interacting with clients and agencies; performing regulatory and client document review; enforcing regulatory compliance; quality improvement; staff training; QA policy development and maintenance; overseeing QA programs at all Eurofins Environment BUs in order to harmonize quality and ethics systems across the environmental business

Memberships and Appointments:
Society of Women Environmental Professionals (SWEP (2007-present)
TNI Quality Systems Committee (2009-2014)
NJ Environmental Laboratory Advisory Committee (2012-present)

Natalie R. Luciano, B.A., Senior Specialist, Environmental Client Services

Education:
B.A. Biology, Bridgewater College (2006)

Continuing Education:
Safe Drinking Water Regulations Revisions, PaAAEL & PA DEP (2010)
PA Regulatory Update Bureau of Safe Drinking Water, PaAAEL (2013)
PA DEP Regulatory Update, PA DEP (2013)

Professional Experience:
With Eurofins Lancaster Laboratories Environmental, LLC since 2007
Specialist, Environmental Client Services and Inside Business Development (2007)
Responsibilities included performing project management; serving as the primary contact for external clients; communicating client requirements to laboratory areas; auditing entries and reviewing sample data
Senior Specialist, Environmental Client Services and Inside Business Development (2013)
Responsibilities include performing project management; serving as the primary contact for external clients; communicating client requirements to laboratory areas; auditing entries and reviewing sample data

Nicole L. Maljovec, M.S., Manager, Environmental Client Services & Inside Business Development

Education:
B.S. Chemistry, St. Bonaventure University (2004)
M.S. Adolescence Education, D'Youville College (2005)

Professional Experience:
CYTEC Industries, Industrial Hygiene Internship (2003-2004)
Responsibilities included performing air monitoring and sampling; complying with OSHA standards; assisting R/D lab with the identification of unknown chemicals and wastes
Niagara Wheatfield, Environmental Science Teacher (2005-2006)
Responsibilities included teaching chemistry, chemistry lab, and environmental science; developing special education plans to assist students with learning disabilities
With Lancaster Laboratories since 2006
Specialist, Environmental Client Services (2006)
Responsibilities included performing project management; advising clients on testing; providing price quotes; monitoring turnaround time; auditing sample entries; answering client questions; communicating client requirements to lab areas; providing status reports, including results, to clients; scheduling sample submissions; ordering sampling containers
Senior Specialist Group Leader, Environmental Client Services (2007)
Responsibilities included performing project management; advising clients on testing; providing price quotes; monitoring turnaround time; auditing sample entries; answering client questions; communicating client requirements to lab areas; providing status reports, including results, to clients; scheduling sample submissions; ordering sampling containers; managing a team of client service representatives and administrative assistants, training of new employees, setting up and delegating new projects, serving as primary project manager for several large clients and consultants
Principal Specialist Group Leader, Environmental Client Services (2012)
Responsibilities included serving as the primary contact or back-up with the laboratory for a number of assigned clients requiring specialized testing or complex projects; understanding and communicating technical information and client requirements to laboratory personnel, helping to ensure that requirements are met; leading broad-based complex projects to a satisfactory conclusion according to client technical and schedule requirements; developing strong relationships with major accounts resulting in additional sales; advising and training other members of the department; serving as a technical resource both internally and externally; proactively assisting Outside Business Development with client visits, presentations, and internal audits for assigned clients; participating on PPI teams
Manager, Environmental Client Services & Inside Business Development (2014)
Responsibilities include overseeing all managerial operations of the department; managing the department in an efficient and financially sound manner; providing leadership and coaching to assigned individuals; participating in long-and short-term planning and goal-setting for the group; coordinating functions and responsibilities of assigned department members to provide consistent service; coordinating internal efforts between Environmental Client Services and other departments; relaying corporate information appropriately

Melissa McDermott, B.A., Inside National Sales Manager, Business Development, Environmental Sciences

Education:

- B.A. Biology, Millersville University (1992)
- Elementary Education Certification, PA (May 2009)
- Middle School Science Certification, PA (July 2009)

Continuing Education:

- Gas Chromatography Principles and Practices (1995)
- Conflict Resolution and Confrontation Skills Seminar (1996)
- Coaching Skills for Supervisors Seminar (1996)
- Waste Testing and Quality Assurance Symposium (1996)
- Entry Level Management (1997)
- How to Deliver Exceptional Customer Service Seminar (1997)
- Statistics at Lancaster Laboratories (2006)

Professional Experience:

- With Eurofins Lancaster Laboratories since 1992
  - Chemist, EPH/Misc. GC (1993)
    - Responsibilities included performing analysis of environmental samples for metals by AA flame and cold vapor generation; assembling client data packages
  - Chemist Coordinator, EPH/Misc. GC (1996)
    - Responsibilities included coordinating rush work; communicating with client service representatives regarding sample status; answering client questions; generating employee job plans; conducting employee evaluations
  - Senior Chemist, EPH/Misc. GC (1997)
    - Responsibilities included performing analysis of environmental samples for DRO and interpretive TPH analyses; verifying analyses performed by other analysts; preparing standards; revising departmental SOPs; method development; reviewing data packages
  - Senior Specialist, Environmental Client Services (1997)
    - Responsibilities included auditing sample entry; answering client questions; communicating client requirements to lab areas; providing status reports, including results, to clients; scheduling sample submissions and providing sampling containers
  - Senior Chemist, EPH/Misc. GC (2002)
    - Responsibilities included reviewing and approving data; writing departmental methods; reviewing and approving data packages; acting as technical resource within department; answering client questions; monitoring and performing QA metrics
  - Senior Specialist, Environmental Client Services (2007)
    - Responsibilities included acting as technical resource between client services and laboratories; scheduling sample submissions and providing sampling containers; communicating client requirements to lab areas
  - Senior Chemist, EPH/Misc. GC (2009)
    - Responsibilities included reviewing and approving data; writing departmental methods; reviewing and approving data packages; acting as technical resource within department; answering client questions; monitoring and performing QA metrics
  - Senior Chemist Group Leader, Pesticides (2011)
    - Responsibilities included performing routine and non-routine instrumental analyses of QC and clients' samples for pesticides, PCBs, herbicides, and other related compounds in accordance with departmental methods and standard operating procedures (SOPs); assisting in implementing special client requests; identifying and offering solutions to correct instrument problems and causes of QC problems; reviewing data for accuracy and completeness (for both routine and non-routine analyses, reports, or data packages); serving as a technical resource for the department; performing both technical and personnel aspects of group operations; performing work within the department or other areas as required; acting as a technical resource, trainer, and troubleshooter to specific department; making recommendations for operational and/or technical improvements; communicating effectively within the group; coaching and developing direct reports; planning and monitoring workflow
  - Principal Specialist, Environmental Business Development (2014)
    - Responsibilities included using company literature, verbal discussions, formal written quotes, proposals, tours, and audits to independently secure new business consistent with operational capabilities and business plan goals; collaborating efforts and activities with those of Outside Sales account managers as needed; focusing on proposal writing for major national accounts; attending face-to-face sales meetings with selected national accounts as needed and maintaining responsibility for their maintenance and growth
  - Inside National Sales Manager, Business Development, Environmental Sciences (2015)
    - Responsibilities include overseeing all managerial operations of the department; managing the department in an efficient and financially sound manner; providing leadership and coaching to assigned individuals; participating in long-and short-term planning and goal-setting for the group; coordinating functions and responsibilities of assigned department members to provide consistent service; relaying corporate information appropriately

Roy R. Mellott Jr., B.S., Senior Chemist Group Leader, GC/MS Volatiles

Education:

B.S. Biology, Millersville University (1993)

Continuing Education:

Hazardous Waste Disposal, LLU (1996)
GC: Principles & Practices, LLU (1997)
GC/MS: Applications/Troubleshooting Seminar, ECS/MDL Systems, Inc. (1999)
Introduction to Interpretation of Mass Spectra, LLU (2005)
Interpretation of Mass Spectra, Intermediate, LLU (2005)
Role of the Leader 1 – Giving Recognition, LLU (2007)
Role of the Leader 2 – Clarifying Performance Expectations, LLU (2007)
Role of the Leader 3 – Developing Others, LLU (2007)
Role of the Leader 4 – Providing Constructive Feedback, LLU (2007)
PPI Team Training, LLU (2010)
PPI Facilitator Workshop, LLU (2010)
Targeted Selection, LLU (2010)
Role of the Leader Building Team Pride and Purpose, LLU (2011)
Role of the Leader Resolving Conflicts with Your Peers, LLU (2011)

Professional Experience:

With Eurofins Lancaster Laboratories since 1995

Senior Lab Tech I, GC/MS Volatiles (1995)

Responsibilities included requisitioning samples; performing sample storage, prescreening, discard, hazardous waste disposal; tracking down missing samples by various means

Chemist/Auditor, GC/MS Volatiles (1996)

Responsibilities included performing analysis of waters, soils, and other matrices for VOCs via various analytical methods; evaluation of analytical data; calibrating and troubleshooting various GC/MS equipment; evaluation/review of analyst-generated data; corresponding with analysts about possible trends (whether analyst- or system-related) in generated data; evaluation/review of corrections of problems with generated data

Senior Chemist, GC/MS Volatiles (2002)

Responsibilities included performing analysis of waters, soils, and other matrices for VOCs via various analytical methods; evaluation of analytical data; setting up, calibrating, and troubleshooting various GC/MS equipment; evaluation/review of analyst-generated data; corresponding with analysts about possible trends (whether analyst- or system-related) in generated data; evaluation/review of corrections of problems with generated data; updating/correcting SOPs and laboratory and analytical procedures; preparation, tracking and documentation of analytical standards used in the laboratory; training of new employees to the department

Senior Chemist Group Leader, GC/MS Volatiles (2005)

Responsibilities include performing analysis of waters, soils, and other matrices for VOCs via various analytical methods; evaluation of analytical data; setting up, calibrating, and troubleshooting various GC/MS equipment; evaluation/review of analyst-generated data; corresponding with analysts about possible trends (whether analyst- or system-related) in generated data; evaluation/review of corrections of problems with generated data; updating/correcting SOPs and laboratory and analytical procedures; preparation, tracking and documentation of analytical standards used in the laboratory; training of new employees to the department

Memberships & Appointments:

Nature Conservancy (1998-present)
Eurofins Lancaster Laboratories
Ethics Committee (1999-2003)
Lancaster Herpetological Society
Treasurer (2005-present)
HabitatMT (2011-present)

Jessica L. Miller, B.S., Senior Chemist, Pesticide Residue Analysis

Education:

B.S. Chemistry, Cedar Crest College (2011)

Continuing Education:

Gas Chromatography Principles and Practice (2011)
Agilent Breaking Bad Chromatography Habits Seminar (2014)

Professional Experience:

With Eurofins Lancaster Laboratories since 2011
- Chemist, Pesticide Residue Analysis (2011)
  - Responsibilities included performing pesticide residue analysis; prescreening samples; calibrating, reviewing, and uploading data
- Senior Chemist, Pesticide Residue Analysis (2014)
  - Responsibilities include performing pesticide residue analysis; prescreening samples; calibrating, reviewing, and uploading data

Memberships and Appointments:

Psi Chi
- Member (2009)

Gamma Sigma Epsilon
- Member (2011)

Megan A. Moeller, B.S., Senior Specialist, Environmental Client Services

Education:

B.S. Environmental Science, University of Delaware (1999)

Professional Experience:

With Lancaster Laboratories since 1999
- Sample Administration/Client Service Specialist, Environmental Client Services (2003)
  - Responsibilities included Interpretation and entry of incoming samples. Route samples to the correct locations. Assist Client Service representatives with auditing, reviewing reports, and reviewing invoices.
- Specialist, Environmental Client Services (2004-2006)
  - Responsibilities included managing projects, prepare quotations, audit sample entries, answer client questions, communicate client requirements to lab areas, schedule sample submissions, and provide sample containers.
- Senior Specialist, Environmental Client Services (2006)
  - Responsibilities include managing projects, prepare quotations, audit sample entries, answer client questions, communicate client requirements to lab areas, schedule sample submissions, and provide sample containers.

Chad A. Moline, B.S., Senior Specialist, GC/MS Volatiles

Education:

B.S. Environmental Studies, Slippery Rock University (1998)
Teaching Certification, Secondary Education, Millersville University (2003)

Professional Experience:

Centre Analytical Laboratories, Lab Technician (1999-2000)
- Responsibilities included running various wet chemistry analyses

Lancaster Laboratories, Chemist/Senior Chemist (2000-2005)
- Responsibilities included maintaining GC/MS instrumentation

Warwick School District, Science Teacher (2005-2006)
- Responsibilities included teaching chemistry and physics to 8th grade students

Conestoga Valley School District, Science Teacher (2006-2007)
- Responsibilities included teaching chemistry and earth science to 8th grade students

With Eurofins Lancaster Laboratories since 2007
- Senior Chemist Group Leader, GC/MS Semivolatiles (2007)
  - Responsibilities included monitoring workflow; meeting client turnaround times
- Senior Chemist, GC/MS Semivolatiles (2012)
  - Responsibilities included maintaining and operating GC/MS instrumentation
- Senior Specialist, GC/MS Volatiles (2014)
  - Responsibilities include performing technical audit of GC/MS volatiles data in a timely manner with zero defects as a goal; acting as a technical resource to department; evaluating issues in technical data and suggesting possible solutions; performing sample/QC verification in the LIMS; reviewing analytical reports; evaluating and interpreting analytical results; writing and revising SOPs; assisting in responding to and eliminating ICARs; making recommendations for technical improvements; communicating effectively within department; completing assigned tasks on time; assisting in "brainstorming" client problems and projects; performing all duties with minimal supervision

Jennifer L. Moyer, B.S., Senior Specialist, Metals

Education:

B.S. Chemistry, Lock Haven University (2000)

Professional Experience:

Lock Haven University, Lab Tech (1996-1998)

Responsibilities included setting up labs; stocking and setting up stock rooms; helping professors with projects

Croda Inc., Process Development Chemist (1998-2000)

Responsibilities included developing and improving procedures on existing products

With Lancaster Laboratories since 2000

Chemist, Metals (2000)

Responsibilities included running and maintaining ICP instruments

Chemist, Metals (2002)

Responsibilities included running and maintaining Graphite Furnace Atomic Absorption instruments

Group Leader/Specialist, Metals (2003)

Responsibilities included overseeing Graphite Furnace Atomic Absorption and Mercury analysts

Senior Specialist, Metals (2007)

Responsibilities include verifying ICP, GFAA, Mercury, and ICP-MS

Kevin T. Moran, M.B.A., Senior Specialist Account Manager, Environmental Business Development/Sales

Education:

B.S. Marine Engineering, U.S. Merchant Marine Academy (1972)

M.B.A. Marketing, Babson College (1981)

Professional Experience:

SAIC, Regional Sales Manager (1994-1999)

Responsibilities included selling process treatment equipment for groundwater remediation to environmental consulting companies and industrial end users; managing a staff of seven engineers and technicians engaged in operating and constructing groundwater treatment systems

Mantech Environmental, Marketing Manager (1999-2000)

Responsibilities included developing strategy to target industrial customers with multiple sites for an innovative groundwater remediation technology

Hazleton Environmental, Marketing Manager (2000-2003)

Responsibilities included developing marketing strategy for sales of process treatment equipment to industrial and municipal users; aiding company in breaking into DOD market for treatment equipment

With Eurofins Lancaster Laboratories since 2003

Senior Specialist Account Manager, Environmental Business Development/Sales (2003)

Responsibilities include managing and growing revenue at assigned industrial accounts; using selling skills to add new industrial and environmental consulting firms for analytical services in New York, New Jersey, and New England

Kathrine K. Muramatsu, B.S., Senior Chemist Group Leader, GC/MS Volatiles

Education:

B.S. Chemistry, University of Colorado (2005)

Continuing Education:

Forensic Science and DNA Testing Certification (2006)

24-Hour Emergency Response (HAZWOPER), Lancaster Laboratories (2009)

American Heart Association (AHA)/American Red Cross certified, Lancaster Laboratories (2009)

Professional Experience:

With Eurofins Lancaster Laboratories since 2007

Chemist, Analytical Chemistry, Professional Scientific Staffing – CO (2007)

Responsibilities included ensuring compliance with cGMPs; performing analysis of system water, clean in place (CIP) samples, clean out of place (COP) samples, and other sample types; methods used were total organic carbon (TOC), pH, conductivity, Limulus Amebocyte Lysate (LAL), and UV spectroscopy

Chemist, GC/MS Volatiles (2007)

Responsibilities included analyzing environmental samples of various sample matrices using purge and trap GC/MS; generating and reviewing raw data; performing instrument maintenance as needed

Chemist Group Leader, GC/MS Volatiles (2009)

Responsibilities included supervising and mentoring personnel; coordinating daily workload through prioritizing and scheduling; processing monthly metrics for the department; verifying sample data; analyzing environmental samples of various sample matrices using purge and trap GC/MS; generating and reviewing raw data; performing instrument maintenance as needed

Senior Chemist Group Leader, GC/MS Volatiles (2014)
Responsibilities include supervising and mentoring personnel; coordinating daily workload through prioritizing and scheduling; processing monthly metrics for the department; verifying sample data; analyzing environmental samples of various sample matrices using purge and trap GC/MS; generating and reviewing raw data; performing instrument maintenance as needed

Awards, Citations, Honorary Societies, and Publications
Dean's List (2002)
Colorado Scholars (2002-2005)
Superlative Service Award (2010)
Two publications in the Journal of Organic Chemistry

Memberships and Appointments:
American Chemical Society

Charles J. Neslund, B.S., Technical Director, Volatiles in Air and Specialty Services Group, Eurofins Lancaster Laboratories Environmental

Education:
B.S. Chemistry, University of Pittsburgh (1982)

Continuing Education:
Graduate studies in organic chemistry, University of Pittsburgh (1983)

Professional Experience:
Lancaster Laboratories (1984-1996)
Chemist (1986)
Group Leader (1987)
Chemist (1991)
OI Analytical, Sales Representative (1996)
With Eurofins Lancaster Laboratories since 1997
Group Leader, GC/MS Semivolatiles (1997)
Responsibilities included supervising personnel; scheduling lab work; managing laboratory operations and financial resources; project management; data interpretation; reviewing and approving data; developing and evaluating new methods; consulting with clients regarding testing needs; revising and updating SOPs and analytical methods
Manager, GC/MS Semivolatiles and Volatiles in Air (2005)
Responsibilities included supervising personnel; scheduling lab work; managing laboratory operations and financial resources; project management; data interpretation; reviewing and approving data; developing and evaluating new methods; consulting with clients regarding testing needs; revising and updating SOPs and analytical methods
Manager, Volatiles in Air and Specialty Services Group (2007)
Responsibilities included supervising personnel; scheduling lab work; managing laboratory operations and financial resources; project management; data interpretation; reviewing and approving data; developing and evaluating new methods; consulting with clients regarding testing needs; revising and updating SOPs and analytical methods; marketing specialty services capabilities; conducting technical presentations
Technical Director, Volatiles in Air and Specialty Services Group, Eurofins Lancaster Laboratories Environmental (2014)
Responsibilities include leading departments in accordance with vision, values, and strategic goals of company; overseeing and facilitating efficient operations and systems, sound business practices, consistent client service, and motivated staff

Awards, Citations, Honorary Societies & Publications:
Dawson-Grundmann Innovation Award (1995)

Memberships & Appointments:
American Chemical Society (ACS)
Chromatography Forum of the Delaware Valley (CFDV)
Past member of Executive Committee of the Chromatography Forum of the Delaware Valley
Air & Waste Management Association (A&WMA)
Society of Environmental Toxicology and Chemistry (SETAC)
Sediment Management Workgroup (SMWG)

Deborah A. Neslund, Senior Specialist, Environmental Sample Administration

Professional Experience:

- Lancaster General Hospital, Phlebotomist (1976-1977)
- Fairfax Hospital, LPN (1978)
- Lancaster General Hospital, Phlebotomist/EKG Technician (1980-1986)
- With Eurofins Lancaster Laboratories since 1986
  - Senior Specialist Coordinator, Environmental Sample Administration (1986)
    - Responsibilities included supervising personnel; directed flow of samples to include prioritization to meet hold times and standards set for rush and other samples; developed and improved systems for efficiency within SA; represented SA in communications with Technical Groups, Client Services, and other support areas; logged-in samples
  - Senior Specialist Group Leader, Environmental Sample Administration (2005)
    - Responsibilities included supervising personnel; directed flow of samples to include prioritization to meet hold times and standards set for rush and other samples; developed and improved systems for efficiency within SA; represented SA in communications with Technical Groups, Client Services, and other support areas; logged-in samples
  - Senior Specialist (2013)
    - Responsibilities include directing flow of samples to include prioritization to meet hold times and standards set for rush and other samples; developing and improving systems for efficiency within SA; representing SA in communications with Technical Groups, Client Services, and other support areas; logging-in samples

Ryan V. Nolt, B.S., Manager, GC/MS Volatiles and Equipment Maintenance & Repair

Education:

- B.S. Chemistry, Millersville University (1997)

Professional Experience:

- With Eurofins Lancaster Laboratories since 1996
  - Clerk II, Sample Support (1996)
    - Responsibilities included performing ASRS operations, preserving incoming samples, homogenizing samples, packing bottle orders, and performing sample discard
  - Senior Technician, ExpressLAB (1997)
    - Responsibilities included performing sample dilutions, preparing standards, prepping samples, and setting up new instruments
  - Chemist, GC/MS Volatiles (1998)
    - Responsibilities included performing purge and trap and GC/MS maintenance; tuning and calibrating GC/MS system; analyzing samples; reviewing, working up, and assembling all supporting data; and preparing new standards
  - Senior Chemist Coordinator, GC/MS Volatiles (2000)
    - Responsibilities included performing routine and non-routine laboratory analysis; diagnosing and solving technical problems; implementing improvements to maximize quality; maintaining and troubleshooting instruments; writing and revising SOPs; validating new methods and equipment; assigning new work to instrument groups and monitoring productivity; training new analysts
  - Principal Chemist Group Leader, GC/MS Volatiles (2005)
    - Responsibilities included performing routine and non-routine laboratory analysis; diagnosing and solving technical problems; implementing improvements to maximize quality; maintaining and troubleshooting instruments; writing and revising SOPs; validating new methods and equipment; assigning new work to instrument groups and monitoring productivity; training new analysts
  - Manager, GC/MS Volatiles (2014)
    - Responsibilities included performing a variety of technical and administrative tasks to develop, evaluate, and supervise staff; planning and monitoring work flow; designing, implementing, and utilizing departmental operations systems; promoting safety; remaining current on technical developments in the area of GC/MS volatiles; communicating with clients; maintaining a strong commitment to quality
  - Manager, GC/MS Volatiles and Equipment Maintenance & Repair (2015)
    - Responsibilities include performing a variety of technical and administrative tasks to develop, evaluate, and supervise staff; planning and monitoring work flow; designing, implementing, and utilizing departmental operations systems; promoting safety; remaining current on technical developments in the area of GC/MS volatiles; communicating with clients; maintaining a strong commitment to quality

Stephen Nowakowski, B.S., Senior Specialist, Safety

Information not available at time of printing

Wanda Oswald, Senior Scientist Group Leader, Organic Extraction
Information not available at time of printing

Anneliese H. Owen, M.B.A., Manager, Environmental Sample Administration
Education:
- B.S. Molecular and Cell Biology, Pennsylvania State University (1986)
- M.B.A. Pennsylvania State University (1993)

Professional Experience:
- With Lancaster Laboratories since 1986
  - Coordinator (1987)
  - Client Services Specialist (1988)
  - Business Development Specialist (1990)
  - Group Leader, Environmental Sample Administration (1992)
    - Responsibilities included: supervise personnel; manage laboratory operations and financial resources; sample interpretation and entry; and monitor corrective action for quality issues.
  - Manager, Environmental Sample Administration (2005)
    - Responsibilities include: supervise personnel; manage laboratory operations and financial resources; sample interpretation and entry; and monitor corrective action for quality issues.

Linda C. Pape, B.A., Senior Chemist, GC/MS Volatiles
Education:
- B.A. Business Administration, Milsaps College (1985)

Professional Experience:
- Rite Aid Pharmacy, Store Manager (1985-1989)
  - Responsibilities included being responsible for overall maintenance and security of merchandise, store, and property; ordering and display of all merchandise; auditing daily cash and inventory reports; scheduling employees; payroll accounting; training of new and prospective personnel
- With Lancaster Laboratories since 1993
  - Chemist, Volatiles by GC (1993)
    - Responsibilities included analyzing client-submitted samples and their associated quality control samples by purge-and-trap gas chromatography; reviewing and uploading the corresponding data in an efficient manner with a high degree of accuracy and quality; evaluating current organizational and analytical systems; suggesting and implementing necessary corrective action to ensure the above can be performed in alignment with client and/or regulatory requirements; initiating and leading technical projects to a timely, accurate, and efficient conclusion while meeting client and/or regulatory requirements with a high degree of quality
  - Chemist, Water Quality (2000)
    - In addition to responsibilities listed above performed CN distillation, PO_4 digestion, and phenol distillation during a 3-month time frame
  - Senior Chemist, Volatiles by GC (2007)
    - Responsibilities included analyzing client-submitted samples and their associated quality control samples by purge-and-trap gas chromatography; reviewing and uploading the corresponding data in an efficient manner with a high degree of accuracy and quality; performing final review (verification) of data for clients (adding appropriate comments as necessary); evaluating current organizational and analytical systems; suggesting and implementing necessary corrective action to ensure the above can be performed in alignment with client and/or regulatory requirements; initiating and leading technical projects to a timely, accurate, and efficient conclusion while meeting client and/or regulatory requirements with a high degree of quality; training new employees in Volatiles by GC soils
  - Senior Chemist, Volatiles by GC/MS (2008)
    - Responsibilities included analyzing client-submitted samples and their associated quality control samples by purge-and-trap gas chromatography/mass spectrometry; reviewing and uploading the corresponding data in an efficient manner with a high degree of accuracy and quality; performing final review (verification) of data for clients (adding appropriate comments as necessary); evaluating current organizational and analytical systems; suggesting and implementing necessary corrective action to ensure the above can be performed in alignment with client and/or regulatory requirements; initiating and leading technical projects to a timely, accurate, and efficient conclusion while meeting client and/or regulatory requirements with a high degree of quality; training new employees
  - Senior Chemist, GC/MS Volatiles (2009)
    - Responsibilities include analyzing client-submitted samples and their associated quality control samples; reviewing and uploading the corresponding data in an efficient manner with a high degree of accuracy and quality; performing final review (verification) of data for clients (adding appropriate comments as necessary); evaluating current organizational and analytical systems; suggesting and implementing necessary corrective action to ensure the above can be performed in alignment with client and/or regulatory requirements; initiating and leading technical projects to a timely, accurate, and efficient conclusion while meeting client and/or regulatory requirements with a high degree of quality; training new employees

James H. Place, B.S., Senior Chemist, Pesticide Residue Analysis

Education:

B.S. Physical Science, York College of Pennsylvania (1997)

Professional Experience:

AMZ Corporation, Laboratory Technician (1998-2000)

Responsibilities included performing analysis and maintenance of chemical compositions pertaining to electroplating baths

Nichia America Co., Laboratory Technician (2000-2001)

Responsibilities included performing analysis of phosphorus for composition of pigments; performing sample screening and AA analysis

AMZ Corporation, Laboratory Technician (2001-2003)

Responsibilities included performing analysis and maintenance of chemical compositions pertaining to electroplating baths; conducting inventory and ordering chemicals

With Lancaster Laboratories since 2003

Chemist, Pesticide Residue Analysis (2003)

Responsibilities include performing routine and non-routine instrumental analyses of QC and clients' samples for pesticides, PCBs, herbicides, and other related compounds in accordance with departmental methods and SOPs; achieving quality results within the time-frame expected by our clients with minimal daily supervision; maintaining the GCs or HPLCs used for routine analyses; identifying and correcting common instrument or QC problems

Senior Chemist, Pesticide Residue Analysis (2008)

Responsibilities include performing routine and non-routine instrumental analyses of QC and clients' samples for pesticides, PCBs, herbicides, and other related compounds in accordance with departmental methods and SOPs; assisting in implementing special client requests; identifying and offering solutions to correct instrument problems and causes of QC problems; reviewing data for accuracy and completeness (for both routine and non-routine analyses, reports, or data packages); serving as a technical resource for the department

Kaitlin N. Plasterer, B.S., Senior Specialist, Environmental Client Services

Education:

B.S. Chemistry/Business, Arcadia University (2010)

Professional Experience:

With Eurofins Lancaster Laboratories since 2011

Specialist, Environmental Client Services (2011)

Responsibilities included serving as the primary contact for assigned clients; understanding basic technical issues and working with management to achieve problem resolution with clients; auditing incoming client paperwork for accuracy and making necessary corrections; assisting Senior Specialists with auditing as needed; identifying problems and suggesting solutions; maintaining knowledge of regulatory requirements and changes that may affect clients

Senior Specialist, Environmental Client Services (2014)

Responsibilities include acting as the environmental client liaison within the laboratory by communicating client's requirements to the technical staff by maintaining project-related documentation, communicating desired turnaround times, and managing information flow; facilitating and organizing client audits, visits, and conference calls; monitoring ongoing projects and providing status updates as needed; auditing client sample paperwork and resolving discrepancies; overseeing the general administration of environmental projects (issuing quotations, answering billing and reporting questions, and scheduling sample pickups); managing a combination of routine, non-routine, and complex client projects; initiating improvements to drive efficiencies; assisting in training; updating training documents and SOPs as appropriate

Awards, Citations, Honorary Societies, and Publications:

Phi Beta Delta Honors Society for Excellence in international education (2010)

Christine M. Ratcliff, B.S., Principal Specialist Group Leader, Specialty Services Group

Education:

B.S. Chemistry, Shippensburg University (1988)

Continuing Education:

Mass Spectral Interpretation, Finnigan MAT Institute (1990)

Professional Experience:

With Eurofins Lancaster Laboratories since 1988

- Chemist (1991)
- Coordinator (1994)
- Group Leader (1996)
- Senior Chemist/Coordinator (1997)
- Senior Chemist (2002)
  - Responsibilities included reviewing and approving data; revising and updating SOPs and analytical methods; reviewing lab data
- Senior Specialist, GC/MS Semivolatiles (2005)
  - Responsibilities included reviewing and approving data; revising and updating SOPs and analytical methods; reviewing lab data
- Principal Specialist, GC/MS Semivolatiles (2009)
  - Responsibilities included reviewing and approving data; revising and updating SOPs and analytical methods; reviewing lab data; performing technical audit of GC/MS semivolatiles data in a timely manner
- Principal Specialist, Volatiles in Air (2009)
  - Responsibilities included reviewing and approving data; revising and updating SOPs and analytical methods; reviewing lab data; performing technical audit of Volatiles in Air, GC/MS semivolatiles, and GC/MS volatiles data in a timely manner
- Principal Specialist, Volatiles in Air (2009)
  - Responsibilities included reviewing and approving data; revising and updating SOPs and analytical methods; reviewing lab data; performing technical audit of Volatiles in Air, GC/MS semivolatiles, GC/MS volatiles, and dioxans and furans data in a timely manner
- Principal Specialist Group Leader, Specialty Services Group (2014)
  - Responsibilities include reviewing and approving data; revising and updating SOPs and analytical methods; reviewing lab data; performing technical audit of Volatiles in Air, GC/MS semivolatiles, GC/MS volatiles, and dioxans and furans data in a timely manner; performing both technical and personnel aspects of group operations; performing work within the department or other areas as required; acting as a technical resource, trainer, and troubleshooter to specific department; making recommendations for operational and/or technical improvements; communicating effectively within the group; coaching and developing direct reports; planning and monitoring workflow; monitoring data for and supporting departmental MOS

Mark A. Ratcliff, B.A., Senior Specialist, GC/MS Semivolatiles

Education:

B.A. Physics, Franklin & Marshall College (1988)

Continuing Education:

Finnegan Mass Spectral Interpretation Course (1991)

Professional Experience:

With Eurofins Lancaster Laboratories since 1989

- Chemist (1992)
- Senior Chemist (1996)
  - Responsibilities included performing GC/MS semivolatiles testing; operating GC/MS instruments; data interpretation; calibrating and repairing instruments; preparing standards; revising and updating SOPs; training other analysts
- Senior Specialist, GC/MS Semivolatiles (2005)
  - Responsibilities include performing GC/MS semivolatiles testing; operating GC/MS instruments; data interpretation; calibrating and repairing instruments; preparing standards; revising and updating SOPs; training other analysts

Barbara F. Reedy, B.S., Senior Specialist, Environmental Quality Assurance

Education:

B.S. Environmental Biology, Millersville University (1993)

Continuing Education:

Environmental GC Analysis Seminar, Restek (2001)
The Internet Audit A Quality Tool, PaAAEL (2001)
Advanced Gas Chromatography Mass Spectroscopy Seminar, PaAAEL (2002)
LC/MS/MS System Seminar, Applied Biosystems (2006)
Introduction to Root Cause Analysis, Patton Professional (2007)
When to Initiate Corrective Action, Patton Professional (2007)
Practical Process Improvement Training in the role of Team Member (2008)
GC Pesticide/PCB's Analysis Training Seminar (2008)
NY/PAAAEL Annual Meeting - Internal & Electronic Audits: Satisfying Regulatory Requirements, Corrective and Preventive Actions, Ethics and Data Integrity Training (2009)
Environmental Laboratory Assessment Basic Assessor Training – TNI Standard 2009 (2012)

Professional Experience:

Department of Environmental Resources, Division of Rivers and Wetlands, Scientific Intern (1993)
Responsibilities included reviewing wetland permits applications; inspecting and photographing wetland mitigation sites; determining hydrology, soil type, and the consistency of the mitigation with the approved project plans; researching records of the sites

With Eurofins Lancaster Laboratories since 1993
Associate Chemist/Chemist, Volatiles by GC (1993)
Responsibilities included calibrating Capillary, VOA, BTEX, and FID instruments; performing routine maintenance; interpreting, reviewing, and uploading data
Senior Chemist, Volatiles by GC (1999)
Responsibilities included being primary verifier for the majority of data for Volatiles by GC for the ELCD/PID and FID for both waters and soils; signing of analytical reports; generating statistically determined QC windows; training new analysts to review and upload data into the LIMS
Senior Specialist, Environmental Quality Assurance (2001)
Responsibilities include ensuring quality of data being produced in the laboratories by performing data review, auditing laboratories, and reviewing written procedures; ensuring laboratory adherence to government regulations and client requirements; reviewing client and government documents for requirements outside our usual laboratory practices; setup and testing new analysis in the laboratory sample management system as required by the departments; maintaining documentation of agency certifications

Memberships & Appointments:

Pennsylvania Association of Accredited Laboratories (2013-present)

Beth A. Rich, Senior Specialist, Safety

Professional Experience:

With Eurofins Lancaster Laboratories since 1998
Senior Administrator, Human Resources (1998)
Responsibilities included entering and maintaining employee information in system; photocopying, filing, maintaining personnel files; tracking mid-year and annual job plan completion; following up on exit interviews and other HR admin and support
Specialist, Human Resources (2005)
Responsibilities included maintaining a high level of human resource generalist knowledge to support all personnel in the HR department and to serve all employees
Senior Specialist, Human Resources (2010)
Responsibilities included maintaining a high level of human resource generalist knowledge to support all personnel in the HR department and to serve all employees
Senior Specialist, Safety (2013)
Responsibilities include managing worker's compensation and return to work programs; coordinating annual health screenings, flu shots, and blood bank donations; setting up new site worker's compensation systems as needed; filing incident reports and tracking recordable incidents; coordinating special medical programs as needed

John R. Riggs, Jr., B.S., Senior Specialist Group Leader, Environmental Software Development

Education:

B.S. Professional Studies (Computer Science/Mathematic), Misericordia University (1994)

Continuing Education:

Masters Business Administration, Elizabethtown College (Expected graduation date: 2015)

Professional Experience:

Nissin Foods, Inc., Distribution Supervisor/IT Engineer (1994-1998)

Responsibilities included acting as a liaison between local and corporate management teams; supervised the activities of multiple teams of material handlers engaged in receiving, storing, and shipping finished goods; ensured the accuracy of orders and inventory to meet customer demand; maintained documentation and prepared reports which reflected the effectiveness and efficiency of department activities; Implemented warehouse safety procedures and hold regular safety meetings; established and recommended changes to policies to improve the organization; supported and maintained Novell servers and backups; administered user accounts and email; configured new desktop machines and maintained existing work stations

AVAR, Project Manager/Lead Developer (1998-2014)

Responsibilities included directing the planning, design, production and management of applications and data centers; lead a development team in creating software applications to provide business solutions; acted as a point of contact for vendors, business units, and Information Technology partners during integration of projects, administering schedules and communicating risks; conducted meetings, helping to facilitate communication and maximize productivity; coordinated the work of multiple teams to support applications for data management systems; oversaw creation and maintenance of all unit and system testing plans; supervised the generation of documentation and technical guides for end users; prepared and deliver end-user training

With Eurofins Lancaster Laboratories since 2014

Senior Specialist Group Leader, Environmental Software Development (2014)

Responsibilities include providing technical support for maintenance of installed software applications and assisting with the development, installation, and maintenance of new applications for general use; assisting in development, implementation, and maintenance of software intended to improve the quality and efficiency of work performed

Heidi L. Roberts, B.S., Senior Chemist, Organic Extraction

Education:

B.S. Environmental Science/Biology, Kutztown University (1996)

Continuing Education:

P.E. Spectroscopy Seminar, Perkin Elmer (1998)
Statistics, LLU (1999)
Pharm. Calc. Class, LLU (1999)
LLI Leadership Training (2000)
Practical Process Improvement Team Member Training (2008)
Practical Process Improvement Facilitator Training (2010)

Professional Experience:

M.J. Reider Associates, Lab Technician (1996-1997)

Responsibilities included organics prep/method development for HEM/various wet chemistry analyses

With Eurofins Lancaster Laboratories since 1997

Chemist, Metals (1998)

Responsibilities included performing metals analyses, maintenance of instruments, verification of analyses, analyzed GMP samples, administered quad studies, MDL studies, IDL studies

Coordinator, Metals (1999)

Responsibilities included coordination of GFAA/FAA/Hg group, verification of analyses, instrument maintenance and operation, updating of SOPs, training records, quad studies, MDLs, and IDLs, performed GMP analyses

Coordinator/Specialist, Environmental Client Services (2001)

Responsibilities included supervising Commercial Account Team and administrators, handle miscellaneous and homeowner calls, prepare bottle orders, audit sample paperwork, monitor sample progress, and handle client concerns

Senior Specialist Group Leader, Environmental Client Services (2005)

Responsibilities included supervising Account Management Team and administrator, work with team members on continual process improvement, manage several large client accounts, prepare bottle orders, audit sample paperwork, monitor sample progress, and handle client concerns

Senior Chemist, Organic Extraction (2007)

Responsibilities include performing non-routine extractions, scheduling prep work, verification of prepped batches, processing MOS reports, updating EtQ for DP36, point person for project rollouts

Memberships and Appointments:

Ethics Committee, Lancaster Laboratories (1998)
MOS Process Improvement Team, Lancaster Laboratories (2005)

Nicholas R. Rossi, M.S., Senior Chemist, EPH/Misc. GC

Education:

B.S. Biology, Messiah College (2005)
M.S. Environmental Pollution Control, Penn State Harrisburg (2011)

Professional Experience:

Vermont Agency of Agriculture, Laboratory Technician/Sample Collector (2004-2005)
Responsibilities included collecting water samples from agricultural sites and extracting samples in the lab
With Eurofins Lancaster Laboratories since 2005
Chemist, GC/MS Volatiles (2005)
Responsibilities included organizing batches of samples, sample preparation, analyzing soil and water samples for volatile organic compounds using purge and trap GC-MS, instrument maintenance, and performing a level II audit on data prior to verification; processing plan improvement (PPI) team to reduce the amount of errors in the prescreen department; evaluating the process, implementing changes, and tracking results
Chemist, EPH/Misc. GC (2011)
Responsibilities included analyzing routine and non-routine samples and their associated quality control samples by gas chromatography; reviewing and reporting the corresponding data; maintaining, optimizing, and calibrating equipment (functions are to be performed in an efficient manner with a high degree of accuracy and quality); assisting in organization of related departmental work and in sample preparation (as required) to consistently meet client turnaround time requirements
Senior Chemist, EPH/Misc. GC (2013)
Responsibilities include performing routine and non-routine instrumental analyses of QC and clients' samples for total petroleum hydrocarbons, diesel range organics, and other miscellaneous organic compounds in accordance with departmental methods and SOPs; assisting in implementing special client requests; identifying and offering solutions to correct instrument problems and causes for QC problems; reviewing data for accuracy and completeness for routine and non-routine analyses, reports, or data packages; serving as a technical resource for the department

Memberships and Appointments:

American Chemical Society (2010)
Pennsylvania Department of Environmental Professionals (2011)

Beth A. Rubino, B.S., Senior Specialist, GC/MS Semivolatiles

Education:

B.S. Environmental Resource Management, Pennsylvania State University (1984)

Professional Experience:

Roy F. Weston, Inc., Chemist (1984-1997)
Responsibilities included extraction laboratory unit leader. Managed staff, sample flow, and scheduling on organic extractions to meet hold time requirements; trained personnel on extraction methods and SOP's; performed field sampling and field laboratory responsibilities
Performed GC/MS sample analysis of semi-volatiles, data interpretation, and instrument maintenance
RECRA Environmental, Inc, Senior Chemist (1997-2001)
Responsibilities included technical support for the GC/MS unit; managed staff, sample flow, and scheduling to meet customer's requirements; conducted training on GC/MS analysis, its software, interpretation, and procedure awareness
Lionville Laboratory, Inc, Data Lead Chemist (2001-2013)
Responsibilities included technical support for GC/MS data review and logbook quality assurance and quality control; trained personnel on MS systems and SOP's; assured compliance with client requirements; Prepared and provided accurate and timely data to clients
With Eurofins Lancaster Laboratories since 2014
Senior Specialist, GC/MS Semivolatiles (2014)
Responsibilities include performing technical audit of GC/MS semivolatiles data in a timely manner with zero defects as a goal

Robin C. Runkle, B.S., Senior Specialist, GC/MS Volatiles

Education:

B.S. Chemistry, State University of New York at Oneonta (1988)

Continuing Education:

Introduction to Mass Spectral Interpretation, Finnigan Mat (1991)
Gas Chromatography: Practical Theory and Applications for LL (1993)
HP5890 GC Troubleshooting and Maintenance, Hewlett-Packard (1993)
Technical Training, OI Analytical (1995)

Professional Experience:

With Lancaster Laboratories since 1989

Senior Chemist (1993)

Responsibilities included: sample preparation; perform GC/MS volatile testing; operate GC/MS instruments; data interpretation; review and approve data; developing and evaluating new methods; calibrating and repairing instruments; prepare standards; reagent preparation; revise and update SOPs and analytical methods; order supplies; train other analysts; and prepare and test trip blank water.

Senior Specialist, GC/MS Volatiles (2005)

Responsibilities include: data review and verification, review and sign reports, respond to and work on client inquiries and ATF requests.

Michael S. Salgado, B.S., Senior Specialist, Training

Education:

B.S. Biology, Moravian College (2010)

Professional Experience:

Light Knowledge Resources, Scientific Writing Intern (2008-2009)

Responsibilities included researching and composing articles focusing on multiple myeloma, of which many have been published on their website The Myeloma Beacon

Indiana University Bloomington, IN, Undergraduate Researcher (2009-2009)

Responsibilities included researching in a virology lab and used techniques and tools such as SDS gel electrophoresis, PCR, RT-PCR, minipreps, sequence analysis, cell transformations and transfections, sterile microbial techniques, pouring plates and media preparation, streaking, colony counts, trouble shooting skills, mixers, balances, pH meters, laminar flow hoods, autoclaves, pipettes, and maintained cultures; the research aimed to formulate a strategy to analyze the role of the Reovirus µ1 membrane penetration protein in induction of apoptosis; the data compiled will be used in further research on this virus

Godiva Chocolatier, Technical Data Entry Technician (2010-2012)

Responsibilities included analyzing ingredient, allergen, regulatory, processing, SOP, audit, packaging and quality information and then shifted the data into their work-in-progress database to aid in Godiva's product lifecycle management project; validated the data entered for the product lifecycle management project and updated database specifications when changes were made to raw material specifications; aided coworkers in different departments in becoming familiar with the new data base and data entry process; actively participated in sensory testing with the sensory team to aid in product development; took part in editing audit, guideline, specification, and safety standard documents

With Eurofins Lancaster Laboratories since 2012

Biologist, Professional Scientific Staffing – PA or NJ (2012)

Responsibilities included performing tissue culture based potency assays on live vaccine products; process intermediates and related experimental samples; prepare solutions and culture media; maintain multiple cell lines; maintain records and test results following GMP

Senior Specialist, Training (2015)

Responsibilities include facilitating Core and Elective training for new employees; conducting orientations, internal courses, and other learning experiences

Grace M. Salm, Specialist Group Leader, Data Deliverables

Continuing Education:

Introduction to Personal Computers, Lancaster County Career and Technology Center (2000)
Windows, Lancaster County Career and Technology Center (2000)
PC Upgrading & Repair, Lancaster County Career and Technology Center (2000)

Professional Experience:

With Eurofins Lancaster Laboratories since 2000
Data Package Administrator, GC/MS Semivolatiles (2000)
Responsibilities included assembling departmental data in specific order; checking in data; filing batchlogs
Specialist, GC/MS Semivolatiles/Data Deliverables (2006)
Responsibilities included performing data assembly in department 4026; assemblers and reviewers became part of department 4038; reviewing data for departments 4026, 4021, and 4030
Specialist Group Leader, Data Deliverables (2010)
Responsibilities include scheduling for data package assembly/review; following up with corrections; assembly/review for 4032, 4037, and review for 4028; following up on CSR requests; conducting performance reviews for direct reports; updating SOPs

Richard A. Shober, B.S., Principal Chemist, Pesticide Residue Analysis

Education:

B.S. Chemistry, Muhlenberg College (1984)

Continuing Education:

Inductively Coupled Plasma Spectroscopy, Allied Analytical (1985)
ACS Short Course, Analytical Chemistry of Contaminants in Surface and Groundwater (1986)
Gas Chromatography: Practical Theory & Application, Lancaster Laboratories (1994)
Mass Spectral Interpretation, Hewlett-Packard (1995)
Comprehensive HPLC, RESTEK (2010)

Professional Experience:

With Lancaster Laboratories since 1984
Principal Chemist, Pesticide Residue Analysis (1999)
Responsibilities include performing pesticide residue testing; operating gas chromatography instruments; interpreting data; repairing instruments; developing new methods for and operating LC/MS/MS; developing and maintaining computer systems/programs for lab use

Awards, Citations, Honorary Societies & Publications:

Poster paper on computer applications for analytical chemistry
Poster paper on tobacco specific nitrosamine analysis

Biographical Listings:

Who's Who in Environmental Science

Stephanie A. Selis, B.S.E., Senior Chemist, GC/MS Volatiles

Education:

B.S.E. Biology, Chemistry Minor, Millersville University (1996)

Professional Experience:

Access I, Access II, PC Focus (1997)
Emergency Evacuation Coordinator (1998)
Gas Chromatography Principles and Practices, Lancaster Laboratories University (1998)
GC/MS Theories and Applications, MDL Systems (1999)
Statistics, Lancaster Laboratories University (2000)
Enlightened Leadership: Getting to the Heart of Change, Lancaster Laboratories University (2000)
Building Relationship Versatility: Social Styles at Work, Lancaster Laboratories University (2000)
Leadership at Lancaster Laboratories, Lancaster Laboratories University (2000)
Introduction to Interpretation of Mass Spectra, Lancaster Laboratories University (2005)

Professional Experience:

With Lancaster Laboratories since 1996
Chemist (1996)
Senior Chemist, Volatiles by GC (2000)
Responsibilities included performing sample analysis, troubleshooting, and maintenance; calibrating the system; establishing QC windows for soil analysis; writing SOPs; performing data entry; preparing standards; performing sample verification; training analysts
Senior Chemist, GC/MS Volatiles (2005)
Responsibilities include performing sample analysis; auditing maintenance notebooks; performing troubleshooting, maintenance, and system calibration; preparing standards; performing sample verification; training analysts

Richard A. Shober, B.S., Principal Chemist, Pesticide Residue Analysis

Education:

B.S. Chemistry, Muhlenberg College (1984)

Continuing Education:

Inductively Coupled Plasma Spectroscopy, Allied Analytical (1985)
ACS Short Course, Analytical Chemistry of Contaminants in Surface and Groundwater (1986)
Gas Chromatography: Practical Theory & Application, Lancaster Laboratories (1994)
Mass Spectral Interpretation, Hewlett-Packard (1995)
Comprehensive HPLC, RESTEK (2010)

Professional Experience:

With Lancaster Laboratories since 1984
Principal Chemist, Pesticide Residue Analysis (1999)
Responsibilities include performing pesticide residue testing; operating gas chromatography instruments; interpreting data; repairing instruments; developing new methods for and operating LC/MS/MS; developing and maintaining computer systems/programs for lab use

Awards, Citations, Honorary Societies & Publications:

Poster paper on computer applications for analytical chemistry
Poster paper on tobacco specific nitrosamine analysis

Biographical Listings:

Who's Who in Environmental Science

Jeffrey B. Smith, B.A., Senior Chemist Group Leader, Volatiles in Air

Education:

B.A. Biology, University of Delaware (1991)

Professional Experience:

Roy F. Weston, Inc., Chemist (1991-1997)
Merck, Chemist (1997-2000)
With Lancaster Laboratories since 2001
Senior Chemist, GC/MS Semivolatiles (2001)
Responsibilities included performing GC/MS analysis of semivolatile organics
Senior Chemist Group Leader, Volatiles in Air (2005)
Responsibilities include tracking of all incoming work and scheduling analysts; tracking all incoming summa orders and assigning to analyst; main CSR contact for group; instrument troubleshooting and maintenance; auditing and certifying data as needed

Michele J. Smith, B.S., Senior Specialist, Specialty Services Group

Education:

B.S. Chemistry, St. Mary's College, Notre Dame, Indiana (1998)
22 credits master's study with Penn State University (2000-2002)

Continuing Education:

Gas Chromatography Principles and Practices, Lancaster Laboratories University (1999)
Statistics, Lancaster Laboratories University (2000)

Professional Experience:

St. Mary's College, Laboratory Teaching Assistant (1996-1998)
Responsibilities included: assisted professor in the laboratory—responsible for experiment demonstrations, answered student's questions, and graded lab reports.
With Lancaster Laboratories since 1998
Chemist (1998)
Responsibilities included: maintain GC/MS instrumentation, tune and calibrate GC/MS, analyze samples by GC/MS, review and assemble all supporting GC/MS data, review daily QC outliers.
Senior Chemist (2001)
Responsibilities included: maintain GC/MS instrumentation, tune and calibrate GC/MS, analyze samples by GC/MS, review and assemble all supporting GC/MS data, perform technical audit of GC/MS and HPLC, sign analysis reports, track samples to meet turnaround time.
Senior Chemist Coordinator (2004)
Responsibilities included: maintain GC/MS instrumentation, tune and calibrate GC/MS, analyze samples by GC/MS, review and assemble all supporting GC/MS data, perform technical audit of GC/MS and HPLC, sign analysis reports, track samples to meet turnaround time.
Senior Specialist Group Leader, GC/MS Semivolatiles (2005)
Responsibilities included: review and assemble GC/MS data, perform technical audit of GC/MS and HPLC, sign analysis reports, schedule and track samples to meet turnaround time.

Senior Specialist, Environmental Client Services (2008)
Responsibilities included auditing sample paperwork; setting up standard forms; generating bottle orders; preparing quotes
Senior Specialist, Specialty Services Group (2011)
Responsibilities include maintaining instrumentation; tuning and calibrating instrument daily; analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality; evaluating current organizational and analytical systems; diagnosing complex problems and offering solutions with a high degree of independence; suggesting and implementing improvements to maximize quality and productivity; acting as technical resource for internal problems and projects; assisting in "brainstorming" client problems and projects; training new employees in all aspects of instrumentation; researching new and emerging technologies

Memberships and Appointments:
American Chemical Society (1998-2002)

Angela D. Sneeringer, B.S., Senior Chemist, GC/MS Volatiles

Education:
B.S. Biochemistry, Elizabethtown College (2001)

Professional Experience:
Wyeth, Chemist (2001-2003)
Responsibilities included CIP/SIP of tanks, large volume solution formulation, record review
Cycle Chem, Technical Services Rep (2003-2005)
Responsibilities included shipping documents for hazardous waste transportation; assisting clients with all necessary paperwork; scheduling of waste pickup
With Eurofins Lancaster Laboratories since 2005
Chemist, Pharmaceutical Raw Materials (2005)
Responsibilities included performing TOC of pharmaceutical waters using OI and Sievers analyzers
Chemist, GC/MS Volatiles (2005)
Responsibilities included performing GC/MS of volatile organic compounds using Agilent 5970 series MS and Shimadzu QP5000, also OI 5660 and 5661 concentrators and autosamplers
Senior Chemist, GC/MS Volatiles (2015)
Responsibilities include maintaining GC/MS instrumentation; tuning and calibrating instrument daily; analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality; evaluating current organizational and analytical systems; suggesting and implementing the necessary corrective action to ensure the above can be performed in alignment with client and/or regulatory requirements; performing all duties with minimal supervision; working on special assignments; diagnosing complex problems and offering solutions with a high degree of independence; assisting in "brainstorming" client problems and projects; completing assigned projects on time; researching new and emerging technologies; producing written and oral reports on research activities

Tara M. Spaide, Senior Specialist, Business Development, Environmental Sciences

Continuing Education:
Algebra and Analytical Geometry, Pennsylvania State University (1993)
Chemistry, Pennsylvania State University (1993)

Professional Experience:
With Eurofins Lancaster Laboratories since 1986
Senior Specialist Coordinator, Organic Extraction (1997)
Responsibilities included supervising personnel; scheduling lab work; managing laboratory operations; reviewing and approving data; and revising and updating analytical methods
Senior Chemist Coordinator, Organic Extraction (2003)
Responsibilities included supervising personnel; scheduling lab work; managing laboratory operations; reviewing and approving data; and revising and updating analytical methods
Senior Chemist Group Leader, Organic Extraction (2005)
Responsibilities included supervising personnel; scheduling lab work; managing laboratory operations; reviewing and approving data; and revising and updating analytical methods
Senior Specialist, Environmental Client Services (2007)
Responsibilities included auditing sample paperwork; setting up standard forms; generating bottle orders; preparing quotes
Senior Specialist, Business Development, Environmental Sciences (2015)
Responsibilities include independently securing new business consistent with operational capabilities and business plan goals; collaborating efforts and activities with those of Outside Sales account managers as needed; focusing on proposal writing for major national accounts; attending face-to-face sales meetings with selected national accounts as needed and maintaining responsibility for their maintenance and growth

Kevin A. Sposito, B.S., Senior Chemist, GC/MS Volatiles

Education:

B.S. Forensic Chemistry, York College of Pennsylvania (2009)

Professional Experience:

Analytical Lab Services, Laboratory Technician (2010)

Responsibilities included performing Liquid-Liquid extractions of water sample to isolate organic analytes of interest

With Eurofins Lancaster Laboratories since 2010

Chemist, GC/MS Volatiles (2010)

Responsibilities included maintaining GC/MS instrumentation; tuning and calibrating instruments daily; analyzing quality control and client samples; reviewing and assembling data

Senior Chemist, GC/MS Volatiles (2015)

Responsibilities include maintaining GC/MS instrumentation; tuning and calibrating instrument daily; analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality; evaluating current organizational and analytical systems; suggesting and implementing the necessary corrective action to ensure the above can be performed in alignment with client and/or regulatory requirements; performing all duties with minimal supervision; working on special assignments; diagnosing complex problems and offering solutions with a high degree of independence; assisting in "brainstorming" client problems and projects; completing assigned projects on time; researching new and emerging technologies; producing written and oral reports on research activities

Larry D. Starkey, Senior Specialist Group Leader, Bay Area Service Center and SeaTac Service Center

Professional Experience:

Walnut Creek Honda, Utility (1987-1992)

Responsibilities included performing new car inventory, general maintenance, and vehicle repair; being a service adviser

Star Courier Service, Manager (1992-2008)

Responsibilities included being a dispatcher, accountant (AP-AR-Income Statement-Tax Prep), supervisor, and driver

With Eurofins Lancaster Laboratories since 2008

Senior Administrator, Bay Area Service Center (2008)

Responsibilities included performing courier service; ordering and inventory control of bottling room; performing preservation with acid, bottle prep, packing of samples, packing of bottle orders, sending of rush e-mails to technical department, assisting in STLC threshold, packing and shipping of hazardous materials, sub-contracting of analysis

Specialist, Bay Area Service Center (2012)

Responsibilities included handling the receipt of samples at the Bay Area Service Center; reconciling chains-of-custody and documenting any discrepancies or damages at receipt; picking up samples and delivering bottle kits in the Bay Area; packing and shipping samples via overnight courier to Eurofins Lancaster Laboratories Environmental, LLC; supporting the SeaTac and Fort Collins Service Centers

Senior Specialist Group Leader, Bay Area Service Center and SeaTac Service Center (2014)

Responsibilities include serving as the primary contact with the laboratory for a number of assigned clients; communicating technical information and conveying client requirements to laboratory personnel, ensuring that those requirements are met; managing large/complex projects according to client technical and schedule requirements; developing strong relationships with major accounts resulting in additional sales; providing courier service including bottle delivery and sample pick-up in Bay Area; assisting in start-up and stocking of other service centers; ordering supplies as needed; performing both technical and personnel aspects of group operations; performing work within the department or other areas as required; acting as a technical resource, trainer, and troubleshooter to specific department; making recommendations for operational and/or technical improvements; communicating effectively within the group; coaching and developing direct reports; planning and monitoring workflow

Christopher M. Stauffer, B.S., Senior Specialist, Environment Software Development

Education:

B.S. Computer Science, Millersville University (2013)

Professional Experience:

Lawn Equipment Parts Co., Junior Network Admin (2008-2011)

Responsibilities included monitoring and maintaining network; applying software patches deployed to employees' desktops

With Eurofins Lancaster Laboratories since 2012

Specialist, Computer Application Development (2012)

Responsibilities included performing software development for Parallax

Senior Specialist, Computer Application Development (2015)

Responsibilities include providing technical support for maintenance of installed software applications and assisting with the development, installation, and maintenance of new applications for general use; assisting in development, implementation, and maintenance of software intended to improve the quality and efficiency of work performed

Memberships and Appointments:

Association for Computing Machinery

Member of SIGARCH, SIGMICRO (2011-2013)

Chelsea B. Stong, B.S., Senior Specialist, GC/MS Volatiles

Education:

B.S. Biology, Eastern University (2007)

Professional Experience:

With Eurofins Lancaster Laboratories since 2006

Laboratory Technician, GC/MS Volatiles (2006)

Responsibilities included scanning samples into LIMS; prepping samples for analysis

Chemist, GC/MS Volatiles (2007)

Responsibilities included analyzing water and soil samples using a GC/MS; prepping samples for analysis; working up raw data

Senior Chemist, GC/MS Volatiles (2012)

Responsibilities included maintaining GC/MS instrumentation; tuning and calibrating instrument daily; analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality; evaluating current organizational and analytical systems; suggesting and implementing the necessary corrective action to ensure the above can be performed in alignment with client and/or regulatory requirements; performing all duties with minimal supervision; working on special assignments; diagnosing complex problems and offering solutions with a high degree of independence; assisting in "brainstorming" client problems and projects; completing assigned projects on time; researching new and emerging technologies; producing written and oral reports on research activities

Senior Specialist, GC/MS Volatiles (2015)

Responsibilities include performing technical audit of GC/MS volatiles data in a timely manner with zero defects as a goal; acting as a technical resource to department; evaluating issues in technical data and suggesting possible solutions; performing sample/QC verification in the LIMS; reviewing analytical reports; evaluating and interpreting analytical results; writing and revising SOPs; assisting in responding to and eliminating ICARs; making recommendations for technical improvements; communicating effectively within department; completing assigned tasks on time; assisting in "brainstorming" client problems and projects; performing all duties with minimal supervision

Andrew J. Strebel, Principal Specialist, Environmental Software Development

Continuing Education:

Advanced Aquarius Programmers Course, Hewlett-Packard (1989)
Environmental Applications of GC/MS, Indiana University (1989)
Environmental GC-MS (DOS) Operation, Hewlett-Packard (1995)
Unix Module 1, Albright College (1995)
Unix Module 2, Albright College (1995)
Unix Shell Scripts, Albright College (1995)
Unix AWK Programming, Albright College (1995)
Target Training, Thru-Put Systems, Inc. (1995)
Report Writer Training, Thru-Put Systems, Inc. (1998)
HP-UX System Administration for HP 9000s, Hewlett Packard (1998)
HP-UX Troubleshooting for HP 9000s, Hewlett Packard (1998)
GC/MS Training Course, MDL Systems (1999)
LC/MS/MS 101 Training Course, Basic Mass Spec Solutions, Inc. (2001)
GC-MSD Macro Programming, Agilent Technologies (2012)

Professional Experience:

With Eurofins Lancaster Laboratories since 1986

Technical Specialist (1991)

Chemist (1994)

Senior Chemist (1997)

Principal Chemist, GC/MS Semivolatiles (2001)

Responsibilities included performing routine semivolatile testing; operated GC/MS semivolatile instruments; data interpretation; reviewed and approved data; developing and evaluating new methods; calibrating and repairing instruments; prepared standards; revised and updated SOPs and analytical methods; trained other analysts; developed and maintained computer systems/programs for lab use; computer validation testing

Principal Specialist, Environmental Software Development (2013)

Responsibilities include special project data interpretation and review; developing and evaluating new methods for the Target data system; developing and maintaining computer systems/programs for lab use; and computer validation testing

Robert Strocko, Jr., B.S., Manager, Metals and Microbiology

Education:

B.S. Biology, York College of Pennsylvania (1988)

Continuing Education:

Thermo Jarrel l ASA ICP Course, Thermo Jarrell ASA (1993)

Professional Experience:

Springettsbury Waste Water Treatment Facility, Chemistry Technician (1986-1988)

Responsibilities included running NPDES tests on wastewater, % solids, NH4, pH, BOD, suspended solids, coliform, dissolved solids, temperature, and Hexa-Chrome testing

Penn Dairies, Laboratory Technician (1988-1989)

Responsibilities included testing raw milk for coliform bacteria for acceptance; performing milk-fat percent solids on milk products; calculating sugar content in sweetened milk

Pennsylvania Department of Environmental Resources, Chemistry Technician (1989-1992)

Responsibilities included receiving samples; logging data for analysis to computer; handling field sampling questions; operating flame AA; shipping cooler to field samples

With Eurofins Lancaster Laboratories since 1992

Chemist, Metals (1992)

Responsibilities included setting up, pouring, and running samples on ICP; reviewing and verifying ICP data; performing instrument maintenance; calculating IDLs, MDLs, and linear ranges; writing SOPs

Chemist/Coordinator, Metals (1996)

Responsibilities included overseeing prep room personnel and work flow; scheduling work flow through prep room; writing job plans and job reviews; ordering standards and reagents; overchecking notebooks

Manager, Metals (1998)

Responsibilities include overseeing technical areas in ICP, low-level mercury, ICP-MS, and mercury; writing SOPs, ICARs, etc.; writing job plans and job reviews; handling technical questions for clients/client services; verifying ICP/ICP-MS/Hg data

Manager, Metals Analysis and Microbiology (2013)

Responsibilities included overseeing technical areas in ICP, low-level mercury, ICP-MS, and mercury; writing SOPs, ICARs, etc.; writing job plans and job reviews; handling technical questions for clients/client services; verifying ICP/ICP-MS/Hg data

Manager, Metals Analysis and Microbiology (2014)

Responsibilities include included overseeing technical areas in ICP, low-level mercury, ICP-MS, and mercury; writing SOPs, ICARs, etc.; writing job plans and job reviews; handling technical questions for clients/client services; verifying ICP/ICP-MS/Hg data; overseeing technical area in Microbiology; tests include Colilert (presence/absence), Colilert (Q-tray), Heterotrophic Plate Count (HPC), Fecal Coliform by Membrane Filtration, Yeast and Mold, Hydrocarbon degraders; overseeing writing of SOPs, responding to ICARs; writing job plans and job reviews; handling technical questions for clients/client services; verifying data

Christiane S. Sweigart, B.S., Senior Specialist, Environmental Quality Assurance

Education:

- B.S. Science, Elizabethtown College (1985)
- Medical/Technology Degree, St. Joseph School of Medical Technology (1985)

Continuing Education:

- The Principals of Gas Chromatography (1993)
- Statistics Course (1993)
- Creative Training Techniques Conference (1997)
- SEDD/ADR Implementation Workshop (2008)
- ERPTOOLSX (Environmental Resources Planning Tools) (2010)
- PPI (Practical Process Improvement) - Facilitator Training (2011)

Professional Experience:

- With Eurofins Lancaster Laboratories since 1985
  - Chemist, GC/MS (1985)
    - Responsibilities included GC/MS operation targeting VOA and BNA compounds, instrument maintenance, sample handling, and data handling (interpretation and documentation)
  - Chemist, GC/VOA (1986)
    - Responsibilities included GC operation targeting both aromatic and halogenated compounds, FID operation, instrument maintenance, sample handling, and data handling (interpretation and documentation); training others on FID methods, development of training/reference manual for FID, development of internal Operating Manual, standard documentation, definition and maintenance of statistically defined windows, and temporary coordinator in Department 4025
  - Chemist Coordinator, GC/VOA (1993)
    - Responsibilities included coordination of sample analysis and data management; job plans and feedback for several personnel; communication both internal and external, and data handling (interpretation and documentation; and combination of existing department with another (personnel, instrumentation, and sample volume)
  - Senior Specialist, Human Resources (1997)
    - Responsibilities included recruiting, training, and professional development
  - Senior Specialist, Electronic Data Deliverables (2001)
    - Responsibilities included EDD generation, EDD content review, and communication (internal and external)
  - Senior Specialist, Environmental Quality Assurance (2013)
    - Responsibilities include ensuring quality of operations and data being produced in the laboratories; ensuring laboratory adherence to government regulations and client requirements; independently performing complex work and special projects in addition to routine and non-routine duties

Awards, Citations, Honorary Societies & Publications:

- Recognition for the implementation of a revamped New Hire Orientation (1999)
- Recognition for the development and presentation of the Ethic's Refresher (2001)

Memberships & Appointments:

- LCAHRM (1997-2001)

Valerie L. Tomayko, B.S., Principal Specialist, Pesticide Residue Analysis

Education:

- A.S. Chemical Engineering Technology, Pennsylvania State University (1977)
- B.S. Human Resource Management, Geneva College (1993)

Professional Experience:

- Hercules Inc., Laboratory Technician (1977-1983)
- Antech Ltd., Associate Chemist, (1985-1989)
- Quanterra (formerly Wadsworth/Alert), Chemist, (1989-1997)
- UEC (United States Steel Engineering Consultants), Chemist (1997)
- With Lancaster Laboratories since 1997
  - Senior Chemist, Pesticide Residue Analysis (1997)
    - Responsibilities included: data interpretation; review and approve data; review data packages; and generate statistical QC limits for Pesticide Residue Analysis and Extractable Petroleum Hydrocarbons/MBC GC and Nitrosamines departments.
  - Senior Chemist Coordinator, Pesticide Residue Analysis (2001)
    - Responsibilities included: Monitor turnaround time and status of samples and packages; coordinate work flow; track employees' progress; assist in implementing procedures/protocols for meeting QA requirements, data package requirements, and special client or project-specific requests. In addition to data interpretation; review and approve data; review data packages; and generate statistical QC limits for Pesticide Residue Analysis and Extractable Petroleum Hydrocarbons/MBC GC and Nitrosamines departments.

Senior Specialist Group Leader, Pesticide Residue Analysis (2005)
Responsibilities included: Monitor turnaround time and status of samples and packages; coordinate work flow; track employees' progress; assist in implementing procedures/protocols for meeting QA requirements, data package requirements, and special client or project-specific requests. In addition to data interpretation; review and approve data; review data packages; and generate statistical QC limits for Pesticide Residue Analysis and Extractable Petroleum Hydrocarbons/MBC GC and Nitrosamines departments.
Senior Specialist Group Leader, Volatiles by GC (2006)
Responsibilities included: Monitor turnaround time and status of samples; coordinate work flow; track employees' progress; assist in implementing procedures/protocols for meeting QA requirements, data package requirements, and special client or project-specific requests. In addition to data interpretation; review and approve data; review data packages; and generate statistical QC limits for GC Volatile analysis.
Principal Specialist, Pesticide Residue Analysis (2011)
Responsibilities include reviewing laboratory data for technical compliance to methods, SOPs, client protocols, and regulatory agency requirements; overchecking and verifying data from the analysts performing instrumental analyses, including QC and clients' samples for pesticides, PCBs, herbicides, and other related compounds; reviewing data for accuracy and completeness (for routine and non-routine analyses, analytical reports, and/or data packages); assisting in implementing special client requests that impact data processing and reporting; identifying and offering solutions to correct problems related to data processing and reporting; serving as a technical resource for the department with regard to QA/QC procedures and issues

Timothy J. Trees, A.A.S., Principal Chemist, Specialty Services Group

Education:

Certificate, N.Y.S. Water/Wastewater Treatment Operations, Columbia Greene Community College (1985)
A.A.S. Environmental Control of Hazardous Waste/Water Quality, Ulster County Community College (1988)

Continuing Education:

Water Treatment Operations, NYS License Board (1984)
Wastewater Treatment Operations, NYS License Board (1986)
Varian AA Course (1992)
Service Operations Process Optimization, Pennsylvania State University (1992)
Hitachi GFAA Workshop, Hitachi, CT (1994)
24-hour HAZWOPER (spill response) (1995)
Atomic Spectroscopy Workshop, Perkin-Elmer (1997)

Professional Experience:

York Wastewater Management (1985-1986)
Rider Engineering (1986-1988)
With Eurofins Lancaster Laboratories since 1988
Senior Technician, Metals (1988)
Responsibilities included: operation, maintenance, and sample preparation of mercury cold vapor and hydride generation instrumentation for the determination of mercury, arsenic, and selenium; data entry; troubleshooting instruments; repair of instrumentations' electronic system.
Chemist I, Metals (1990)
Responsibilities included: operation and maintenance of graphite furnace instrumentation; verification of mercury cold vapor and hydride generation data; coaching and training of personnel in the operation of mercury and hydride instrumentation; troubleshooting and repair of instrumentations' mechanical and electronic system.
Chemist I/Coordinator, Metals (1992)
Responsibilities included: operation and maintenance of graphite furnace instrumentation; ICP operation; verification of mercury cold vapor and hydride generation data; coaching and training of personnel in the operation of mercury, hydride, and graphite
furnace instrumentation; troubleshooting and repair of instrumentations' mechanical and electronic system; systems operation optimization to increase production; scheduling of personnel for department operation; job plan and review with employees.
Chemist II/Coordinator, Metals (1993)
Responsibilities included: coaching and training of personnel in the operation of mercury, hydride, and graphite furnace instrumentation; assist clients with data interpretation and process improvement; ICP operation; verification of graphite furnace, mercury cold vapor, and hydride generation data; data package review; troubleshooting and repair of instrumentations' mechanical and electronic systems; system operations optimization to increase production; scheduling of personnel for department operation; job plan and review with employees.

Senior Chemist/Coordinator, Metals (1994)

Responsibilities included: operation, maintenance, repair, and troubleshooting of department graphite furnaces; flame atomic absorption, mercury cold vapor, hydride generation, and Inductively Coupled Plasma Instrumentation as well as computer systems used in the operation with these instruments; data qualification, interpretation, and verification of department workload; assist clients with interpretation of data, cause and effect; coaching and training of department personnel in areas of sample preparation, instrument setup, maintenance, and analysis using these instruments; job plan, review, and evaluation with employees; ordering of supplies; maintained operation of Metals Atomic Absorption for the department; method development for both environmental and pharmaceutical divisions for graphite furnace and ICP work; Set up and maintain, all SOPs and documentation for computer systems and instrumentation to comply with GMP regulations; data package review for metals analysis; review and verification of ICP data as needed.

Principal Chemist/Coordinator, Metals (1996)

Responsibilities included: operation, maintenance, repair, and troubleshooting of department graphite furnaces; flame atomic absorption, mercury cold vapor, hydride generation, and Inductively Coupled Plasma Instrumentation as well as computer systems used in the operation with these instruments; data qualification, interpretation, and verification of department workload; assist clients with interpretation of data, cause and effect; coaching and training of department personnel in areas of sample preparation, instrument setup, maintenance, and analysis using these instruments; job plan, review, and evaluation with employees; ordering of supplies; maintained operation of Metals Atomic Absorption for the department; method development for both environmental and pharmaceutical divisions for graphite furnace and ICP work; Set up and maintain, all SOPs and documentation for computer systems and instrumentation to comply with GMP regulations; data package review for metals analysis; review and verification of ICP data as needed.

Senior Chemist, GC/MS Semivolatiles (1998)

Responsibilities included: operation, maintenance, and troubleshooting of GC/MS instrumentation; HP5890, 6890 GC, 5971, 5972, 5973 Mass Spec; review and data interpretation of various analyses including but not limited to, 8270C, Appendix IX, 625, CLP 3/90, and 2/88; standards preparation for various methods; data interpretation and data package assembly of batch data; evaluation and review of system procedures.

Principal Chemist, GC/MS Semivolatiles (2001)

Responsibilities included: operation, maintenance, and troubleshooting of GC/MS instrumentation; HP5890, 6890 GC, 5971,5972, 5973 Mass Spec; method development, research, and development of GC/MS procedures; review and data interpretation of various analyses including but not limited to 8270C, Appendix IX, 625, CLP 3/90 and 2/88; standards preparation for various methods; data interpretation and data package assembly of batch data; evaluation and review of system procedures; analysis and troubleshooting of HPLC and analysis of PAHs; coaching and training of analysts to assist with troubleshooting; working in Pharmaceutical Method Development and Validation, operating LC/MS, LC/MS/MS, and GC/MS instrumentation, and performing instrument qualifications since June 2003

Principal Chemist, Flexible Staffing (2006)

Responsibilities included working in GC/MS Volatiles in Air department; operation, maintenance, and troubleshooting GC/MS instrumentation; HP5890, 6890 GC, 5971, 5972, 5973 Mass Spec; method development, research, and development of GC/MS procedures; review and data interpretation of various analyses including but not limited to TO-15 and TO-14; standards preparation for various methods; data interpretation and data package assembly of batch data; evaluation and review of system procedures; ability to operate a variety of instrumentation and data systems

Principal Chemist, GC/MS Semivolatiles (2007)

Responsibilities included operating, performing maintenance on, and troubleshooting GC/MS instrumentation; HP5890, 6890 GC, 5971,5972, 5973, 5975 Mass Spec; setting up and performing method development of Thermo Fisher TRACE GC and DSQ II MS; performing method development using both EI and CI mode of analysis; method development, research, and development of GC/MS procedures; review and data interpretation of various analyses including, but not limited to, 8270C, Appendix IX, 625, CLP 3/90 and 2/88; standards preparation for various methods; data interpretation and data package assembly of batch data; evaluation and review of system procedures; analysis and troubleshooting of HPLC and analysis of PAHs; coaching and training of analysts to assist with troubleshooting; Including working in GC/MS Volatiles in Air department; operation, maintenance, and troubleshooting GC/MS instrumentation; HP5890, 6890 GC, 5971, 5972, 5973 Mass Spec; method development, research, and development of GC/MS procedures; review and data interpretation of various analyses including but not limited to TO-15 and TO-14; standards preparation for various methods; data interpretation and data package assembly of batch data; evaluation and review of system procedures; ability to operate a variety of instrumentation and data systems

Principal Chemist, Specialty Services Group (2011)

Responsibilities include acting as technical resource within the environmental division; developing and validating analytical protocols; troubleshooting and solving analytical chemistry problems; optimizing instrument configuration and performance; evaluating and interpreting analytical results; writing SOPs; assisting in responding to and eliminating ICARs, assisting in optimizing procedures in prep lab; communicating effectively within department; performing routine work as required. Maintain and operation of Thermo Fisher Scientific TSQ Quantum XLS MS/MS as well as TSQ8000 MS/MS with a Trace 1310 GC; developing methods utilizing GC triple Quad technology in a variety of matrices; utilizing various extraction technologies such as QuEChERS (Quick, Easy, Cheap, Effective, Rugged, and Safe) to effectively extract and cleanup sample matrices

Holly L. Trego, M.S., Manager, Environmental Software Development

Education:

- B.S. Computer Science, Millersville University (1998)
- M.S. Computer Science, Pennsylvania State University (2004)

Professional Experience:

- Millersville University (1994-1998)
  - Computer Programmer
    - Responsibilities included organizing meetings with staff of Academic Advising and students; maintained statistics on students' grades in the Undeclared program using SAS; created reports in Cobol to report on the statistics; organized summer orientation for the Undeclared program
  - Internet Programmer
    - Responsibilities included creating and maintaining various interactive web pages to allow students to view information; developed web site for students to vote on what classes departments should offer
- With Eurofins Lancaster Laboratories since 1996
  - Senior Specialist, Computer Applications Development (1996)
    - Responsibilities included write Visual Basic code to general client reports; design Powerbuilder System with customized macros which processes analytical data; develop data acquisition software with SQL*Loader
  - Senior Specialist/Group Leader, Computer Applications Development (2005)
    - Responsibilities included managing environmental application development projects, maintenance of existing applications
  - Manager, Computer Applications Development (2007)
    - Responsibilities included managing environmental application development projects, maintenance of existing applications
  - Manager, Environmental Software Development (2013)
    - Responsibilities include managing application development projects, maintenance of existing applications

Nicole M. Veety, B.S., Senior Chemist Group Leader, Instrumental Water Quality

Education:

- AA Psychology, Harrisburg Area Community College (1997)
- B.S. Psychobiology, Lebanon Valley College (2000)

Professional Experience:

- With Eurofins Lancaster Laboratories since 2000
  - Senior Technician, Instrumental Water Quality (2000)
    - Responsibilities included various prep analyses, data entry, TOC and TOX analyses.
  - Chemist, Instrumental Water Quality (2003)
    - Responsibilities included performing various analyses, verification, and review and revise SOPs.
  - Senior Chemist, Instrumental Water Quality (2006)
    - Responsibilities include performing various analyses, method development, verification, and review and revise SOPs.
  - Senior Chemist Group Leader, Instrumental Water Quality (2009)
    - Responsibilities include performing various analyses, method development, verification, and review and revise SOPs; acting as a technical resource, trainer, and troubleshooter; making recommendations for operational and/or technical improvements; coaching and developing direct reports; planning and monitoring workflow.

Awards, Citations, Honorary Societies, and Publications:

- Phi Theta Kappa National Honor Society (Alpha Nu Omega) (1996-2000)

David Velasquez, Senior Account Manager, Environmental Sciences

Information not available at time of printing

Robert Todd Vincent, B.S., Principal Chemist, Organic Extraction

Education:

B.S. Chemistry, West Virginia Wesleyan College (2001)

Professional Experience:

With Lancaster Laboratories since 2001

Chemist, EPH/Misc. GC (2001)

Responsibilities included analyzing samples; performing equipment repair; GC method development

Chemist, Organic Extraction (2005)

Responsibilities included performing method development; equipment repair

Senior Chemist, Organic Extraction (2007)

Responsibilities included performing method development; equipment repair; vendor relations; technology evaluation

Principal Chemist, Organic Extraction (2011)

Responsibilities include performing high level, difficult preps (with minimal supervision or guidance) following standard operating procedures (SOPs); self-train in new techniques; entering information into computer; training new or existing employees in extraction techniques or use of equipment; using knowledge to actively improve current processes; developing, enhancing, and validating new extraction methods; keeping work area clean and organized; preparing spikes; repairing equipment; updating departmental SOPs and training manual; disposing of wastes in approved manner; assisting in incident prevention and remediation when necessary

Harry D. Ward, Ph.D., Principal Specialist, Training

Education:

B.S. Chemistry, Muhlenberg College (1980)

Ph.D. Organic Chemistry, University of Delaware (1985)

Professional Experience:

Armstrong World Industries, Inc., Research Scientist (1985-2003)

Responsibilities included performing research and development related to flooring

With Eurofins Lancaster Laboratories since 2003

Senior Chemist, Pharmaceutical Product Testing (2003)

Responsibilities included performing pharmaceutical product testing

Senior Chemist, Method Development & Validation (2005)

Responsibilities included performing pharmaceutical method development and validation

Senior Training Specialist, Human Resources (2006)

Responsibilities included design and delivery of core and elective technical training

Principal Training Specialist, Human Resources (2008)

Responsibilities included design and delivery of core and elective technical training

Principal Specialist Group Leader, Training (2011)

Responsibilities included managing the resources of the technical training group; designing and delivering core and elective technical training

Principal Specialist, Training (2015)

Responsibilities included facilitating all steps associated with technical training

Barbara J. Weaver, M.S., CIH, Principal Specialist, Training

Education:

B.S. Chemistry, Elizabethtown College (1971)
M.S. Analytical Chemistry, Illinois Institute of Technology (2001)

Certifications:

CIH - American Board of Industrial Hygiene - Certified in the comprehensive practice of industrial hygiene (1983), Certification #2719

Continuing Education:

Business Law, Elizabethtown College (1979)
NIOSH Course #553 "Industrial Hygiene Sampling, Decision Making, Monitoring and Record Keeping, Sampling Strategies" (1979)
Industrial Toxicology, 5-Day Workshop, Thomas Jefferson University (1980)
Special Topics: Environmental Analytical Chemistry, Graduate Work, Villanova University (1981)
"Comprehensive Industrial Hygiene Review", University of Cincinnati, NIOSH Education Resource Center (1983)
Environmental Health, Graduate Work, West Chester University (1985)
Chemical Hygiene - The OSHA Laboratory Standard, NEAIHA PDC (1990)
Health and Safety Management for Hazardous Waste Professionals, AIHA PDC #11 (1990)
Financial Accounting, Penn State (1990)
NIOSH Course #582 "Sample and Analysis of Airborne Asbestos Dust", NIOSH Education Resource Center, Cincinnati (1992)
Survey of Management, Penn State University (1993)
Laboratory Safety and Health, American Chemical Society (1994)
24-hour HAZWOPER (spill response) and Refreshers (1995-present)
Health, Safety, and Environmental Auditing, Johns Hopkins (1995)
Managing Ionizing Radiation Programs for Industrial Hygienists, AIHA (1996)
Radiation Safety Officer Training, Radiation Safety Associates, MA (1997)
Presenting Data and Information, Edward R. Tufte, Graphic Press LLC (2005)
IATA/FIATA Dangerous Goods, IATA (2007)
GC/MS Training Seminar, Restek (2008)
IATA Dangerous Goods Refresher Training, DGI (2009)
Exposure Assessment Strategies and Statistics, 4.6 CEUs, AIHA (2009)
Practical Process Improvement, Training in the Role of Facilitator (2010)
DOT (49CFR) Shipper Course, DGI (2011)
IATA Acceptance Training, all inclusive (2011)

Professional Experience:

Warner Lambert, Inc., Quality Control Chemist (1970-1973)
- Responsibilities included performing USP/NF and client-specific raw materials and product testing; conducting specific project assignments such as documentation of product-specific alcohol denaturing at supplier's site; pre-market new product quality control testing; serving on panels for testing fragrance and color

Hershey Medical Center, Junior Research Technician (1973-1974)
- Responsibilities included developing rubidium-crystal FID-GC (nitrogen sensitive) methods for the low level detection of barbiturates in solution and in blood extracts; performing analysis of blood and spiked blood from rat and monkey; performing analysis of a specific liver enzyme; using preparative fix-angle ultracentrifuge in sample preparation; developing electron microscopy photographs for liver cell mitochondria study

Elizabethtown College, Laboratory Instructor (1977-1978)
- Responsibilities included preparing materials for freshman chemistry laboratories; providing basic laboratory instruction for freshmen; conducting research on the separation of linoleic and linolenic acids (omega-3 and omega-6 fatty acids in olive oil) using spinning band distillation; testing flame-retardant cellulose insulation to determine the flame-retardant formulation for industrial client

With Lancaster Laboratories since 1978

Chemist, Air Quality/Industrial Hygiene (1978)
- Responsibilities included performing air and miscellaneous chemical analysis using gas chromatography, colorimetric analysis, UV-Vis, spectrophotometry, fiber-counting using phase contrast microscopy, and infrared analysis

Program Manager, Air Quality/Industrial Hygiene (1978)
- Responsibilities for the Air Quality and Miscellaneous Chemistry Group included conducting NIOSH, OSHA, and EPA air sampling and analysis; industrial hygiene (air quality and employee exposure in the workplace) consulting services; responsibilities for laboratory work included method development for analysis of pharmaceutical active compounds in air; method development for the FID-GC analysis of cholesterol and fatty acid profiles; infra-red and gas chromatography methods; forensic sample analysis and expert witness testimony; USP/NF testing, some ASTM testing, analytical microscopy using phase contrast, fluorescence and light microscopy; preparing and/or submitting PAT and QA test samples and blanks for analysis; business development, technical writing, proposal, pricing and quote development, and client services for QA/IH; managing the industrial hygiene field sampling/consultation and industrial hygiene/miscellaneous chemistry (client special projects) lab group; maintaining DEA registration; serving as laboratory director for the AIHA analytical laboratory certification for more than 10 years

Marketing and Technical Services Specialist, Business Development (1987)
Responsibilities included inside and external business development including client visits and trade shows; serving as client services/account representative for air quality, foods, and pharmaceutical sciences; creating and tracking quotes and responses to requests for bids and proposals; continued to serve as laboratory director for the AIHA analytical laboratory certification
Principal Specialist reporting to Vice President, Environmental and Pharmaceutical Sciences (1987)
Responsibilities included technical writing, special projects, and performing Graphite Furnace Atomic Absorption for Pb and Cu in water; pesticides data entry verification; coordinating, developing, and providing technical and EHS training; providing technical support to the EHS staff; serving as interim EHS officer and the EHS liaison with our parent company; serving as Lancaster Radiation Safety Officer during the period in which Lancaster held a site NRC license; serving as a permanent member of the safety committee representing EHS training
Principal Specialist, Training (1991)
Responsibilities include coordinating, developing, and providing technical training and environmental health and safety (EHS) training; soliciting and managing grants for training programs; providing coordination for the external and continuing education programs; providing technical support for the EHS staff and continuing to represent EHS training on the safety committee

Awards, Citations, Honorary Societies & Publications:

1 publication on microscopy
1 publication on NMR and Copper-histidine
Book Review - Review of *Guidelines for Laboratory Design: Health and Safety Aspect,* ***The Synergist*** March 2002
Acknowledged in two EPA publications: Pb-Based Paint Laboratory Operations Guidelines: Analysis of Pb in Paint, Dust and Soil (EPA 747-R-92-006 May 1993) and Environmental Management Guide for Small Laboratories (EPA 233-B-98-001 July 1998)
Biographical Listings: *Who's Who in the East*, under Barbara J. Felty; *Who's Who in the Safety Profession*
2014 designated as a Fellow of the American Industrial Hygiene Association

Barbara J. Weaver, M.S., CIH, Principal Specialist, Training (continued)

Memberships and Appointments:

American Board of Industrial Hygiene (1984-present)
American Industrial Hygiene Association (AIHA) Member (1980-present), Fellow (2014 to present)
Sampling and Laboratory Analysis Committee (2001-present)
Communication and Training Methods Committee (2006-present)
AIHA - Central Pennsylvania Section, Charter Member (1981-present)
Treasurer (1981-1984, 2008-present), President-elect (1985-1986, 2002-2005), President (1986-1987, 2005-2006), Secretary (2007-2008), Membership Director (1988-1993), Director (2000-2002)
American Chemical Society (1985-present)
Chemical Health and Safety Section, Membership Committee (1992-1993)
Lancaster County Industrial Safety Council (Director 1988-1990)
Leadership Lancaster (1995)
Mentor (1999-2002), Marketing Committee (1999-2000)
Johns Hopkins NIOSH Education Resource Center Continuing Education Advisory Committee (1996-2006)
Penn State University–Lancaster Center Advisory Committee (2002–2006)
Chromatography Forum, Delaware Valley (2002-present/lifetime member)

Timothy S. Weaver, B.A., Senior Specialist, Environmental Software Development

Education:

B.A. Mathematics, Franklin & Marshall College (1996)

Professional Experience:

With Eurofins Lancaster Laboratories since 1996
Computer Specialist, Volatiles by GC (1996)
Responsibilities included programming, maintenance, and updates
Computer Specialist, Environmental Sciences (1997)
Responsibilities included disk format programming initially, followed by pesticides system and database maintenance and programming
Specialist, Computer Applications Development (2002)
Responsibilities included pesticides system and database maintenance and programming; invoice print server maintenance; LLENS program administration
Senior Specialist, Environmental Software Development (2008)
Responsibilities include pesticides system and database maintenance and programming; invoice print server maintenance; LLENS program administration

Chad Wettig, Senior Specialist Group Leader, Sample Support

Continuing Education:

- Leadership at Lancaster Laboratories, LLI (2000)
- Role of a Leader (parts 1-4), LLI (2007)
- PPI Team Training, LLI (2009)
- Microsoft Excel 2003, HACC (2011)

Professional Experience:

- Landis Valley, Waiter (1995)
  - Responsibilities included setting up banquets; serving food; maintenance work
- With Eurofins Lancaster Laboratories since 1995
  - Clerk II, Sample Support (1995)
    - Responsibilities included performing homogenization, Subsampling, preservation; operating ASRS; handling hazardous sample discard
  - Senior Technician, Sample Support (1998)
    - Responsibilities included operating ASRS; performing homogenization, preservation, volatile prep; handling hazardous sample discard
  - Specialist, Sample Support (1999)
    - Responsibilities included being the technical contact between labs and client services; investigating client issues with samples
  - Chemist Group Leader, Sample Support (2000)
    - Responsibilities included acting as a resource for Client Services, Sample Administration, and the technical departments concerning all sample questions, problems, and availability; investigating problems; setting up, and maintaining systems for special projects; assisting in ASRS hardware support; communicating with Environmental Health and Safety office concerning hazardous discard; verifying results for various analysis; performing all jobs in the department as needed including volatile prep, prescreen and dilutions; assisting with ASRS operation, preservation, homogenization, and moisture; performing both technical and personnel aspects of group operations; performing work within the department or other areas as required; acting as a technical resource, trainer, and troubleshooter to specific department; making recommendations for operational and/or technical improvements; communicating effectively within the group; coaching and developing direct reports; planning and monitoring workflow; monitoring data for and supporting departmental MOS
  - Senior Specialist Group Leader, Sample Support (2015)
    - Responsibilities include acting as a resource for Client Services, Sample Administration, and the technical departments concerning all sample questions, problems, and availability; investigating problems; setting up, and maintaining systems for special projects; assisting in ASRS hardware support; communicating with Environmental Health and Safety office concerning hazardous discard; verifying results for various analysis; performing all jobs in the department as needed including volatile prep, prescreen and dilutions; assisting with ASRS operation, preservation, homogenization, and moisture; performing both technical and personnel aspects of group operations; performing work within the department or other areas as required; acting as a technical resource, trainer, and troubleshooter to specific department; making recommendations for operational and/or technical improvements; communicating effectively within the group; coaching and developing direct reports; planning and monitoring workflow; monitoring data for and supporting departmental MOS

Heather E. Williams, B.S., Senior Chemist, EPH/Miscellaneous GC

Education:

- B.S. Forensic and Investigative Science, West Virginia University (2004)

Continuing Education:

- Principles of Gas Chromatography, LLU (2007)

Professional Experience:

- With Lancaster Laboratories since 2006
  - Chemist, EPH/Miscellaneous GC (2006)
    - Responsibilities included analyzing routine samples and their associated QC by gas chromatography for extractable petroleum products such as DRO, TPH, and other related materials; reviewing, calculating, and reporting the corresponding data and results; maintaining, optimizing, and calibrating Gas Chromatographs in an efficient and accurate manner; assisting in organization of department work, track samples, and prepare samples and standards to consistently meet turnaround time requirements
  - Senior Chemist, EPH/Miscellaneous GC (2008)
    - Responsibilities include analyzing routine samples and their associated QC by gas chromatography for extractable petroleum products such as DRO, TPH and other related materials; reviewing, interpreting, calculating, and reporting the corresponding data and results; maintaining, optimizing, and calibrating Gas Chromatographs in an efficient and accurate manner; assisting in organization of department work, tracking samples; preparing samples and standards to consistently meet turnaround time requirements; verifying sample data; corresponding with client service representatives regarding client inquiries and providing answers and solutions when problems arise; SOP writing and revising as new methods are developed; assisting with new instrument installation and set-up; participating in practical process improvements as a member of a team

Bret M. Winey, B.S., Senior Specialist, Environmental Software Development

Education:

B.S. Computer Science, Millersville University (2005)

Professional Experience:

Penn State University, College of Medicine, Programmer/Analyst (2009-2011)

Responsibilities included developing systems responsible for collecting and analyzing medical research data

Weidenhammer Systems Corp., Programmer/Analyst (2011-2012)

Responsibilities included maintaining and implementing functionality on clients' websites, using specification gathered directly from the respective client

Donegal Mutual Insurance Company, Inc., Programmer (2012-2013)

Responsibilities included maintaining existing web presentation and provide aid during transition to new website design

With Eurofins Lancaster Laboratories since 2013

Senior Specialist, Environmental Software Development (2013)

Responsibilities include providing technical support for maintenance of installed software applications and assisting with the development, installation, and maintenance of new applications for general use; assisting in development, implementation, and maintenance of software intended to improve the quality and efficiency of work performed

Meng Yu, M.S., Principal Chemist, Specialty Services Group

Education:

B.S. Chemical Engineering, Zhejiang University of Technology (1986)

Post Graduate, Biogeography and Environmental Assessment, University of Saarland (1995)

M.S. Chemistry, Catholic University of Leuven (1999)

Professional Experience:

Setsco Service Ltd, Executive Chemist (1999-2002)

Responsibilities performing EPA and USDA method development and validation for water, soil, food, and pharmaceutical materials using USP, BP, and AOAC methods; performing pesticide residue analysis using all kinds of GC

Cantest Ltd, Research Chemist (2002-2008)

Responsibilities included performing bioanalytical and food safety method development and validation; performing pesticide and drug residue method validation as per USDA, EPA, CFIA methods; UPLCMSMS, LCMSMS, LCMS and GCMS operation and maintenance

Pharmanet Inc. HSP Laboratory, Research Scientist (2008-2010)

Responsibilities included performing bioanalytical method development and validation for plasma, urine, tissue, etc.; performing LCMSMS operation, tuning, and maintenance

With Lancaster Laboratories since 2010

Principal Chemist, Specialty Services Group (2010)

Responsibilities include developing and validating new testing methods; operating and maintaining LCMSMS instruments; performing sample analyses

Memberships and Appointments:

ASMS (2010)

Holly B. Ziegler, B.S., Senior Chemist, GC/MS Semivolatiles

Education:

B.S. Forensic Chemistry, Buffalo State College (SUNY) (2006)

Professional Experience:

New York State Police, Toxicology Intern (2005-2006)

Responsibilities included performing analysis of alternative medicines using FPIA, SPE, GC/NPD, and GC/MS

With Eurofins Lancaster Laboratories since 2006

Chemist, GC/MS Volatiles (2006)

Responsibilities included analyzing soils and waters for VOAs using purge and trap and GC/MS instrumentation

Senior Chemist, GC/MS Volatiles (2010)

Responsibilities included analyzing performing GC/MS analysis of water and soil samples along with other matrices by various analytical methods such as EPA 8260B and CLP; evaluating analytical data generated; calibrating and troubleshooting GC/MS instrumentation; assisting other employees with any questions that may arise and helping to train new employees

Senior Chemist, GC/MS Semivolatiles (2011)

Responsibilities include maintaining GC/MS instrumentation; tuning and calibrating instruments daily; analyzing quality control and client samples; reviewing and assembling this data in an efficient manner with a high degree of quality to meet client requirements; working on special assignments; running 8270C, 625, THPA, and TEL methods

Memberships and Appointments:

Emergency Response Team (Hazmat technician) – LLI (2006-2011)

Michael A. Ziegler, B.S., Senior Chemist, Volatiles in Air

Education:

B.S. Molecular Biology, Clarion University of PA (2002)

Professional Experience:

With Eurofins Lancaster Laboratories since 2006

Chemist, GC/MS Volatiles (2006)

Responsibilities included maintaining GC/MS instrumentation; tuning and calibrating instrument daily; analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality; evaluating current organizational and analytical systems; suggesting and implementing the necessary corrective action to ensure the above can be performed in alignment with client and/or regulatory requirements; performing all duties with minimal supervision

Chemist, Volatiles in Air (2010)

Responsibilities included maintaining GC and/or GC/MS instrumentation and calibrating GC and/or GC/MS instrument daily; analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality to meet client requirements; performing various Airlab duties associated with sample prep and sample flow (these include, but are not limited to, sample retrieval and entry, Nitrogen tank replacement, summa can cleaning, summa/FC requests, and sample pressurization/prescreen)

Senior Chemist, Volatiles in Air (2014)

Responsibilities include maintaining GC and/or GC/MS instrumentation and calibrating GC and/or GC/MS instrument daily; analyzing quality control and client samples; reviewing and assembling data in an efficient manner with a high degree of quality to meet client requirements; performing various Airlab duties associated with sample prep and sample flow (these include, but are not limited to, sample retrieval and entry, Nitrogen tank replacement, summa can cleaning, summa/FC requests, and sample pressurization/prescreen)

Eurofins Document Reference	1-P-QM-GDL-9015382	**Revision**	5
Effective Date	Jan 18, 2016	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix E		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Kathryn Brungard
Reviewed and Approved by	Robert Strocko;Review;Friday, January 15, 2016 1:58:39 PM EST Duane Luckenbill;Review;Monday, January 18, 2016 2:28:15 PM EST Dorothy Love;Approval;Monday, January 18, 2016 2:53:05 PM EST

Document Title	Document ID	Historical Document ID	Document Owner
Level 1			
Environmental Quality Policy Manual	1-P-QM-GDL-9015377	DOD - Environmental Quality Policy Manual	4052 - Environmental Quality Assurance
Procedure Cross Reference List	1-P-QM-GDL-9015378	DOD - Environmental Quality Policy Manual Appendix A	4052 - Environmental Quality Assurance
Certifications, Accreditation, Registrations, and Contracts	1-P-QM-GDL-9015379	DOD - Environmental Quality Policy Manual Appendix B	4052 - Environmental Quality Assurance
Organizational Charts Personnel to Sign Reports	1-P-QM-GDL-9015380	DOD - Environmental Quality Policy Manual Appendix C	4052 - Environmental Quality Assurance
Personnel Qualifications and Responsibilities	1-P-QM-GDL-9015381	DOD - Environmental Quality Policy Manual Appendix D	4052 - Environmental Quality Assurance
SOPs and Analytical Methods	1-P-QM-GDL-9015382	DOD - Environmental Quality Policy Manual Appendix E	4052 - Environmental Quality Assurance
Instrument and Equipment List	1-P-QM-GDL-9015383	DOD - Environmental Quality Policy Manual Appendix F	4052 - Environmental Quality Assurance
Preventative Maintenance Schedules	1-P-QM-GDL-9015384	DOD - Environmental Quality Policy Manual Appendix G	4052 - Environmental Quality Assurance
Calibration Schedules	1-P-QM-GDL-9015385	DOD - Environmental Quality Policy Manual Appendix H	4052 - Environmental Quality Assurance
NELAP Scope of Testing	1-P-QM-GDL-9015386	DOD - Environmental Quality Policy Manual Appendix I	4052 - Environmental Quality Assurance
Quality Control Types, Frequency, and Corrective Action	1-P-QM-GDL-9015387	DOD - Environmental Quality Policy Manual Appendix J	4052 - Environmental Quality Assurance
Microbiological Testing	1-P-QM-GDL-9015388	DOD - Environmental Quality Policy Manual Appendix K	4052 - Environmental Quality Assurance
Manual Integration for ELLE	1-P-QM-GDL-9017675	Policy 0001	4052 - Environmental Quality Assurance
Laboratory Ethics and Data Integrity Policy	1-P-QM-GDL-9017679	Policy 0007	4052 - Environmental Quality Assurance
Chemical Hygiene Plan	1-P-QM-GDL-9015198	Chemical Hygiene Plan	6098 - Safety
Preparedness, Prevention, and Contingency Plan	1-P-QM-GDL-9017681	Policy 0010	6098 - Safety
Exposure Control Plan for Bloodborne Pathogens	1-P-QM-GDL-9017682	Policy 0011	6098 - Safety
Level 2			
Balance, Syringe, Pipette Verification	1-P-QM-QMA-9015389	DOD - LOM-SOP-ES-235	4052 - Environmental Quality Assurance
Bay Area Service Center Dangerous Goods Shipping Procedure	1-P-QM-QMA-9017337	LOM-SOP-ES-237	50 - Bay Area Service Center
Building Security	1-P-QM-QMA-9017366	LOM-SOP-LAB-212	6043 - Physical Services
Change Control Procedures for ELLE	1-P-QM-QMA-9028515	N/A	4052 - Environmental Quality Assurance

Document Title	Document ID	Historical Document ID	Document Owner
Level 2 (continued)			
Chromatography Integration and Documentation	1-P-QM-QMA-9017333	LOM-SOP-ES-232	4052 - Environmental Quality Assurance
Chromatography Integration and Documentation for OH VAP	1-P-QM-QMA-9022815	LOM-SOP-ES-232 (OH VAP)	4052 - Environmental Quality Assurance
Communicating Maximum Contaminant Level (MCL) Exceedances	1-P-QM-QMA-9017330	LOM-SOP-ES-227	4039 – Environmental Client Services
Compliance with Environmental GLP Regulations	1-P-QM-QMA-9022322	LOM-SOP-LAB-204 and LOM-SOP-LAB-224	4052 - Environmental Quality Assurance
Data and Record Storage, Security, Retention, Archival, and Disposal	1-P-QM-QMA-9017358	LOM-SOP-LAB-203	6047 - Office Services
Data Entry, Verification and Reporting	1-P-QM-QMA-9017322	LOM-SOP-ES-218	4052 - Environmental Quality Assurance
Demonstrations of Capability	1-P-QM-QMA-9015390	DOD - LOM-SOP-ES-238	4052 - Environmental Quality Assurance
Determining Method Detection Limits and Limits of Quantitation	1-P-QM-QMA-9017309	LOM-SOP-ES-203	4052 - Environmental Quality Assurance
E-Mail System	1-P-QM-QMA-9017360	LOM-SOP-LAB-205	9013 - Information Technology
Employee Training Program	1-P-QM-QMA-9017379	LOM-SOP-LAB-231	6047 - Office Services
Environmental Project Cycle	1-P-QM-QMA-9017338	LOM-SOP-ES-239	4052 - Environmental Quality Assurance
Establishing Control Limits	1-P-QM-QMA-9017313	LOM-SOP-ES-207	4052 - Environmental Quality Assurance
EtQ System User Account Maintenance	1-P-QM-QMA-9017380	LOM-SOP-LAB-232	6047 - Office Services
Eurofins North America E-Mail and Archiving	1-P-QM-QMA-9020074	NA	9013 - Information Technology
Facilities Operation Manual	1-P-QM-QMA-9017374	LOM-SOP-LAB-223	6043 - Physical Services
Facility Change Control Procedure	1-P-QM-QMA-9017364	LOM-SOP-LAB-209	6043 - Physical Services
Forensic Laboratory Services	1-P-QM-QMA-9017307	LOM-SOP-ES-201	4052 - Environmental Quality Assurance
Guidelines for Analytical Decision Making in Environmental Testing	1-P-QM-QMA-9021833	LOM-SOP-LAB-226	4052 - Environmental Quality Assurance
Guidelines for Writing Technical Reports	1-P-QM-QMA-9017308	LOM-SOP-ES-202	4052 - Environmental Quality Assurance
Handling of Client Technical Complaints (Investigations and Response)	1-P-QM-QMA-9017332	LOM-SOP-ES-231	4052 - Environmental Quality Assurance
HP-UX Target 3.5 Data System Accounts and Electronic Signature Security	1-P-QM-QMA-9017336	LOM-SOP-ES-236	4052 - Environmental Quality Assurance
Implementation of the Computer Services Validation Master Plan (CSVMP)	1-P-QM-QMA-9017425	LOM-SOP-VAL-210	4044 - Environmental Software Development
Insect and Rodent Control	1-P-QM-QMA-9017367	LOM-SOP-LAB-213	6043 - Physical Services
Instrument Maintenance and Calibration	1-P-QM-QMA-9017325	LOM-SOP-ES-222	4052 - Environmental Quality Assurance
Investigation and Corrective Action of Noncompliant Data	1-P-QM-QMA-9017315	LOM-SOP-ES-209	4052 - Environmental Quality Assurance

Document Title	Document ID	Historical Document ID	Document Owner
Level 2 – (continued)			
Investigation and Corrective Action Reporting for Laboratory Problems	1-P-QM-QMA-9017331	LOM-SOP-ES-230	4052 - Environmental Quality Assurance
Laboratory Housekeeping and Cleaning	1-P-QM-QMA-9017373	LOM-SOP-LAB-221	6043 - Physical Services
Laboratory Notebooks, Logbooks, and Documentation for Environmental Testing	1-P-QM-QMA-9021767	LOM-SOP-LAB-220	4052 - Environmental Quality Assurance
Laboratory Sample Analysis Record (LSAR) Documentation	1-P-QM-QMA-9017318	LOM-SOP-ES-212	4052 - Environmental Quality Assurance
Laboratory/Quality Systems Procedures Summary	1-P-QM-QMA-9033535	N/A	4052 - Environmental Quality Assurance
Legal Chain-of-Custody Documentation	1-P-QM-QMA-9017335	LOM-SOP-ES-234	4052 - Environmental Quality Assurance
Missed Holding Time Reports	1-P-QM-QMA-9017326	LOM-SOP-ES-223	4052 - Environmental Quality Assurance
Monitoring of the Volatile Organics Analysis (VOA) Storage Areas for Contamination	1-P-QM-QMA-9017311	LOM-SOP-ES-205	4052 - Environmental Quality Assurance
Monitoring Temperatures in Refrigerators, Freezers, Incubators, and Ovens Using the ETM	1-P-QM-QMA-9021509	N/A	4052 - Environmental Quality Assurance
Obtaining a Representative Environmental Solid Sample Aliquot	1-P-QM-QMA-9017334	LOM-SOP-ES-233	4052 - Environmental Quality Assurance
Procurement of Environmental Laboratory Supplies	1-P-QM-QMA-9021705	LOM-SOP-LAB-218	4052 - Environmental Quality Assurance
Proficiency Test Samples	1-P-QM-QMA-9017321	LOM-SOP-ES-216	4052 - Environmental Quality Assurance
Quarantine Soils Procedures	1-P-QM-QMA-9017317	LOM-SOP-ES-211	4052 - Environmental Quality Assurance
Reagents and Standards	1-P-QM-QMA-9017328	LOM-SOP-ES-225	4052 - Environmental Quality Assurance
Review of Legal Matters	1-P-QM-QMA-9017371	LOM-SOP-LAB-219	40 - Environmental Sciences
Sample Requisition	1-P-QM-QMA-9017312	LOM-SOP-ES-206	4052 - Environmental Quality Assurance
Subcontracting Analytical Testing	1-P-QM-QMA-9017310	LOM-SOP-ES-204	4052 - Environmental Quality Assurance
Thermometer Use and Calibration	1-P-QM-QMA-9017314	LOM-SOP-ES-208	4052 - Environmental Quality Assurance
Use and Maintenance of Reagent Water Supply	1-P-QM-QMA-9017368	LOM-SOP-LAB-214	4052 - Environmental Quality Assurance
Utilizing the Services and Support of the Computer Systems Group	1-P-QM-QMA-9017362	LOM-SOP-LAB-207	9013 - Information Technology
Validation and Authorization of Analytical Methods	1-P-QM-QMA-9017329	LOM-SOP-ES-226	4052 - Environmental Quality Assurance
Windows Network and Computer Accounts	1-P-QM-QMA-9017361	LOM-SOP-LAB-206	9013 - Information Technology
Writing and Reviewing Lancaster Laboratories Policies and Operating Procedures	1-P-QM-QMA-9017356	LOM-SOP-LAB-201	6047 - Office Services

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Microbiology			
2% Brilliant Green Bile Broth (for Coliform Test Dept. 02)	1-P-QM-WI -9018027	SOP-PM-001, Media 400	3002 - Environmental Microbiology
Biological Reaction Activity Test	1-P-QM-WI -9032790	Analysis 13697, 13698, 13699	3002 - Environmental Microbiology
Coliform Analysis - Presence/Absence and MPN	1-P-QM-WI -9014018	Analysis 6477, 6479, 8161, 13666, 13668, 13669, 13671	3002 - Environmental Microbiology
EC Medium – for Dept. 02	1-P-QM-WI -9018028	SOP-PM-001, Media 401	3002 - Environmental Microbiology
Free Chlorine Residual Data Records (Optional Total Chlorine Reading)	1-P-QM-WI -9011681	Analysis 0308	3002 - Environmental Microbiology
Hexadecane HC Emulsion (for HC degrading PC study)	1-P-QM-WI -9018016	SOP-PM-001, Media 382	3002 - Environmental Microbiology
Hydrocarbon Degrading Plate Count Study Waters and Solids	1-P-QM-WI -9013997	Analysis 6157, 6158	3002 - Environmental Microbiology
Lauryl Sulfate Tryptose Broth (1x LST) Single Strength – for Dept. 02	1-P-QM-WI -9018025	SOP-PM-001, Media 398	3002 - Environmental Microbiology
Lauryl Sulfate Tryptose Double Strength (2x LST) – for Dept. 02	1-P-QM-WI -9018026	SOP-PM-001, Media 399	3002 - Environmental Microbiology
M-FC (for Dept. 02)	1-P-QM-WI -9018024	SOP-PM-001, Media 397	3002 - Environmental Microbiology
Modification DPD Free Chlorine Residual In Water (Presence/Absence)	1-P-QM-WI -9011686	Analysis 0416	3002 - Environmental Microbiology
Modification Fecal Coliform by Membrane Filtration	1-P-QM-WI -9011598	Analysis 0199, 11028	3002 - Environmental Microbiology
MS/Agar Noble Base (for HC degrading PC study)	1-P-QM-WI -9018021	SOP-PM-001, Media 390	3002 - Environmental Microbiology
MS/Agar Noble Medium (for HC degrading PC study for Dept. 02)	1-P-QM-WI -9018022	SOP-PM-001, Media 391	3002 - Environmental Microbiology
Pour Plate Analysis - Heterotrophic Plate Count and Yeast/Mold	1-P-QM-WI -9011658	Analysis 0307, 4196, 12833, 13667, 13670	3002 - Environmental Microbiology
Quanti-Tray X Sealer	1-P-QM-PRO-9017534	OMC-PM-078	3002 - Environmental Microbiology
Tryptic Soy Broth (TSB) for Dept. 02 Sterility Checks	1-P-QM-WI -9018035	SOP-PM-001, Media 409	3002 - Environmental Microbiology
Tryptic Soy Broth (TSB)—for Dept. 02	1-P-QM-WI -9018023	SOP-PM-001, Media 396	3002 - Environmental Microbiology
Level 3 – Environmental Sciences			
Calibrating the 1-uL Standard Delivery Groove on the Archon Model 5100A and O.I. 4660 Autosampler Systems	1-P-QM-PRO-9017815	SOP-OR-075	4021 - GC/MS Volatiles
Determination of GRO by GC in Waters and Wastewaters by Method 8015B, 8015C, 8015D	1-P-QM-WI -9015131	Analysis DOD - 1635, 1636, 1728, 1729, 2762, 2763, 8229, 8268, 10598	4021 - GC/MS Volatiles
Determination of GRO by GC in Waters and Wastewaters by Method AK101	1-P-QM-WI -9013129	Analysis 1438, 1440	4021 - GC/MS Volatiles
Determination of Volatile Gasoline Range Organics in Soil and Water - Northwest GX Method	1-P-QM-WI -9013411	Analysis 2005, 2006, 8273, 8274	4021 - GC/MS Volatiles
Determination of Volatile Gasoline Range Organics in Soil and Water Maine Method	1-P-QM-WI -9012774	Analysis 10438, 10439	4021 - GC/MS Volatiles

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Determination of Volatile Gasoline Range Organics in Soil and Water Oklahoma Method	1-P-QM-WI -9013441	Analysis 2315, 8789	4021 - GC/MS Volatiles
Determination of Volatile Target Compounds and Gasoline Range Organics (GRO) by Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS) in Waters and Wastewaters by Method 8260C	1-P-QM-WI -9013078	Analysis 11996, 11997, 13130	4021 - GC/MS Volatiles
Determination of Volatile Target Compounds and Gasoline Range Organics (GRO) by GC/MS in Soils and Solids by Method 8260B	1-P-QM-WI -9012764	Analysis 10237, 10607, 10949, 10950, 10951	4021 - GC/MS Volatiles
Determination of Volatile Target Compounds and Gasoline Range Organics (GRO) by GC/MS in Soils and Solids by Method 8260C	1-P-QM-WI -9013077	Analysis 11995	4021 - GC/MS Volatiles
Determination of Volatile Target Compounds and Gasoline Range Organics (GRO) by GCMS in Waters and Wastewaters by Method 8260B	1-P-QM-WI -9015141	Analysis DOD - 2898, 10335, 10943, 10945	4021 - GC/MS Volatiles
Determination of Volatile Target Compounds by Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS) in Waters and Wastewaters by Method 6200B	1-P-QM-WI -9015099	Analysis 10460	4021 - GC/MS Volatiles
Gasoline Range Organics (GRO) in Soils using Purge and Trap Gas Chromatography by SW-846, Method 8015B or SW-846, Method 8015C, or SW-846, Method 8015D	1-P-QM-WI -9015132	Analysis DOD - 1637, 1638, 1700, 1725, 1726, 2765, 2766, 5550, 5551, 10599, 12989	4021 - GC/MS Volatiles
GC and GC/MS Instrumentation Maintenance	1-P-QM-PRO-9015467	DOD - SOP-MS-004	4021 - GC/MS Volatiles
GC/MS Volatile Standards Traceability	1-P-QM-PRO-9015469	DOD - SOP-MS-006	4021 - GC/MS Volatiles
GC/MS Volatiles Audit Process	1-P-QM-PRO-9015471	DOD - SOP-MS-012	4021 - GC/MS Volatiles
Glassware Cleaning	1-P-QM-PRO-9015465	DOD - SOP-MS-001	4021 - GC/MS Volatiles
GRO in Soils for South Carolina	1-P-QM-WI -9012790	Analysis 10654	4021 - GC/MS Volatiles
GRO in Water for South Carolina	1-P-QM-WI -9012789	Analysis 10653	4021 - GC/MS Volatiles
Level II Review of GS/MS Volatiles	1-P-QM-PRO-9017810	SOP-MS-017	4021 - GC/MS Volatiles
Low Concentration Waters for Volatile Organic Analysis	1-P-QM-WI -9015153	Analysis DOD - 4914	4021 - GC/MS Volatiles
Method AK101 for the Determination of Gasoline Range Organics in Soil Analysis for the State of Alaska	1-P-QM-WI -9013134	Analysis 1450, 1451	4021 - GC/MS Volatiles
Preparation and Analysis of Cleaning Blanks for GC and GC/MS Volatiles	1-P-QM-PRO-9015470	DOD - SOP-MS-007	4021 - GC/MS Volatiles
Preparation and Testing of Storage Blanks for GC/MS Volatile Analysis	1-P-QM-PRO-9015473	DOD - SOP-MS-015	4021 - GC/MS Volatiles
Preparation and Testing of Trip Blanks for GC/MS Volatile Analyses	1-P-QM-PRO-9015466	DOD - SOP-MS-002	4021 - GC/MS Volatiles
Preparation of Oil Samples	1-P-QM-WI -9015068	Analysis DOD - 0373	4021 - GC/MS Volatiles
Preservation and Residual Chlorine Checks of Samples for GC/MS Volatile Water Analysis	1-P-QM-PRO-9015468	DOD - SOP-MS-005	4021 - GC/MS Volatiles
Purgeable Aromatics in High-Level Soils by Method 8021B	1-P-QM-WI -9015190	Analysis DOD - 8179	4021 - GC/MS Volatiles
Purgeable Aromatics in Water Samples by Method 602	1-P-QM-WI -9014655	Analysis 8241	4021 - GC/MS Volatiles
Purgeable Aromatics in Water Samples by Method 8021B	1-P-QM-WI -9015135	Analysis DOD - 2102, 6464, 8806	4021 - GC/MS Volatiles
Statistical Calculations Used in the Analysis of Samples by EPA Methodology	1-P-QM-PRO-9015491	DOD - SOP-OR-020	4021 - GC/MS Volatiles
Targeted Library Search by GC/MS	1-P-QM-WI -9013053	Analysis 11660	4021 - GC/MS Volatiles

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
The Determination of 1,2,3- Trichloropropane by Gas Chromatography/ Mass Spectrometry (GC/MS) using Isotope Dilution and Selective Ion Monitoring (SIM)	1-P-QM-WI -9012867	Analysis 11017	4021 - GC/MS Volatiles
The Determination of 1,4-Dioxane by Gas Chromatography/Mass Spectrometry (GC/MS) using Isotope Dilution and Selective Ion Monitoring (SIM)	1-P-QM-WI -9015075	Analysis DOD - 0527, 10326	4021 - GC/MS Volatiles
The Determination of Ethylene Oxide and Crotonaldehyde by Gas Chromatography/Mass Spectrometry (GC/MS) in Water and Soil by SW-846 Method 8260B	1-P-QM-WI -9014003	Analysis 6372, 6377	4021 - GC/MS Volatiles
The Determination of Vinyl Chloride and Carbon Disulfide by Gas Chromatography/Mass Spectrometry (GC/MS) using Selective Ion Monitoring (SIM)	1-P-QM-WI -9013992	Analysis 6008	4021 - GC/MS Volatiles
The Determination of Vinyl Chloride, Trichloroethene and Tetrachloroethene by Gas Chromatography /Mass Spectrometry (GC/MS) using Selective Ion Monitoring (SIM)	1-P-QM-WI -9013082	Analysis 12030	4021 - GC/MS Volatiles
The Determination of Volatile Organic Compounds in Wastewater by Isotope Dilution and Gas Chromatography/Mass Spectrometry (GC/MS)	1-P-QM-WI -9015136	Analysis 2394, 2417	4021 - GC/MS Volatiles
Toxicity Characteristic Leachate Procedure (TCLP); Determination of Volatile Target Compounds by GCMS in Zero Headspace Extractions (ZHE)	1-P-QM-WI -9015142	Analysis DOD - 3636	4021 - GC/MS Volatiles
Use of 40-mL Vials for Volatile Organic Analyses	1-P-QM-PRO-9015474	DOD - SOP-MS-016	4021 - GC/MS Volatiles
Volatile Compounds in Aqueous and Solid Samples by SW-846 8260B for OH VAP	1-P-QM-WI -9012739	Analysis 10237, 10335 OH VAP	4021 - GC/MS Volatiles
Volatile Organics Tentatively Identified Compound Method	1-P-QM-WI -9015084	Analysis DOD - 0890, 0880, 12028	4021 - GC/MS Volatiles
Volatile Organics Tentatively Identified Compound Method (Interpretive)	1-P-QM-WI -9012746	Analysis 0882, 0884, 12027	4021 - GC/MS Volatiles
Waters for Purgeable Organic Compounds by Capillary Column Gas Chromatography Mass Spectrometry	1-P-QM-WI -9015143	Analysis DOD - 3648	4021 - GC/MS Volatiles
Waters for Volatile Organic Compounds by Purge and Trap Gas Chromatography/Mass Spectrometry using EPA Method 624	1-P-QM-WI -9015097	Analysis DOD - 10371	4021 - GC/MS Volatiles
3030 C, Treatment for Acid-Extractable Metals for North Carolina Groundwater Samples	1-P-QM-WI -9013465	Analysis 2812, 10651, 11988, 11989	4022 - Metals
Bottletop Dispensers	1-P-QM-PRO-9015404	DOD - MC-IO-019	4022 - Metals
Digestion of Aqueous Samples by SW-846 3005A for ICP Analysis – OH VAP	1-P-QM-WI -9024237	Analysis 1848 OH VAP	4022 - Metals
Digestion of Aqueous Samples by SW-846 3010A for ICP Analysis – OH VAP	1-P-QM-WI -9024239	Analysis 5705 OH VAP	4022 - Metals
Digestion of Aqueous Samples by SW846 Method 3020A/3010A Modified for Analysis by ICP/MS for OH VAP	1-P-QM-WI -9022821	6050 OH VAP	4022 - Metals
Digestion of Aqueous Samples by SW-846 Method 7470A for OH VAP	1-P-QM-WI -9013986	Analysis 5713 OH VAP	4022 - Metals
Digestion of Aqueous Samples by SW-846 Method 7470A, EPA 254.1	1-P-QM-WI -9015082	Analysis DOD - 5713, 5714	4022 - Metals

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Digestion of Non-Aqueous Samples by SW-846 Method 3050B for OH VAP	1-P-QM-WI -9013983	Analysis 5708, 10637, 11026, 11027 OH VAP	4022 - Metals
Digestion of Solid Samples by SW-846 Method 7471A - OH VAP	1-P-QM-WI -9013985	Analysis 5711 OH VAP	4022 - Metals
Dilute/Run and AVS/SEM Sample Handling for Metals	1-P-QM-WI -9013476	Analysis 4792, 13449	4022 - Metals
Fixed-Volume Hand-Held Pipettes	1-P-QM-PRO-9015403	DOD - MC-IO-003	4022 - Metals
Glassware Cleaning	1-P-QM-PRO-9015463	DOD - SOP-IO-013	4022 - Metals
Langelier Index in Water	1-P-QM-WI -9012744	Analysis 0576	4022 - Metals
Low Level Mercury by EPA Method 1631 Revision E in Waters Using Cold Vapor Atomic Fluorescence Spectrometry	1-P-QM-WI -9013144	Analysis 1573, 1574	4022 - Metals
Maintenance and Calibration of HACH Model 2100N Laboratory Turbidimeter	1-P-QM-PRO-9017427	MC-IO-017	4022 - Metals
Mercury in Aqueous and Solid Samples by SW-846 Method 7470A (Aqueous) and 7471A (Solid) for OH VAP	1-P-QM-WI -9011649	Analysis 0259, 0159 OH VAP	4022 - Metals
Mercury in Aqueous, Solid and Tissue Samples by Cold Vapor AA	1-P-QM-WI -9015067	Analysis DOD - 0259, 0159	4022 - Metals
Metals by ICP for Methods SW-846 6010B/C (aqueous, solid, tissue) and EPA 200.7(aqueous)	1-P-QM-WI -9018442	Analysis 6966, 1643, 6935, 7914, 6946, 6947, 1650, 6949, 6952, 6951, 6953, 1654, 1662, 1656, 1657, 6958, 6960, 1667, 6961,10145, 6955, 6944, 6936, 6969, 7968, …	4022 - Metals
Metals by Inductively Coupled Plasma Mass Spectrometry for SW-846 Methods 6020/6020A (aqueous, solid, tissue) and EPA 200.8 (aqueous)	1-P-QM-WI -9018443	Analysis 6142, 6123, 6125, 10801, 6126, 6127, 6129, 6128, 6132, 6131, 6133, 6134, 6140, 6136, 6137, 6138, 6143, 6139, 6135, 6124, 6141, 6146, 6144, 6147, 6145, …	4022 - Metals
Metals Use of the LLENS System	1-P-QM-PRO-9015464	DOD - SOP-IO-036	4022 - Metals
Sample Prep of Sediments, Sludges, Soils, and Tissues by SW846 3050B for Analysis of Metals by ICP and ICP-MS	1-P-QM-WI -9015160	Analysis DOD - 5708, 10637	4022 - Metals
Sample Preparation of Leachates and Other Wastewater for Analysis of Total Metals by Inductively Coupled Plasma-Mass Spectrometer (ICP-MS)	1-P-QM-WI -9015165	Analysis DOD - 6050, 10639	4022 - Metals
Sample Preparation of Oils for Analysis of Metals by Inductively Coupled Plasma Spectroscopy	1-P-QM-WI -9015091	Analysis DOD - 1015	4022 - Metals
Sample Preparation of Potable Water, Groundwater, Surface Water, and Wastewater for Analysis of Total Recoverable Metals by ICP (5716)	1-P-QM-WI -9013987	Analysis 5716	4022 - Metals
Sample Preparation of Potable Water, Groundwater, Surface Water, and Wastewater for Analysis of Total Recoverable Metals by ICPMS (7050)	1-P-QM-WI -9014042	Analysis 7050	4022 - Metals

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Sample Preparation of Soil, Sediment, Sludge, Oils, and Tissues for Total Mercury Analysis by Atomic Absorption Cold Vapor Technique	1-P-QM-WI -9015161	Analysis DOD - 5711, 10638	4022 - Metals
Sample Preparation of Wastewater and Leachates for Analysis of Total Metals by Inductively Coupled Plasma Atomic Emission Spectrometry	1-P-QM-WI -9015159	Analysis DOD - 5705, 10636	4022 - Metals
Sample Preparation of Waters for Analysis of Total Recoverable Metals by Inductively Coupled Plasma Optical Emission Spectrometry	1-P-QM-WI -9015133	Analysis DOD - 1848, 10635	4022 - Metals
Trace Metals in Aqueous and Non-Aqueous Samples by Method SW-846 6010B for OH VAP	1-P-QM-WI -9022822	7066, 6966, 1743, 1643, 7035, 6935, 7046, 6946, 7047, 6947, 1750, 1650, 7049, 6949, 7052, 6952, 7051, 6951, 7053, 6953, 1754, 1654, 1762, 1662, 7058, 6958, 1767, 1667, 7061, 6961, 7055, 6955, 7044, 6944, 7036, 6936, 7022, 6925, 7071, 6971, 7072,... OH VAP	4022 - Metals
Trace Metals in Aqueous and Non-Aqueous Samples by Method SW-846 6020 for OH VAP	1-P-QM-WI -9022820	6127, 6027, 6131, 6031, 6137, 6037, 6139, 6039, 6133, 6033, 6125, 6142, 6042, 6128, 6028, 6124, 6024, 6126, 6026, 6145, 6045, 6135, 6035 OH VAP	4022 - Metals
Undigested Sample Preparation of Potable Water for Analysis of Total Recoverable Metals by Inductively Coupled Plasma Mass Spectrometry [ICP-MS]	1-P-QM-WI -9013994	Analysis 6051, 5281	4022 - Metals
Analysis of Chlorinated Herbicides by 8151A in Water	1-P-QM-WI -9015088	Analysis DOD - 0952, 10407	4024 - Pesticide Residue Analysis
Analysis of Pesticides by 8081B in Solid Samples using GC-ECD	1-P-QM-WI -9015108	Analysis DOD - 10590	4024 - Pesticide Residue Analysis
Analysis of Polychlorinated Biphenyls (PCBs) by 8082A in Aqueous Samples using GC-ECD	1-P-QM-WI -9015109	Analysis DOD - 10591, 13092	4024 - Pesticide Residue Analysis
Captan and Captafol by Method 8081A in Waters and Solids using GC-ECD	1-P-QM-WI -9013435	Analysis 2257, 2253	4024 - Pesticide Residue Analysis
Chlorinated Acids in Water Using GC-ECD by Method 515.1	1-P-QM-WI -9013405	Analysis 1864	4024 - Pesticide Residue Analysis
Chlorinated Herbicides by 8151A in Solids by GC-ECD	1-P-QM-WI -9015158	Analysis DOD - 10401	4024 - Pesticide Residue Analysis
Common Equations Used During Chromatographic Analyses	1-P-QM-PRO-9015501	DOD - SOP-PP-040	4024 - Pesticide Residue Analysis
Creating Calibration Timed Events in Chrom Perfect	1-P-QM-PRO-9018227	SOP-PP-036	4024 - Pesticide Residue Analysis
Data Audit Procedure for Department 4024	1-P-QM-PRO-9018224	SOP-PP-023	4024 - Pesticide Residue Analysis
Determination of Picric Acid in Soil Samples by HPLC with UV	1-P-QM-WI -9012797	Analysis 10709	4024 - Pesticide Residue Analysis
EDB, DBCP and TCP by Method 8011 in Solids using Microextraction and GC-ECD	1-P-QM-WI -9025366	Analysis 13214	4024 - Pesticide Residue Analysis
EDB/DBCP and TCP by Method 504.1 or 8011 in Waters using Microextraction and GC-ECD	1-P-QM-WI -9015094	Analysis DOD - 1034, 7934, 10398	4024 - Pesticide Residue Analysis
Extraction By Method 8318/8318A for Carbamate and Urea Pesticides in Solids	1-P-QM-WI -9013140	Analysis 1510, 11143	4024 - Pesticide Residue Analysis

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Extraction for Perchlorate by Method 6850 in Solids	1-P-QM-WI -9015167	Analysis DOD - 6568	4024 - Pesticide Residue Analysis
Extraction of Chlorinated Acids and Herbicides in Drinking Water by Method 515.1	1-P-QM-WI -9014002	Analysis 6369	4024 - Pesticide Residue Analysis
Extraction of Chlorinated Herbicides in a Soil Matrix	1-P-QM-WI -9013472	Analysis 4181	4024 - Pesticide Residue Analysis
Extraction of Chlorinated Herbicides in a Water Matrix by SW-846 8151A	1-P-QM-WI -9015078	Analysis DOD - 0816, 11110, 11111	4024 - Pesticide Residue Analysis
Extraction of Formaldehyde and Other Aldehydes in a Water by Method 8315A	1-P-QM-WI -9015090	Analysis DOD - 1013, 11124, 12857	4024 - Pesticide Residue Analysis
Extraction of Nitroaromatics and Nitroamines by Method 8330/A/B in Water	1-P-QM-WI -9015171	Analysis DOD - 6915, 11122, 11125, 13432	4024 - Pesticide Residue Analysis
Extraction Procedure for the Determination of Formaldehyde and Aldehydes in a Solid Matrix	1-P-QM-WI -9015162	Analysis DOD - 5876, 11139	4024 - Pesticide Residue Analysis
Formaldehyde and Other Aldehydes by Method 8315A in Aqueous and Solid Samples using HPLC	1-P-QM-WI -9013471	Analysis 8044, 8045, 12856, 13022, 13031	4024 - Pesticide Residue Analysis
Interpretation of Chromatographic Data	1-P-QM-PRO-9015494	DOD - SOP-PP-011	4024 - Pesticide Residue Analysis
Liquid/Liquid Extraction Procedure for the Determination of Organophosphorous Pesticides in a Wastewater Matrix	1-P-QM-WI -9012765	Analysis 10240	4024 - Pesticide Residue Analysis
Low Level PCBs in Water by Method 8082/8082A using GC-ECD	1-P-QM-WI -9013081	Analysis 12013, 12686	4024 - Pesticide Residue Analysis
Medium Level Sonic Probe Extraction Procedure for the Determination of Pesticides and PCBs in a Solid Matrix	1-P-QM-WI -9012745	Analysis 0819M, 11144	4024 - Pesticide Residue Analysis
Microextraction by Method 504.1 or 8011 for EDB, DBCP, and TCP in Water	1-P-QM-WI -9014309	Analysis 7786, 13715	4024 - Pesticide Residue Analysis
Microextraction of EDB, DBCP, and TCP in Solids by Method 8011	1-P-QM-WI -9025371	Analysis 13218	4024 - Pesticide Residue Analysis
Micromass Quattro Micro Tandem Mass Spectrometer with a Waters 2795 HPLC System (LC/MS/MS)	1-P-QM-PRO-9018230	SOP-PP-042	4024 - Pesticide Residue Analysis
Microwave Extraction Method 3546 for PCBs in a Solid Matrix	1-P-QM-WI -9015104	Analysis DOD - 10497, 11140, 13100	4024 - Pesticide Residue Analysis
Microwave Extraction Method 3546 for Pesticides in a Solid Matrix	1-P-QM-WI -9015103	Analysis DOD - 10496, 11141	4024 - Pesticide Residue Analysis
Microwave Extraction of Pesticides and PCBs in Non-aqueous Samples by SW-846 Method 3546 for OH VAP	1-P-QM-WI -9022433	Analysis 10496, 10497 OH VAP	4024 - Pesticide Residue Analysis
Monitoring QC Data Acceptance Limits	1-P-QM-PRO-9015496	DOD - SOP-PP-025	4024 - Pesticide Residue Analysis
Nitroaromatics and Nitroamines by Method 8330B in Water and Solids using HPLC with UV Detection	1-P-QM-WI -9029396	Analysis DOD - 13395, 13413	4024 - Pesticide Residue Analysis
Nitroaromatics and Nitroamines in Water and Solids by HPLC with UV Detection by Method 8330(A)	1-P-QM-WI -9015172	Analysis DOD - 6916, 6918, 10595, 10596, 10131, 10132	4024 - Pesticide Residue Analysis
Nitrogen and Phosphorus Containing Pesticides by EPA Method 507 in Water using GC-NPD	1-P-QM-WI -9013407	Analysis 1870	4024 - Pesticide Residue Analysis
N-Methylcarbamate Pesticides by Method 8318 / 8318A in Solids	1-P-QM-WI -9013139	Analysis 1509, 10597	4024 - Pesticide Residue Analysis
N-Methylcarbamates by Method 531.1 in Groundwater and Drinking Water using High Performance Liquid Chromatography (HPLC)	1-P-QM-WI -9013126	Analysis 1340	4024 - Pesticide Residue Analysis

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
OP Pesticides (Acephate and Methamidophos) by 8141A in Aqueous and Solid Samples using GC-NPD	1-P-QM-WI -9013395	Analysis 1782, 1785	4024 - Pesticide Residue Analysis
Organic Acids in Water by Methods 8015B/D or 8321B using HPLC/UV	1-P-QM-WI -9015063	Analysis 8843, 12737, 13947	4024 - Pesticide Residue Analysis
Organophosphorous Pesticides by Method 8141A/8141B in Solid Samples using GC-NPD	1-P-QM-WI -9015157	Analysis DOD - 5367, 10408, 10594, 13178, 13184	4024 - Pesticide Residue Analysis
Organophosphorous Pesticides by Methods 8141A/8141B/622 in Aqueous Samples using GC-NPD	1-P-QM-WI -9015156	Analysis DOD - 5366, 10410, 10593, 12144, 13182, 13186	4024 - Pesticide Residue Analysis
Passive In-Situ Chemical Extraction Sampler (PISCES) Procedure for the Determination of Polychlorinated Biphenyls (PCBs)	1-P-QM-WI -9013121	Analysis 12801	4024 - Pesticide Residue Analysis
PCBs in Oil by SW-846 Method 8082	1-P-QM-WI -9011597	Analysis 0174	4024 - Pesticide Residue Analysis
Perchlorate by Method 6850 in Waters and Solids by LC/MS/MS	1-P-QM-WI -9015166	Analysis DOD - 6386, 6557	4024 - Pesticide Residue Analysis
Pesticide Extract Cleanup Using Gel Permeation Chromatography	1-P-QM-PRO-9015407	DOD - MC-OE-004	4024 - Pesticide Residue Analysis
Pesticides by Method 8081A in Solid Samples using GC-ECD	1-P-QM-WI -9015128	Analysis DOD - 1363, 1420, 4225, 10738, 13237	4024 - Pesticide Residue Analysis
Pesticides in Aqueous and Non-aqueous Samples by SW-846 Method 8081A for OH VAP	1-P-QM-WI -9022430	Analysis 0177, 1363, 10738 OH VAP	4024 - Pesticide Residue Analysis
Pesticides in Aqueous Samples by Method 608	1-P-QM-WI -9014174	Analysis 7572	4024 - Pesticide Residue Analysis
Pesticides in Water by Method 8081A using GC-ECD	1-P-QM-WI -9015066	Analysis DOD - 0177, 0950, 0180, 1954	4024 - Pesticide Residue Analysis
Pesticides in Water by Method 8081B using GC-ECD	1-P-QM-WI -9015107	Analysis DOD - 10589, 10647	4024 - Pesticide Residue Analysis
Picric Acid in Water by Method 8015B Using HPLC with UV Detection	1-P-QM-WI -9013439	Analysis 2265	4024 - Pesticide Residue Analysis
Polychlorinated Biphenyls (PCBs) by Method 608 or 8082 in Waters	1-P-QM-WI -9015164	Analysis DOD - 6030, 10227	4024 - Pesticide Residue Analysis
Polychlorinated Biphenyls (PCBs) by Method 8082 in Solids and Wipes	1-P-QM-WI -9015126	Analysis DOD - 0042, 1030, 6011, 7512, 10225, 10736, 10906, 12800, 13236	4024 - Pesticide Residue Analysis
Polychlorinated Biphenyls (PCBs) in Aqueous and Non-aqueous Samples by SW-846 Method 8082 for OH VAP	1-P-QM-WI -9022429	Analysis 10225, 10227, 10736 OH VAP	4024 - Pesticide Residue Analysis
Polychlorinated Biphenyls (PCBs) in Solid Samples by 8082A Using GC-ECD	1-P-QM-WI -9015110	Analysis DOD - 10592, 10885, 12718, 13099, 13219, 13713	4024 - Pesticide Residue Analysis
Prescreening Water and Soil Samples for Pesticides and PCBs	1-P-QM-PRO-9018229	SOP-PP-041	4024 - Pesticide Residue Analysis
Preventative and Corrective GC Maintenance	1-P-QM-PRO-9015495	DOD - SOP-PP-013	4024 - Pesticide Residue Analysis
Preventative and Corrective HPLC Maintenance for the Pesticide Residue Analysis Department	1-P-QM-PRO-9015497	DOD - SOP-PP-029	4024 - Pesticide Residue Analysis
QC Data Acceptability and Corrective Action	1-P-QM-PRO-9015493	DOD - SOP-PP-002	4024 - Pesticide Residue Analysis

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Separatory Funnel Extraction by Method 3510C, 608 or 622 for Pesticides and PCBs in a Wastewater	1-P-QM-WI -9015079	Analysis DOD - 6654, 10241, 11112, 11113, 11114, 11116, 11117, 11118, 11119, 11120, 11121, 11123, 11126, 11960, 12026, 12822, 13086, 13093, 13183, 13187	4024 - Pesticide Residue Analysis
Separatory Funnel Extraction of Pesticides and PCBs in Aqueous Samples by SW-846 Method 3510C for OH VAP	1-P-QM-WI -9022427	Analysis 11117, 11118 OH VAP	4024 - Pesticide Residue Analysis
Separatory Funnel Extraction Procedure for the Determination of Chlorinated Pesticides; Nitrogen and Phosphorus Containing Pesticides; and PCBs in a Drinking Water Matrix	1-P-QM-WI -9014001	Analysis 6368, 11127	4024 - Pesticide Residue Analysis
Setting Retention Time Windows	1-P-QM-PRO-9018226	SOP-PP-035	4024 - Pesticide Residue Analysis
Setting Up Analysis Numbers in the Departmental Database	1-P-QM-PRO-9018228	SOP-PP-037	4024 - Pesticide Residue Analysis
Setting Up Single Component Initial Calibrations	1-P-QM-PRO-9015498	DOD - SOP-PP-031	4024 - Pesticide Residue Analysis
Sonic Probe Extraction for the Determination of Pesticides in a Solid Matrix	1-P-QM-WI -9015163	Analysis DOD - 11129, 11131, 11134	4024 - Pesticide Residue Analysis
Sonic Probe Extraction of Pesticides and PCBs in Solid Samples by SW-846 Method 3550C for OH VAP	1-P-QM-WI -9022432	Analysis 0819, 11134 OH VAP	4024 - Pesticide Residue Analysis
Sonic Probe Extraction Procedure for the Determination of Polychlorinated Biphenyls (PCBs) in a Solid Matrix	1-P-QM-WI -9015081	Analysis DOD - 0819, 11128, 11132, 11135	4024 - Pesticide Residue Analysis
Sonication Extraction of Nitroaromatics and Nitroamines by Method 8330/A/B in Soilds	1-P-QM-WI -9015173	Analysis DOD - 6917, 11137, 11138, 13433	4024 - Pesticide Residue Analysis
Soxhlet Extraction (Method 3540C) for Triazine Herbicides and Organophosphorous Pesticides in a Solid Matrix	1-P-QM-WI -9015170	Analysis DOD - 6677, 11130, 11133, 11142, 13181, 13185	4024 - Pesticide Residue Analysis
Standards Preparation, Coding, and Storage	1-P-QM-PRO-9018222	SOP-PP-021	4024 - Pesticide Residue Analysis
Standards Traceability and Monitoring	1-P-QM-PRO-9018220	SOP-PP-003	4024 - Pesticide Residue Analysis
Uploading Data to the LIMS	1-P-QM-PRO-9018225	SOP-PP-027	4024 - Pesticide Residue Analysis
Using "Datalog" Software for Data Acquisition of Multicomponent Pesticides/PCBs	1-P-QM-PRO-9015499	DOD - SOP-PP-032	4024 - Pesticide Residue Analysis
Using "Datalog" Software for Single-component Data Acquisition	1-P-QM-PRO-9015500	DOD - SOP-PP-033	4024 - Pesticide Residue Analysis
Waste Dilution Procedure for the Determination of PCBs in Oil	1-P-QM-WI -9015077	Analysis DOD - 0815	4024 - Pesticide Residue Analysis
Waste Dilution Procedure for the Determination of Pesticides and PCBs in a Non-Water Soluble Leachate Matrix	1-P-QM-WI -9015080	Analysis DOD - 11114DIL	4024 - Pesticide Residue Analysis
Analysis of Chlorinated Herbicides in Water by Selective Ion Monitoring Gas Chromatography/Mass Spectroscopy (SIM/GC/MS)	1-P-QM-WI -9013416	Analysis 2026	4026 - GC/MS Semivolatiles
Determination of Benz(a)pyrene in Smokeless Tobacco by Selective Ion Monitoring Gas Chromatography/Mass Spectrometry (SIM/GC/MS)	1-P-QM-WI -9014169	Analysis 7325, 0089	4026 - GC/MS Semivolatiles

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Determination of N-Nitrosodimethylamine (NDMA) in Water and Soil by EPA 1625C	1-P-QM-WI -9012803	Analysis 10962, 11622	4026 - GC/MS Semivolatiles
Determination of Priority Pollutants by Method 625	1-P-QM-WI -9015093	Analysis DOD - 10334, 2783	4026 - GC/MS Semivolatiles
Determination of Tetraethyl Lead (TEL) and Tetramethyl Lead (TML) by GC/MS Analysis	1-P-QM-WI -9015145	Analysis DOD - 4220, 4221	4026 - GC/MS Semivolatiles
Dioxin Screening (2,3,7,8-TCDD) of Aqueous and Solid Matrices using GC-MS SIM	1-P-QM-WI -9015072	Analysis DOD - 0382, 1196	4026 - GC/MS Semivolatiles
Extraction of Semi-Volatile Organic Compounds by Method 525.2 in Drinking Waters	1-P-QM-WI -9015152	Analysis DOD - 4894	4026 - GC/MS Semivolatiles
Extraction Procedure for the Determination of 2-Chlrorbenzalmalonotrile (CS) and 3-Quinuclidinyl Benzilate (BZ) in Water and Wastewater	1-P-QM-WI -9012779	Analysis 10475	4026 - GC/MS Semivolatiles
Extraction Procedure for the Determination of PAHs in an XAD Air Tube Sample by TO-15A	1-P-QM-WI -9014491	Analysis 7806AIR	4026 - GC/MS Semivolatiles
GC/MS Audit Process	1-P-QM-PRO-9015455	DOD - SOP-EX-009	4026 - GC/MS Semivolatiles
GC/MS Electronic Data Management and Handling	1-P-QM-PRO-9015453	DOD - SOP-EX-006	4026 - GC/MS Semivolatiles
GC/MS Preventative and Corrective Maintenance	1-P-QM-PRO-9015393	DOD - MC-EX-001	4026 - GC/MS Semivolatiles
Liquid/Liquid Extraction Procedure for the Determination of Base-Neutrals and Acid Extractables in a Wastewater Matrix by Method 8270	1-P-QM-WI -9015098	Analysis DOD - 10458	4026 - GC/MS Semivolatiles
Liquid/Liquid Extraction Procedure for the Determination of Neutral Extractables in a Wastewater Matrix	1-P-QM-WI -9013043	Analysis 11629	4026 - GC/MS Semivolatiles
Liquid-Liquid Extraction Procedure for the Determination of Target Compound List Analytes in a Water Matrix	1-P-QM-WI -9015147	Analysis DOD - 4606	4026 - GC/MS Semivolatiles
Low-Level Sonic Probe Extraction Procedure by Method 3550C for the Determination of Semivolatiles in a Solid Matrix	1-P-QM-WI -9015070	Analysis DOD - 0381, 10478, 10480, 10483, 10486, 10487L	4026 - GC/MS Semivolatiles
Low-Level Sonic Probe Extraction Procedure for the Determination of Target Compound List Analytes in a Solid Matrix	1-P-QM-WI -9015148	Analysis DOD - 4607	4026 - GC/MS Semivolatiles
Low-Level Sonication Extraction Procedure for the Determination of Polynuclear Aromatic Hydrocarbons (PAHs) in a Solid Matrix by GC/MS	1-P-QM-WI -9014490	Analysis 7806	4026 - GC/MS Semivolatiles
Microwave Extraction by Method 3546 for Semivolatiles	1-P-QM-WI -9015105	Analysis DOD - 10498, 10809, 10810, 10811, 10812, 10813, 10814, 11630, 11916	4026 - GC/MS Semivolatiles
Microwave Extraction for the Determination of Semivolatiles in a Solid Matrix	1-P-QM-WI -9012780	Analysis 10481, 11598	4026 - GC/MS Semivolatiles
Microwave Extraction of Semivolatiles in Non-Aqueous Samples by SW-846 Method 3546 for OH VAP	1-P-QM-WI -9022475	Analysis 10813 OH VAP	4026 - GC/MS Semivolatiles
Monitoring QC Data Acceptance Limits	1-P-QM-PRO-9015457	DOD - SOP-EX-020	4026 - GC/MS Semivolatiles
Pesticide Extract Cleanup Using Gel Permeation Chromatography for OH VAP	1-P-QM-PRO-9023663	N/A	4026 - GC/MS Semivolatiles
Quality Control Spike Mix Verification	1-P-QM-PRO-9015454	DOD - SOP-EX-008	4026 - GC/MS Semivolatiles

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Semivolatile Compounds by Method 525.2 in Drinking Water using GC/MS	1-P-QM-WI -9015092	Analysis DOD - 10333	4026 - GC/MS Semivolatiles
Semivolatile Extract Cleanup Using Gel Permeation Chromatography	1-P-QM-PRO-9015406	DOD - MC-OE-003	4026 - GC/MS Semivolatiles
Semivolatile Extract Cleanup Using Gel Permeation Chromatography for OH VAP	1-P-QM-PRO-9023664	N/A	4026 - GC/MS Semivolatiles
Semivolatile Organic Compounds by Method 8270D in Aqueous and Non-Aqueous Matrices using GC-MS	1-P-QM-WI -9015100	Analysis DOD - 10461, 10462, 10726	4026 - GC/MS Semivolatiles
Semivolatile Organic Compounds in Aqueous and Non-Aqueous Samples by Method SW-846 8270C for OH VAP	1-P-QM-WI -9022474	Analysis 1309, 10723 OH VAP	4026 - GC/MS Semivolatiles
Semivolatile Organic Compounds, Including DRO/ORO, by Method 8270C in Aqueous and Non-Aqueous Matrices Using GC-MS	1-P-QM-WI -9015087	Analysis DOD - 0949, 1309, 1476, 1536, 1946, 1947, 1953, 2035, 2395, 4615, 4678, 4688, 6387, 6397, 7804, 7805, 10032, 10723, 10724, 10727, 10728, 13615, 13618	4026 - GC/MS Semivolatiles
Semivolatile Organics Tentatively Identified Compound Method	1-P-QM-WI -9015083	Analysis DOD - 0885, 0886, 0887, 0893, 7125, 12126	4026 - GC/MS Semivolatiles
Semivolatile Run/Injection Log Generation	1-P-QM-PRO-9015456	DOD - SOP-EX-019	4026 - GC/MS Semivolatiles
Semivolatile Spiking and Calibration Standards	1-P-QM-PRO-9015452	DOD - SOP-EX-001	4026 - GC/MS Semivolatiles
Semivolatiles by Methods 8270C/D SIM	1-P-QM-WI -9015192	Analysis DOD - 8357, 0038, 0039, 10010, 10137, 10138, 10725, 11915, 11917, 12969, 12970, 12971	4026 - GC/MS Semivolatiles
Separatory Funnel Extraction (Method 3510C) or Waste Dilution (Method 3580A) of Base Neutrals and Acid Extractables in Leachates	1-P-QM-WI -9015149	Analysis DOD - 4731	4026 - GC/MS Semivolatiles
Separatory Funnel Extraction by Method 3510C for BNAs in Wastewater	1-P-QM-WI -9015076	Analysis DOD - 0813, 11010, 11015, 10464, 10467, 10476	4026 - GC/MS Semivolatiles
Separatory Funnel Extraction by Method 3510C for Tetraethyl Lead in Waters	1-P-QM-WI -9015101	Analysis DOD - 10472	4026 - GC/MS Semivolatiles
Separatory Funnel Extraction for the Determination of PAHs in Water by GC/MS Using Method 3510C	1-P-QM-WI -9015185	Analysis DOD - 7807	4026 - GC/MS Semivolatiles
Separatory Funnel Extraction Procedure for the Determination of Base-Neutrals and Acid Extractables by SIM in a Wastewater Matrix	1-P-QM-WI -9015121	Analysis DOD - 11012, 10465, 10466, 10470, 10471, 11912	4026 - GC/MS Semivolatiles
Separatory Funnel Extraction Procedure for the Determination of Base-Neutrals and Acid Extractables in a Wastewater Matrix by Method 625	1-P-QM-WI -9015188	Analysis DOD - 8108, 10463	4026 - GC/MS Semivolatiles
Separatory Funnel Extraction Semivolatile Organic Compounds in an Aqueous Samples by SW-846 Method 3510C for OH VAP	1-P-QM-WI -9022472	Analysis 10464 OH VAP	4026 - GC/MS Semivolatiles
Solid Phase Extraction Procedure for the Determination of THPA, THPI and PA in a Water Matrix	1-P-QM-WI -9012865	Analysis 11011	4026 - GC/MS Semivolatiles
Sonic Probe Extraction Procedure for the Determination of Semivolatiles in a Complex Matrix	1-P-QM-WI -9015189	Analysis DOD - 8108TJ	4026 - GC/MS Semivolatiles

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Sonic Probe Extraction Procedure for the Determination of Semivolatiles in a Solid Matrix by SIM	1-P-QM-WI -9015102	Analysis DOD - 10479, 10484, 10489, 11914	4026 - GC/MS Semivolatiles
Sonic Probe Extraction Procedure for the Determination of Semivolatiles in Non-Aqueous Samples by SW-846 Method 3550C for OH VAP	1-P-QM-WI -9022476	Analysis 0381 10478 OH VAP	4026 - GC/MS Semivolatiles
The Determination of d-Limonene in Plastic by Gas Chromatography/Mass Spectrometry (GC/MS)	1-P-QM-WI -9012761	Analysis 10215	4026 - GC/MS Semivolatiles
The Determination of Semivolatiles by Large Volume Injection (LVI) Gas Chromatography/Mass Spectrometry (GC/MS)	1-P-QM-WI -9014025	Analysis 6570	4026 - GC/MS Semivolatiles
THPA, THPI and PA by 8270C Mod. or CEPH 440 in Waters and Solids Using GC/MS	1-P-QM-WI -9013141	Analysis 1542, 2345	4026 - GC/MS Semivolatiles
Waste Dilution Procedure for the Determination of Acid Extractables and Base-Neutrals in a Non-Water Soluble Leachate Matrix	1-P-QM-WI -9015150	Analysis DOD - 4731DIL	4026 - GC/MS Semivolatiles
Waste Dilution Procedure for the Determination of Acid Extractables and Base-Neutrals in a Non-Water Soluble Matrix	1-P-QM-WI -9015071	Analysis DOD - 0381DIL	4026 - GC/MS Semivolatiles
Accusterilizer - Steam Sterilizer	1-P-QM-PRO-9015400	DOD - MC-IC-008	4027 - Instrumental Water Quality
Automated Determination of Ammonia Nitrogen in Water and Wastewater Using Segmented Flow Analysis and Gas Diffusion by EPA 350.1	1-P-QM-PRO-9020808	Analysis 12892, 13000	4027 - Instrumental Water Quality
Automated Determination of Phenols in Water, Wastewater, and Soils By Automated Flow Analyzer EPA 420.4, EPA 420.2, SW-846, 9066	1-P-QM-WI -9011690	Analysis 0434, 2393, 5912	4027 - Instrumental Water Quality
Automated Determination of Total Kjeldahl Nitrogen in Water, Wastewater, and Solids	1-P-QM-WI -9011633	Analysis 0217, 1511, 0223, 4235, 6165	4027 - Instrumental Water Quality
Department 4027 Chemical Inventory and Review Procedures	1-P-QM-PRO-9015460	DOD - SOP-IC-016	4027 - Instrumental Water Quality
Determination of Hexavalent Chromium by Ion Chromatography in Solids and Waters SW-846 7199 and EPA 218.6	1-P-QM-WI -9013989	Analysis 5892, 6467	4027 - Instrumental Water Quality
Determination of Inorganic Anions by Ion Chromatography	1-P-QM-WI -9011637	Analysis 0224, 0228, 0332, 0368, 1504, 1505, 1506, 7322, 7332, 7333, 7334, 7335, 7336, 7337, 7338	4027 - Instrumental Water Quality
Determination of Inorganic Anions by Ion Chromatography (Department of Defense)	1-P-QM-WI -9015115	Analysis DOD - 10697, 10698, 10699, 10700, 10701, 10702, 10703	4027 - Instrumental Water Quality
Determination of Nitrocellulose in Water and Soil	1-P-QM-WI -9011683	Analysis 0370, 0371, 1105, 1106	4027 - Instrumental Water Quality
Determination of Perchlorate by Ion Chromatography	1-P-QM-WI -9013993	Analysis 6019, 10130, 10147	4027 - Instrumental Water Quality
Determination of TOC and TC in Solids and Sludges by Combustion	1-P-QM-WI -9013418	Analysis 2079, 0383, 6623, 10065, 11356, 11763	4027 - Instrumental Water Quality
Determination of Total and Amenable Cyanide in Water, Wastewater, and Soils, Free Cyanide in Water and Wastewater, Reactive Cyanide of Solids, and Weak Acid Dissociable Cyanide in Waters and Soils	1-P-QM-WI -9011646	Analysis 0237, 1123, 1549, 5895, 5898, 8255, 0241, 4814, 0961, 0957, 0959	4027 - Instrumental Water Quality

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Determination of Total and Available Cyanide in Water using Amperometric Detection by ASTM D 7511-09e2 and Method OIA-1677-09	1-P-QM-WI -9013123	Analysis 12823, 12941, 12999	4027 - Instrumental Water Quality
Determination of Total and Soluble Phosphorus in Water, Wastewater, and Soils (Colorimetric, Ascorbic Acid, Automated)	1-P-QM-WI -9011640	Analysis 0227, 0345, 1546, 5893, 5894, 13463	4027 - Instrumental Water Quality
Determination of Total Carbon in Water and Wastewater	1-P-QM-WI -9013142	Analysis 1550	4027 - Instrumental Water Quality
Determination of Total Cyanide in Water, Wastewater, and Soils (Department of Defense) SW-846 9012B, SW-846 9012A	1-P-QM-WI -9015116	Analysis DOD - 10704, 10705	4027 - Instrumental Water Quality
Determination of Total Organic Carbon in Water and Wastewater (Quadruplicate Studies)	1-P-QM-WI -9011682	Analysis 0354	4027 - Instrumental Water Quality
Determination of Total Organic Carbon, Dissolved Organic Carbon, and Inorganic Carbon in Water and Wastewater	1-P-QM-WI -9011651	Analysis 0273, 6090, 7547	4027 - Instrumental Water Quality
Digestion of Total and Soluble Phosphorus in Water, Wastewater, and Soils EPA 361.1, SM20 4500 P B, and SM20 4500 P E	1-P-QM-WI -9014675	Analysis 8261, 8262, 8263, 8264, 8895, 13464	4027 - Instrumental Water Quality
Hexavalent Chromium (Cr VI) in Aqueous and Non-aqueous Samples by Method SW-846 7199 for OH VAP	1-P-QM-WI -9022443	Analysis 5892, 6467 OH VAP	4027 - Instrumental Water Quality
ICS-1000, ICS 1100, ICS-2000 and ICS-3000 Ion Chromatography Systems	1-P-QM-PRO-9015402	DOD - MC-IC-010	4027 - Instrumental Water Quality
Low Level Hexavalent Chromium by Ion Chromatography in Solids and Waters	1-P-QM-WI -9029677	Analysis 12868	4027 - Instrumental Water Quality
Maintenance and Calibration of A.I. Scientific AIM600 Digestor	1-P-QM-PRO-9015397	DOD - MC-IC-005	4027 - Instrumental Water Quality
Maintenance of Continuous Flow Analyzers	1-P-QM-PRO-9015399	DOD - MC-IC-007	4027 - Instrumental Water Quality
Maintenance of the OI Analytical Model 1030 Total Organic Carbon Analyzer	1-P-QM-PRO-9015398	DOD - MC-IC-006	4027 - Instrumental Water Quality
Maintenance of the OI Analytical Total Organic Carbon Solids Analyzer	1-P-QM-PRO-9015461	DOD - SOP-IC-017	4027 - Instrumental Water Quality
Moisture by Sartorius Moisture Analyzer/Moisture by Mettler Toledo HB43 SM20 2540 G	1-P-QM-WI -9013422	Analysis 2111, 2118, 2121	4027 - Instrumental Water Quality
Nitrate Nitrogen in Water and Wastewater (Colorimetric, Automated Cadmium Reduction)	1-P-QM-WI -9011635	Analysis 0220, 7882, 5992	4027 - Instrumental Water Quality
Nitrite Nitrogen in Water and Wastewater (Colorimetric, Automated)	1-P-QM-WI -9011634	Analysis 0219, 5991	4027 - Instrumental Water Quality
pH Electrodes and Meters	1-P-QM-PRO-9015396	DOD - MC-IC-003	4027 - Instrumental Water Quality
Phenol Distillation (as Preparation for Analysis on the Flow Analyzer)	1-P-QM-WI -9011693	Analysis 0491, 5911, 8123	4027 - Instrumental Water Quality
Quality Control for Auto-Analyzer Analyses Performed in Instrumental Water Quality	1-P-QM-PRO-9015459	DOD - SOP-IC-004	4027 - Instrumental Water Quality
Reagent Water Extraction (as Preparation for Analysis on the Ion Chromatograph or Autoanalyzer)	1-P-QM-WI -9013127	Analysis 1352, 10129	4027 - Instrumental Water Quality
Total and Amenable Cyanide Distillation (As Preparation for Analysis on the Automatic Flow Analyzer)	1-P-QM-WI -9011694	Analysis 0492, 1548, 5896, 5897, 8256, 0956, 0958	4027 - Instrumental Water Quality
Total Cyanide Analysis of Waters and Solids by Massachusetts Contingency Plan (MCP)/NJ DKQP	1-P-QM-WI -9012873	Analysis 11151	4027 - Instrumental Water Quality
Total Cyanide Distillation (Department of Defense)	1-P-QM-WI -9015117	Analysis DOD - 10706, 10707	4027 - Instrumental Water Quality

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Total Kjeldahl Nitrogen Digestion of Solids and Soils (a preparation for Analysis #1511)	1-P-QM-WI -9013138	Analysis 1465	4027 - Instrumental Water Quality
Total Kjeldahl Nitrogen Digestion of Water and Wastewater (A Preparation for Analysis 0217)	1-P-QM-WI -9013136	Analysis 1460	4027 - Instrumental Water Quality
Weak Acid Dissociable Cyanide Distillation (as Preparation for Analysis on the Flow Analyzer)	1-P-QM-WI -9014171	Analysis 7528, 0960	4027 - Instrumental Water Quality
Calibration of the Leachate Tumblers	1-P-QM-PRO-9015416	DOD - MC-TL-002	4028 - Leachate Preparation
Cation Exchange Capacity of Soils (Sodium Acetate) by Method 9081	1-P-QM-WI -9015138	Analysis DOD - 2595	4028 - Leachate Preparation
Food and Tissue Preparation	1-P-QM-WI -9015137	Analysis DOD - 2487	4028 - Leachate Preparation
Glassware Cleaning for Leachate Extractions	1-P-QM-PRO-9015525	DOD - SOP-TL-001	4028 - Leachate Preparation
Leachate Blank Evaluations	1-P-QM-PRO-9015526	DOD - SOP-TL-002	4028 - Leachate Preparation
Manually Pressurized Zero Headspace Extractor (ZHE)	1-P-QM-PRO-9015528	DOD - SOP-TL-004	4028 - Leachate Preparation
pH Meters and Probes	1-P-QM-PRO-9015415	DOD - MC-TL-001	4028 - Leachate Preparation
Procedure for Calculating and Reporting Weighted Average Results for TCLP Extracts	1-P-QM-PRO-9015529	DOD - SOP-TL-005	4028 - Leachate Preparation
Shake Extraction of Solid Waste with Water ASTM Method #D3987-85	1-P-QM-WI -9015074	Analysis DOD - 0447	4028 - Leachate Preparation
Subsampling and Preservation of Leachates	1-P-QM-PRO-9015527	DOD - SOP-TL-003	4028 - Leachate Preparation
Synthetic Precipitation Leaching Procedure (SPLP) for Nonvolatile Leachates	1-P-QM-WI -9015130	Analysis DOD - 1567	4028 - Leachate Preparation
Synthetic Precipitation Leaching Procedure (SPLP) Zero Headspace Leachates	1-P-QM-WI -9015194	Analysis DOD - 8792, 1339	4028 - Leachate Preparation
Toxicity Characteristic Leaching Procedure TCLP Nonvolatile Leachates	1-P-QM-WI -9015086	Analysis DOD - 0947, 1339	4028 - Leachate Preparation
Toxicity Characteristic Leaching Procedure TCLP Zero Headspace Leachates, Method 1311	1-P-QM-WI -9015085	Analysis DOD - 0946, 2573, 0075	4028 - Leachate Preparation
Waste Extraction Test Leaching Procedure for Volatile and Non-volatile Analytes	1-P-QM-WI -9015129	Analysis DOD - 1435, 1436	4028 - Leachate Preparation
#1443 Specific Gravity by SM 2710 F #6569 Bulk Density by ASTM E868-82 Sec 9.9 Modified	1-P-QM-WI -9013131	Analysis 1443, 6569	4029 - Water Quality
Accumet Model AB30 pH/Ion/Conductivity Meter	1-P-QM-PRO-9015419	DOD - MC-WQ-004	4029 - Water Quality
Acid Volatile Sulfide in Solids	1-P-QM-WI -9013392	Analysis 1630	4029 - Water Quality
Adjustable Volume Handheld Pipettes	1-P-QM-PRO-9015426	DOD - MC-WQ-014	4029 - Water Quality
Ammonia Nitrogen by Ion-Selective Electrode Method (ISE) in Solids by EPA 350.3 (Modified) and SM 4500-NH3B-1997	1-P-QM-WI -9012763	Analysis 10222, 10696	4029 - Water Quality
Ammonia-Nitrogen for Soils (Tritrimetric Distillation Procedure) by 4500-NH3 B/C (Modified)-1997, or EPA 350.2 (Modified)	1-P-QM-WI -9012743	Analysis 0573	4029 - Water Quality
Ammonia-Nitrogen for Waters (Titrimetric Distillation Procedure) by 4500-NH3 B/C (Modified)-1997, or EPA 350.2	1-P-QM-WI -9011636	Analysis 0221	4029 - Water Quality

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Analysis of Conductivity, Alkalinity, pH, Temperature of pH, Fluoride, Turbidity, Total Hardness, Carbonate, Bicarbonate, and Ammonia by Either Man-Tech Multi-Parameter System or Manual Technique	1-P-QM-WI -9013112	Analysis 12145, 12146, 12147, 12148, 12149, 12150, 12151, 12152, 12677, 12678, 12679	4029 - Water Quality
Bellack Distillation for Fluoride in Waters and Solids by SM 4500 F B–1997 or EPA 340.1 Procedure 6.1	1-P-QM-WI -9013133	Analysis 1448	4029 - Water Quality
BOD by SM 5210 B-2001 or EPA 405.1 and CBOD by SM 5210 B–2001 in Waters	1-P-QM-WI -9011645	Analysis 0235, 1364	4029 - Water Quality
Calibration of Hach 2100AN Turbidimeter	1-P-QM-PRO-9015423	DOD - MC-WQ-010	4029 - Water Quality
Chemical Oxygen Demand (COD) (Dichromate Reflux Method) (Titrimetric, Mid-Level)	1-P-QM-WI -9011644	Analysis 0234	4029 - Water Quality
Chemical Oxygen Demand (COD) (Dichromatic Reflux Method) (Colorimetric)	1-P-QM-WI -9013470	Analysis 4001	4029 - Water Quality
Chemical Oxygen Demand (Low-Level) by 410.4	1-P-QM-WI -9032852	Analysis 13700	4029 - Water Quality
Chemical Review	1-P-QM-PRO-9015534	DOD - SOP-WQ-016	4029 - Water Quality
Chloride (Titrimetric Determination) by SM 4500-Cl C-1997	1-P-QM-WI -9013035	Analysis 1124	4029 - Water Quality
Chlorine Residual by 4500 Cl F-2000, or EPA 330.4	1-P-QM-WI -9011648	Analysis 0240	4029 - Water Quality
Color by 2120 B-2001, or EPA 110.2	1-P-QM-WI -9011653	Analysis 0277	4029 - Water Quality
Colorimetric Sulfide in Waters (#0230), Sulfide as H2S (#10293 Calculation), Dissolved Sulfide in Waters (#10499) by 4500-S2 B/C/D-2000, 4500-S2 F-2000, or EPA 376.2	1-P-QM-WI -9011642	Analysis 0230, 10293, 10499	4029 - Water Quality
Determination of Flash Point for Liquids and Solids	1-P-QM-WI -9011689	Analysis 0430	4029 - Water Quality
Digestion Procedure for the Determination of Hexavalent Chromium (Cr VI) Digestion of Non-aqueous Samples by Method SW-846 3060A for OH VAP	1-P-QM-WI -9022448	Analysis 7825 OH VAP	4029 - Water Quality
Dissolved Oxygen (Membrane Electrode) by 4500 O G-2001 or EPA 360.1	1-P-QM-WI -9011688	Analysis 0428	4029 - Water Quality
Dissolved Silica (Colorimetric) by SM4500SiO2 C-1997 or EPA 370.1	1-P-QM-WI -9012742	Analysis 0559	4029 - Water Quality
Equipment Incubators and Refrigerators	1-P-QM-PRO-9015420	DOD - MC-WQ-006	4029 - Water Quality
Equipment Muffle Furnaces and Ovens	1-P-QM-PRO-9015422	DOD - MC-WQ-009	4029 - Water Quality
Ferrous Iron By Method 3500-Fe B (Modified) - 1997	1-P-QM-WI -9015060	Analysis 8344	4029 - Water Quality
Fixed Dissolved Solids (Calculation)	1-P-QM-WI -9011628	Analysis 0210	4029 - Water Quality
Fixed Suspended Solids (Gravimetric) (#207) Volatile Suspended Solids (Gravimetric) (#208) by SM 2540 E - 1997	1-P-QM-WI -9011626	Analysis 0207, 0208	4029 - Water Quality
Fixed Volume Hand-Held Pipettes	1-P-QM-PRO-9015425	DOD - MC-WQ-013	4029 - Water Quality
Flash Point for Liquids and Solids by ASTM Method D93-07 - ERPIMS	1-P-QM-WI -9035589	Analysis 0430 ERPIMS	4029 - Water Quality
Hach DR 2800 Spectrophotometer	1-P-QM-PRO-9015427	DOD - MC-WQ-017	4029 - Water Quality
Hexane Extractable Material (HEM) and Silica Gel Treated Hexane Extractable Materials (SGT-HEM) in Waters by EPA Method 1664A and 1664B	1-P-QM-WI -9014492	Analysis 8079, 8078, 0612	4029 - Water Quality
Hexavalent Chromium (Colorimetric) by SW-846 7196A	1-P-QM-WI -9011652	Analysis 0276	4029 - Water Quality

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Hexavalent Chromium (Colorimetric) in Waters by CTRCP	1-P-QM-WI -9013410	Analysis 1968	4029 - Water Quality
Hexavalent Chromium (Colorimetric) in Waters by MCP	1-P-QM-WI -9012870	Analysis 11145	4029 - Water Quality
Hexavalent Chromium (Colorimetric) in Waters by SM846 7196A NJ DKQP	1-P-QM-WI -9029546	Analysis 13447	4029 - Water Quality
Hexavalent Chromium in Soilds (Alkaline Digestion and Analysis Methods) by SW846 3060A, SW846 7196A NJ DKQP	1-P-QM-WI -9029548	Analysis 13431	4029 - Water Quality
Hexavalent Chromium in Solids (Alkaline Digestion and Analysis Methods)	1-P-QM-WI -9011687	Analysis 0425, 7825, 2432	4029 - Water Quality
Hexavalent Chromium in Solids by Alkaline Digestion and Analysis Methods (Department of Defense)	1-P-QM-WI -9015114	Analysis DOD - 10679, 7825	4029 - Water Quality
Hexavalent Chromium in Solids by CTRCP (Alkaline Digestion and Analysis Methods)	1-P-QM-WI -9013409	Analysis 1962, 7825	4029 - Water Quality
Hexavalent Chromium in Solids by MCP (Alkaline Digestion and Analysis Methods)	1-P-QM-WI -9012871	Analysis 11146	4029 - Water Quality
Hexavalent Chromium in Waters (Colorimetric) (Department of Defense)	1-P-QM-WI -9015113	Analysis DOD - 10678	4029 - Water Quality
Ignitability of Solids by 40 CFR, Part 261.21	1-P-QM-WI -9012741	Analysis 0542	4029 - Water Quality
Instructions for Collecting Data on the LLENS System	1-P-QM-PRO-9015533	DOD - SOP-WQ-014	4029 - Water Quality
Low-Level Hexavalent Chromium (colorimetric) by 3500-Cr B-2009	1-P-QM-WI -9013132	Analysis 1446	4029 - Water Quality
Maintenance of Desiccators	1-P-QM-PRO-9015424	DOD - MC-WQ-012	4029 - Water Quality
Maintenance of Hot Plates	1-P-QM-PRO-9015430	DOD - MC-WQ-024	4029 - Water Quality
Methylene-Blue-Active Substances (MBAS) by 5540 C-2000 or EPA 425.1	1-P-QM-WI -9011638	Analysis 0225	4029 - Water Quality
Moisture (Gravimetric), Total Residue (#0521), Volatile Residue (#0522), Total Fixed Residue/Ash (#1029) by SM 2540 G-1997 or SM 2540 E-1997 in Solids	1-P-QM-WI -9014030	Analysis 6866, 0521, 0522, 1029	4029 - Water Quality
n-Hexane Extractable Material (HEM) in Solids and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM)	1-P-QM-WI -9013456	Analysis 2562, 6598	4029 - Water Quality
Orion 960 Autotitration System	1-P-QM-PRO-9015428	DOD - MC-WQ-022	4029 - Water Quality
Orthophosphate by EPA 365.3, or 4500-P E-1999	1-P-QM-WI -9011639	Analysis 0226	4029 - Water Quality
Oxidation-Reduction Potential	1-P-QM-WI -9013403	Analysis 1821	4029 - Water Quality
Paint Filter Liquids Test (Free Liquids Test)	1-P-QM-WI -9013402	Analysis 1820	4029 - Water Quality
Particle Size Distribution of Soils and Solids/Grain Size Classification by ASTM D422-63 (reapproved 2007)	1-P-QM-WI -9014165	Analysis 7103, 11601, 11604	4029 - Water Quality
Percent Solids for GC/MS by EPA 1666	1-P-QM-WI -9013444	Analysis 2365	4029 - Water Quality
pH (SW) (Electrometric)	1-P-QM-WI -9011685	Analysis 0394, 0496	4029 - Water Quality
pH Probes and Meters	1-P-QM-PRO-9015421	DOD - MC-WQ-007	4029 - Water Quality
Quality Control Data for Wet Chemistry	1-P-QM-PRO-9015535	DOD - SOP-WQ-017	4029 - Water Quality
Reactive Sulfide	1-P-QM-WI -9013032	Analysis 1122	4029 - Water Quality
Reactivity of Waste	1-P-QM-WI -9013027	Analysis 1121	4029 - Water Quality
Settleable Solids by 2540 F-1997, or EPA 160.5	1-P-QM-WI -9011631	Analysis 0215	4029 - Water Quality

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Soluble Biochemical Oxygen Demand Determination in Waters by Incubation by 5210 B Modified-2001 or EPA 405.1	1-P-QM-WI -9012740	Analysis 0541	4029 - Water Quality
Specific Conductance (Solids) by SW-846 9050 (Modified), EPA 120.1 (Modified) or 2510B-1997	1-P-QM-WI -9013113	Analysis 1215	4029 - Water Quality
Spectronic Genesys 2 and Genesys 10 Vis Spectrophotometers	1-P-QM-PRO-9015417	DOD - MC-WQ-002	4029 - Water Quality
Standardization of 0.02 and 0.1 Normal Sulfuric Acid	1-P-QM-PRO-9015530	DOD - SOP-WQ-002	4029 - Water Quality
Standardization of 0.02 Normal Sodium Hydroxide	1-P-QM-PRO-9015531	DOD - SOP-WQ-005	4029 - Water Quality
Sulfate (turbidimetric) by EPA 375.4 in Waters	1-P-QM-WI -9013037	Analysis 1125	4029 - Water Quality
Sulfide Titration for Water by 4500 S2 F-2000, EPA 376.1, or SW-846 Method 9034	1-P-QM-WI -9013125	Analysis 1333	4029 - Water Quality
Sulfite by 4500-SO3 B-2000, or EPA 377.1	1-P-QM-WI -9011641	Analysis 0229	4029 - Water Quality
Total Dissolved Solids (Calculation)	1-P-QM-WI -9011627	Analysis 0209	4029 - Water Quality
Total Dissolved Solids by 2540 C	1-P-QM-WI -9014026	Analysis 6649	4029 - Water Quality
Total Dissolved Solids in Waters (Gravimetric) by 2540 C-1997 or EPA 160.1	1-P-QM-WI -9011630	Analysis 0212	4029 - Water Quality
Total Fixed Solids Total Volatile Solids by 2540 E-1997, 160.4 or 2540 G-1997	1-P-QM-WI -9011624	Analysis 0204, 0205	4029 - Water Quality
Total Solids by 2540 B-1997, EPA 160.3 or 2540 G-1997	1-P-QM-WI -9011623	Analysis 0203	4029 - Water Quality
Total Suspended Solids in Waters (Gravimetric) by SM 2540 D - 1997	1-P-QM-WI -9012778	Analysis 10457	4029 - Water Quality
Volatile Dissolved Solids (Calculation)	1-P-QM-WI -9011629	Analysis 0211	4029 - Water Quality
Water Quality Washroom Procedures	1-P-QM-PRO-9015532	DOD - SOP-WQ-006	4029 - Water Quality
YSI Model 5100 Dissolved Oxygen Meter	1-P-QM-PRO-9015429	DOD - MC-WQ-023	4029 - Water Quality
Analysis of Air for Selected Volatile Organic Compounds by Gas Chromatography with Flame Ionization Detector and Photo Using EPA Method 18 and 25	1-P-QM-WI -9015177	Analysis DOD - 7090	4030 - Volatiles in Air
Calibration of Pressure Gauges	1-P-QM-PRO-9015391	DOD - MC-AL-002	4030 - Volatiles in Air
Cleaning and Handling of Flow Controllers	1-P-QM-PRO-9015432	DOD - SOP-AL-002	4030 - Volatiles in Air
Cleaning and Handling of Summa Canisters	1-P-QM-PRO-9015431	DOD - SOP-AL-001	4030 - Volatiles in Air
Helium as a Tracer Gas	1-P-QM-WI -9012770	Analysis 10341	4030 - Volatiles in Air
Oxygen and Carbon Dioxide in Air	1-P-QM-WI -9011592	Analysis 0034	4030 - Volatiles in Air
Preparing Summa Can Order	1-P-QM-PRO-9017690	SOP-AL-005	4030 - Volatiles in Air
Procedure for Compositing Samples from a Tedlar Bag	1-P-QM-PRO-9017689	SOP-AL-004	4030 - Volatiles in Air
Routine Instrument Maintenance for Volatiles in Air by GC and GC/MS	1-P-QM-PRO-9015392	DOD - MC-AL-003	4030 - Volatiles in Air
SIM Analysis of Low-Level Volatile Organic Compounds in Air Collected in Specially Treated Canisters or Tedlar Bags Using Cryogenic Preconcentration and Gas Chromatography with SIM Mass Selective Detection Using EPA Method TO-15	1-P-QM-WI -9015182	Analysis DOD - 7345	4030 - Volatiles in Air
The Determination of Volatile Organic Compounds in Air Collected in Summa Canisters or Tedlar Bags Using Cryogenic Preconcentration and GC/MS Detection Using EPA Method TO-14 or TO-15	1-P-QM-WI -9015155	Analysis DOD - 5265, 5298, 0015, 0037, 7199, 7869	4030 - Volatiles in Air

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Volatiles in Air Audit Process	1-P-QM-PRO-9015433	DOD - SOP-AL-003	4030 - Volatiles in Air
Volatiles in Air Tentatively Identified Compound Method	1-P-QM-WI -9014034	Analysis 6900	4030 - Volatiles in Air
Volatiles in Air Tentatively Identified Compound Method (Interpretive)	1-P-QM-WI -9012747	Analysis 0888	4030 - Volatiles in Air
Calibration, Operation and Maintenance of pH Probes and Meters	1-P-QM-PRO-9017426	MC-FS-002	4031 - Field Sampling
Collecting Potable Water Samples	1-P-QM-PRO-9017759	SOP-FS-004	4031 - Field Sampling
Collecting Water Samples for Regulatory Purposes	1-P-QM-PRO-9015458	DOD - SOP-FS-012	4031 - Field Sampling
Direct Field Readings Using Orion Model 1230 Multi-Parameter Meter	1-P-QM-PRO-9017761	SOP-FS-008	4031 - Field Sampling
Groundwater Monitoring Sampling Procedure	1-P-QM-PRO-9017760	SOP-FS-006	4031 - Field Sampling
Low Level Mercury Sampling	1-P-QM-PRO-9017763	SOP-FS-010	4031 - Field Sampling
Performing Free Chlorine Residual Readings	1-P-QM-PRO-9017764	SOP-FS-011	4031 - Field Sampling
Sampling Swimming Pool Water	1-P-QM-PRO-9018291	SOP-TR-003	4031 - Field Sampling
Soil Sampling Procedures	1-P-QM-PRO-9017758	SOP-FS-003	4031 - Field Sampling
Symphony Multi-Parameter Meter	1-P-QM-PRO-9017762	SOP-FS-009	4031 - Field Sampling
Wastewater Field Sampling Procedures	1-P-QM-PRO-9017757	SOP-FS-002	4031 - Field Sampling
1,6-hexanediamine in by 8015B Modified in Waters and Solids	1-P-QM-WI -9028763	Analysis 8919, 8920	4032 - EPH/Misc. GC
10g Silica Gel Cleanup for Hydrocarbons by GC in Soil and Water Matrices	1-P-QM-WI -9013055	Analysis 11681	4032 - EPH/Misc. GC
3 g Silica Gel Column Cleanup for DRO	1-P-QM-WI -9021425	Analysis 12932	4032 - EPH/Misc. GC
Alumina Column Cleanup by Method 3610B for Solid Samples	1-P-QM-WI -9013040	Analysis 11599, 11600	4032 - EPH/Misc. GC
Analysis of DRO/RRO by Alaska 102/103 in Waters and Soils	1-P-QM-WI -9013394	Analysis 1738, 1741, 1742, 2238, 2244, 2245, 2923	4032 - EPH/Misc. GC
Carbon Dioxide in Water Using Headspace Sampling Techniques and GC-TCD, Method RSK-175 or 8015	1-P-QM-WI -9015187	Analysis DOD - 8097, 13139	4032 - EPH/Misc. GC
CCWE Water Miscible Solvents	1-P-QM-WI -9012748	Analysis 0969	4032 - EPH/Misc. GC
Common Equations Used During Chromatographic Analyses	1-P-QM-PRO-9015448	DOD - SOP-EP-008	4032 - EPH/Misc. GC
Determination of Diesel and Residual Range Organics using Alaska 102/103 Small Volume (SV) Protocols in Aqueous Samples	1-P-QM-WI -9021778	Analysis 13025, 13028, 13222, 13930	4032 - EPH/Misc. GC
Determination of Petroleum Range Organics in Waters and Solids using FL-PRO	1-P-QM-WI -9013420	Analysis 0347, 0359, 2099, 2100	4032 - EPH/Misc. GC
DRO by 8015B and TPH by NWTPH-DX (Modified) in Water using Mini-Extraction and GC-FID	1-P-QM-WI -9021423	Analysis 12899, 12908, 12917	4032 - EPH/Misc. GC
DRO in Waters or Solids by Wisconsin DRO Method using GC-FID	1-P-QM-WI -9014172	Analysis 7553, 7554	4032 - EPH/Misc. GC
DRO/TPH by Method 8015 (B, C, or D) in Waters using Microextraction and GC-FID	1-P-QM-WI -9020899	Analysis 12858, 12879, 13163, 13165	4032 - EPH/Misc. GC
EPH by Massachusetts Protocol (MAEPH) in Waters and Solids Using GC	1-P-QM-WI -9013971	Analysis 5331, 5332, 5944, 5949, 5968, 5969, 10892, 10897	4032 - EPH/Misc. GC
EPH in Waters and Solids Using GC-FID by Method ECY97-602 WA EPH	1-P-QM-WI -9013990	Analysis 5979, 5970	4032 - EPH/Misc. GC

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Extractable Petroleum Hydrocarbons by Method OA-2 (Iowa/Missouri Protocol) in Waters and Solids using GC/FID	1-P-QM-WI -9013421	Analysis 2110, 2112	4032 - EPH/Misc. GC
Extraction of Soils/Solids for Glycol Analysis	1-P-QM-WI -9013039	Analysis 11551, 13121	4032 - EPH/Misc. GC
Extraction of Solids/Soils for Analysis of Alcohols by Method 8015B	1-P-QM-WI -9011684	Analysis 0380	4032 - EPH/Misc. GC
Extraction Procedure for the Determination of Diesel Range Organics in a Water or Wastewater Matrix by Oklahoma Methodology	1-P-QM-WI -9013016	Analysis 11168	4032 - EPH/Misc. GC
Extraction Procedure for the Determination of Total Petroleum Hydrocarbon Organics in a Water or Wastewater Matrix by Texas Methodology	1-P-QM-WI -9013023	Analysis 11192	4032 - EPH/Misc. GC
Extraction Procedure for the Determination of Total Petroleum Hydrocarbons in a Water or Wastewater Matrix by Connecticut Methodology	1-P-QM-WI -9013020	Analysis 11178	4032 - EPH/Misc. GC
Extraction Procedure for the Determination ofTotal Petroleum Hydrocarbons in a Soil or Solid Matrix by Texas Methodology	1-P-QM-WI -9013033	Analysis 11230, 11244	4032 - EPH/Misc. GC
Extraction Procedure for Wisconsin DRO Soils and Solid Waste	1-P-QM-WI -9012868	Analysis 11029	4032 - EPH/Misc. GC
Fractionated EPH using LA RECAP Ranges in Waters and Solids by GC-FID	1-P-QM-WI -9015030	Analysis 8323, 8324, 6976, 7062	4032 - EPH/Misc. GC
GC Routine and Nonroutine Maintenance for Instrumentation Used for VPH Analysis	1-P-QM-PRO-9023979	N/A	4032 - EPH/Misc. GC
Glycols by Method 8015B/8015C in Solids using GC-FID	1-P-QM-WI -9015029	Analysis 8283, 12925, 12934	4032 - EPH/Misc. GC
Glycols in Waters by Method 8015B or 8015C Using GC-FID	1-P-QM-WI -9015028	Analysis 8278, 11099, 12926	4032 - EPH/Misc. GC
Interpretation and Integration of Chromatographic Data	1-P-QM-PRO-9015451	DOD - SOP-EP-011	4032 - EPH/Misc. GC
MA DEP VPH in Waters and Solids Using GC	1-P-QM-WI -9015061	Analysis 8754, 8765, 5869, 5988, 6629, 6630, 10886, 10889	4032 - EPH/Misc. GC
Maintenance and Troubleshooting Procedures for GC-FID Instrumentation	1-P-QM-PRO-9015447	DOD - SOP-EP-006	4032 - EPH/Misc. GC
Microextraction by Method 3511 for the Determination of Diesel Range Organics in Water	1-P-QM-WI -9013110	Analysis 12059, 12897, 13175, 13177	4032 - EPH/Misc. GC
Microwave Extraction Method 3546 for DRO and Saturated Hydrocarbons in a Solid Matrix	1-P-QM-WI -9015120	Analysis DOD - 10942, 11509, 11210	4032 - EPH/Misc. GC
Microwave Extraction Method 3546 for NJ EPH in a Solid Matrix	1-P-QM-WI -9012864	Analysis 10979, 11990	4032 - EPH/Misc. GC
Microwave Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in a Solid Matrix by Montana Protocol	1-P-QM-WI -9013028	Analysis 11212	4032 - EPH/Misc. GC
Microwave Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in a Solid Matrix by Washington Protocol	1-P-QM-WI -9013029	Analysis 11213	4032 - EPH/Misc. GC
Microwave Extraction, Method 3546, for MA EPH in a Solid Matrix	1-P-QM-WI -9013429	Analysis 2168, 11235	4032 - EPH/Misc. GC
Monitoring QC Data Acceptance Limits	1-P-QM-PRO-9015450	DOD - SOP-EP-010	4032 - EPH/Misc. GC
New Jersey Extractable Petroleum Hydrocarbons (NJEPH) in Waters and Solids using GC-FID	1-P-QM-WI -9012863	Analysis 10967, 10973, 11986, 12997	4032 - EPH/Misc. GC

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
PMI VOCs (Direct Injection) by Method 1671A in Waters Using GC/FID	1-P-QM-WI -9013445	Analysis 2366, 2380	4032 - EPH/Misc. GC
QC Data Acceptability and Corrective Action	1-P-QM-PRO-9015449	DOD - SOP-EP-009	4032 - EPH/Misc. GC
Qualitative/Quantitative GC Fingerprint by 8015B Mod/ 8015C Mod/ or 8015D Mod	1-P-QM-WI -9013412	Analysis 2012, 2535	4032 - EPH/Misc. GC
Quick Silica Gel Cleanup for Hydrocarbons by GC in Solid and Water Matrices	1-P-QM-WI -9013430	Analysis 2176	4032 - EPH/Misc. GC
Separatory Funnel Extract Procedure for the Determination of Extractable Petroleum Hydrocarbons (EPH) in a Water or Wastewater Matrix by Tennessee Methodology	1-P-QM-WI -9013021	Analysis 11179	4032 - EPH/Misc. GC
Separatory Funnel Extraction by Method 3510C for DRO in Water by California Methodology	1-P-QM-WI -9013446	Analysis 2376, 11169, 11180, 11187, 11188, 11198, 11199, 12820, 13156	4032 - EPH/Misc. GC
Separatory Funnel Extraction for DRO and RRO by AK 102/103 in a Water Matrix	1-P-QM-WI -9013022	Analysis 11184, 11185, 11242, 13027, 13030	4032 - EPH/Misc. GC
Separatory Funnel Extraction Method 3510C for DRO in Water or Wastewater	1-P-QM-WI -9015175	Analysis DOD - 7003, 10304, 11164, 11167, 11171, 11172, 11176, 11177, 11181, 11183, 11189, 11190, 11191, 11195, 11196, 11201, 11203, 11596, 12820, 12906, 12915, 12923, 13095, 13212	4032 - EPH/Misc. GC
Separatory Funnel Extraction Method ECY 97-602 NWTPH-DX for TPH in a Water or Wastewater Matrix	1-P-QM-WI -9013424	Analysis 2135, 11197, 12007, 12119, 12120, 12907, 12916, 12924	4032 - EPH/Misc. GC
Separatory Funnel Extraction Procedure for the Determination of Diesel Range Organics in a Water or Wastewater Matrix by Maine Methodology	1-P-QM-WI -9013014	Analysis 11165	4032 - EPH/Misc. GC
Separatory Funnel Extraction Procedure for the Determination of Diesel Range Organics in a Water or Wastewater Matrix by Wisconsin Protocol	1-P-QM-WI -9013015	Analysis 11166	4032 - EPH/Misc. GC
Separatory Funnel Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in a Water Matrix by Washington Methodology	1-P-QM-WI -9013019	Analysis 11175	4032 - EPH/Misc. GC
Separatory Funnel Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in a Water or Wastewater Matrix by Massachusetts or New Jersey Protocol	1-P-QM-WI -9014170	Analysis 7326, 10980, 11200 MA/LA/NJ	4032 - EPH/Misc. GC
Separatory Funnel Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in a Water or Wastewater Matrix by Montana Protocol	1-P-QM-WI -9013018	Analysis 11174, 11243	4032 - EPH/Misc. GC
Separatory Funnel Extraction Procedure for the Determination of Total Petroleum Hydrocarbon Organics in a Water or Wastewater Matrix by FL-PRO	1-P-QM-WI -9013017	Analysis 11170	4032 - EPH/Misc. GC
Silica Gel Column Cleanup (Method 3630C Mod) for Hydrocarbons by GC in Aqueous Matrices	1-P-QM-WI -9020897	Analysis 12894	4032 - EPH/Misc. GC
Silica Gel Fractionation for Hydrocarbons by GC in Soil and Water Matrices	1-P-QM-WI -9012711	Analysis 0497	4032 - EPH/Misc. GC

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Sonic Disruption Extraction Procedure for the Determination of GC Fingerprint on Petroleum Products in Soil or Solid Matrix	1-P-QM-WI -9015151	Analysis DOD - 4833, 11227	4032 - EPH/Misc. GC
Sonic Probe Extraction by FL-PRO for Petroleum Range Organics in Solids	1-P-QM-WI -9013026	Analysis 11208	4032 - EPH/Misc. GC
Sonic Probe Extraction for the Determination of Extractable Total Petroleum Hydrocarbons in Soil or Solid Matrix Connecticut Methology	1-P-QM-WI -9013030	Analysis 11216	4032 - EPH/Misc. GC
Sonic Probe Extraction for TPH in Solids by Washington DX	1-P-QM-WI -9014041	Analysis 7024, 11234, 12008, 12117, 12118	4032 - EPH/Misc. GC
Sonic Probe Extraction of Glycols by Method 3550C from a Solid Matrix	1-P-QM-WI -9032542	Analysis 12933	4032 - EPH/Misc. GC
Sonic Probe Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in Soil or Solid Matrix Tennessee Methodology	1-P-QM-WI -9013031	Analysis 11217	4032 - EPH/Misc. GC
Sonication Extraction Method 3550C for DRO in Soils or Solids	1-P-QM-WI -9015176	Analysis DOD - 7004, 10303, 11204, 11205, 11209, 11215, 11218, 11219, 11225, 11228, 11229, 11233, 11236, 11237, 11238, 13097	4032 - EPH/Misc. GC
Sonication Extraction Procedure for the Determination of Diesel Organics in Soil or Solid Matrix by Alaska Methodology	1-P-QM-WI -9015123	Analysis DOD - 11222, 11223, 11239, 11248	4032 - EPH/Misc. GC
Sonication Extraction Procedure for the Determination of Diesel Organics in Soil or Solid Matrix Oklahoma Methodology	1-P-QM-WI -9013024	Analysis 11206	4032 - EPH/Misc. GC
Sonication Extraction Procedure for the Determination of Diesel Range Organics in Soil or Solid Matrix California Methodology	1-P-QM-WI -9013025	Analysis 11207, 11214	4032 - EPH/Misc. GC
Terphenyls by Method 8015B in Water and Solids Using GC-FID	1-P-QM-WI -9012769	Analysis 10318, 10319	4032 - EPH/Misc. GC
TNRCC TX Method 1005 - Total Petroleum Hydrocarbons (Gasoline Range, Diesel Range, and Extended Range Organics) in Waters and Solids	1-P-QM-WI -9013442	Analysis 2318, 2321	4032 - EPH/Misc. GC
Total Extractable Hydrocarbons (TEH) by Method 8015B Modified Using GC-FID	1-P-QM-WI -9013137	Analysis 1464, 1469, 10007	4032 - EPH/Misc. GC
Total Petroleum Hydrocarbons with Ranges by Methods 8015B/8015C/8015D in Waters and Solids by GC-FID	1-P-QM-WI -9015186	Analysis DOD - 8093, 8107, 2500, 2516, 2729, 2740, 0071, 0072, 6631, 6635, 10199, 10365, 12952	4032 - EPH/Misc. GC
Total Saturated Hydrocarbons by Method 8015C in Waters and Solids using GC/FID	1-P-QM-WI -9013038	Analysis 11507, 11554	4032 - EPH/Misc. GC
TPH by CT ETPH	1-P-QM-WI -9013462	Analysis 2768, 2769	4032 - EPH/Misc. GC
TPH by Methods 8015B/C/D mod. in Waters and Solids Using GC-FID	1-P-QM-WI -9015154	Analysis DOD - 5256, 5260, 8734, 8735, 13137, 13138	4032 - EPH/Misc. GC
TPH by NWTPH-Dx (modified) in Soils using GC-FID	1-P-QM-WI -9015027	Analysis 8272, 2214, 12006	4032 - EPH/Misc. GC
TPH by NWTPH-Dx (modified) in Waters using GC-FID	1-P-QM-WI -9015026	Analysis 8271, 2211, 12005	4032 - EPH/Misc. GC
TPH by TN EPH in Water and Soil using GC-FID	1-P-QM-WI -9013463	Analysis 2784, 2785	4032 - EPH/Misc. GC
TPH DRO (Diesel Range Organics) by Oklahoma DEQ Method	1-P-QM-WI -9014308	Analysis 7784, 7785, 10024, 10027	4032 - EPH/Misc. GC

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
TPH-DRO by 8015B in Water using GC-FID (Diesel Range Organics)	1-P-QM-WI -9020088	1070, 2216, 5867, 6609, 6610, 6884, 6885, 6912, 6913, 8269, 8349, 11918, 12680, 12816, 11346	4032 - EPH/Misc. GC
TPH-DRO by 8015B/8015C/8015D in Solids using GC-FID (Diesel Range Organics)	1-P-QM-WI -9015191	Analysis DOD - 1104, 2222, 5868, 6901, 6902, 8270, 8345, 10941, 12831, 13567	4032 - EPH/Misc. GC
TPH-DRO by 8015C South Carolina Methodology Using GC-FID	1-P-QM-WI -9024963	Analysis 13094, 13096	4032 - EPH/Misc. GC
TPH-DRO by 8015C/8015D in Water using GC-FID (Diesel Range Organics)	1-P-QM-WI -9015111	Analysis DOD - 10600, 13256	4032 - EPH/Misc. GC
TPH-DRO by Methods 8015C or 8015D in Solids using GC-FID	1-P-QM-WI -9015112	Analysis DOD - 10601, 12838	4032 - EPH/Misc. GC
TPH-DX with Fuel Identification in Waters and Solids by NWTPH-DX	1-P-QM-WI -9023949	Analysis 12071, 12082, 12093, 12094	4032 - EPH/Misc. GC
TX 1006 Characterization of C6-C35 Petroleum Hydrocarbons in Waters and Soilds	1-P-QM-WI -9013996	Analysis 6091, 6104	4032 - EPH/Misc. GC
Using "Range Compound Analysis" Software for Range Data Acquisition	1-P-QM-PRO-9017817	SOP-OR-082	4032 - EPH/Misc. GC
Volatile Hydrocarbons in Water by Method RSK-175 Modified and SW-846 8015 Using Headspace Sampling Techniques and GC-FID	1-P-QM-WI -9015178	Analysis DOD - 7105, 10602, 13693	4032 - EPH/Misc. GC
Volatile Organic Concentration of Waste Samples by Method 25D Using FID and ELCD	1-P-QM-WI -9014040	Analysis 7001	4032 - EPH/Misc. GC
VPH in Waters and Solids Using GC-FID by Method ECY 97-602 WA VPH	1-P-QM-WI -9013982	Analysis 5665, 5666	4032 - EPH/Misc. GC
Waste Dilution for the Determination of Saturated Hydrocarbons in an Oil Matrix	1-P-QM-WI -9013051	Analysis 11657	4032 - EPH/Misc. GC
Water Miscible Solvents by Method 8015B/8015C/8015D Using GC-FID	1-P-QM-WI -9015169	Analysis DOD - 6624, 10501, 10603, 10604	4032 - EPH/Misc. GC
Analysis of Nicotine in Tobacco by GC/FID Following Coresta 62	1-P-QM-WI -9014032	Analysis 6878	4035 - Nitrosamines
Analysis of Nicotine in Tobacco by GC/FID for Smokeless Tobacco Products Using the CDC Method	1-P-QM-WI -9011595	Analysis 0097	4035 - Nitrosamines
Analysis of Tobacco Specific Nitrosamines (TSNA) in Tobacco Leaf by LC/MS/MS	1-P-QM-WI -9013802	Analysis 5102	4035 - Nitrosamines
CDC Tobacco Moisture	1-P-QM-WI -9011594	Analysis 0091	4035 - Nitrosamines
Column Cleanup of Tobacco for TSNAs	1-P-QM-WI -9014036	Analysis 6962	4035 - Nitrosamines
Extraction of Nicotine from Tobacco and Tobacco Products	1-P-QM-WI -9014031	Analysis 6870	4035 - Nitrosamines
Extraction of Nicotine from Tobacco Products Using the Centers for Disease Control Protocol	1-P-QM-WI -9011593	Analysis 0088	4035 - Nitrosamines
Extraction of Tobacco for Benzo[a]Pyrene	1-P-QM-WI -9014033	Analysis 6883	4035 - Nitrosamines
Extraction of Tobacco Specific N-Nitrosamines in Tobacco Filler	1-P-QM-WI -9013443	Analysis 2326LC	4035 - Nitrosamines
Nitrate in Tobacco Prep	1-P-QM-WI -9013457	Analysis 2610	4035 - Nitrosamines
Nitrate Nitrogen in Tobacco (Colorimetric, Automated Cadmium Reduction)	1-P-QM-WI -9013464	Analysis 2808	4035 - Nitrosamines
Nitrite in Tobacco Prep	1-P-QM-WI -9013438	Analysis 2264	4035 - Nitrosamines
Nitrite Nitrogen Analysis in Tobacco	1-P-QM-WI -9013440	Analysis 2266	4035 - Nitrosamines
Tobacco Drying and Grinding	1-P-QM-WI -9013801	Analysis 4998	4035 - Nitrosamines

Document Title	Document ID	Historical Document ID	Department Owner
Level 3 – Environmental Sciences (continued)			
10g Silica Gel Cleanup for Hydrocarbons by GC in Soil and Water Matrices	1-P-QM-WI -9013055	Analysis 11681	4036 - Organic Extraction
3 g Silica Gel Column Cleanup for DRO	1-P-QM-WI -9021425	Analysis 12932	4036 - Organic Extraction
Alumina Column Cleanup by Method 3610B for Solid Samples	1-P-QM-WI -9013040	Analysis 11599, 11600	4036 - Organic Extraction
Cleanup Procedures for the Extraction of Pesticides and Polychlorinated Biphenyls (PCBs)	1-P-QM-PRO-9015477	DOD - SOP-OE-004	4036 - Organic Extraction
Concentration Using a TurboVap LV Concentration Workstation	1-P-QM-PRO-9015489	DOD - SOP-OE-016	4036 - Organic Extraction
Determination of Percentage Fat Using Accelerated Solvent Extraction (ASE)	1-P-QM-WI -9015144	Analysis DOD - 4193ASE	4036 - Organic Extraction
Determining QC Sample Volume for Organic Extractions	1-P-QM-PRO-9015480	DOD - SOP-OE-007	4036 - Organic Extraction
Electrothermal Heating Mantles	1-P-QM-PRO-9015410	DOD - MC-OE-009	4036 - Organic Extraction
Extraction By Method 8318/8318A for Carbamate and Urea Pesticides in Solids	1-P-QM-WI -9013140	Analysis 1510, 11143	4036 - Organic Extraction
Extraction for Perchlorate by Method 6850 in Solids	1-P-QM-WI -9015167	Analysis DOD - 6568	4036 - Organic Extraction
Extraction of Chlorinated Acids and Herbicides in Drinking Water by Method 515.1	1-P-QM-WI -9014002	Analysis 6369	4036 - Organic Extraction
Extraction of Chlorinated Herbicides in a Soil Matrix	1-P-QM-WI -9013472	Analysis 4181	4036 - Organic Extraction
Extraction of Chlorinated Herbicides in a Water Matrix by SW-846 8151A	1-P-QM-WI -9015078	Analysis DOD - 0816, 11110, 11111	4036 - Organic Extraction
Extraction of Formaldehyde and Other Aldehydes in a Water by Method 8315A	1-P-QM-WI -9015090	Analysis DOD - 1013, 11124, 12857	4036 - Organic Extraction
Extraction of Nitroaromatics and Nitroamines by Method 8330/A/B in Water	1-P-QM-WI -9015171	Analysis DOD - 6915, 11122, 11125, 13432	4036 - Organic Extraction
Extraction of Semi-Volatile Organic Compounds by Method 525.2 in Drinking Waters	1-P-QM-WI -9015152	Analysis DOD - 4894	4036 - Organic Extraction
Extraction Procedure for the Determination of 2-Chlrorbenzalmalonotrile (CS) and 3-Quinuclidinyl Benzilate (BZ) in Water and Wastewater	1-P-QM-WI -9012779	Analysis 10475	4036 - Organic Extraction
Extraction Procedure for the Determination of Diesel Range Organics in a Water or Wastewater Matrix by Oklahoma Methodology	1-P-QM-WI -9013016	Analysis 11168	4036 - Organic Extraction
Extraction Procedure for the Determination of Formaldehyde and Aldehydes in a Solid Matrix	1-P-QM-WI -9015162	Analysis DOD - 5876, 11139	4036 - Organic Extraction
Extraction Procedure for the Determination of PAHs in an XAD Air Tube Sample by TO-15A	1-P-QM-WI -9014491	Analysis 7806AIR	4036 - Organic Extraction
Extraction Procedure for the Determination of Total Petroleum Hydrocarbon Organics in a Water or Wastewater Matrix by Texas Methodology	1-P-QM-WI -9013023	Analysis 11192	4036 - Organic Extraction
Extraction Procedure for the Determination of Total Petroleum Hydrocarbons in a Water or Wastewater Matrix by Connecticut Methodology	1-P-QM-WI -9013020	Analysis 11178	4036 - Organic Extraction
Extraction Procedure for the Determination ofTotal Petroleum Hydrocarbons in a Soil or Solid Matrix by Texas Methodology	1-P-QM-WI -9013033	Analysis 11230, 11244	4036 - Organic Extraction
Extraction Procedure for Wisconsin DRO Soils and Solid Waste	1-P-QM-WI -9012868	Analysis 11029	4036 - Organic Extraction
Glassware Cleaning for Organic Extractions	1-P-QM-PRO-9015475	DOD - SOP-OE-001	4036 - Organic Extraction
Glassware Cleaning using Automatic Washers for non-Organic Extraction Glassware	1-P-QM-PRO-9015487	DOD - SOP-OE-014	4036 - Organic Extraction

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Liquid/Liquid Extraction Procedure for the Determination of Base-Neutrals and Acid Extractables in a Wastewater Matrix by Method 8270	1-P-QM-WI -9015098	Analysis DOD - 10458	4036 - Organic Extraction
Liquid/Liquid Extraction Procedure for the Determination of Neutral Extractables in a Wastewater Matrix	1-P-QM-WI -9013043	Analysis 11629	4036 - Organic Extraction
Liquid/Liquid Extraction Procedure for the Determination of Organophosphorous Pesticides in a Wastewater Matrix	1-P-QM-WI -9012765	Analysis 10240	4036 - Organic Extraction
Liquid-Liquid Extraction Procedure for the Determination of Target Compound List Analytes in a Water Matrix	1-P-QM-WI -9015147	Analysis DOD - 4606	4036 - Organic Extraction
Low-Level Sonic Probe Extraction Procedure by Method 3550C for the Determination of Semivolatiles in a Solid Matrix	1-P-QM-WI -9015070	Analysis DOD - 0381, 10478, 10480, 10483, 10486, 10487L	4036 - Organic Extraction
Low-Level Sonic Probe Extraction Procedure for the Determination of Target Compound List Analytes in a Solid Matrix	1-P-QM-WI -9015148	Analysis DOD - 4607	4036 - Organic Extraction
Low-Level Sonication Extraction Procedure for the Determination of Polynuclear Aromatic Hydrocarbons (PAHs) in a Solid Matrix by GC/MS	1-P-QM-WI -9014490	Analysis 7806	4036 - Organic Extraction
Maintenance and Calibration of the Microwave Accelerated Reaction System	1-P-QM-PRO-9017428	MC-OE-013	4036 - Organic Extraction
Maintenance of Accelerated Solvent Extractor (ASE) and the Pressurized Solvent Extractor (PSE)	1-P-QM-PRO-9015486	DOD - SOP-OE-013	4036 - Organic Extraction
Medium Level Sonic Probe Extraction Procedure for the Determination of Pesticides and PCBs in a Solid Matrix	1-P-QM-WI -9012745	Analysis 0819M, 11144	4036 - Organic Extraction
Microextraction by Method 3511 for the Determination of Diesel Range Organics in Water	1-P-QM-WI -9013110	Analysis 12059, 12897, 13175, 13177	4036 - Organic Extraction
Microextraction by Method 504.1 or 8011 for EDB, DBCP, and TCP in Water	1-P-QM-WI -9014309	Analysis 7786, 13715	4036 - Organic Extraction
Microextraction of EDB, DBCP, and TCP in Solids by Method 8011	1-P-QM-WI -9025371	Analysis 13218	4036 - Organic Extraction
Microwave Extraction by Method 3546 for Semivolatiles	1-P-QM-WI -9015105	Analysis DOD - 10498, 10809, 10810, 10811, 10812, 10813, 10814, 11630, 11916	4036 - Organic Extraction
Microwave Extraction for the Determination of Semivolatiles in a Solid Matrix	1-P-QM-WI -9012780	Analysis 10481, 11598	4036 - Organic Extraction
Microwave Extraction Method 3546 for DRO and Saturated Hydrocarbons in a Solid Matrix	1-P-QM-WI -9015120	Analysis DOD - 10942, 11509, 11210	4036 - Organic Extraction
Microwave Extraction Method 3546 for NJ EPH in a Solid Matrix	1-P-QM-WI -9012864	Analysis 10979, 11990	4036 - Organic Extraction
Microwave Extraction Method 3546 for PCBs in a Solid Matrix	1-P-QM-WI -9015104	Analysis DOD - 10497, 11140, 13100	4036 - Organic Extraction
Microwave Extraction Method 3546 for Pesticides in a Solid Matrix	1-P-QM-WI -9015103	Analysis DOD - 10496, 11141	4036 - Organic Extraction
Microwave Extraction of Pesticides and PCBs in Non-aqueous Samples by SW-846 Method 3546 for OH VAP	1-P-QM-WI -9022433	Analysis 10496, 10497 OH VAP	4036 - Organic Extraction
Microwave Extraction of Semivolatiles in Non-Aqueous Samples by SW-846 Method 3546 for OH VAP	1-P-QM-WI -9022475	Analysis 10813 OH VAP	4036 - Organic Extraction

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Microwave Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in a Solid Matrix by Montana Protocol	1-P-QM-WI -9013028	Analysis 11212	4036 - Organic Extraction
Microwave Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in a Solid Matrix by Washington Protocol	1-P-QM-WI -9013029	Analysis 11213	4036 - Organic Extraction
Microwave Extraction, Method 3546, for MA EPH in a Solid Matrix	1-P-QM-WI -9013429	Analysis 2168, 11235	4036 - Organic Extraction
Multipette Stream Operation and Calibration	1-P-QM-PRO-9029413	N/A	4036 - Organic Extraction
N-Evap	1-P-QM-PRO-9015411	DOD - MC-OE-010	4036 - Organic Extraction
Organic Extraction Standards Storage and Handling	1-P-QM-PRO-9015490	DOD - SOP-OE-017	4036 - Organic Extraction
Passive In-Situ Chemical Extraction Sampler (PISCES) Procedure for the Determination of Polychlorinated Biphenyls (PCBs)	1-P-QM-WI -9013121	Analysis 12801	4036 - Organic Extraction
Pesticide Extract Cleanup Using Gel Permeation Chromatography	1-P-QM-PRO-9015407	DOD - MC-OE-004	4036 - Organic Extraction
Pesticide Extract Cleanup Using Gel Permeation Chromatography for OH VAP	1-P-QM-PRO-9023663	N/A	4036 - Organic Extraction
Pesticide Extract Concentration Using a Zymark TurboVap II Concentration Workstation	1-P-QM-PRO-9015485	DOD - SOP-OE-012	4036 - Organic Extraction
Pesticides and Polychlorinated Biphenyls (PCBs) Cleanup Procedures for OH VAP	1-P-QM-PRO-9024148	N/A	4036 - Organic Extraction
pH Meters and Electrodes	1-P-QM-PRO-9015478	DOD - SOP-OE-005	4036 - Organic Extraction
Pore Water Generation Procedure	1-P-QM-WI -9015106	Analysis DOD - 10500	4036 - Organic Extraction
Procedure for Containment and Clean Up of Hazardous Materials Spills in Organic Prep Lab	1-P-QM-PRO-9015479	DOD - SOP-OE-006	4036 - Organic Extraction
Quick Silica Gel Cleanup for Hydrocarbons by GC in Solid and Water Matrices	1-P-QM-WI -9013430	Analysis 2176	4036 - Organic Extraction
Refrigerated Recirculators	1-P-QM-PRO-9015409	DOD - MC-OE-008	4036 - Organic Extraction
Routine Maintenance of Miele Glass Washers	1-P-QM-PRO-9015484	DOD - SOP-OE-011	4036 - Organic Extraction
Sampling Equipment Cleaning and Validation for Metals Analysis	1-P-QM-WI -9015089	Analysis DOD - 10068	4036 - Organic Extraction
Scheduling Extraction Batches	1-P-QM-PRO-9015481	DOD - SOP-OE-008	4036 - Organic Extraction
Semivolatile Extract Cleanup Using Gel Permeation Chromatography	1-P-QM-PRO-9015406	DOD - MC-OE-003	4036 - Organic Extraction
Semivolatile Extract Cleanup Using Gel Permeation Chromatography for OH VAP	1-P-QM-PRO-9023664	N/A	4036 - Organic Extraction
Semivolatile Extract Concentration Using a Zymark TurboVap II Concentration Workstation	1-P-QM-PRO-9015488	DOD - SOP-OE-015	4036 - Organic Extraction
Separatory Funnel Extract Procedure for the Determination of Extractable Petroleum Hydrocarbons (EPH) in a Water or Wastewater Matrix by Tennessee Methodology	1-P-QM-WI -9013021	Analysis 11179	4036 - Organic Extraction
Separatory Funnel Extraction (Method 3510C) or Waste Dilution (Method 3580A) of Base Neutrals and Acid Extractables in Leachates	1-P-QM-WI -9015149	Analysis DOD - 4731	4036 - Organic Extraction
Separatory Funnel Extraction by Method 3510C for BNAs in Wastewater	1-P-QM-WI -9015076	Analysis DOD - 0813, 11010, 11015, 10464, 10467, 10476	4036 - Organic Extraction
Separatory Funnel Extraction by Method 3510C for DRO in Water by California Methodology	1-P-QM-WI -9013446	Analysis 2376, 11169, 11180, 11187, 11188, 11198, 11199, 12820, 13156	4036 - Organic Extraction

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Separatory Funnel Extraction by Method 3510C for Tetraethyl Lead in Waters	1-P-QM-WI -9015101	Analysis DOD - 10472	4036 - Organic Extraction
Separatory Funnel Extraction by Method 3510C, 608 or 622 for Pesticides and PCBs in a Wastewater	1-P-QM-WI -9015079	Analysis DOD - 6654, 10241, 11112, 11113, 11114, 11116, 11117, 11118, 11119, 11120, 11121, 11123, 11126, 11960, 12026, 12822, 13086, 13093, 13183, 13187	4036 - Organic Extraction
Separatory Funnel Extraction for DRO and RRO by AK 102/103 in a Water Matrix	1-P-QM-WI -9013022	Analysis 11184, 11185, 11242, 13027, 13030	4036 - Organic Extraction
Separatory Funnel Extraction for the Determination of PAHs in Water by GC/MS Using Method 3510C	1-P-QM-WI -9015185	Analysis DOD - 7807	4036 - Organic Extraction
Separatory Funnel Extraction Method 3510C for DRO in Water or Wastewater	1-P-QM-WI -9015175	Analysis DOD - 7003, 10304, 11164, 11167, 11171, 11172, 11176, 11177, 11181, 11183, 11189, 11190, 11191, 11195, 11196, 11201, 11203, 11596, 12820, 12906, 12915, 12923, 13095, 13212	4036 - Organic Extraction
Separatory Funnel Extraction Method ECY 97-602 NWTPH-DX for TPH in a Water or Wastewater Matrix	1-P-QM-WI -9013424	Analysis 2135, 11197, 12007, 12119, 12120, 12907, 12916, 12924	4036 - Organic Extraction
Separatory Funnel Extraction of Pesticides and PCBs in Aqueous Samples by SW-846 Method 3510C for OH VAP	1-P-QM-WI -9022427	Analysis 11117, 11118 OH VAP	4036 - Organic Extraction
Separatory Funnel Extraction Procedure for the Determination of Base-Neutrals and Acid Extractables by SIM in a Wastewater Matrix	1-P-QM-WI -9015121	Analysis DOD - 11012, 10465, 10466, 10470, 10471, 11912	4036 - Organic Extraction
Separatory Funnel Extraction Procedure for the Determination of Base-Neutrals and Acid Extractables in a Wastewater Matrix by Method 625	1-P-QM-WI -9015188	Analysis DOD - 8108, 10463	4036 - Organic Extraction
Separatory Funnel Extraction Procedure for the Determination of Chlorinated Pesticides; Nitrogen and Phosphorus Containing Pesticides; and PCBs in a Drinking Water Matrix	1-P-QM-WI -9014001	Analysis 6368, 11127	4036 - Organic Extraction
Separatory Funnel Extraction Procedure for the Determination of Diesel Range Organics in a Water or Wastewater Matrix by Maine Methodology	1-P-QM-WI -9013014	Analysis 11165	4036 - Organic Extraction
Separatory Funnel Extraction Procedure for the Determination of Diesel Range Organics in a Water or Wastewater Matrix by Wisconsin Protocol	1-P-QM-WI -9013015	Analysis 11166	4036 - Organic Extraction
Separatory Funnel Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in a Water Matrix by Washington Methodology	1-P-QM-WI -9013019	Analysis 11175	4036 - Organic Extraction
Separatory Funnel Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in a Water or Wastewater Matrix by Massachusetts or New Jersey Protocol	1-P-QM-WI -9014170	Analysis 7326, 10980, 11200 MA/LA/NJ	4036 - Organic Extraction

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Separatory Funnel Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in a Water or Wastewater Matrix by Montana Protocol	1-P-QM-WI -9013018	Analysis 11174, 11243	4036 - Organic Extraction
Separatory Funnel Extraction Procedure for the Determination of Total Petroleum Hydrocarbon Organics in a Water or Wastewater Matrix by FL-PRO	1-P-QM-WI -9013017	Analysis 11170	4036 - Organic Extraction
Separatory Funnel Extraction Semivolatile Organic Compounds in an Aqueous Samples by SW-846 Method 3510C for OH VAP	1-P-QM-WI -9022472	Analysis 10464 OH VAP	4036 - Organic Extraction
Silica Gel Column Cleanup (Method 3630C Mod) for Hydrocarbons by GC in Aqueous Matrices	1-P-QM-WI -9020897	Analysis 12894	4036 - Organic Extraction
Silica Gel Fractionation for Hydrocarbons by GC in Soil and Water Matrices	1-P-QM-WI -9012711	Analysis 0497	4036 - Organic Extraction
Solid Phase Extraction Procedure for the Determination of THPA, THPI and PA in a Water Matrix	1-P-QM-WI -9012865	Analysis 11011	4036 - Organic Extraction
Solvent and Reagent Lot Testing for Organic Extractions	1-P-QM-PRO-9015476	DOD - SOP-OE-002	4036 - Organic Extraction
Sonic Disruption Extraction Procedure for the Determination of GC Fingerprint on Petroleum Products in Soil or Solid Matrix	1-P-QM-WI -9015151	Analysis DOD - 4833, 11227	4036 - Organic Extraction
Sonic Probe Extraction by FL-PRO for Petroleum Range Organics in Solids	1-P-QM-WI -9013026	Analysis 11208	4036 - Organic Extraction
Sonic Probe Extraction for the Determination of Extractable Total Petroleum Hydrocarbons in Soil or Solid Matrix Connecticut Methology	1-P-QM-WI -9013030	Analysis 11216	4036 - Organic Extraction
Sonic Probe Extraction for the Determination of Pesticides in a Solid Matrix	1-P-QM-WI -9015163	Analysis DOD - 11129, 11131, 11134	4036 - Organic Extraction
Sonic Probe Extraction for TPH in Solids by Washington DX	1-P-QM-WI -9014041	Analysis 7024, 11234, 12008, 12117, 12118	4036 - Organic Extraction
Sonic Probe Extraction of Glycols by Method 3550C from a Solid Matrix	1-P-QM-WI -9032542	Analysis 12933	4036 - Organic Extraction
Sonic Probe Extraction of Pesticides and PCBs in Solid Samples by SW-846 Method 3550C for OH VAP	1-P-QM-WI -9022432	Analysis 0819, 11134 OH VAP	4036 - Organic Extraction
Sonic Probe Extraction Procedure for the Determination of Extractable Petroleum Hydrocarbons in Soil or Solid Matrix Tennessee Methodology	1-P-QM-WI -9013031	Analysis 11217	4036 - Organic Extraction
Sonic Probe Extraction Procedure for the Determination of Polychlorinated Biphenyls (PCBs) in a Solid Matrix	1-P-QM-WI -9015081	Analysis DOD - 0819, 11128, 11132, 11135	4036 - Organic Extraction
Sonic Probe Extraction Procedure for the Determination of Semivolatiles in a Complex Matrix	1-P-QM-WI -9015189	Analysis DOD - 8108TJ	4036 - Organic Extraction
Sonic Probe Extraction Procedure for the Determination of Semivolatiles in a Solid Matrix by SIM	1-P-QM-WI -9015102	Analysis DOD - 10479, 10484, 10489, 11914	4036 - Organic Extraction
Sonic Probe Extraction Procedure for the Determination of Semivolatiles in Non-Aqueous Samples by SW-846 Method 3550C for OH VAP	1-P-QM-WI -9022476	Analysis 0381 10478 OH VAP	4036 - Organic Extraction

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Sonication Extraction Method 3550C for DRO in Soils or Solids	1-P-QM-WI -9015176	Analysis DOD - 7004, 10303, 11204, 11205, 11209, 11215, 11218, 11219, 11225, 11228, 11229, 11233, 11236, 11237, 11238, 13097	4036 - Organic Extraction
Sonication Extraction of Nitroaromatics and Nitroamines by Method 8330/A/B in Soilds	1-P-QM-WI -9015173	Analysis DOD - 6917, 11137, 11138, 13433	4036 - Organic Extraction
Sonication Extraction Procedure for the Determination of Diesel Organics in Soil or Solid Matrix by Alaska Methodology	1-P-QM-WI -9015123	Analysis DOD - 11222, 11223, 11239, 11248	4036 - Organic Extraction
Sonication Extraction Procedure for the Determination of Diesel Organics in Soil or Solid Matrix Oklahoma Methodology	1-P-QM-WI -9013024	Analysis 11206	4036 - Organic Extraction
Sonication Extraction Procedure for the Determination of Diesel Range Organics in Soil or Solid Matrix California Methodology	1-P-QM-WI -9013025	Analysis 11207, 11214	4036 - Organic Extraction
Soxhlet Extraction (Method 3540C) for Triazine Herbicides and Organophosphorous Pesticides in a Solid Matrix	1-P-QM-WI -9015170	Analysis DOD - 6677, 11130, 11133, 11142, 13181, 13185	4036 - Organic Extraction
Soxhlet Extraction Procedure for Extractable Matter in Textiles	1-P-QM-WI -9015134	Analysis DOD - 1948, 1949, 1950, 1951, 1952	4036 - Organic Extraction
Spike Solution Testing and Approval	1-P-QM-PRO-9015482	DOD - SOP-OE-009	4036 - Organic Extraction
Steam Bath and N-Evap Usage, Calibration and Maintenance	1-P-QM-PRO-9015408	DOD - MC-OE-007	4036 - Organic Extraction
Ultrasonic Probe Horn Cleaning	1-P-QM-PRO-9015483	DOD - SOP-OE-010	4036 - Organic Extraction
Ultrasonic Processor Maintenance and Tuning	1-P-QM-PRO-9015405	DOD - MC-OE-002	4036 - Organic Extraction
Waste Dilution for the Determination of Saturated Hydrocarbons in an Oil Matrix	1-P-QM-WI -9013051	Analysis 11657	4036 - Organic Extraction
Waste Dilution Procedure for the Determination of Acid Extractables and Base-Neutrals in a Non-Water Soluble Leachate Matrix	1-P-QM-WI -9015150	Analysis DOD - 4731DIL	4036 - Organic Extraction
Waste Dilution Procedure for the Determination of Acid Extractables and Base-Neutrals in a Non-Water Soluble Matrix	1-P-QM-WI -9015071	Analysis DOD - 0381DIL	4036 - Organic Extraction
Waste Dilution Procedure for the Determination of PCBs in Oil	1-P-QM-WI -9015077	Analysis DOD - 0815	4036 - Organic Extraction
Waste Dilution Procedure for the Determination of Pesticides and PCBs in a Non-Water Soluble Leachate Matrix	1-P-QM-WI -9015080	Analysis DOD - 11114DIL	4036 - Organic Extraction
Analysis of Fluorotelomer Alcohols in Water, Wastewater, Soil and Sludges	1-P-QM-WI -9035224	Analysis 13969, 13977	4037 - Specialty Services Group
Determination of Dioxin-like Polychlorinated Biophenyls by HRGC/HRMS in Aqueous and Solid Matrices	1-P-QM-WI -9013071	Analysis 11773, 12416, 12942	4037 - Specialty Services Group
Determination of Diuron, Fenuron and Monuron in Soil Samples by LC/MS/MS	1-P-QM-WI -9013054	Analysis 11663	4037 - Specialty Services Group
Determination of Diuron, Fenuron and Monuron in Water Samples by SPE Extraction and LC/MS/MS	1-P-QM-WI -9013044	Analysis 11639	4037 - Specialty Services Group
Determination of Endothall in Soil Samples by LCMSMS	1-P-QM-WI -9015125	Analysis DOD - 11688	4037 - Specialty Services Group
Determination of Glycols in Waters by Direct Injection LC/MS/MS Method	1-P-QM-WI -9013111	Analysis 12060	4037 - Specialty Services Group
Determination of Hydrazine in Mainstream Smoke via Liquid Chromatography/Tandem Mass Spectrometry	1-P-QM-WI -9020139	NA	4037 - Specialty Services Group

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Determination of Hydrazine, Monomethylhydrazine and 1,1-Dimethylhydrazinein Soil Samples by LC/MS/MS	1-P-QM-WI -9015096	Analysis DOD - 10346	4037 - Specialty Services Group
Determination of Hydrazine, Monomethylhydrazine and 1.1-Dimethylhydrazine in Aqueous Samples by LC/MS/MS Using SW-846 8315A Modified	1-P-QM-WI -9015095	Analysis DOD - 10342	4037 - Specialty Services Group
Determination of Multiple Client Specific APIs in Surface Water by LCMSMS	1-P-QM-WI -9023568	N/A	4037 - Specialty Services Group
Determination of PCB Homologs in Waters and Solids by Method 680	1-P-QM-WI -9034081	Analysis 13716, 13729	4037 - Specialty Services Group
Determination of Percentage Lipids in Animal and Marine Tissue	1-P-QM-WI -9032128	Analysis 13448	4037 - Specialty Services Group
Determination of Perchlorate in Milk and Milk Powder by LCMSMS	1-P-QM-WI -9013074	Analysis 11962, 11964	4037 - Specialty Services Group
Determination of Perfluorinated Compounds (PFCs) in Solids by Method 537 Modified Using LC/MS/MS	1-P-QM-WI -9035864	Analysis 14027	4037 - Specialty Services Group
Determination of Perfluorooctanoic Acid (PFOA) in Aqueous Samples by LC/MS/MS	1-P-QM-WI -9012866	Analysis 11016	4037 - Specialty Services Group
Determination of Selected Perfluorinated Alkyl Acids (PFAAs) in Aqueous Samples by LC/MS/MS by Method 537	1-P-QM-WI -9012802	Analysis 10954	4037 - Specialty Services Group
Determination of Tetra- Through Octa-Chlorinated Dioxins and Furans using HRGC/HRMS by EPA 1613B or SW-846 8290A	1-P-QM-WI -9015119	Analysis DOD - 10915, 11031, 11645, 11650, 12935, 12936, 12937, 13232, 13233	4037 - Specialty Services Group
DFS HRGC/HRMS Preventative and Corrective Maintenance	1-P-QM-PRO-9015412	DOD - MC-SP-001	4037 - Specialty Services Group
Extraction of Vegetation utilizing the QuEChERS (Quick, Easy, Cheap, Effective, Rugged, Safe) Technique for Pesticides	1-P-QM-WI -9013073	Analysis 11911	4037 - Specialty Services Group
Extraction of Water and Soil Samples by Method 680	1-P-QM-WI -9034059	Analysis 13730, 13731	4037 - Specialty Services Group
Extraction of Waters for Fluorotelomer Alcohols	1-P-QM-WI -9035209	Analysis 13976, 13978	4037 - Specialty Services Group
Glassware Cleaning for HRMS Extractions	1-P-QM-PRO-9025452	N/A	4037 - Specialty Services Group
Maintenance and Tuning for Thermo Scientific TSQ Quantum Access Tandem Mass Spectrometer with a Thermo Electron Accela HPLC System (LC/MS/MS)	1-P-QM-PRO-9018268	SOP-SP-001	4037 - Specialty Services Group
ORGANOTINS by KRONE et al. (1989) via GC/MS and Selected Ion Monitoring (SIM)	1-P-QM-WI -9028808	N/A	4037 - Specialty Services Group
PCB Congeners by Method 1668 HRGC/HRMS in Aqueous and Solid Matricies	1-P-QM-WI -9013114	Analysis 12154, 12429	4037 - Specialty Services Group
Processing High Resolution Mass Spectrometry Data Using TargetQuan	1-P-QM-PRO-9018269	SOP-SP-004	4037 - Specialty Services Group
Sample Extract Column Cleanup Procedure for HRMS Analysis	1-P-QM-PRO-9015510	DOD - SOP-SP-003	4037 - Specialty Services Group
Separatory Funnel Sample Extraction Procedure for HRMS Analysis in a Water Matrix	1-P-QM-WI -9015118	Analysis DOD - 10914	4037 - Specialty Services Group
Soxhlet Sample Extraction Procedure for HRMS Analysis in a Solid Matrix	1-P-QM-WI -9015122	Analysis DOD - 11030	4037 - Specialty Services Group
Standards Management in the High Resolution Mass Spectrometry Laboratory	1-P-QM-PRO-9018270	SOP-SP-005	4037 - Specialty Services Group

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
The Determination of Pesticides by Gas Chromatography/Tandem Mass Spectrometry (GC/MS/MS)	1-P-QM-WI -9013072	Analysis 11788	4037 - Specialty Services Group
Thermo Scientific Trace Ultra Gas Chromatograph Quantum XLS Tandem Mass Spectrometer (GC/MS/MS) Preventative and Corrective Maintenance	1-P-QM-PRO-9017429	MC-SP-002	4037 - Specialty Services Group
Archiving Department 4025 Raw Sample Data and Other Miscellaneous Data	1-P-QM-PRO-9015445	DOD - SOP-DP-022	4038 - Data Deliverables
Assembly and Review of Environmental Data Packages	1-P-QM-PRO-9017748	SOP-DP-037	4038 - Data Deliverables
Generation and Content Review of GLP Compliant Data Packages	1-P-QM-PRO-9017747	SOP-DP-034	4038 - Data Deliverables
Overchecking the Electronic Data Deliverable	1-P-QM-PRO-9015442	DOD - SOP-DP-009	4038 - Data Deliverables
Preparation of Data Packages on CD ROM	1-P-QM-PRO-9015444	DOD - SOP-DP-014	4038 - Data Deliverables
Processing and Sending Data Packages	1-P-QM-PRO-9015441	DOD - SOP-DP-007	4038 - Data Deliverables
Auditing Client Paperwork	1-P-QM-PRO-9015436	DOD - SOP-CL-007	4039 – Environmental Client Services
Client Concern and ISPD Code Entry	1-P-QM-PRO-9015439	DOD - SOP-CL-015	4039 – Environmental Client Services
Client/Prospects Visits	1-P-QM-PRO-9017799	SOP-MK-104	4039 – Environmental Client Services
Creating Bottle Orders	1-P-QM-PRO-9017701	SOP-CL-016	4039 – Environmental Client Services
Creating Project Information Lists	1-P-QM-PRO-9017702	SOP-CL-017	4039 – Environmental Client Services
Daily or Weekly DEP Reporting	1-P-QM-PRO-9017699	SOP-CL-012	4039 – Environmental Client Services
Monthly DEP Reporting	1-P-QM-PRO-9017700	SOP-CL-013	4039 – Environmental Client Services
Phone Log and Email Documentation	1-P-QM-PRO-9015435	DOD - SOP-CL-006	4039 – Environmental Client Services
Preparing Quotations	1-P-QM-PRO-9017698	SOP-CL-008	4039 – Environmental Client Services
Proposal Preparation	1-P-QM-PRO-9017800	SOP-MK-105	4039 – Environmental Client Services
Sample Set-Up Form Creation Guide	1-P-QM-PRO-9015438	DOD - SOP-CL-014	4039 – Environmental Client Services
Scheduling and Pricing of Rush Samples	1-P-QM-PRO-9015437	DOD - SOP-CL-010	4039 – Environmental Client Services
Tracking and Communicating Rush Results	1-P-QM-PRO-9015434	DOD - SOP-CL-005	4039 – Environmental Client Services
ELLE QA Reports to Management	1-P-QM-PRO-9020717	N/A	4052 - Environmental Quality Assurance
Environmental Quality Assurance Functions for GLP Compliance	1-P-QM-PRO-9018256	SOP-QC-032	4052 - Environmental Quality Assurance
Environmental Quality Assurance Review of Client Project and Bid Documents	1-P-QM-PRO-9022599	N/A	4052 - Environmental Quality Assurance
ETM System Probe Calibration	1-P-QM-PRO-9015418	DOD - MC-WQ-003	4052 - Environmental Quality Assurance
Hosting of Environmental Client and Agency Audits	1-P-QM-PRO-9022134	N/A	4052 - Environmental Quality Assurance
Maintenance of Environmental Certifications and Accreditations	1-P-QM-PRO-9018261	SOP-QC-039	4052 - Environmental Quality Assurance
Performing Electronic Data Audits using Mint Miner Software	1-P-QM-PRO-9018259	SOP-QC-036	4052 - Environmental Quality Assurance

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Performing Environmental Quality Assurance Audits	1-P-QM-PRO-9020535	N/A	4052 - Environmental Quality Assurance
Proficiency Test and Double Blind Samples	1-P-QM-PRO-9018237	SOP-QC-003	4052 - Environmental Quality Assurance
QA Approval of Environmental Analytical Procedures and Standard Operating Procedures	1-P-QM-PRO-9022099	N/A	4052 - Environmental Quality Assurance
QA Processing for Bottle Lot and Preservative Checks	1-P-QM-PRO-9035857	N/A	4052 - Environmental Quality Assurance
Quality Assurance Review of End-of-Month QC Reports	1-P-QM-PRO-9018253	SOP-QC-028	4052 - Environmental Quality Assurance
Sample Pick-Up, Transportation, and Delivery	1-P-QM-PRO-9018293	SOP-TR-018	6041 - Transportation
Transportation Summary SOP	1-P-QM-PRO-9028514	N/A	6041 - Transportation
What to Do in Case of Vehicular Accident or Breakdown	1-P-QM-PRO-9018292	SOP-TR-010	6041 - Transportation
Assigning Sample Delivery Group Numbers and Five-Digit Sample Codes to Sample Groups	1-P-QM-PRO-9015506	DOD - SOP-SA-119	6042 - Environmental Sample Administration
Entry of Environmental Samples Requiring Subcontracting	1-P-QM-PRO-9015507	DOD - SOP-SA-129	6042 - Environmental Sample Administration
Environmental Sample Entry	1-P-QM-PRO-9015502	DOD - SOP-SA-101	6042 - Environmental Sample Administration
Environmental Sample Receipt and Unpacking	1-P-QM-PRO-9015504	DOD - SOP-SA-103	6042 - Environmental Sample Administration
Filing of Sample Information	1-P-QM-PRO-9015505	DOD - SOP-SA-107	6042 - Environmental Sample Administration
Sample Receipt at Sample Receipt Desk	1-P-QM-PRO-9015503	DOD - SOP-SA-102	6042 - Environmental Sample Administration
Taking the Temperature of Environmental Samples Upon Arrival at the Lab	1-P-QM-PRO-9015508	DOD - SOP-SA-138	6042 - Environmental Sample Administration
ASRS Emergency Failure Procedure	1-P-QM-PRO-9015523	DOD - SOP-SS-024	6055 - Sample Support
Automated Storage and Retrieval System (ASRS) Lockout/Tagout Procedure	1-P-QM-PRO-9015518	DOD - SOP-SS-019	6055 - Sample Support
Automated Storage, Retrieval, and Discarding of Samples	1-P-QM-PRO-9015512	DOD - SOP-SS-006	6055 - Sample Support
Bulk Solid Sample Preparation by SW-846 5035A for OH VAP	1-P-QM-WI -9012777	Analysis 11967 OH VAP	6055 - Sample Support
GC/MS - Bulk Solid Matrix Sample Preparation	1-P-QM-WI -9015069	Analysis DOD - 0374, 6646, 10445, 11966, 11967	6055 - Sample Support
Glassware Cleaning	1-P-QM-PRO-9018271	SOP-SS-026	6055 - Sample Support
Hardware Procedures for ASRS	1-P-QM-PRO-9015515	DOD - SOP-SS-015	6055 - Sample Support
Homogenization, Sample Splitting, and Subsampling of Solid Waste Samples from Environmental Sources	1-P-QM-PRO-9015513	DOD - SOP-SS-009	6055 - Sample Support
Instructions for Collecting Data on the LLENS System	1-P-QM-PRO-9015520	DOD - SOP-SS-021	6055 - Sample Support
Liquid Sample Preservation	1-P-QM-PRO-9015511	DOD - SOP-SS-002	6055 - Sample Support
Maintenance of Desiccators	1-P-QM-PRO-9015414	DOD - MC-SS-002	6055 - Sample Support
Moisture (Gravimetric)	1-P-QM-WI -9015065	Analysis DOD - 0111, 6111, 7611, 11624, 12845	6055 - Sample Support
Non-Automated Storage, Retrieval, and Discarding of Samples	1-P-QM-PRO-9015521	DOD - SOP-SS-022	6055 - Sample Support
Outlier Quality Control Data	1-P-QM-PRO-9015519	DOD - SOP-SS-020	6055 - Sample Support
Percent Solids by SM 2540G-1997	1-P-QM-WI -9015183	Analysis DOD - 7400	6055 - Sample Support

Document Title	Document ID	Historical Document ID	Document Owner
Level 3 – Environmental Sciences (continued)			
Pipette Dispenser Calibration Procedure	1-P-QM-PRO-9015517	DOD - SOP-SS-018	6055 - Sample Support
Preparation of Soil and Solid Samples for GC Volatile Analyses	1-P-QM-WI -9015124	Analysis DOD - 1150, 6170, 11968, 11969	6055 - Sample Support
Preparation of Soils for Volatile Analysis by EPA SW-846 Method 5035	1-P-QM-WI -9015193	Analysis DOD - 8389, 8390, 6130, 6117, 6174, 7578, 7320	6055 - Sample Support
Preparation of Solid Samples by SW-846 Method 5035A (Field Preserved and EnCores) for OH VAP	1-P-QM-WI -9022845	Analysis 2392, 6171, 6176, 7320, 7578, 7579, 8389, 8390 OH VAP	6055 - Sample Support
Preparation of Vials for Field Preservation of Soils for Volatile Analysis	1-P-QM-WI -9015073	Analysis DOD - 0388, 6119, 6169, 6647, 0405, 1169, 6171, 6172, 6173, 6645, 2392, 6176, 7579, 0069, 11014, 11764	6055 - Sample Support
Prescreening Water and Soil Samples for Volatile Organic Compounds	1-P-QM-PRO-9015522	DOD - SOP-SS-023	6055 - Sample Support
Preservation and Bottles Room Preservative Traceability	1-P-QM-PRO-9015516	DOD - SOP-SS-017	6055 - Sample Support
Sample Preparation of Solid Samples for Extraction and Analysis by SW-846 8330B	1-P-QM-PRO-9030806	N/A	6055 - Sample Support
Sample Support Ovens	1-P-QM-PRO-9015413	DOD - MC-SS-001	6055 - Sample Support
Subsampling for Subcontracted Analyses	1-P-QM-PRO-9015514	DOD - SOP-SS-010	6055 - Sample Support
Tobacco Moisture	1-P-QM-WI -9015168	Analysis DOD - 6611	6055 - Sample Support
Water Content (Moisture) by ASTM D 2216	1-P-QM-WI -9014166	Analysis 7116, 7119	6055 - Sample Support
Bottle Preparation	1-P-QM-PRO-9018263	SOP-SB-003	6059 - Sample Bottles
Packing Bottle Orders	1-P-QM-PRO-9018264	SOP-SB-008	6059 - Sample Bottles
Preparation of Acid Dilutions	1-P-QM-PRO-9018267	SOP-SB-017	6059 - Sample Bottles
Preparation of Trip Blanks	1-P-QM-PRO-9018265	SOP-SB-012	6059 - Sample Bottles
Processing Bottle Orders	1-P-QM-PRO-9018266	SOP-SB-016	6059 - Sample Bottles

Eurofins Document Reference	1-P-QM-GDL-9015383	**Revision**	4
Effective Date	Dec 31, 2015	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix F		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Christiane Sweigart
Reviewed and Approved by	Duane Luckenbill;Review;Sunday, December 13, 2015 10:36:34 PM EST Dorothy Love;Approval;Thursday, December 17, 2015 3:56:52 PM EST

Instrument	# of Units	Manufacturer/Model #
Liquid Chromatography/Gas Chromatography/Mass Spectrometry (LC/GC/MS)		
LC/MS/MS	1	AB Sciex 4000 with Agilent 1100 Series LC
LC/MS/MS	1	Agilent 1200 LC with Agilent 6410 MS/MS
LC/MS/MS	1	Agilent 1290 LC with Micromass Quattro micro MS/MS and Waters 2996 Photodiode Array UV-Vis Detector
LC/MS/MS	1	Thermo Scientific TSQ Quantum Access with Acella LC
LC/MS/MS	2	Waters 2795 LC with Micromass Quattro micro MS/MS
GC/MS	2	Agilent 5972
GC/MS	20	Agilent 5973
GC/MS	10	Agilent 5975
GC/MS	3	Agilent 5977A
GC/MS	2	Shimadzu
GC/MS	1	Thermo Scientific ISQ
GC/MS	1	DSQ II MS with Trace GC Ultra GC
GC/MS/MS	1	Thermo TSQ 8000 MSMS with Trace 1310 GC
GC/MS/MS	1	Thermo TSQ Quantum XLS MSMS with Trace GC Ultra GC
HRGC/HRMS	4	Thermo Scientific DFS
Gas Chromatograph	13	Agilent 5890
Gas Chromatograph	40	Agilent 6890
Gas Chromatograph	2	Shimadzu
Gas Chromatograph	26	Agilent 7890
Gas Chromatograph	1	Varian 3400
Auxiliary Equipment for Gas Chromatographs		
Most of the GC/MS and GC systems include autosamplers and approximately half are fitted with purge and trap concentrators for analysis of volatiles.		
Purge/Trap Concentrators	30	OI 4560/4660
Autosamplers	13	Archon 5100/5100A
Autosamplers	20	Agilent 7673
Autosamplers	21	Agilent 7683
Autosamplers	28	Agilent 7693
Autosamplers	6	OI 4551/4552
Autosamplers	5	EST Centruion
Autosamplers	7	Thermo Scientific AS TriPlus
Autosamplers	3	CTC Combipal Headspace
Automated Sampling System (Tedlar Bags)	1	Tekmar 2016/2032/LSC2000
Automated Sampling System (Summa Canisters)	3	Entech 7016CR Autosamplers
Automated Sampling System (Tedlar Bags/Summa Canisters)	1	Entech 7032A
Automated Sampling System (Tedlar Bags/Summa Canisters)	1	Markes CIA-A HL Satellite Autosampler
Automated Concentrator	3	Entech 7100
Automated Concentrator	1	Markes Unity 2/CIA-A HL
Automated Summa Canister Cleaning System	1	Wasson/TO-Clean
Detectors available for GC: Electron Capture, Flame Ionization, Photoionization, Hall Electrolytic Conductivity, Nitrogen/Phosphorus, and Thermal Conductivity. All of the chromatographs are connected to electronic integration systems.		

High Performance Liquid Chromatography		
High Performance Liquid Chromatograph	2	Agilent 1100 LC
High Performance Liquid Chromatograph	2	Agilent 1200 HPLC
High Performance Liquid Chromatograph	1	Waters alliance 2695
High Performance Liquid Chromatograph	1	Waters alliance 2795
Gel Permeation Chromatography		
Gel Permeation Chromatograph	3	J2Scientific AccuPrep
Ion Chromatography		
Ion Chromatograph	1	Metrohm 881 IC Pro
Ion Chromatograph	1	Dionex ICS1000
Ion Chromatograph	1	Dionex ICS3000
Ion Chromatograph	1	Dionex ICS2000
Ion Chromatograph	4	Dionex ICS1100
Atomic Absorption/Emission Spectrophotometry		
ICAP™ 6000 Duo ICP Analyzer	4	Thermo
ICP/MS	1	P/E Sciex Elan 9000
ICP/MS	1	Agilent 7500ce
ICP/MS	1	Agilent 7700x
Mercury Analyzer	2	Leeman Labs Hydra II
Mercury Analyzer	1	Leeman Labs HYDRA AF_{GOLD+}
Prep Station	3	Thomas Cain DEENA 60
UV Vis/IR Spectrophotometry:		
UV-Vis Spectrophotometer	3	Spectronic Genesys
UV-Vis Spectrophotomenter	1	Hach DR2800
Miscellaneous Chemistry Instrumentation		
Auto-titrator System	2	Mantech
Block Digestion Systems	8	Environmental Express SC150
Block Digestion Systems	6	Environmental Express SC154
Centrifuge	5	Various
Chilled water recirculators		Various
Closed Cup Flashpoint Apparatus, Pensky-Martin	1	Fisher Scientific TA6
Cyanide Midi Distillation Kits	3	Various
Dissolved Oxygen Meter	1	YSI Model 59
Flow Solution Autoanalyzer	2	Alpkem
Glassware washer - automated	6	Miele – (2) PG8257 (1) G7827 (1) G7704 (2) G7883
Kjehldal Distillation Apparatus	2	Fisher
Microwave Extractors	3	CEM MarsXpress
pH meters	13	Various
Phenol Midi Distillation	2	Andrews Glass
Pressurized Solvent Extractor	2	Dionex ASE200
Puck Mill	1	ESSA/2000
Sonicators	12	Various
Total Organic Carbon Analyzer	2	O.I. Corp. 1030
Total Organic Carbon Combustion Analyzer	1	O.I. Corp. 1010
Turbidimeter	1	Hach 2100AN
Zero Headspace Extractor	74	Various Models

Microbiology Equipment		
Autoclave	2	Steris – Amsco,
Balance	5	Mettler, PB 3002
Balance	1	Mettler-Toledo, AT200
Balance	2	Mettler-Toledo, PR2002
Balance	1	Sartorius BP4100
Biological Safety Cabinet	4	NuAire NU-425-600 Type A/B 3
Biological Safety Cabinet	1	NuAire NU-435-600 Type B2 Fume Hood
Colony Counter	1	Quebec Dark Field
Incubator	1	PGC 9311-1127
Incubator	1	PS WFY20SAWI
Microscope	1	Stereoscope with Zoom, AO Model 570
Microscope	1	Zeiss
pH Meter	2	Orion Model 410A
Quanti-Tray Sealer	1	IDEXX Model 2X
Water Bath	1	Boekel Grant with Removal Heater Circulator
Water Bath	1	Thermo Electron Corp.
Water Bath	1	Precision Coliform Incubator Bath
Water Bath	1	VWR 1275PC
Water Bath	2	Thermo Scientific Model 2862
UV Light	1	Spectronics

Computer Equipment

Our laboratories make extensive use of computers for business applications, technical operations (e.g., our sample management system), and QA Program (see section on Quality Assurance). The following is a list of the major components of our computer systems.

Numerous physical and virtual servers used to support the systems

Oracle systems run on IBM UNIX servers:

- One IBM Power 740 Server running AIX UNIX with 6 - 3.3 GHz Power7 Cores CPUs, 128GB RAM.
- One IBM P5-520 Server running AIX UNIX with 4-way 1.90GHz CPUs, 24GB RAM.
- 40+ Terra Bytes of disk storage and several SAN devices including V7000, DS4100, HP2000 and Clarion CX4-40.
- Various tape backup systems
- On-line fail over databases are available for all corporate production Oracle databases.

Networks/Telecommunication:

- TCP/IP based network
- Ten Gigabit switch to accommodate company server farm
- Dual Cisco 6506E network cores

Personal Computers/Servers:

- Internet access is provided with an ASA firewall to control incoming and outgoing traffic
- ArcServe backup server
- Microsoft Exchange server
- Dell PowerEdge file and print servers
- More than 30 Network File Servers
- More than 1000 Personal Computers

Power Systems:

- 3 Phase Power Supply
- Backup generators for life safety and sample integrity preservation

Eurofins Document Reference	1-P-QM-GDL-9015384	**Revision**	3
Effective Date	Aug 8, 2014	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix G		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Kathryn Brungard
Reviewed and Approved by	Duane Luckenbill;Review;Tuesday, July 29, 2014 11:01:38 AM EDT Robert Strocko;Review;Wednesday, July 30, 2014 1:13:46 PM EDT Dorothy Love;Approval;Wednesday, July 30, 2014 2:16:10 PM EDT

Preventive Maintenance Schedule

Instrument	Preventive Maintenance	Frequency
GC/MS GC/MS/MS	Change septum	AN* : Min. weekly
	Clean/replace injection port seal & liner	AN
	Check/clean fans	Monthly or AN
	Check/clean cool flow	Monthly or AN
	Clean source and replace parts	Bimonthly or AN
	Change oil in diffusion pump	Annually or AN
	Change oil and service rough pump	Annually
	Change column	AN
GC and GC/MS Purge and Trap Concentrators	Check gas flows and pressures	Prior to calib. or AN
	Replace adsorbent trap in concentrators	AN
	Flush purge pathways	Monthly or AN
	Clean/replace water management	AN
GC	Septum change	AN: Min. weekly
	Column/injection port maintenance	AN
	Clean detector	AN
	Leak check ECDs	Semiannually
	Change/clean PID lamp	AN
	Change/clean/Replace FID parts	AN
	Change column	AN
GC/HRMS	System bakeout	AN
	Replacing the Secondary Electron Multiplier (SEM)	AN
	Adjusting potentials on ion source	AN
	Check sensitivity and resolution on ion source	Daily
	Cleaning ion source	AN
	Replace filament on ion source	AN
	Cleaning reference inlet	AN
	Check oil level on forepumps	monthly
	Change oil on forepumps	Yearly or if oil is cloudy or discolored
	Exchange lubricant reservoir on turbopumps	Yearly or after 5000 hours of operation
	Replace injection port liner	AN
	Clip injection port end of column	AN
	Replace septum	AN
	Clean chiller water/air filters and inspect fluid level	Monthly
	Change column	AN
LC/MS/MS	Change rough pump (vacuum) oil	Annually
	Clean cones and spray chamber	As needed, before each calibration
	Clean source and ion lenses	Annually
	Check electrospray capillary	AN
	Empty waste liquid reservoir	AN
	Tune and calibrate MS	AN

Instrument	Preventive Maintenance	Frequency
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 reservoir	AN
Cold Vapor AA and Cold Vapor AF	Replace pump tubing	AN
	Lubricate pump head & autosampler	AN
	Clean optical cells and windows	AN
ICP	Replace pump winding	AN
	Lubricate autosampler	AN
	Vacuum instrument airfilters and air intakes	AN
	Clean optics and lenses	AN
	Clean Torch and injector tip	AN
	Clean nebulizer and spray chamber	AN
ICP/MS	Change interface rough pump oil	AN
	Change MS rough pump oil	AN
	Clean cones and ion lenses	AN
	Clean Torch, injector tip, nebulizer and spray chamber	AN
	Change peristaltic tubing	AN
	Vacuum instrument airfilters and air intakes	AN
	Empty waste liquid reservoir	AN
Total Organic Carbon Analyzer	Check for leaks	AN
	Inspect rotary valve	AN
	Clean gas permeation tube	AN
	Check halide scrubber	AN
	Check dessicant tube	AN
	Dust back and clean circuit boards	AN
Autoanalyzer spectrophotometer	Clean sample probe	AN
	Clean proportioning pump	AN
	Inspect pump tubing, replace if worn	AN
	Clean wash receptacles	AN

*AN = as needed. These actions may be performed more frequently as required by the instrument's operational response.

Eurofins Document Reference	1-P-QM-GDL-9015385	**Revision**	4
Effective Date	Dec 31, 2015	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix H		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Barbara F. Reedy
Reviewed and Approved by	Duane Luckenbill;Review;Sunday, December 13, 2015 10:30:21 PM EST Dorothy Love;Approval;Thursday, December 17, 2015 3:57:57 PM EST

Details on method/instrument calibration processes are provided in the individual Analytical Procedures. This appendix provides an overview for representative methodology.
Note: This appendix is not applicable to OH VAP work. See the OH VAP approved SOPs for calibration information.

Calibration Summary for SW-846 Methods

	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
GC/MS Volatiles* (8260B)	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 %RSD CCCs <30%	Every 12 hours	1	RF for SPCCs >0.300 for chlorobenzene and 1,1,2,2-tetrachloro-ethane, and >0.100 for 1,1-dichloroethene, bromoform and chloromethane %Drift for CCCs <20
GC/MS Volatiles* (8260C)	After C-cal fails	7	RF must meet minimum RF listed in SOP %RSD of <20% for all analytes (10% may fail)	Every 12 hours	1	RF must meet minimum RF listed in SOP %Drift for CCCs <20, 20% can fail if not detected in proceeding samples
GC/MS Semivolatiles (8270C)*	After C-cal fails	6	RF for SPCCs >0.050 Max %RSD for CCCs <30%	Every 12 hours	1	RF for SPCCs 0.050 %Drift for CCCs <20
GC/MS Semivolatiles (8270D)*	After C-cal fails	6	% RSD ≤ 20% for each compound, (no more than 10% of the compounds can exceed 20% RSD); alternate fit must be used for any analyte with RSD >20% (use linear fit if correlation coefficient is 0.990 or greater; if correlation coefficient is < 0.990 then quadratic fit can be used, but the coefficient of determination must be 0.990 or greater). If linear fit is used, it must pass a linear regression check (the low standard must be within 30% of its true concentration)	Every 12 hours	1	%Drift ± 20%; (no more than 20% of the compounds can exceed 20% drift, and all compounds that exceed 20% drift must be ≤ 50% drift)
GC/MS Semi-volatiles SIM	After C-cal Fails	6	% RSD for all compounds ≤20%	Every 12 hours	1	%Drift ± 20%

Calibration Summary for SW-846 Methods

	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
GC VOA	After C-cal fails	At least 5	% RSD ≤20% for individual compounds. Alternatively, if the average of the %RSDs of all compounds in the calibration standard is ≤20% then the average RF can be used for all compounds.	Every 10 samples	1	%Drift ± 15% for individual compounds or average % drift for all compounds in the standard ± 15%
GC Pesticides (8081A)	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 20 samples or 12 hours	1	≤15% drift from initial response for quantitation C-cal - A CCV is also compliant if the average % difference is ≤15% for all compounds in the CCV standard. DDT/Endrin breakdown check 15% every 12 hours or 20 injections
GC Pesticides (8081B)	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%	Every 20 samples or 12 hours ,	1	≤20% drift from initial response for quantitation DDT/Endrin breakdown check 15% every 12 hours or 20 injections
GC PCBs (8082)	After C-cal fails	5	20% RSD of RFs of initial calibration to use avg. 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 20 samples or 12 hours	1	≤15% drift from initial response for quantitation C-cal - A CCV is also compliant if the average % difference is ≤15% for all compounds in the CCV standard.
GC PCBs (8082A)	After C-cal fails	5	20% RSD of RFs of initial calibration to use avg. RF, otherwise use curve fit.	Every 20 samples or 12 hours	1	≤20% drift from initial response for quantitation
GC Herbicides (8151A)	After C-cal fails	5	20% RSD of RFs of initial calibration to use avg. 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% drift from initial response for quantitation C-cal - A CCV is also compliant if the average % difference is ≤15% for all compounds in the CCV standard.

Calibration Summary for SW-846 Methods

	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
Explosives by HPLC (8330)	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% drift from initial response for quantitation C-cal - A CCV is also compliant if the average % difference is ≤15% for all compounds in the CCV standard.
Explosives by HPLC (8330A/B)	Each new run or after C-cal fails	5	20% RSD of RFs of initial calibration to use average RF, otherwise use curve fit	Every 10 samples	1	≤20% drift from initial response for quantitation
Congeners by HRGC/HRMS	After C-cal fails	6	If %RSD for native compounds <20% and for labeled compounds <35%, otherwise a calibration curve is used	Every 12 hours	1	<15% valley peak resolution for 2378-TCDD All native and labeled compounds meet method defined recovery limits RTs within ±15 secs of RT in ICAL
Dioxins by HRGC/HRMS	After C-cal fails	6	If %RSD for native compounds <20% and for labeled compounds <35%, otherwise a calibration curve is used	Every 12 hours	1	<25% valley peak resolution for 2378-TCDD All native and labeled compounds meet method defined recovery limits RTs within ±15 secs of RT in ICAL
GC TPH-GRO	After C-cal fails	At least 5	% RSD of <20% to use the average CF, otherwise use calibration curve	Every 12 hours	1	%Drift ±15%
GC TPH-DRO (8015B)	After C-cal fails	5	20% RSD of RFs of initial calibration to use average RF, otherwise use curve fit.	Every 12 hours	1	% Drift ±15%
GC TPH-DRO (8015C/D)	After C-cal fails	5	20% RSD of RFs of initial calibration to use average RF, otherwise use curve fit.	Every 12 hours	1	% Drift ±20%
ICP/MS	Each new run	1	Independent calibration verification (ICV) within ±10%	Every 10 samples	1	±10% of true value
ICP	Each new run	1	Independent calibration verification within ±10%, standards <5%RSD	Every 10 samples	1	Same as initial
CVAA	Each new run	5	Independent calibration verification within ±10% Correlation coefficient >0.995	Every 10 samples	1	±20% of true value

Calibration Summary for SW-846 Methods						
	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
Autoanalyzer	Daily	6	Correlation coefficient >0.995	Every 10 samples	1	±10% of true value
TOC Analyzer	Monthly	Water – 6 Soil – 4	Corr. Coeff. > 0.995	Every 10 samples	1	±10% of true value
Balance	Daily	bracket range of use	Top-loading: ± 2% or ± 0.02g of true value of weight, whichever is greater. Analytical: ± 0.1% or ± 0.5mg of true value of weight, whichever is greater.	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, if average of the %RSD of all compounds in calibration standard is ≤15%, the AVG RF can be used for all compounds.

Abbreviations
Std Conc - The number of standard concentrations used
%RSD - Percent Relative Standard Deviation CF – Calibration Factor
SPCCs - System Performance Check Compounds
CCCs - Calibration Check Compounds C-cal - Continuing Calibration
RF - Response factor
CVAA - Cold Vapor Atomic Absorption
ICP/MS - Inductively Coupled Plasma – Mass Spectrometry
ICP - Inductively Coupled Plasma spectrophotometer; ICP run also includes inter-element correction check standard (at beginning and end of run)

GC/MS Tuning Criteria		
BFB Key Ions and Ion Abundance Criteria:		
Mass	**Method 8260B**	**Method 524.2**
50	15% to 40% of mass 95	15% to 40% of mass 95
75	30% to 60% of mass 95	30% to 80% of mass 95
95	Base peak = 100%	Base peak = 100%
96	5% to 9% of mass 95	5% to 9% of mass 95
173	<2% of mass 174	<2% of mass 174
174	>50% of mass 95	>50% of mass 95
175	5% to 9% of mass 174	5% to 9% of mass 174
176	>95% but <101% of mass 174	>95% but <101% of mass 174
177	5% to 9% of mass 176	5% to 9% of mass 176

DFTPP Key Ions and Ion Abundance Criteria:			
Mass	**Method 8270D**	**Method 8270C**	**Method 525.2**
51	30 % to 80 % of mass 198	30 % to 60 % of mass 198	10 % to 80 % of base peak
68	<2% of mass 69	<2% of mass 69	<2% of mass 69
69	mass 69 relative	mass 69 relative abundance	mass 69 relative abundance

	abundance		
70	<2% of mass 69	<2% of mass 69	<2% of mass 69
127	25 % to 75 % of mass 198	40% to 60 % of mass 198	10% to 80 % of base peak
197	<1% of mass 198	<1% of mass 198	<2% of mass 198
198	Base Peak = 100%	Base Peak = 100%	Base peak or >50 % of mass 442
199	5% to 9% of mass 198	5% to 9% of mass 198	5% to 9% of mass 198
275	10% to 30% of mass 198	10% to 30% of mass 198	10% to 60% of base peak
365	>0.75% of mass 198	>1% of mass 198	>1% of base peak
441	Present but < 24% mass 442	Present but < mass 443	Present but < mass 443
442	>50% of mass 198	>40% of mass 198	Base peak or >50% of mass 198
443	15% to 24% of mass 442	17% to 23% of mass 442	15% to 24% of mass 442

Calibration Summary for Drinking Water Methods

	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
GC/MS 525.2	After C-cal fails	6	The RSD for each analyte mean RF must be ≤30%. Or a linear regression calibration curve may be used.	Every 12 hours	1	%D for RF must be ≤30%. If curve used, the point must fall on curve from I-cal.
GC 504.1	Every new run	5	% RSD <20% to use Average RF, otherwise use calibration curve.	Every 10 samples or each batch if <10 samples	1	70% to 130% of expected value
GC/MS 524.2	After C-cal fails	4	% RSD <20% otherwise use calibration curve	Every 12 hours	1	%D for RF must be ≤30%. If curved used, the % recovery based on the concentration spiked must be 70% to 130% of expected value.
GC 507 515.1	Each new run, or after C-cal fails	3	≤20% RSD of RFs of Initial Calibration to use avg. RF, otherwise use curve fit. (Degradation for DDT, Endrin ≤20% initially - Method 508.)	Every 10 samples	1	≤20% drift from initial response for both quantitation and confirmation.
HPLC 531.1	Each new run, or after C-cal fails	3	≤20% RSD of RFs of initial calibration to use avg. RF, otherwise use curve fit	Every 10 samples and/or blanks	1	≤20% drift from initial response.
Mercury auto-analyzer	Each new run	5	Initial calibration verification with ±5%	Every 10 samples	1	±10% of true value
Auto-analyzer	Daily	6	Correlation coefficient >0.995	Every 10 samples	1	±10% of true value
Balance	Daily	bracket range of use	Top-loading: ± 2% or ± 0.02g of true value of weight, whichever is greater. Analytical: ± 0.1% or ± 0.5mg of true value of weight, whichever is greater.	N/A	N/A	N/A

Calibration Summary for Drinking Water Methods						
	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
ICP	Each new run	1	Initial calibration verification ±5%	Every 10 samples	1	±10% of true value
ICP-MS	Each new run	1	Independent calibration verification within ±10%	Every 10 samples	1	±15% of true value
pH meter	Daily	3	See SOP	Every 10 samples	1	Statistical limits
IC	Monthly	5	Correlation coefficient >0.995	Every 10 samples	1	±10% of true value
ISE	Every 3 months	5	Correlation coefficient >0.995	Every 10 samples	1	±10% of true value

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
%D - Percent Difference
C-cal - Continuing Calibration
CVAF – Cold Vapor Atomic Fluorescence
HPLC - High Performance Liquid Chromatography
GC - Gas Chromatograph
GC/MS - Gas Chromatography/Mass Spectrometry
ICP - Inductively Coupled Plasma spectrophotometer
ICP/MS - Inductively Coupled Plasma – Mass Spectrometry
IC - Ion Chromatograph
ISE - Ion Specific Electrode

Method 507

Laboratory Performance Check Solution (analyzed prior to system calibration)

Test	Analyte	Conc. µg/mL	Requirements
Sensitivity	Vernolate	0.05	Detection of analyte; S/N > 3
Chromatographic performance	Bromacil	5.0	0.80 < PGF[a] <1.20
Column performance	Prometon Atrazine	0.30 0.15	Resolution[b] > 0.7

[a]PGF - Peak Gaussian factor. Calculated using the equation:

$$PGF = \frac{1.83 \times W(1/2)}{W(1/10)}$$

Where W(1/2) is the peak width at half height and W(1/10) is the peak width at 10% peak height.

[b]Resolution between the two peaks as defined by the equation:

$$R = \frac{t}{W}$$

Where t is the difference in elution times between the two peaks and W is the average peak width, at the baseline, of the two peaks.

Method 531.1 Laboratory Performance Check Solution (analyzed prior to system calibration)			
Test	*Analyte*	Conc. µg/mL	Requirements
Sensitivity	3-Hydroxycarbofuran	2	Detection of analyte; S/N > 3
Chromatographic performance	Aldicarb Sulfoxide	100	0.90 < PGF < 1.1[a]
Column performance	Methiocarb4-Bromo-3,5-Dimethylphenyl N-Methylcarbamate (IS)	20 10	Resolution > 1.0[b]

[a]PGF - Peak Gaussian factor. Calculated using the equation:

$$PGF = \frac{1.83 \times W(1/2)}{W(1/10)}$$

Where: W(1/2) is the peak width at half height in seconds
W(1/10) is the peak width in seconds at 10% peak height.

[b]Resolution between the two peaks as defined by the equation:

$$R = \frac{t}{W}$$

Where: t is the difference in elution times between the two peaks
W is the average peak width, at the baseline, of the two peaks.

Method 515 **Laboratory Performance Check Solution** **(analyzed prior to system calibration)**			
Test	Analyte	Conc. µg/mL	Requirements
Sensitivity	Dinoseb	0.004	Detection of analyte; S/N >3
Chromatographic performance	4-Nitrophenol	1.6	0.70 < PGF[a] < 1.05
Column performance	3,5-Dichlorobenzoic acid 4-Nitrophenol	0.6 1.6	Resolution[b] >0.40

[a]PGF - Peak Gaussian factor. Calculated using the equation:

$$PGF = \frac{1.83 \times W(1/2)}{W(1/10)}$$

Where W(1/2) is the peak width at half height and W(1/10) is the peak width at tenth height.

[b]Resolution between the two peaks as defined by the equation:

$$R = \frac{t}{W}$$

Where t is the difference in elution times between the two peaks and W is the average peak width, at the baseline, of the two peaks.

Calibration Summary for EPA 100, 200, 300, 600 & 1600 Series Methods

	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
GC/MS Volatiles*	After C-cal fails	5	RSD ≤35% for all compounds*, or a linear regression may be used	Every 24 hours	1	All compounds must meet the QC acceptance criteria as stated in the method. Compounds not stated must meet a 65% -135% recovery criteria.
GC/MS Semivolatiles**	After C-cal fails	5	RSD ≤35% for all compounds**, or a linear regression may be used Tailing factors: Benzidine < 3 Pentachlorophenol < 5	Every 24 hours	1	All compounds calibrating for <20
GC Pesticides & PCBs (Method 608)	After C-cal fails	5	10% RSD of RFs of initial calibration to use avg. RF, otherwise use curve fit. Degradation for DDT, Endrin 15%	Every 10 samples	1	≤15% drift from initial response for quantitation
GC VOA Halocarbons and/or Aromatics	After C-cal fails	At least 5	%RSD of ≤10% for individual compounds to use average RFs. If %RSD >10%, a quadratic fit type is used if correlation coefficient is >0.995.	Every 12 hours, or every 10 samples	1	Method defined limits
Dioxins by HRGC/HRMS	After C-cal fails	6	If %RSD for native compounds <20% and for labeled compounds <20%, otherwise a calibration curve is used	Every 12 hours	1	<25% valley peak resolution for 2378-TCDD All native and labeled compounds meet method defined recovery limits RTs within ±15 secs of RT in ICAL
ICP/MS	Each new run	1	Independent calibration verification (ICV) within ±10%	Every 10 samples	1	±15% of true value
ICP	Each new run	1	Independent calibration verification within ±5%, standards <3%RSD	Every 10 samples	1	±10% of true value
CVAA	Each new run	5	Independent calibration verification within ±5% Correlation coefficient >0.995	Every 10 samples	1	±10% of true value

Calibration Summary for EPA 100, 200, 300, 600 & 1600 Series Methods

	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
CVAF	Each new run	5	The RSD ≤ 15%, and the low standard recovers ±23% of the true value	After the calibration and at the end of the analytical batch	1	±23% of the true value
Auto-analyzer	Daily	6	Correlation coefficient >0.995	Every 10 samples	1	±10% of true value
TOC	Monthly	6	Corr. Coeff. > 0.995	Every 10 samples	1	±10% of true value
Balance	Daily	4	Top-loading ±0.5%, Analytical ± 0.1% for weights >0.1 g 50 mg ± 0.5%, 20 mg ± 1.0% 10 mg and 5 mg ± 2.0%	N/A	N/A	N/A

*All compounds with %RSD >35 must use first or second order regression fit of the five calibration points. The first order regression may only be used if the correlation coefficient r ≥0.990. The second order regression may only be used if the coefficient of determination $r^2 \geq 0.990$.

* * All compounds with % RSD >35 must use first order regression fit of the five calibration points. The first order regression may only be used if the correlation coefficient r ≥0.990.

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
C-cal - Continuing Calibration
CVAA - Cold Vapor Atomic Absorption spectrophotometer
CVAF - Cold Vapor Fluorescence spectrophotometer
HPLC - High Performance Liquid Chromatography
ICP - Inductively Coupled Plasma spectrophotometer; ICP run also includes inter-element correction check standard (beginning and end of run)
ICP/MS - Inductively Coupled Plasma - Mass Spectrometry

Calibration Summary for EPA TO Series Methods						
	Initial Calibration			Continuing Calibration Verification		
Instrument	Frequency	# Std Conc	Acceptance Criteria	Frequency	# Std Conc	Acceptance Criteria
GC/MS Volatiles TO-15	After C-cal fails	Minimum of 5	RSD ≤30% for all compounds, 2 allowed to be >30% as long as <40%.	Every 24 hours	1	All compounds ≤30 difference.
GC/MS Volatiles TO-14A	After C-cal fails	Minimum of 5	RSD ≤30% for all compounds, 2 allowed to be >30% as long as <40%.	Every 24 hours	1	All compounds ≤30 difference.

Eurofins Document Reference	1-P-QM-GDL-9015386	**Revision**	4
Effective Date	Dec 31, 2015	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix I		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Barbara Reedy
Reviewed and Approved by	Duane Luckenbill;Review;Sunday, December 13, 2015 10:27:16 PM EST Dorothy Love;Approval;Thursday, December 17, 2015 3:58:32 PM EST

NOTE: Current certificates are maintained by the QA Department and are available on our website at http://env.lancasterlabs.com/resources/certifications

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Eurofins Lancaster Laboratories Environmental LLC
2425 New Holland Pike
Lancaster, PA 17601-5994

Matrix: Drinking Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 110.2		Color	NELAP	PA	4/4/2005
EPA 150.1		pH	NELAP	PA	2/28/2002
EPA 1613	B	Dioxin	NELAP	PA	10/5/2010
EPA 1664	B	Oil and grease	NELAP	PA	1/27/2014
EPA 1664	A	Oil and grease	NELAP	PA	5/24/2011
EPA 180.1		Turbidity	NELAP	PA	4/4/2005
EPA 200.7	4.4	Aluminum	NELAP	PA	4/4/2005
EPA 200.7	4.4	Barium	NELAP	PA	1/22/2001
EPA 200.7	4.4	Beryllium	NELAP	PA	6/2/2004
EPA 200.7	4.4	Cadmium	NELAP	PA	1/22/2001
EPA 200.7	4.4	Calcium	NELAP	PA	11/28/2001
EPA 200.7	4.4	Chromium	NELAP	PA	1/22/2001
EPA 200.7	4.4	Cobalt	NELAP	PA	10/16/2008
EPA 200.7	4.4	Copper	NELAP	PA	1/22/2001
EPA 200.7	4.4	Iron	NELAP	PA	4/4/2005
EPA 200.7	4.4	Lithium	NELAP	PA	11/13/2012
EPA 200.7	4.4	Magnesium	NELAP	PA	12/4/2007
EPA 200.7	4.4	Manganese	NELAP	PA	4/4/2005
EPA 200.7	4.4	Nickel	NELAP	PA	1/22/2001
EPA 200.7	4.4	Potassium	NELAP	PA	5/24/2011
EPA 200.7	4.4	Silver	NELAP	PA	1/26/2001
EPA 200.7	4.4	Sodium	NELAP	PA	1/22/2001
EPA 200.7	4.4	Strontium	NELAP	PA	5/24/2011
EPA 200.7	4.4	Sulfur	NELAP	PA	11/9/2012
EPA 200.7	4.4	Tin	NELAP	PA	11/3/2008
EPA 200.7	4.4	Vanadium	NELAP	PA	10/16/2008
EPA 200.7	4.4	Zinc	NELAP	PA	4/4/2005
EPA 200.8	5.4	Antimony	NELAP	PA	2/10/2005
EPA 200.8	5.4	Arsenic	NELAP	PA	2/10/2005
EPA 200.8	5.4	Barium	NELAP	PA	11/16/2011
EPA 200.8	5.4	Beryllium	NELAP	PA	2/10/2005
EPA 200.8	5.4	Cadmium	NELAP	PA	2/10/2005
EPA 200.8	5.4	Calcium	NELAP	PA	11/16/2011
EPA 200.8	5.4	Chromium	NELAP	PA	2/10/2005
EPA 200.8	5.4	Copper	NELAP	PA	3/9/2007
EPA 200.8	5.4	Iron	NELAP	PA	11/2/2012
EPA 200.8	5.4	Lead	NELAP	PA	2/10/2005
EPA 200.8	5.4	Magnesium	NELAP	PA	11/2/2012
EPA 200.8	5.4	Manganese	NELAP	PA	11/16/2011

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Drinking Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 200.8	5.4	Nickel	NELAP	PA	2/10/2005
EPA 200.8	5.4	Potassium	NELAP	PA	11/16/2011
EPA 200.8	5.4	Selenium	NELAP	PA	2/10/2005
EPA 200.8	5.4	Sodium	NELAP	PA	11/16/2011
EPA 200.8	5.4	Strontium	NELAP	PA	11/16/2011
EPA 200.8	5.4	Thallium	NELAP	PA	2/10/2005
EPA 200.8	5.4	Zinc	NELAP	PA	11/16/2011
EPA 218.7		Chromium VI	NELAP	PA	11/27/2013
EPA 245.1	3.0	Mercury	NELAP	PA	8/29/2001
EPA 300.0	2.1	Bromide	NELAP	PA	11/9/2012
EPA 300.0	2.1	Chloride	NELAP	PA	5/17/2005
EPA 300.0	2.1	Fluoride	NELAP	PA	1/22/2004
EPA 300.0	2.1	Nitrate as N	NELAP	PA	10/31/2002
EPA 300.0	2.1	Nitrite as N	NELAP	PA	10/31/2002
EPA 300.0	2.1	Sulfate	NELAP	PA	7/7/2003
EPA 335.4		Cyanide	NELAP	PA	7/11/2006
EPA 353.2		Nitrate as N	NELAP	PA	2/28/2002
EPA 353.2		Nitrite as N	NELAP	PA	2/28/2002
EPA 353.2		Total nitrate-nitrite	NELAP	PA	5/24/2011
EPA 504.1	1.1	1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	PA	5/17/2005
EPA 504.1	1.1	1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	PA	2/28/2002
EPA 504.1	1.1	1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	PA	1/26/2001
EPA 507	2.1	Alachlor (Lasso)	NELAP	PA	2/28/2002
EPA 507	2.1	Atrazine	NELAP	PA	2/28/2002
EPA 507	2.1	Simazine	NELAP	PA	2/28/2002
EPA 508	3.1	Aldrin (HHDN)	NELAP	PA	5/18/2005
EPA 508	3.1	Aroclor-1016 (PCB-1016)	NELAP	PA	4/24/2007
EPA 508	3.1	Aroclor-1221 (PCB-1221)	NELAP	PA	4/24/2007
EPA 508	3.1	Aroclor-1232 (PCB-1232)	NELAP	PA	4/24/2007
EPA 508	3.1	Aroclor-1242 (PCB-1242)	NELAP	PA	4/24/2007
EPA 508	3.1	Aroclor-1248 (PCB-1248)	NELAP	PA	4/24/2007
EPA 508	3.1	Aroclor-1254 (PCB-1254)	NELAP	PA	4/24/2007
EPA 508	3.1	Aroclor-1260 (PCB-1260)	NELAP	PA	4/24/2007
EPA 508	3.1	Chlordane (tech.)	NELAP	PA	2/28/2002
EPA 508	3.1	Dieldrin	NELAP	PA	1/3/2002
EPA 508	3.1	Endrin	NELAP	PA	2/28/2002
EPA 508	3.1	Heptachlor	NELAP	PA	2/28/2002
EPA 508	3.1	Heptachlor epoxide	NELAP	PA	2/28/2002
EPA 508	3.1	Hexachlorobenzene	NELAP	PA	2/28/2002
EPA 508	3.1	Hexachlorocyclopentadiene	NELAP	PA	2/28/2002
EPA 508	3.1	Methoxychlor	NELAP	PA	2/28/2002
EPA 508	3.1	Toxaphene (Chlorinated camphene)	NELAP	PA	4/14/2015
EPA 508	3.1	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	PA	2/28/2002

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Drinking Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 515.1	4.0	2,4,5-TP (Silvex)	NELAP	PA	1/24/2001
EPA 515.1	4.0	2,4-D	NELAP	PA	1/24/2001
EPA 515.1	4.0	Dalapon (2,2-Dichloropropionic acid)	NELAP	PA	1/24/2001
EPA 515.1	4.0	Dicamba	NELAP	PA	1/24/2001
EPA 515.1	4.0	Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	NELAP	PA	1/24/2001
EPA 515.1	4.0	Pentachlorophenol (PCP)	NELAP	PA	1/24/2001
EPA 515.1	4.0	Picloram (4-Amino-3,5,6-trichloro-2-pyridinecarboxylic acid)	NELAP	PA	1/24/2001
EPA 524.2	4.1	1,1,1,2-Tetrachloroethane	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,1,1-Trichloroethane	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,1,2,2-Tetrachloroethane	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,1,2-Trichloroethane	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,1-Dichloro-2-propanone (1,1-Dichloropropanone)	NELAP	PA	5/17/2005
EPA 524.2	4.1	1,1-Dichloroethane	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,1-Dichloroethene (1,1-Dichloroethylene)	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,1-Dichloropropene	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,2,3-Trichlorohenzene	NELAP	PA	4/4/2005
EPA 524.2	4.1	1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,2,4-Trichlorobenzene	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,2,4-Trimethylhenzene	NELAP	PA	4/4/2005
EPA 524.2	4.1	1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,2-Dichloroethane	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,2-Dichloropropane	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,3,5-Trimethylhenzene	NELAP	PA	5/17/2005
EPA 524.2	4.1	1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,3-Dichloropropane	NELAP	PA	10/31/2002
EPA 524.2	4.1	1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	10/31/2002
EPA 524.2	4.1	1-Chlorobutane	NELAP	PA	5/24/2007
EPA 524.2	4.1	2,2-Dichloropropane	NELAP	PA	10/31/2002
EPA 524.2	4.1	2-Butanone (Methyl ethyl ketone, MEK)	NELAP	PA	5/24/2007
EPA 524.2	4.1	2-Chlorotoluene	NELAP	PA	10/31/2002
EPA 524.2	4.1	2-Hexanone	NELAP	PA	5/24/2007
EPA 524.2	4.1	2-Nitropropane	NELAP	PA	5/24/2007
EPA 524.2	4.1	4-Chlorotoluene	NELAP	PA	10/31/2002
EPA 524.2	4.1	4-Methyl-2-pentanone (MIBK)	NELAP	PA	5/24/2007
EPA 524.2	4.1	Acetone	NELAP	PA	5/24/2007
EPA 524.2	4.1	Acrylonitrile	NELAP	PA	5/24/2007
EPA 524.2	4.1	Allyl chloride (3-Chloropropene)	NELAP	PA	7/3/2007
EPA 524.2	4.1	Benzene	NELAP	PA	10/31/2002
EPA 524.2	4.1	Bromobenzene	NELAP	PA	10/31/2002
EPA 524.2	4.1	Bromochloromethane	NELAP	PA	4/4/2005
EPA 524.2	4.1	Bromodichloromethane	NELAP	PA	10/31/2002
EPA 524.2	4.1	Bromoform	NELAP	PA	10/31/2002
EPA 524.2	4.1	Carbon disulfide	NELAP	PA	5/24/2007

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Drinking Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 524.2	4.1	Carbon tetrachloride	NELAP	PA	10/31/2002
EPA 524.2	4.1	Chloroacetonitrile	NELAP	PA	5/24/2007
EPA 524.2	4.1	Chlorobenzene	NELAP	PA	10/31/2002
EPA 524.2	4.1	Chloroethane	NELAP	PA	10/31/2002
EPA 524.2	4.1	Cbloroform	NELAP	PA	10/31/2002
EPA 524.2	4.1	Dibromochloromethane	NELAP	PA	10/31/2002
EPA 524.2	4.1	Dibromomethane	NELAP	PA	10/31/2002
EPA 524.2	4.1	Dichlorodifluoromethane (Freon 12)	NELAP	PA	4/4/2005
EPA 524.2	4.1	Diethyl ether (Ethyl ether)	NELAP	PA	5/24/2007
EPA 524.2	4.1	Diisopropyl ether (DIPE)	NELAP	PA	1/7/2010
EPA 524.2	4.1	Ethyl methacrylate	NELAP	PA	5/24/2007
EPA 524.2	4.1	Ethyl tert-butyl ether (ETBE)	NELAP	PA	1/24/2007
EPA 524.2	4.1	Ethylbenzene	NELAP	PA	10/31/2002
EPA 524.2	4.1	Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	4/4/2005
EPA 524.2	4.1	Hexachloroethane	NELAP	PA	5/24/2007
EPA 524.2	4.1	Isopropylbenzene (Cumene)	NELAP	PA	4/4/2005
EPA 524.2	4.1	Methacrylonitrile	NELAP	PA	5/24/2007
EPA 524.2	4.1	Methyl bromide (Bromomethane)	NELAP	PA	10/31/2002
EPA 524.2	4.1	Methyl chloride (Chloromethane)	NELAP	PA	10/31/2002
EPA 524.2	4.1	Methyl iodide (Iodomethane)	NELAP	PA	5/24/2007
EPA 524.2	4.1	Methyl tert-butyl ether (MTBE)	NELAP	PA	4/4/2005
EPA 524.2	4.1	Methylacrylate	NELAP	PA	5/24/2007
EPA 524.2	4.1	Methylene chloride (Dichloromethane)	NELAP	PA	10/31/2002
EPA 524.2	4.1	Methylmethacrylate	NELAP	PA	5/24/2007
EPA 524.2	4.1	Naphthalene	NELAP	PA	5/17/2005
EPA 524.2	4.1	Nitrobenzene	NELAP	PA	5/17/2005
EPA 524.2	4.1	Pentachloroethane	NELAP	PA	5/24/2007
EPA 524.2	4.1	Propionitrile (Ethyl cyanide)	NELAP	PA	5/24/2007
EPA 524.2	4.1	Styrene	NELAP	PA	10/31/2002
EPA 524.2	4.1	Tetrachloroethene (PCE, Perchloroethylene)	NELAP	PA	10/31/2002
EPA 524.2	4.1	Tetrahydrofuran (THF)	NELAP	PA	5/24/2007
EPA 524.2	4.1	Toluene	NELAP	PA	10/31/2002
EPA 524.2	4.1	Total trihalomethanes (TTHMs)	NELAP	PA	10/31/2002
EPA 524.2	4.1	Trichloroethene (TCE, Trichloroethylene)	NELAP	PA	10/31/2002
EPA 524.2	4.1	Trichlorofluoromethane (Freon 11)	NELAP	PA	4/4/2005
EPA 524.2	4.1	Vinyl chloride (Chloroethene)	NELAP	PA	10/31/2002
EPA 524.2	4.1	Xylenes, total	NELAP	PA	10/31/2002
EPA 524.2	4.1	cis-1,2-Dichloroethene	NELAP	PA	10/31/2002
EPA 524.2	4.1	cis-1,3-Dichloropropene	NELAP	PA	10/31/2002
EPA 524.2	4.1	m+p-Xylene	NELAP	PA	12/8/2014
EPA 524.2	4.1	n-Butylbenzene	NELAP	PA	4/4/2005
EPA 524.2	4.1	n-Propylbenzene	NELAP	PA	5/17/2005
EPA 524.2	4.1	o-Xylene	NELAP	PA	12/8/2014
EPA 524.2	4.1	p-Isopropyltoluene (4-Isopropyltoluene)	NELAP	PA	5/17/2005
EPA 524.2	4.1	sec-Butylbenzene	NELAP	PA	4/4/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Drinking Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 524.2	4.1	tert-Amyl methyl ether (TAME)	NELAP	PA	1/24/2007
EPA 524.2	4.1	tert-Butyl alcohol (2-Methyl-2-propanol)	NELAP	PA	5/24/2007
EPA 524.2	4.1	tert-Butylbenzene	NELAP	PA	4/4/2005
EPA 524.2	4.1	trans-1,2-Dichloroethene	NELAP	PA	10/31/2002
EPA 524.2	4.1	trans-1,3-Dichloropropene	NELAP	PA	10/31/2002
EPA 524.2	4.1	trans-1,4-Dichloro-2-butene	NELAP	PA	5/24/2007
EPA 525.2	2.0	2,3-Dichlorobiphenyl (BZ 5)	NELAP	PA	5/17/2005
EPA 525.2	2.0	Acenaphthene	NELAP	PA	5/25/2007
EPA 525.2	2.0	Acenaphthylene	NELAP	PA	4/28/2010
EPA 525.2	2.0	Alachlor (Lasso)	NELAP	PA	2/28/2002
EPA 525.2	2.0	Aldrin (HHDN)	NELAP	PA	10/9/2013
EPA 525.2	2.0	Anthracene	NELAP	PA	5/25/2007
EPA 525.2	2.0	Atrazine	NELAP	PA	1/3/2002
EPA 525.2	2.0	Benzo[a]anthracene	NELAP	PA	5/25/2007
EPA 525.2	2.0	Benzo[a]pyrene	NELAP	PA	1/24/2001
EPA 525.2	2.0	Benzo[b]fluoranthene	NELAP	PA	6/4/2007
EPA 525.2	2.0	Benzo[ghi]perylene	NELAP	PA	7/3/2007
EPA 525.2	2.0	Benzo[k]fluoranthene	NELAP	PA	6/4/2007
EPA 525.2	2.0	Benzyl butyl phthalate (Butyl benzyl phthalate)	NELAP	PA	5/25/2007
EPA 525.2	2.0	Butachlor	NELAP	PA	12/19/2002
EPA 525.2	2.0	Chrysene (Benzo[a]phenanthrene)	NELAP	PA	5/25/2007
EPA 525.2	2.0	Di-n-butyl phthalate	NELAP	PA	5/25/2007
EPA 525.2	2.0	Dibenzo[a,h]anthracene	NELAP	PA	5/25/2007
EPA 525.2	2.0	Dieldrin	NELAP	PA	5/17/2005
EPA 525.2	2.0	Diethyl phthalate	NELAP	PA	5/25/2007
EPA 525.2	2.0	Dimethyl phthalate	NELAP	PA	5/25/2007
EPA 525.2	2.0	Endrin	NELAP	PA	5/17/2005
EPA 525.2	2.0	Fluoranthene	NELAP	PA	3/7/2012
EPA 525.2	2.0	Fluorene	NELAP	PA	2/7/2012
EPA 525.2	2.0	Heptachlor	NELAP	PA	5/17/2005
EPA 525.2	2.0	Heptachlor epoxide	NELAP	PA	5/17/2005
EPA 525.2	2.0	Hexachlorobenzene	NELAP	PA	2/11/2005
EPA 525.2	2.0	Hexachlorocyclopentadiene	NELAP	PA	1/24/2001
EPA 525.2	2.0	Indeno(1,2,3-cd)pyrene	NELAP	PA	2/7/2012
EPA 525.2	2.0	Methoxychlor	NELAP	PA	1/24/2001
EPA 525.2	2.0	Metolachlor	NELAP	PA	12/19/2002
EPA 525.2	2.0	Metribuzin	NELAP	PA	12/19/2002
EPA 525.2	2.0	Phenanthrene	NELAP	PA	5/25/2007
EPA 525.2	2.0	Propachlor (Ramrod)	NELAP	PA	1/24/2001
EPA 525.2	2.0	Pyrene	NELAP	PA	5/25/2007
EPA 525.2	2.0	Simazine	NELAP	PA	1/3/2002
EPA 525.2	2.0	bis(2-Ethylhexyl) adipate (di(2-Ethylhexyl) adipate)	NELAP	PA	1/24/2001
EPA 525.2	2.0	bis(2-Ethylhexyl) phthalate (DEHP)	NELAP	PA	1/24/2001

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Drinking Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 525.2	2.0	gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	PA	1/24/2001
EPA 531.1	3.1	3-Hydroxycarbofuran	NELAP	PA	11/7/2006
EPA 531.1	3.1	Aldicarb (Temik)	NELAP	PA	4/14/2015
EPA 531.1	3.1	Aldicarb sulfone	NELAP	PA	1/24/2001
EPA 531.1	3.1	Aldicarb sulfoxide	NELAP	PA	1/24/2001
EPA 531.1	3.1	Carbaryl (Sevin)	NELAP	PA	10/9/2002
EPA 531.1	3.1	Carbofuran (Furaden)	NELAP	PA	1/24/2001
EPA 531.1	3.1	Methomyl (Lannate)	NELAP	PA	1/24/2001
EPA 531.1	3.1	Oxamyl (Vydate)	NELAP	PA	1/24/2001
EPA 8015		Ethane	NELAP	PA	5/24/2011
EPA 8015		Methane	NELAP	PA	5/24/2011
EPA 8015		Propane	NELAP	PA	11/9/2012
SM 2120 B		Color	NELAP	PA	5/25/2005
SM 2130 B		Turbidity	NELAP	PA	5/17/2005
SM 2320 B		Alkalinity as CaCO3	NELAP	PA	1/24/2001
SM 2340 C		Total hardness as CaCO3	NELAP	PA	5/24/2011
SM 2510 B		Conductivity	NELAP	PA	5/17/2005
SM 2540 C		Total dissolved solids (TDS)	NELAP	PA	6/2/2004
SM 2540 D		Residue, nonfilterable (TSS)	NELAP	PA	5/24/2011
SM 2550 B		Temperature, deg. C	NELAP	PA	4/4/2005
SM 4500-Cl F		Total residual chlorine	NELAP	PA	5/24/2011
SM 4500-F- C		Fluoride	NELAP	PA	10/15/2003
SM 4500-H+ B		pH	NELAP	PA	5/16/2007
SM 4500-P E		Orthophosphate as P	NELAP	PA	6/12/2007
SM 4500-SiO2 C	20-22	Silica, dissolved	NELAP	PA	5/24/2007
SM 5310 C		Total organic carbon (TOC)	NELAP	PA	4/18/2013
SM 5540 C		Surfactants as MBAS	NELAP	PA	5/24/2007
SM 9215 B		Heterotrophic bacteria (Enumeration)	NELAP	PA	2/5/2003
SM 9223 Colilert		Total coliform & E. coli (P/A)	NELAP	PA	1/26/2001

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
AK-101		Gasoline-range organics (GRO)	NELAP	PA	12/12/2005
AK-102		Diesel-range organics (DRO)	NELAP	PA	12/12/2005
ASTM D7511-09		Total cyanide	NELAP	PA	2/15/2013
EPA 1010		Ignitability	NELAP	PA	12/12/2005
EPA 130.2		Hardness	NELAP	PA	1/19/2005
EPA 1311		Toxicity characteristic leaching procedure (TCLP)	NELAP	PA	12/12/2005
EPA 1312		Synthetic precipitation leaching procedure (SPLP)	NELAP	PA	12/12/2005
EPA 160.1		Residue, filterable (TDS)	NELAP	PA	1/19/2005
EPA 160.4		Residue, volatile	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1613	B	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	NELAP	PA	6/30/2010
EPA 1613	B	1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	NELAP	PA	6/30/2010
EPA 1613	B	2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 1613	B	2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	NELAP	PA	6/30/2010
EPA 1613	B	2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)(Dioxin)	NELAP	PA	6/30/2010
EPA 1613	B	2,3,7,8-Tetrachlorodibenzofuran (TCDF)	NELAP	PA	6/30/2010
EPA 1613	B	Total heptachlorodibenzo-p-dioxin (HpCDD)	NELAP	PA	8/6/2010
EPA 1613	B	Total heptachlorodibenzofuran (HpCDF)	NELAP	PA	8/6/2010
EPA 1613	B	Total hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	8/6/2010
EPA 1613	B	Total hexachlorodibenzofuran (HxCDF)	NELAP	PA	8/6/2010
EPA 1613	B	Total pentachlorodibenzo-p-dioxin (PeCDD)	NELAP	PA	8/6/2010
EPA 1613	B	Total pentachlorodibenzofuran (PeCDF)	NELAP	PA	8/6/2010
EPA 1613	B	Total tetrachlorodibenzo-p-dioxin (TCDD)	NELAP	PA	8/6/2010
EPA 1613	B	Total tetrachlorodibenzofuran (TCDF)	NELAP	PA	8/6/2010
EPA 1625	C	N-Nitrosodimethylamine	NELAP	PA	11/23/2010
EPA 1631	E	Mercury	NELAP	PA	10/16/2014
EPA 1664	A	Non-polar material	NELAP	PA	11/17/2006
EPA 1664	A	Oil and grease	NELAP	PA	1/19/2005
EPA 1664	B	Oil and grease	NELAP	PA	1/27/2014
EPA 1666	A	4-Methyl-2-pentanone (MIBK)	NELAP	PA	12/12/2005
EPA 1666	A	Diisopropyl ether (DIPE)	NELAP	PA	1/19/2005
EPA 1666	A	Ethyl acetate	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1666	A	Isobutyraldehyde	NELAP	PA	1/19/2005
EPA 1666	A	Isopropyl acetate	NELAP	PA	1/19/2005
EPA 1666	A	Isopropyl alcohol (2-Propanol)	NELAP	PA	12/2/2009
EPA 1666	A	Methyl formate	NELAP	PA	1/19/2005
EPA 1666	A	Tetrahydrofuran (THF)	NELAP	PA	1/19/2005
EPA 1666	A	Xylenes, total	NELAP	PA	1/19/2005
EPA 1666	A	n-Amyl acetate (n-Pentyl acetate)	NELAP	PA	4/4/2005
EPA 1666	A	n-Amyl alcohol (1-Pentanol)	NELAP	PA	4/4/2005
EPA 1666	A	n-Butyl acetate	NELAP	PA	4/4/2005
EPA 1666	A	n-Heptane	NELAP	PA	1/19/2005
EPA 1666	A	n-Hexane	NELAP	PA	1/19/2005
EPA 1666	A	tert-Butyl alcohol (2-Methyl-2-propanol)	NELAP	PA	4/4/2005
EPA 1668		2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	NELAP	PA	2/1/2013
EPA 1668		2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ 194)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ 196)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ 207)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ 195)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ 197)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',6-Heptachlorobiphenyl (BZ 171)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4'-Hexachlorobiphenyl (BZ 128)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ 177)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ 201)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ 175)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5'-Hexachlorobiphenyl (BZ 130)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ 199)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ 208)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,5',6-Octachlorobiphenyl (BZ 198)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ 172)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ 174)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ 200)	NELAP	PA	12/17/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ 173)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5-Hexachlorobiphenyl (BZ 129)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,6'-Hexachlorobiphenyl (BZ 132)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ 176)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,6-Hexachlorobiphenyl (BZ 131)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4-Pentachlorobiphenyl (BZ 82)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ 202)	NELAP	PA	2/1/2013
EPA 1668		2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ 178)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5,5'-Hexachlorobiphenyl (BZ 133)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5,6'-Hexachlorobiphenyl (BZ 135)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ 179)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5,6-Hexachlorobiphenyl (BZ 134)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5-Pentachlorobiphenyl (BZ 83)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',6,6'-Hexachlorobiphenyl (BZ 136)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',6-Pentachlorobiphenyl (BZ 84)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3'-Tetrachlorobiphenyl (BZ 40)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5',6-Hexachlorobiphenyl (BZ 149)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5'-Pentachlorobiphenyl (BZ 97)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5,5'-Hexachlorobiphenyl (BZ 146)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5,6'-Hexachlorobiphenyl (BZ 148)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ 188)	NELAP	PA	2/1/2013
EPA 1668		2,2',3,4',5,6-Hexachlorobiphenyl (BZ 147)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5-Pentachlorobiphenyl (BZ 90)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',6'-Pentachlorobiphenyl (BZ 98)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',6,6'-Hexachlorobiphenyl (BZ 150)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',6-Pentachlorobiphenyl (BZ 91)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4'-Tetrachlorobiphenyl (BZ 42)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ 183)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5'-Hexachlorobiphenyl (BZ 138)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ 203)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ 180)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ 182)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ 204)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ 181)	NELAP	PA	12/17/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		2,2',3,4,4',5-Hexachlorobiphenyl (BZ 137)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',6'-Hexachlorobiphenyl (BZ 140)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ 184)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',6-Hexachlorobiphenyl (BZ 139)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4'-Pentachlorobiphenyl (BZ 85)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5',6-Hexachlorobiphenyl (BZ 144)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5'-Pentachlorobiphenyl (BZ 87)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ 185)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5,6'-Hexachlorobiphenyl (BZ 143)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ 186)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5,6-Hexachlorobiphenyl (BZ 142)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5-Pentachlorobiphenyl (BZ 86)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,6'-Pentachlorobiphenyl (BZ 89)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,6,6'-Hexachlorobiphenyl (BZ 145)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,6-Pentachlorobiphenyl (BZ 88)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4-Tetrachlorobiphenyl (BZ 41)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5',6-Pentachlorobiphenyl (BZ 95)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5'-Tetrachlorobiphenyl (BZ 44)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5,5',6-Hexachlorobiphenyl (BZ 151)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5,5'-Pentachlorobiphenyl (BZ 92)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5,6'-Pentachlorobiphenyl (BZ 94)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5,6,6'-Hexachlorobiphenyl (BZ 152)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5,6-Pentachlorobiphenyl (BZ 93)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5-Tetrachlorobiphenyl (BZ 43)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,6'-Tetrachlorobiphenyl (BZ 46)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,6,6'-Pentachlorohiphenyl (BZ 96)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,6-Tetrachlorohiphenyl (BZ 45)	NELAP	PA	12/17/2012
EPA 1668		2,2',3-Trichlorobipbenyl (BZ 16)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4',5,5'-Hexachlorobiphenyl (BZ 153)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4',5,6'-Hexachlorobiphenyl (BZ 154)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4',5-Pentachlorobiphenyl (BZ 99)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4',6,6'-Hexachlorobiphenyl (BZ 155)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4',6-Pentachlorohiphenyl (BZ 100)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4'-Tetrachlorobiphenyl (BZ 47)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,5',6-Pentachlorobiphenyl (BZ 103)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,5'-Tetrachlorobiphenyl (BZ 49)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,5,5'-Pentachlorobiphenyl (BZ 101)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,5,6'-Pentachlorobiphenyl (BZ 102)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,5-Tetrachlorobiphenyl (BZ 48)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,6'-Tetrachlorobipbenyl (BZ 51)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,6,6'-Pentachlorobiphenyl (BZ 104)	NELAP	PA	2/1/2013
EPA 1668		2,2',4,6-Tetrachlorobiphenyl (BZ 50)	NELAP	PA	12/17/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		2,2',4-Trichlorobiphenyl (BZ 17)	NELAP	PA	12/17/2012
EPA 1668		2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	NELAP	PA	12/17/2012
EPA 1668		2,2',5,6'-Tetrachlorobiphenyl (BZ 53)	NELAP	PA	12/17/2012
EPA 1668		2,2',5-Trichlorobiphenyl (BZ 18)	NELAP	PA	12/17/2012
EPA 1668		2,2',6,6'-Tetrachlorobiphenyl (BZ 54)	NELAP	PA	12/17/2012
EPA 1668		2,2',6-Trichlorobiphenyl (BZ 19)	NELAP	PA	12/17/2012
EPA 1668		2,2'-Dichlorobiphenyl (BZ 4)	NELAP	PA	12/17/2012
EPA 1668		2,3',4',5',6-Pentachlorobiphenyl (BZ 125)	NELAP	PA	12/17/2012
EPA 1668		2,3',4',5'-Tetrachlorobiphenyl (BZ 76)	NELAP	PA	12/17/2012
EPA 1668		2,3',4',5,5'-Pentachlorobiphenyl (BZ 124)	NELAP	PA	12/17/2012
EPA 1668		2,3',4',5-Tetrachlorobiphenyl (BZ 70)	NELAP	PA	12/17/2012
EPA 1668		2,3',4',6-Tetrachlorobiphenyl (BZ 71)	NELAP	PA	12/17/2012
EPA 1668		2,3',4'-Trichlorobiphenyl (BZ 33)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4',5',6-Hexachlorobiphenyl (BZ 168)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4',5'-Pentachlorobiphenyl (BZ 123)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4',5,5'-Hexachlorobiphenyl (BZ 167)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4',5-Pentachlorobiphenyl (BZ 118)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4',6-Pentachlorobiphenyl (BZ 119)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,5',6-Pentachlorobiphenyl (BZ 121)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,5'-Tetrachlorobiphenyl (BZ 68)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,5,5'-Pentachlorobiphenyl (BZ 120)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,5-Tetrachlorobiphenyl (BZ 67)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,6-Tetrachlorobiphenyl (BZ 69)	NELAP	PA	12/17/2012
EPA 1668		2,3',4-Trichlorobiphenyl (BZ 25)	NELAP	PA	12/17/2012
EPA 1668		2,3',5',6-Tetrachlorobiphenyl (BZ 73)	NELAP	PA	12/17/2012
EPA 1668		2,3',5'-Trichlorobiphenyl (BZ 34)	NELAP	PA	12/17/2012
EPA 1668		2,3',5,5'-Tetrachlorobiphenyl (BZ 72)	NELAP	PA	12/17/2012
EPA 1668		2,3',5-Trichlorobiphenyl (BZ 26)	NELAP	PA	12/17/2012
EPA 1668		2,3',6-Trichlorobiphenyl (BZ 27)	NELAP	PA	12/17/2012
EPA 1668		2,3'-Dichlorobiphenyl (BZ 6)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5',6-Hexachlorobiphenyl (BZ 164)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5'-Pentachlorobiphenyl (BZ 122)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ 193)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5,5'-Hexachlorobiphenyl (BZ 162)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5,6-Hexachlorobiphenyl (BZ 163)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5-Pentachlorobiphenyl (BZ 107)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',6-Pentachlorobiphenyl (BZ 110)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4'-Tetrachlorobiphenyl (BZ 56)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ 191)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5'-Hexachlorobiphenyl (BZ 157)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ 205)	NELAP	PA	2/1/2013

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ 189)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ 190)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5-Hexachlorobiphenyl (BZ 156)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',6-Hexachlorobiphenyl (BZ 158)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4'-Pentachlorobiphenyl (BZ 105)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5',6-Hexachlorobiphenyl (BZ 161)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5'-Pentachlorobiphenyl (BZ 108)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ 192)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5,5'-Hexachlorobiphenyl (BZ 159)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5,6-Hexachlorobiphenyl (BZ 160)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5-Pentachlorobiphenyl (BZ 106)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,6-Pentachlorobiphenyl (BZ 109)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4-Tetrachlorobiphenyl (BZ 55)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5',6-Pentachlorobiphenyl (BZ 113)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5'-Tetrachlorobiphenyl (BZ 58)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5,5',6-Hexachlorobiphenyl (BZ 165)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5,5'-Pentachlorobiphenyl (BZ 111)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5,6-Pentachlorobiphenyl (BZ 112)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5-Tetrachlorobiphenyl (BZ 57)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',6-Tetrachlorobiphenyl (BZ 59)	NELAP	PA	12/17/2012
EPA 1668		2,3,3'-Trichlorobiphenyl (BZ 20)	NELAP	PA	12/17/2012
EPA 1668		2,3,4',5,6-Pentachlorobiphenyl (BZ 117)	NELAP	PA	12/17/2012
EPA 1668		2,3,4',5-Tetrachlorobiphenyl (BZ 63)	NELAP	PA	12/17/2012
EPA 1668		2,3,4',6-Tetrachlorobiphenyl (BZ 64)	NELAP	PA	12/17/2012
EPA 1668		2,3,4'-Trichlorobiphenyl (BZ 22)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,4',5,6-Hexachlorobiphenyl (BZ 166)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,4',5-Pentachlorobiphenyl (BZ 114)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,4',6-Pentachlorobiphenyl (BZ 115)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,4'-Tetrachlorobiphenyl (BZ 60)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,5,6-Pentachlorobiphenyl (BZ 116)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,5-Tetrachlorobiphenyl (BZ 61)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,6-Tetrachlorobiphenyl (BZ 62)	NELAP	PA	12/17/2012
EPA 1668		2,3,4-Trichlorobiphenyl (BZ 21)	NELAP	PA	12/17/2012
EPA 1668		2,3,5,6-Tetrachlorobiphenyl (BZ 65)	NELAP	PA	12/17/2012
EPA 1668		2,3,5-Trichlorobiphenyl (BZ 23)	NELAP	PA	12/17/2012
EPA 1668		2,3,6-Trichlorobiphenyl (BZ 24)	NELAP	PA	12/17/2012
EPA 1668		2,3-Dichlorobiphenyl (BZ 5)	NELAP	PA	12/17/2012
EPA 1668		2,4',5-Trichlorobiphenyl (BZ 31)	NELAP	PA	12/17/2012
EPA 1668		2,4',6-Trichlorobiphenyl (BZ 32)	NELAP	PA	12/17/2012
EPA 1668		2,4'-Dichlorobiphenyl (BZ 8)	NELAP	PA	12/17/2012
EPA 1668		2,4,4',5-Tetrachlorobiphenyl (BZ 74)	NELAP	PA	12/17/2012
EPA 1668		2,4,4',6-Tetrachlorobiphenyl (BZ 75)	NELAP	PA	12/17/2012
EPA 1668		2,4,4'-Trichlorobiphenyl (BZ 28)	NELAP	PA	12/17/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		2,4,5-Trichlorobiphenyl (BZ 29)	NELAP	PA	12/17/2012
EPA 1668		2,4,6-Trichlorobiphenyl (BZ 30)	NELAP	PA	12/17/2012
EPA 1668		2,4-Dichlorobiphenyl (BZ 7)	NELAP	PA	12/17/2012
EPA 1668		2,5-Dichlorobiphenyl (BZ 9)	NELAP	PA	12/17/2012
EPA 1668		2,6-Dichlorobiphenyl (BZ 10)	NELAP	PA	12/17/2012
EPA 1668		2-Chlorobiphenyl (BZ 1)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,4',5,5'-Hexachlorobiphenyl (BZ 169)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,4',5-Pentachlorobipbenyl (BZ 126)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,4'-Tetrachlorobiphenyl (BZ 77)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,5'-Tetrachlorobiphenyl (BZ 79)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,5,5'-Pentachlorobiphenyl (BZ 127)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,5-Tetrachlorobiphenyl (BZ 78)	NELAP	PA	12/17/2012
EPA 1668		3,3',4-Trichlorobiphenyl (BZ 35)	NELAP	PA	12/17/2012
EPA 1668		3,3',5,5'-Tetrachlorobiphenyl (BZ 80)	NELAP	PA	12/17/2012
EPA 1668		3,3',5-Trichlorobiphenyl (BZ 36)	NELAP	PA	12/17/2012
EPA 1668		3,3'-Dichlorobiphenyl (BZ 11)	NELAP	PA	12/17/2012
EPA 1668		3,4',5-Tricblorobiphenyl (BZ 39)	NELAP	PA	12/17/2012
EPA 1668		3,4'-Dichlorobiphenyl (BZ 13)	NELAP	PA	12/17/2012
EPA 1668		3,4,4',5-Tetrachlorobiphenyl (BZ 81)	NELAP	PA	12/17/2012
EPA 1668		3,4,4'-Trichlorobiphenyl (BZ 37)	NELAP	PA	12/17/2012
EPA 1668		3,4,5-Trichlorobipbenyl (BZ 38)	NELAP	PA	12/17/2012
EPA 1668		3,4-Dichlorobiphenyl (BZ 12)	NELAP	PA	12/17/2012
EPA 1668		3,5-Dichlorobiphenyl (BZ 14)	NELAP	PA	12/17/2012
EPA 1668		3-Chlorobiphenyl (BZ 2)	NELAP	PA	12/17/2012
EPA 1668		4,4'-Dichlorobiphenyl (BZ 15)	NELAP	PA	12/17/2012
EPA 1668		4-Chlorobiphenyl (BZ 3)	NELAP	PA	12/17/2012
EPA 1668		Decachlorobiphenyl	NELAP	PA	2/1/2013
EPA 1668	A	PCBs as congeners by HRGC/HRMS	NELAP	PA	3/4/2015
EPA 1668	C	PCBs as congeners by HRGC/HRMS	NELAP	PA	3/4/2015
EPA 1671	A	Acetonitrile	NELAP	PA	1/19/2005
EPA 1671	A	Diethylamine	NELAP	PA	1/19/2005
EPA 1671	A	Dimethyl sulfoxide	NELAP	PA	1/19/2005
EPA 1671	A	Ethanol	NELAP	PA	1/19/2005
EPA 1671	A	Methanol	NELAP	PA	1/19/2005
EPA 1671	A	Methyl cellosolve (2-Metboxyetbanol)	NELAP	PA	1/19/2005
EPA 1671	A	Triethylamine	NELAP	PA	1/19/2005
EPA 1671	A	n-Propanol (1-Propanol)	NELAP	PA	1/19/2005
EPA 170.1		Temperature, deg. C	NELAP	PA	4/4/2005
EPA 180.1		Turbidity	NELAP	PA	1/19/2005
EPA 200.2		Metals sample preparation	NELAP	PA	1/24/2007
EPA 200.7	4.4	Aluminum	NELAP	PA	1/19/2005
EPA 200.7	4.4	Antimony	NELAP	PA	1/19/2005
EPA 200.7	4.4	Arsenic	NELAP	PA	1/19/2005
EPA 200.7	4.4	Barium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Beryllium	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 200.7	4.4	Boron	NELAP	PA	1/19/2005
EPA 200.7	4.4	Cadmium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Calcium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Chromium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Cobalt	NELAP	PA	1/19/2005
EPA 200.7	4.4	Copper	NELAP	PA	1/19/2005
EPA 200.7	4.4	Iron	NELAP	PA	1/19/2005
EPA 200.7	4.4	Lead	NELAP	PA	1/19/2005
EPA 200.7	4.4	Lithium	NELAP	PA	2/7/2012
EPA 200.7	4.4	Magnesium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Manganese	NELAP	PA	1/19/2005
EPA 200.7	4.4	Molybdenum	NELAP	PA	1/19/2005
EPA 200.7	4.4	Nickel	NELAP	PA	1/19/2005
EPA 200.7	4.4	Potassium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Selenium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Silver	NELAP	PA	4/4/2005
EPA 200.7	4.4	Sodium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Strontium	NELAP	PA	5/24/2011
EPA 200.7	4.4	Thallium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Tin	NELAP	PA	1/19/2005
EPA 200.7	4.4	Titanium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Vanadium	NELAP	PA	1/19/2005
EPA 200.7	4.4	Zinc	NELAP	PA	1/19/2005
EPA 200.7	4.4	Zirconium	NELAP	PA	7/29/2015
EPA 200.8	5.4	Aluminum	NELAP	PA	1/7/2010
EPA 200.8	5.4	Antimony	NELAP	PA	4/4/2005
EPA 200.8	5.4	Arsenic	NELAP	PA	4/4/2005
EPA 200.8	5.4	Barium	NELAP	PA	4/4/2005
EPA 200.8	5.4	Beryllium	NELAP	PA	4/4/2005
EPA 200.8	5.4	Boron	NELAP	PA	1/11/2012
EPA 200.8	5.4	Cadmium	NELAP	PA	4/4/2005
EPA 200.8	5.4	Calcium	NELAP	PA	1/7/2010
EPA 200.8	5.4	Chromium	NELAP	PA	4/4/2005
EPA 200.8	5.4	Cobalt	NELAP	PA	11/23/2010
EPA 200.8	5.4	Copper	NELAP	PA	4/4/2005
EPA 200.8	5.4	Iron	NELAP	PA	11/23/2010
EPA 200.8	5.4	Lead	NELAP	PA	4/4/2005
EPA 200.8	5.4	Magnesium	NELAP	PA	1/7/2010
EPA 200.8	5.4	Manganese	NELAP	PA	11/23/2010
EPA 200.8	5.4	Molybdenum	NELAP	PA	1/7/2010
EPA 200.8	5.4	Nickel	NELAP	PA	4/4/2005
EPA 200.8	5.4	Potassium	NELAP	PA	1/7/2010
EPA 200.8	5.4	Selenium	NELAP	PA	12/12/2005
EPA 200.8	5.4	Silver	NELAP	PA	1/2/2007
EPA 200.8	5.4	Sodium	NELAP	PA	1/7/2010

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 200.8	5.4	Strontium	NELAP	PA	1/7/2010
EPA 200.8	5.4	Thallium	NELAP	PA	5/31/2006
EPA 200.8	5.4	Tin	NELAP	PA	1/7/2010
EPA 200.8	5.4	Titanium	NELAP	PA	1/7/2010
EPA 200.8	5.4	Vanadium	NELAP	PA	1/7/2010
EPA 200.8	5.4	Zinc	NELAP	PA	1/18/2011
EPA 218.6		Chromium VI	NELAP	PA	4/4/2005
EPA 245.1	3.0	Mercury	NELAP	PA	1/19/2005
EPA 300.0	2.1	Bromide	NELAP	PA	4/4/2005
EPA 300.0	2.1	Chloride	NELAP	PA	1/19/2005
EPA 300.0	2.1	Fluoride	NELAP	PA	5/25/2005
EPA 300.0	2.1	Nitrate as N	NELAP	PA	1/19/2005
EPA 300.0	2.1	Nitrite as N	NELAP	PA	1/19/2005
EPA 300.0	2.1	Sulfate	NELAP	PA	1/19/2005
EPA 3005	A	Preconcentration under acid	NELAP	PA	12/12/2005
EPA 3010	A	Hot plate acid digestion (HNO3 + HCl)	NELAP	PA	12/12/2005
EPA 3020	A	Hot plate acid digestion (HNO3 only)	NELAP	PA	12/12/2005
EPA 305.2		Acidity as CaCO3	NELAP	PA	1/24/2007
EPA 3060	A	Alkaline digestion of Cr(VI)	NELAP	PA	1/24/2007
EPA 335.4		Total cyanide	NELAP	PA	1/19/2005
EPA 350.1		Ammonia as N	NELAP	PA	10/9/2013
EPA 351.2		Kjeldahl nitrogen, total (TKN)	NELAP	PA	1/19/2005
EPA 3510	C	Separatory funnel liquid-liquid extraction	NELAP	PA	12/12/2005
EPA 3511		Organic compounds in water by microextraction	NELAP	PA	3/7/2012
EPA 3520	C	Continuous liquid-liquid extraction	NELAP	PA	12/12/2005
EPA 353.2		Nitrate as N	NELAP	PA	1/19/2005
EPA 353.2		Nitrite as N	NELAP	PA	1/19/2005
EPA 353.2		Total nitrate-nitrite	NELAP	PA	4/4/2005
EPA 3620	B	Florisil cleanup	NELAP	PA	12/12/2005
EPA 3630	C	Silica gel cleanup	NELAP	PA	12/12/2005
EPA 3640	A	Gel permeation cleanup (GPC)	NELAP	PA	12/12/2005
EPA 365.1		Phosphorus, total	NELAP	PA	4/4/2005
EPA 365.3		Orthophosphate as P	NELAP	PA	1/19/2005
EPA 3660	B	Sulfur cleanup	NELAP	PA	12/12/2005
EPA 375.4		Sulfate	NELAP	PA	4/4/2005
EPA 410.4		Chemical oxygen demand (COD)	NELAP	PA	4/1/2005
EPA 415.1		Total organic carbon (TOC)	NELAP	PA	1/19/2005
EPA 420.4		Total phenolics	NELAP	PA	4/17/2007
EPA 425.1		Surfactants as MBAS	NELAP	PA	1/19/2005
EPA 5030	C	Aqueous-phase purge-and-trap	NELAP	PA	1/27/2014
EPA 5030	B	Aqueous-phase purge-and-trap	NELAP	PA	12/12/2005
EPA 524.2	4.1	1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	1/18/2011
EPA 524.2	4.1	1,2-Dichloroethane	NELAP	PA	1/18/2011
EPA 524.2	4.1	4-Methyl-2-pentanone (MIBK)	NELAP	PA	5/24/2011
EPA 524.2	4.1	Acetone	NELAP	PA	1/18/2011

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 524.2	4.1	Benzene	NELAP	PA	1/18/2011
EPA 524.2	4.1	Chlorobenzene	NELAP	PA	1/18/2011
EPA 524.2	4.1	Chloroform	NELAP	PA	1/18/2011
EPA 524.2	4.1	Methylene chloride (Dichloromethane)	NELAP	PA	5/24/2011
EPA 524.2	4.1	Tetrahydrofuran (THF)	NELAP	PA	5/24/2011
EPA 524.2	4.1	Toluene	NELAP	PA	1/18/2011
EPA 524.2	4.1	m+p-Xylene	NELAP	PA	7/25/2011
EPA 524.2	4.1	o-Xylene	NELAP	PA	5/24/2011
EPA 6010		Aluminum	NELAP	PA	12/12/2005
EPA 6010		Antimony	NELAP	PA	12/12/2005
EPA 6010		Arsenic	NELAP	PA	12/12/2005
EPA 6010		Barium	NELAP	PA	12/12/2005
EPA 6010		Beryllium	NELAP	PA	12/12/2005
EPA 6010		Boron	NELAP	PA	12/12/2005
EPA 6010		Cadmium	NELAP	PA	12/12/2005
EPA 6010		Calcium	NELAP	PA	12/12/2005
EPA 6010		Chromium	NELAP	PA	12/12/2005
EPA 6010		Cobalt	NELAP	PA	12/12/2005
EPA 6010		Copper	NELAP	PA	12/12/2005
EPA 6010		Iron	NELAP	PA	12/12/2005
EPA 6010		Lead	NELAP	PA	12/12/2005
EPA 6010		Lithium	NELAP	PA	1/18/2011
EPA 6010		Magnesium	NELAP	PA	12/12/2005
EPA 6010		Manganese	NELAP	PA	12/12/2005
EPA 6010	C	Metals by ICP/AES	NELAP	PA	3/26/2012
EPA 6010	B	Metals by ICP/AES	NELAP	PA	3/26/2012
EPA 6010		Molybdenum	NELAP	PA	12/12/2005
EPA 6010		Nickel	NELAP	PA	12/12/2005
EPA 6010		Potassium	NELAP	PA	12/12/2005
EPA 6010		Selenium	NELAP	PA	12/12/2005
EPA 6010		Silver	NELAP	PA	12/12/2005
EPA 6010		Sodium	NELAP	PA	12/12/2005
EPA 6010		Strontium	NELAP	PA	12/12/2005
EPA 6010		Sulfur	NELAP	PA	12/19/2011
EPA 6010		Thallium	NELAP	PA	12/12/2005
EPA 6010		Tin	NELAP	PA	12/12/2005
EPA 6010		Titanium	NELAP	PA	12/12/2005
EPA 6010		Vanadium	NELAP	PA	12/12/2005
EPA 6010		Zinc	NELAP	PA	12/12/2005
EPA 6010		Zirconium	NELAP	PA	7/29/2015
EPA 602		Benzene	NELAP	PA	1/19/2005
EPA 602		Ethylbenzene	NELAP	PA	1/19/2005
EPA 602		Methyl tert-butyl ether (MTBE)	NELAP	PA	1/19/2005
EPA 602		Napthalene	NELAP	PA	1/18/2011
EPA 602		Styrene	NELAP	PA	6/24/2008

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 602		Toluene	NELAP	PA	1/19/2005
EPA 602		Xylenes, total	NELAP	PA	1/19/2005
EPA 602		m+p-Xylene	NELAP	PA	1/18/2011
EPA 602		o-Xylene	NELAP	PA	1/18/2011
EPA 6020		Aluminum	NELAP	PA	1/7/2010
EPA 6020		Antimony	NELAP	PA	12/12/2005
EPA 6020		Arsenic	NELAP	PA	12/12/2005
EPA 6020		Barium	NELAP	PA	12/12/2005
EPA 6020		Beryllium	NELAP	PA	12/12/2005
EPA 6020		Boron	NELAP	PA	1/11/2012
EPA 6020		Cadmium	NELAP	PA	12/12/2005
EPA 6020		Calcium	NELAP	PA	1/7/2010
EPA 6020		Chromium	NELAP	PA	12/12/2005
EPA 6020		Cobalt	NELAP	PA	11/23/2010
EPA 6020		Copper	NELAP	PA	12/12/2005
EPA 6020		Iron	NELAP	PA	11/23/2010
EPA 6020		Lead	NELAP	PA	12/12/2005
EPA 6020		Magnesium	NELAP	PA	1/7/2010
EPA 6020		Manganese	NELAP	PA	11/23/2010
EPA 6020	A	Metals by ICP/MS	NELAP	PA	3/26/2012
EPA 6020		Molybdenum	NELAP	PA	1/7/2010
EPA 6020		Nickel	NELAP	PA	7/23/2008
EPA 6020		Potassium	NELAP	PA	1/7/2010
EPA 6020		Selenium	NELAP	PA	12/12/2005
EPA 6020		Silver	NELAP	PA	1/12/2007
EPA 6020		Sodium	NELAP	PA	1/7/2010
EPA 6020		Strontium	NELAP	PA	1/7/2010
EPA 6020		Thallium	NELAP	PA	12/12/2005
EPA 6020		Tin	NELAP	PA	1/7/2010
EPA 6020		Titanium	NELAP	PA	1/7/2010
EPA 6020		Vanadium	NELAP	PA	1/7/2010
EPA 6020		Zinc	NELAP	PA	1/18/2011
EPA 608		4,4'-DDD	NELAP	PA	1/19/2005
EPA 608		4,4'-DDE	NELAP	PA	1/19/2005
EPA 608		4,4'-DDT	NELAP	PA	1/19/2005
EPA 608		Aldrin (HHDN)	NELAP	PA	1/19/2005
EPA 608		Aroclor-1016 (PCB-1016)	NELAP	PA	12/11/2006
EPA 608		Aroclor-1221 (PCB-1221)	NELAP	PA	12/11/2006
EPA 608		Aroclor-1232 (PCB-1232)	NELAP	PA	12/11/2006
EPA 608		Aroclor-1242 (PCB-1242)	NELAP	PA	12/11/2006
EPA 608		Aroclor-1248 (PCB-1248)	NELAP	PA	12/11/2006
EPA 608		Aroclor-1254 (PCB-1254)	NELAP	PA	12/11/2006
EPA 608		Aroclor-1260 (PCB-1260)	NELAP	PA	12/11/2006
EPA 608		Aroclor-1268 (PCB-1268)	NELAP	PA	11/13/2012
EPA 608		Chlordane (tech.)	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 608		Dieldrin	NELAP	PA	1/19/2005
EPA 608		Endosulfan I	NELAP	PA	1/19/2005
EPA 608		Endosulfan II	NELAP	PA	1/19/2005
EPA 608		Endosulfan sulfate	NELAP	PA	1/19/2005
EPA 608		Endrin	NELAP	PA	1/19/2005
EPA 608		Endrin aldehyde	NELAP	PA	1/19/2005
EPA 608		Heptachlor	NELAP	PA	1/19/2005
EPA 608		Heptachlor epoxide	NELAP	PA	1/19/2005
EPA 608		Methoxychlor	NELAP	PA	5/2/2006
EPA 608		Mirex	NELAP	PA	11/13/2012
EPA 608		Toxaphene (Chlorinated camphene)	NELAP	PA	1/19/2005
EPA 608		alpha-BHC (alpha-Hexachlorocyclohexane)	NELAP	PA	1/19/2005
EPA 608		beta-BHC (beta-Hexachlorocyclohexane)	NELAP	PA	1/19/2005
EPA 608		delta-BHC (delta-Hexachlorocyclohexane)	NELAP	PA	1/19/2005
EPA 608		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	PA	1/19/2005
EPA 622		Azinphos-methyl (Guthion)	NELAP	PA	6/15/2009
EPA 622		Bolstar (Sulprofos)	NELAP	PA	6/15/2009
EPA 622		Carbophenothion (Trithion)	NELAP	PA	4/28/2010
EPA 622		Chlorpyrifos	NELAP	PA	6/15/2009
EPA 622		Coumaphos	NELAP	PA	6/15/2009
EPA 622		Demeton-O	NELAP	PA	6/15/2009
EPA 622		Demeton-S	NELAP	PA	6/15/2009
EPA 622		Diazinon (Spectracide)	NELAP	PA	6/15/2009
EPA 622		Dichlorovos (DDVP, Dichlorvos)	NELAP	PA	6/15/2009
EPA 622		Disulfoton	NELAP	PA	6/15/2009
EPA 622		EPN (Santox)	NELAP	PA	6/15/2009
EPA 622		Ethion	NELAP	PA	6/15/2009
EPA 622		Ethoprop (Prophos)	NELAP	PA	6/15/2009
EPA 622		Famphur	NELAP	PA	6/15/2009
EPA 622		Fensulfothion	NELAP	PA	6/15/2009
EPA 622		Fenthion	NELAP	PA	6/15/2009
EPA 622		Malathion	NELAP	PA	6/15/2009
EPA 622		Merphos	NELAP	PA	6/15/2009
EPA 622		Methyl parathion (Parathion, methyl)	NELAP	PA	6/15/2009
EPA 622		Mevinphos	NELAP	PA	6/15/2009
EPA 622		Naled	NELAP	PA	6/15/2009
EPA 622		Parathion, ethyl (Ethyl parathion, Parathion)	NELAP	PA	6/15/2009
EPA 622		Phorate (Thimet)	NELAP	PA	6/15/2009
EPA 622		Ronnel	NELAP	PA	6/15/2009
EPA 622		Stirophos (Tetrachlorovinphos)	NELAP	PA	6/15/2009
EPA 622		Tokuthion (Prothiophos)	NELAP	PA	6/15/2009
EPA 622		Trichloronate	NELAP	PA	6/15/2009
EPA 624		1,1,1,2-Tetrachloroethane	NELAP	PA	1/19/2005
EPA 624		1,1,1-Trichloroethane	NELAP	PA	1/19/2005
EPA 624		1,1,2,2-Tetrachloroethane	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 624		1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	NELAP	PA	7/3/2007
EPA 624		1,1,2-Trichloroethane	NELAP	PA	1/19/2005
EPA 624		1,1-Dichloroethane	NELAP	PA	1/19/2005
EPA 624		1,1-Dichloroethene (1,1-Dichloroethylene)	NELAP	PA	1/19/2005
EPA 624		1,1-Dichloropropene	NELAP	PA	7/3/2007
EPA 624		1,2,3-Trichlorobenzene	NELAP	PA	7/3/2007
EPA 624		1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	PA	7/3/2007
EPA 624		1,2,3-Trimethylbenzene	NELAP	PA	7/3/2007
EPA 624		1,2,4-Trichlorobenzene	NELAP	PA	7/3/2007
EPA 624		1,2,4-Trimethylbenzene	NELAP	PA	7/3/2007
EPA 624		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	PA	7/3/2007
EPA 624		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	PA	7/3/2007
EPA 624		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 624		1,2-Dichloroethane	NELAP	PA	1/19/2005
EPA 624		1,2-Dichloropropane	NELAP	PA	1/19/2005
EPA 624		1,3,5-Trimethylbenzene	NELAP	PA	7/3/2007
EPA 624		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 624		1,3-Dichloropropane	NELAP	PA	7/3/2007
EPA 624		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 624		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	7/3/2007
EPA 624		2,2-Dichloropropane	NELAP	PA	7/3/2007
EPA 624		2-Butanone (Methyl ethyl ketone, MEK)	NELAP	PA	7/3/2007
EPA 624		2-Chloroethyl vinyl ether	NELAP	PA	1/19/2005
EPA 624		2-Chlorotoluene	NELAP	PA	7/3/2007
EPA 624		2-Hexanone	NELAP	PA	7/3/2007
EPA 624		4-Chloro-2-nitrophenol	NELAP	PA	7/3/2007
EPA 624		4-Chlorotoluene	NELAP	PA	7/3/2007
EPA 624		4-Methyl-2-pentanone (MIBK)	NELAP	PA	5/2/2006
EPA 624		Acetone	NELAP	PA	7/3/2007
EPA 624		Acetonitrile	NELAP	PA	7/3/2007
EPA 624		Acrolein (Propenal)	NELAP	PA	1/19/2005
EPA 624		Acrylonitrile	NELAP	PA	1/19/2005
EPA 624		Allyl chloride (3-Chloropropene)	NELAP	PA	7/3/2007
EPA 624		Benzene	NELAP	PA	1/19/2005
EPA 624		Bromobenzene	NELAP	PA	7/3/2007
EPA 624		Bromochloromethane	NELAP	PA	5/2/2006
EPA 624		Bromodichloromethane	NELAP	PA	1/19/2005
EPA 624		Bromoform	NELAP	PA	1/19/2005
EPA 624		Carbon disulfide	NELAP	PA	7/3/2007
EPA 624		Carbon tetrachloride	NELAP	PA	1/19/2005
EPA 624		Chlorobenzene	NELAP	PA	1/19/2005
EPA 624		Chloroethane	NELAP	PA	1/19/2005
EPA 624		Chloroform	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 624		Chloroprene (2-Chloro-1,3-butadiene)	NELAP	PA	6/12/2009
EPA 624		Cyclohexane	NELAP	PA	7/3/2007
EPA 624		Dibromochloromethane	NELAP	PA	4/4/2005
EPA 624		Dibromomethane	NELAP	PA	7/3/2007
EPA 624		Dichlorodifluoromethane (Freon 12)	NELAP	PA	7/3/2007
EPA 624		Diisopropyl ether (DIPE)	NELAP	PA	5/2/2006
EPA 624		Ethyl acetate	NELAP	PA	1/20/2012
EPA 624		Ethyl methacrylate	NELAP	PA	7/3/2007
EPA 624		Ethylbenzene	NELAP	PA	1/19/2005
EPA 624		Freon 113 (1,1,2-Trichloro-1,2,2-trifluoroethane)	NELAP	PA	2/1/2011
EPA 624		Freon-123A	NELAP	PA	2/1/2011
EPA 624		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	PA	7/3/2007
EPA 624		Isopropylbenzene (Cumene)	NELAP	PA	5/2/2006
EPA 624		Methacrylonitrile	NELAP	PA	7/3/2007
EPA 624		Methyl bromide (Bromomethane)	NELAP	PA	1/19/2005
EPA 624		Methyl chloride (Chloromethane)	NELAP	PA	1/19/2005
EPA 624		Methyl iodide (Iodomethane)	NELAP	PA	7/3/2007
EPA 624		Methyl tert-butyl ether (MTBE)	NELAP	PA	12/12/2005
EPA 624		Methylene chloride (Dichloromethane)	NELAP	PA	1/19/2005
EPA 624		Methylmethacrylate	NELAP	PA	7/3/2007
EPA 624		Naphthalene	NELAP	PA	7/3/2007
EPA 624		Pentachloroethane	NELAP	PA	7/3/2007
EPA 624		Propionitrile (Ethyl cyanide)	NELAP	PA	7/3/2007
EPA 624		Styrene	NELAP	PA	5/2/2006
EPA 624		Tetrachloroethene (PCE, Perchloroethylene)	NELAP	PA	1/19/2005
EPA 624		Tetrahydrofuran (THF)	NELAP	PA	7/3/2007
EPA 624		Toluene	NELAP	PA	1/19/2005
EPA 624		Trichloroethene (TCE, Trichloroethylene)	NELAP	PA	1/19/2005
EPA 624		Trichlorofluoromethane (Freon 11)	NELAP	PA	1/19/2005
EPA 624		Vinyl acetate	NELAP	PA	7/3/2007
EPA 624		Vinyl chloride (Chloroethene)	NELAP	PA	1/19/2005
EPA 624		Xylenes, total	NELAP	PA	1/19/2005
EPA 624		cis-1,2-Dichloroethene	NELAP	PA	6/12/2009
EPA 624		cis-1,3-Dichloropropene	NELAP	PA	1/19/2005
EPA 624		n-Butylbenzene	NELAP	PA	7/3/2007
EPA 624		n-Heptane	NELAP	PA	7/3/2007
EPA 624		n-Hexane	NELAP	PA	7/3/2007
EPA 624		n-Propylbenzene	NELAP	PA	7/3/2007
EPA 624		p-Isopropyltoluene (4-Isopropyltoluene)	NELAP	PA	7/3/2007
EPA 624		sec-Butylbenzene	NELAP	PA	7/3/2007
EPA 624		tert-Amyl methyl ether (TAME)	NELAP	PA	5/2/2006
EPA 624		tert-Butyl alcohol (2-Methyl-2-propanol)	NELAP	PA	5/2/2006
EPA 624		tert-Butyl ethyl ether	NELAP	PA	5/2/2006
EPA 624		tert-Butylbenzene	NELAP	PA	7/3/2007
EPA 624		trans-1,2-Dichloroethene	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 624		trans-1,3-Dichloropropene	NELAP	PA	1/19/2005
EPA 625		1,1'-Biphenyl (Biphenyl, Lemonene)	NELAP	PA	7/3/2007
EPA 625		1,2,4,5-Tetrachlorobenzene	NELAP	PA	5/2/2006
EPA 625		1,2,4-Trichlorobenzene	NELAP	PA	1/19/2005
EPA 625		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 625		1,2-Diphenylhydrazine	NELAP	PA	5/2/2006
EPA 625		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 625		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 625		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	7/3/2007
EPA 625		1-Methylphenanthrene	NELAP	PA	5/2/2006
EPA 625		2,3,4,6-Tetrachlorophenol	NELAP	PA	7/3/2007
EPA 625		2,3-Dichloroaniline	NELAP	PA	5/2/2006
EPA 625		2,3-Dinitrotoluene	NELAP	PA	7/3/2007
EPA 625		2,4,5-Trichlorophenol	NELAP	PA	7/3/2007
EPA 625		2,4,6-Trichlorophenol	NELAP	PA	1/19/2005
EPA 625		2,4-Dichlorophenol	NELAP	PA	1/19/2005
EPA 625		2,4-Dimethylphenol	NELAP	PA	1/19/2005
EPA 625		2,4-Dinitrophenol	NELAP	PA	1/19/2005
EPA 625		2,4-Dinitrotoluene (2,4-DNT)	NELAP	PA	1/19/2005
EPA 625		2,6-Dichlorophenol	NELAP	PA	7/3/2007
EPA 625		2,6-Dinitrotoluene (2,6-DNT)	NELAP	PA	1/19/2005
EPA 625		2-Chloronaphthalene	NELAP	PA	1/19/2005
EPA 625		2-Chlorophenol	NELAP	PA	1/19/2005
EPA 625		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	NELAP	PA	1/19/2005
EPA 625		2-Methylnaphthalene	NELAP	PA	7/3/2007
EPA 625		2-Methylphenol (o-Cresol)	NELAP	PA	7/3/2007
EPA 625		2-Nitroaniline	NELAP	PA	7/3/2007
EPA 625		2-Nitrophenol	NELAP	PA	1/19/2005
EPA 625		3+4-Methylphenol (m+p-Cresol)	NELAP	PA	7/3/2007
EPA 625		3,3'-Dichlorobenzidine	NELAP	PA	1/19/2005
EPA 625		3-Nitroaniline	NELAP	PA	7/3/2007
EPA 625		4-Bromophenyl phenyl ether	NELAP	PA	1/19/2005
EPA 625		4-Chloro-3-methylphenol	NELAP	PA	1/19/2005
EPA 625		4-Chloroaniline	NELAP	PA	7/3/2007
EPA 625		4-Chlorophenyl phenyl ether	NELAP	PA	1/19/2005
EPA 625		4-Nitroaniline	NELAP	PA	7/3/2007
EPA 625		4-Nitrophenol	NELAP	PA	1/19/2005
EPA 625		Acenaphthene	NELAP	PA	1/19/2005
EPA 625		Acenaphthylene	NELAP	PA	1/19/2005
EPA 625		Acetophenone	NELAP	PA	5/2/2006
EPA 625		Aniline	NELAP	PA	5/2/2006
EPA 625		Anthracene	NELAP	PA	4/4/2005
EPA 625		Benzidine	NELAP	PA	1/19/2005
EPA 625		Benzo[a]anthracene	NELAP	PA	1/19/2005
EPA 625		Benzo[a]pyrene	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 625		Benzo[b]fluoranthene	NELAP	PA	1/19/2005
EPA 625		Benzo[ghi]perylene	NELAP	PA	1/19/2005
EPA 625		Benzo[k]fluoranthene	NELAP	PA	1/19/2005
EPA 625		Benzoic acid	NELAP	PA	5/2/2006
EPA 625		Benzyl alcohol	NELAP	PA	7/3/2007
EPA 625		Butyl benzyl phthalate (Benzyl butyl phthalate)	NELAP	PA	1/19/2005
EPA 625		Carbazole	NELAP	PA	5/2/2006
EPA 625		Chrysene (Benzo[a]phenanthrene)	NELAP	PA	1/19/2005
EPA 625		Di-n-butyl phthalate	NELAP	PA	1/19/2005
EPA 625		Di-n-octyl phthalate	NELAP	PA	1/19/2005
EPA 625		Dibenzo[a,h]anthracene	NELAP	PA	1/19/2005
EPA 625		Dibenzofuran	NELAP	PA	7/3/2007
EPA 625		Diethyl phthalate	NELAP	PA	1/19/2005
EPA 625		Dimethyl phthalate	NELAP	PA	1/19/2005
EPA 625		Diphenyl ether	NELAP	PA	7/3/2007
EPA 625		Fluoranthene	NELAP	PA	1/19/2005
EPA 625		Fluorene	NELAP	PA	1/19/2005
EPA 625		Hexachlorobenzene	NELAP	PA	1/19/2005
EPA 625		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	1/19/2005
EPA 625		Hexachlorocyclopentadiene	NELAP	PA	1/19/2005
EPA 625		Hexachloroethane	NELAP	PA	1/19/2005
EPA 625		Indeno(1,2,3-cd)pyrene	NELAP	PA	1/19/2005
EPA 625		Isophorone	NELAP	PA	1/19/2005
EPA 625		N-Nitrosodi-n-butylamine	NELAP	PA	5/2/2006
EPA 625		N-Nitrosodi-n-propylamine	NELAP	PA	1/19/2005
EPA 625		N-Nitrosodiethylamine	NELAP	PA	5/2/2006
EPA 625		N-Nitrosodimethylamine	NELAP	PA	1/19/2005
EPA 625		N-Nitrosodiphenylamine	NELAP	PA	1/19/2005
EPA 625		N-Nitrosopyrrolidine	NELAP	PA	5/2/2006
EPA 625		Naphthalene	NELAP	PA	1/19/2005
EPA 625		Nitrobenzene	NELAP	PA	1/19/2005
EPA 625		Pentachlorobenzene	NELAP	PA	7/3/2007
EPA 625		Pentachlorophenol (PCP)	NELAP	PA	1/19/2005
EPA 625		Phenanthrene	NELAP	PA	1/19/2005
EPA 625		Phenol	NELAP	PA	1/19/2005
EPA 625		Pyrene	NELAP	PA	1/19/2005
EPA 625		Pyridine	NELAP	PA	5/2/2006
EPA 625		alpha-Terpineol	NELAP	PA	5/2/2006
EPA 625		bis(2-Chloroethoxy)methane	NELAP	PA	1/19/2005
EPA 625		bis(2-Chloroethyl) ether	NELAP	PA	1/19/2005
EPA 625		bis(2-Chloroisopropyl) ether	NELAP	PA	1/19/2005
EPA 625		bis(2-Ethylhexyl) phthalate (DEHP)	NELAP	PA	1/19/2005
EPA 625		n-Decane	NELAP	PA	5/2/2006
EPA 625		n-Docosane	NELAP	PA	5/2/2006

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 625		n-Dodecane	NELAP	PA	5/2/2006
EPA 625		n-Eicosane	NELAP	PA	5/2/2006
EPA 625		n-Hexadecane	NELAP	PA	5/2/2006
EPA 625		n-Octadecane	NELAP	PA	5/2/2006
EPA 625		n-Tetradecane	NELAP	PA	5/2/2006
EPA 625		o-Toluidine (2-Toluidine, 2-Methylaniline)	NELAP	PA	7/3/2007
EPA 6850		Perchlorate	NELAP	PA	1/19/2011
EPA 7196	A	Chromium VI	NELAP	PA	4/6/2006
EPA 7199		Chromium VI	NELAP	PA	1/4/2006
EPA 7470		Mercury	NELAP	PA	11/21/2005
EPA 8011		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	PA	5/2/2006
EPA 8011		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	PA	12/12/2005
EPA 8015		Diesel-range organics (DRO)	NELAP	PA	12/12/2005
EPA 8015		Diethylene glycol	NELAP	PA	1/20/2012
EPA 8015		Ethane	NELAP	PA	12/4/2007
EPA 8015		Ethanol	NELAP	PA	12/4/2007
EPA 8015		Ethene	NELAP	PA	12/4/2007
EPA 8015		Ethylene glycol	NELAP	PA	12/4/2007
EPA 8015		Gasoline-range organics (GRO)	NELAP	PA	12/12/2005
EPA 8015		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	PA	2/7/2012
EPA 8015		Isopropyl alcohol (2-Propanol)	NELAP	PA	12/4/2007
EPA 8015		Methane	NELAP	PA	12/4/2007
EPA 8015		Methanol	NELAP	PA	12/4/2007
EPA 8015	C	Nonhalogenated organics by GC/FID	NELAP	PA	3/26/2012
EPA 8015	B	Nonhalogenated organics by GC/FID	NELAP	PA	3/26/2012
EPA 8015	D	Nonhalogenated organics by GC/FID	NELAP	PA	7/29/2015
EPA 8015		Propane	NELAP	PA	12/4/2007
EPA 8015		Propylene glycol	NELAP	PA	1/20/2012
EPA 8015		Tetraethylene glycol	NELAP	PA	1/20/2012
EPA 8015		Total petroleum hydrocarbons (TPH)	NELAP	PA	1/24/2007
EPA 8015		Triethylene glycol	NELAP	PA	1/20/2012
EPA 8015		n-Butyl alcohol (n-Butanol, 1-Butanol)	NELAP	PA	2/7/2012
EPA 8015		n-Propanol (1-Propanol)	NELAP	PA	2/7/2012
EPA 8021		Benzene	NELAP	PA	12/12/2005
EPA 8021		Ethylbenzene	NELAP	PA	12/12/2005
EPA 8021		Isopropylbenzene (Cumene)	NELAP	PA	12/12/2005
EPA 8021		Methyl tert-butyl ether (MTBE)	NELAP	PA	2/11/2011
EPA 8021		Napbthalene	NELAP	PA	6/24/2008
EPA 8021		Toluene	NELAP	PA	12/12/2005
EPA 8021	B	VOCs by GC/PID/ELCD	NELAP	PA	3/26/2012
EPA 8021		Xylenes, total	NELAP	PA	12/12/2005
EPA 8021		m-Xylene	NELAP	PA	11/23/2009
EPA 8021		o-Xylene	NELAP	PA	11/23/2009
EPA 8021		p-Xylene	NELAP	PA	11/23/2009

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8081		4,4'-DDD	NELAP	PA	2/10/2006
EPA 8081		4,4'-DDE	NELAP	PA	12/12/2005
EPA 8081		4,4'-DDT	NELAP	PA	12/12/2005
EPA 8081		Aldrin (HHDN)	NELAP	PA	12/12/2005
EPA 8081		Chlordane (tech.)	NELAP	PA	12/12/2005
EPA 8081		Dieldrin	NELAP	PA	12/12/2005
EPA 8081		Endosulfan I	NELAP	PA	2/10/2006
EPA 8081		Endosulfan II	NELAP	PA	12/12/2005
EPA 8081		Endosulfan sulfate	NELAP	PA	12/12/2005
EPA 8081		Endrin	NELAP	PA	12/12/2005
EPA 8081		Endrin aldehyde	NELAP	PA	12/12/2005
EPA 8081		Endrin ketone	NELAP	PA	2/10/2006
EPA 8081		Heptachlor	NELAP	PA	12/12/2005
EPA 8081		Heptachlor epoxide	NELAP	PA	12/12/2005
EPA 8081		Kepone	NELAP	PA	5/2/2006
EPA 8081		Methoxychlor	NELAP	PA	12/12/2005
EPA 8081		Mirex	NELAP	PA	12/12/2005
EPA 8081	A	Organochlorine pesticides by GC/ECD	NELAP	PA	3/26/2012
EPA 8081	B	Organochlorine pesticides by GC/ECD	NELAP	PA	1/1/2013
EPA 8081		Toxaphene (Chlorinated camphene)	NELAP	PA	12/12/2005
EPA 8081		alpha-BHC (alpha-Hexachlorocyclohexane)	NELAP	PA	2/10/2006
EPA 8081		alpha-Chlordane	NELAP	PA	2/10/2006
EPA 8081		beta-BHC (beta-Hexachlorocyclohexane)	NELAP	PA	2/10/2006
EPA 8081		delta-BHC (delta-Hexachlorocyclohexane)	NELAP	PA	2/10/2006
EPA 8081		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	PA	2/10/2006
EPA 8081		gamma-Chlordane	NELAP	PA	2/10/2006
EPA 8082		Aroclor-1016 (PCB-1016)	NELAP	PA	12/11/2006
EPA 8082		Aroclor-1221 (PCB-1221)	NELAP	PA	12/11/2006
EPA 8082		Aroclor-1232 (PCB-1232)	NELAP	PA	12/11/2006
EPA 8082		Aroclor-1242 (PCB-1242)	NELAP	PA	12/11/2006
EPA 8082		Aroclor-1248 (PCB-1248)	NELAP	PA	12/11/2006
EPA 8082		Aroclor-1254 (PCB-1254)	NELAP	PA	12/11/2006
EPA 8082		Aroclor-1260 (PCB-1260)	NELAP	PA	12/11/2006
EPA 8082		Aroclor-1262 (PCB-1262)	NELAP	PA	7/23/2008
EPA 8082		Aroclor-1268 (PCB-1268)	NELAP	PA	7/23/2008
EPA 8082		Decachlorobiphenyl	NELAP	PA	12/17/2012
EPA 8082	A	PCBs by GC/ECD	NELAP	PA	3/26/2012
EPA 8141		Alachlor (Lasso)	NELAP	PA	1/21/2009
EPA 8141		Atrazine	NELAP	PA	12/12/2005
EPA 8141		Azinphos-methyl (Guthion)	NELAP	PA	12/12/2005
EPA 8141		Bolstar (Sulprofos)	NELAP	PA	12/12/2005
EPA 8141		Carbophenothion (Trithion)	NELAP	PA	11/9/2012
EPA 8141		Chlorpyrifos	NELAP	PA	12/12/2005
EPA 8141		Coumaphos	NELAP	PA	12/12/2005
EPA 8141		Demeton-O	NELAP	PA	12/12/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8141		Demeton-S	NELAP	PA	12/12/2005
EPA 8141		Diazinon (Spectracide)	NELAP	PA	12/12/2005
EPA 8141		Dichlorovos (DDVP, Dichlorvos)	NELAP	PA	12/12/2005
EPA 8141		Disulfoton	NELAP	PA	12/12/2005
EPA 8141		EPN (Santox)	NELAP	PA	12/12/2005
EPA 8141		Ethion	NELAP	PA	12/12/2005
EPA 8141		Ethoprop (Prophos)	NELAP	PA	12/12/2005
EPA 8141		Famphur	NELAP	PA	12/12/2005
EPA 8141		Fensulfothion	NELAP	PA	12/12/2005
EPA 8141		Fenthion	NELAP	PA	12/12/2005
EPA 8141		Malathion	NELAP	PA	12/12/2005
EPA 8141		Merphos	NELAP	PA	12/12/2005
EPA 8141		Methyl parathion (Parathion, methyl)	NELAP	PA	12/12/2005
EPA 8141		Metolachlor	NELAP	PA	1/24/2007
EPA 8141		Mevinphos	NELAP	PA	12/12/2005
EPA 8141		Naled	NELAP	PA	12/12/2005
EPA 8141	B	Organophosphorus compounds by GC/NPD	NELAP	PA	3/26/2012
EPA 8141	A	Organophosphorus compounds by GC/NPD	NELAP	PA	3/26/2012
EPA 8141		Parathion, ethyl (Ethyl parathion, Parathion)	NELAP	PA	12/12/2005
EPA 8141		Phorate (Thimet)	NELAP	PA	12/12/2005
EPA 8141		Ronnel	NELAP	PA	12/12/2005
EPA 8141		Simazine	NELAP	PA	12/12/2005
EPA 8141		Stirophos (Tetrachlorovinphos)	NELAP	PA	5/2/2006
EPA 8141		Tokuthion (Prothiophos)	NELAP	PA	12/12/2005
EPA 8141		Trichloronate	NELAP	PA	5/2/2006
EPA 8151		2,4,5-T	NELAP	PA	12/12/2005
EPA 8151		2,4,5-TP (Silvex)	NELAP	PA	12/12/2005
EPA 8151		2,4-D	NELAP	PA	12/12/2005
EPA 8151		2,4-DB (Butoxon)	NELAP	PA	12/12/2005
EPA 8151	A	Chlorinated herbicides by GC/ECD	NELAP	PA	3/26/2012
EPA 8151		Dalapon (2,2-Dichloropropionic acid)	NELAP	PA	12/12/2005
EPA 8151		Dicamba	NELAP	PA	12/12/2005
EPA 8151		Dichloroprop (Dichlorprop)	NELAP	PA	1/24/2007
EPA 8151		Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	NELAP	PA	12/12/2005
EPA 8151		MCPA	NELAP	PA	12/12/2005
EPA 8151		MCPP (Mecoprop)	NELAP	PA	12/12/2005
EPA 8151		Pentachlorophenol (PCP)	NELAP	PA	12/12/2005
EPA 8151		Picloram (4-Amino-3,5,6-trichloro-2-pyridinecarboxylic acid)	NELAP	PA	12/12/2005
EPA 8260		1,1,1,2-Tetrachloroethane	NELAP	PA	12/12/2005
EPA 8260		1,1,1-Trichloroethane	NELAP	PA	12/12/2005
EPA 8260		1,1,2,2-Tetrachloroethane	NELAP	PA	12/12/2005
EPA 8260		1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	NELAP	PA	12/12/2005
EPA 8260		1,1,2-Trichloroethane	NELAP	PA	12/12/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8260		1,1-Dichloroethane	NELAP	PA	12/12/2005
EPA 8260		1,1-Dichloroethene (1,1-Dichloroethylene)	NELAP	PA	12/12/2005
EPA 8260		1,1-Dichloropropene	NELAP	PA	12/12/2005
EPA 8260		1,2,3-Trichlorobenzene	NELAP	PA	12/12/2005
EPA 8260		1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	PA	12/12/2005
EPA 8260		1,2,4-Trichlorobenzene	NELAP	PA	12/12/2005
EPA 8260		1,2,4-Trimethylbenzene	NELAP	PA	12/12/2005
EPA 8260		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	PA	12/12/2005
EPA 8260		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	PA	12/12/2005
EPA 8260		1,2-Dichloro-1,1,2-trifluoroethane	NELAP	PA	3/19/2015
EPA 8260		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	12/12/2005
EPA 8260		1,2-Dichloroethane	NELAP	PA	12/12/2005
EPA 8260		1,2-Dichloropropane	NELAP	PA	12/12/2005
EPA 8260		1,3,5-Trimethylbenzene	NELAP	PA	12/12/2005
EPA 8260		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	12/12/2005
EPA 8260		1,3-Dichloropropane	NELAP	PA	12/12/2005
EPA 8260		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	12/12/2005
EPA 8260		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	12/12/2005
EPA 8260		2,2-Dichloropropane	NELAP	PA	5/2/2006
EPA 8260		2-Butanone (Methyl ethyl ketone, MEK)	NELAP	PA	5/2/2006
EPA 8260		2-Chloroethyl vinyl ether	NELAP	PA	12/12/2005
EPA 8260		2-Chlorotoluene	NELAP	PA	12/12/2005
EPA 8260		2-Hexanone	NELAP	PA	12/12/2005
EPA 8260		2-Nitropropane	NELAP	PA	1/19/2011
EPA 8260		3,3'-Dimethyl-1-butanol	NELAP	PA	4/17/2009
EPA 8260		4-Chlorotoluene	NELAP	PA	12/12/2005
EPA 8260		4-Methyl-2-pentanone (MIBK)	NELAP	PA	12/12/2005
EPA 8260		Acetone	NELAP	PA	12/12/2005
EPA 8260		Acetonitrile	NELAP	PA	12/12/2005
EPA 8260		Acrolein (Propenal)	NELAP	PA	12/12/2005
EPA 8260		Acrylonitrile	NELAP	PA	12/12/2005
EPA 8260		Allyl chloride (3-Chloropropene)	NELAP	PA	12/12/2005
EPA 8260		Benzene	NELAP	PA	12/12/2005
EPA 8260		Benzyl chloride	NELAP	PA	7/3/2007
EPA 8260		Bromobenzene	NELAP	PA	12/12/2005
EPA 8260		Bromochloromethane	NELAP	PA	12/12/2005
EPA 8260		Bromodichloromethane	NELAP	PA	12/12/2005
EPA 8260		Bromoform	NELAP	PA	12/12/2005
EPA 8260		Carbon disulfide	NELAP	PA	12/12/2005
EPA 8260		Carbon tetrachloride	NELAP	PA	12/12/2005
EPA 8260		Chlorobenzene	NELAP	PA	12/12/2005
EPA 8260		Chloroethane	NELAP	PA	12/12/2005
EPA 8260		Chloroform	NELAP	PA	12/12/2005
EPA 8260		Chloroprene (2-Chloro-1,3-butadiene)	NELAP	PA	7/3/2007

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8260		Crotonaldehyde	NELAP	PA	10/30/2014
EPA 8260		Cyclohexane	NELAP	PA	7/3/2007
EPA 8260		Cyclohexanone	NELAP	PA	6/7/2012
EPA 8260		Dibromochloromethane	NELAP	PA	12/12/2005
EPA 8260		Dibromomethane	NELAP	PA	5/2/2006
EPA 8260		Dichlorodifluoromethane (Freon 12)	NELAP	PA	12/12/2005
EPA 8260		Diethyl ether (Ethyl ether)	NELAP	PA	2/1/2011
EPA 8260		Diisopropyl ether (DIPE)	NELAP	PA	7/3/2007
EPA 8260		Dimethyl ether	NELAP	PA	6/7/2012
EPA 8260		Epichlorohydrin (1-Chloro-2,3-epoxypropane)	NELAP	PA	4/17/2009
EPA 8260		Ethanol	NELAP	PA	1/24/2007
EPA 8260		Ethyl acetate	NELAP	PA	1/24/2007
EPA 8260		Ethyl methacrylate	NELAP	PA	1/24/2007
EPA 8260		Ethyl tert-butyl ether (ETBE)	NELAP	PA	1/24/2007
EPA 8260		Ethylbenzene	NELAP	PA	12/12/2005
EPA 8260		Ethylene oxide	NELAP	PA	10/30/2014
EPA 8260		Freon 113 (1,1,2-Trichloro-1,2,2-trifluoroethane)	NELAP	PA	3/4/2015
EPA 8260		Gasoline-range organics (GRO)	NELAP	PA	6/8/2006
EPA 8260		Heptane	NELAP	PA	1/20/2012
EPA 8260		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	12/12/2005
EPA 8260		Hexachloroethane	NELAP	PA	5/23/2012
EPA 8260		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	PA	7/3/2007
EPA 8260		Isopropyl alcohol (2-Propanol)	NELAP	PA	1/18/2011
EPA 8260		Isopropylbenzene (Cumene)	NELAP	PA	5/2/2006
EPA 8260		Methacrylonitrile	NELAP	PA	7/3/2007
EPA 8260		Methyl acetate	NELAP	PA	1/24/2007
EPA 8260		Methyl bromide (Bromomethane)	NELAP	PA	12/12/2005
EPA 8260		Methyl chloride (Chloromethane)	NELAP	PA	12/12/2005
EPA 8260		Methyl iodide (Iodomethane)	NELAP	PA	5/25/2007
EPA 8260		Methyl tert-butyl ether (MTBE)	NELAP	PA	12/12/2005
EPA 8260		Methylcyclohexane	NELAP	PA	1/21/2009
EPA 8260		Methylene chloride (Dichloromethane)	NELAP	PA	12/12/2005
EPA 8260		Methylmethacrylate	NELAP	PA	5/25/2007
EPA 8260		Naphthalene	NELAP	PA	12/12/2005
EPA 8260		Pentachloroethane	NELAP	PA	1/24/2007
EPA 8260		Propionitrile (Ethyl cyanide)	NELAP	PA	12/12/2005
EPA 8260		Styrene	NELAP	PA	12/12/2005
EPA 8260		Tetrachloroethene (PCE, Perchloroethylene)	NELAP	PA	12/12/2005
EPA 8260		Tetrahydrofuran (THF)	NELAP	PA	1/18/2011
EPA 8260		Toluene	NELAP	PA	12/12/2005
EPA 8260		Trichloroethene (TCE, Trichloroethylene)	NELAP	PA	12/12/2005
EPA 8260		Trichlorofluoromethane (Freon 11)	NELAP	PA	12/12/2005
EPA 8260	B	VOCs by GC/MS	NELAP	PA	3/26/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8260	C	VOCs by GC/MS	NELAP	PA	3/26/2012
EPA 8260		Vinyl acetate	NELAP	PA	12/12/2005
EPA 8260		Vinyl chloride (Chloroethene)	NELAP	PA	12/12/2005
EPA 8260		Xylenes, total	NELAP	PA	12/12/2005
EPA 8260		cis-1,2-Dichloroethene	NELAP	PA	12/12/2005
EPA 8260		cis-1,3-Dichloropropene	NELAP	PA	12/12/2005
EPA 8260		m+p-Xylene	NELAP	PA	4/17/2009
EPA 8260		n-Butyl alcohol (n-Butanol, 1-Butanol)	NELAP	PA	4/17/2009
EPA 8260		n-Butylbenzene	NELAP	PA	12/12/2005
EPA 8260		n-Hexane	NELAP	PA	1/20/2012
EPA 8260		n-Propylamine	NELAP	PA	12/12/2005
EPA 8260		n-Propylbenzene	NELAP	PA	1/24/2007
EPA 8260		o-Xylene	NELAP	PA	4/17/2009
EPA 8260		p-Isopropyltoluene (4-Isopropyltoluene)	NELAP	PA	1/24/2007
EPA 8260		sec-Butylbenzene	NELAP	PA	12/12/2005
EPA 8260		tert-Amyl alcohol (2-Methyl-2-butanol)	NELAP	PA	4/17/2009
EPA 8260		tert-Amyl methyl ether (TAME)	NELAP	PA	1/24/2007
EPA 8260		tert-Butyl alcohol (2-Methyl-2-propanol)	NELAP	PA	12/12/2005
EPA 8260		tert-Butyl formate	NELAP	PA	4/17/2009
EPA 8260		tert-Butylbenzene	NELAP	PA	12/12/2005
EPA 8260		trans-1,2-Dichloroethene	NELAP	PA	12/12/2005
EPA 8260		trans-1,3-Dichloropropene	NELAP	PA	12/12/2005
EPA 8260		trans-1,4-Dichloro-2-butene	NELAP	PA	7/3/2007
EPA 8260 SIM		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	12/4/2007
EPA 8270		1,1'-Biphenyl (Biphenyl, Lemonene)	NELAP	PA	4/17/2009
EPA 8270		1,2,3,4-Tetrachlorobenzene	NELAP	PA	7/3/2007
EPA 8270		1,2,3,4-Tetrahydronaphthalene	NELAP	PA	4/17/2009
EPA 8270		1,2,3,5-Tetrachlorobenzene	NELAP	PA	7/3/2007
EPA 8270		1,2,4,5-Tetrachlorobenzene	NELAP	PA	12/12/2005
EPA 8270		1,2,4-Trichlorobenzene	NELAP	PA	12/12/2005
EPA 8270		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	12/12/2005
EPA 8270		1,2-Diphenylhydrazine	NELAP	PA	12/12/2005
EPA 8270		1,3,5-Trinitrobenzene (1,3,5-TNB)	NELAP	PA	12/12/2005
EPA 8270		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	12/12/2005
EPA 8270		1,3-Dinitrobenzene (1,3-DNB)	NELAP	PA	12/12/2005
EPA 8270		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	12/12/2005
EPA 8270		1,4-Dinitrobenzene (1,4-DNB)	NELAP	PA	4/17/2009
EPA 8270		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	4/17/2009
EPA 8270		1,4-Naphthoquinone	NELAP	PA	12/12/2005
EPA 8270		1,4-Phenylenediamine	NELAP	PA	12/12/2005
EPA 8270		1-Chloronaphthalene	NELAP	PA	12/12/2005
EPA 8270		1-Methylnaphthalene	NELAP	PA	4/17/2009
EPA 8270		1-Naphthylamine (alpha-Naphthylamine)	NELAP	PA	12/12/2005
EPA 8270		2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl) ether)	NELAP	PA	1/19/2011
EPA 8270		2,3,4,6-Tetrachlorophenol	NELAP	PA	12/12/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		2,4,5-Trichlorophenol	NELAP	PA	12/12/2005
EPA 8270		2,4,6-Trichlorophenol	NELAP	PA	12/12/2005
EPA 8270		2,4-Dichlorophenol	NELAP	PA	12/12/2005
EPA 8270		2,4-Dimethylphenol	NELAP	PA	12/12/2005
EPA 8270		2,4-Dinitrophenol	NELAP	PA	12/12/2005
EPA 8270		2,4-Dinitrotoluene (2,4-DNT)	NELAP	PA	12/12/2005
EPA 8270		2,6-Dichlorophenol	NELAP	PA	12/12/2005
EPA 8270		2,6-Dinitrotoluene (2,6-DNT)	NELAP	PA	12/12/2005
EPA 8270		2-Acetylaminofluorene	NELAP	PA	12/12/2005
EPA 8270		2-Butoxyethanol	NELAP	PA	2/7/2012
EPA 8270		2-Chloronaphthalene	NELAP	PA	12/12/2005
EPA 8270		2-Chlorophenol	NELAP	PA	12/12/2005
EPA 8270		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	NELAP	PA	12/12/2005
EPA 8270		2-Methylnaphthalene	NELAP	PA	12/12/2005
EPA 8270		2-Methylphenol (o-Cresol)	NELAP	PA	12/12/2005
EPA 8270		2-Naphthylamine (beta-Naphthylamine)	NELAP	PA	12/12/2005
EPA 8270		2-Nitroaniline	NELAP	PA	12/12/2005
EPA 8270		2-Nitrophenol	NELAP	PA	12/12/2005
EPA 8270		2-Picoline (2-Methylpyridine)	NELAP	PA	5/2/2006
EPA 8270		3+4-Methylphenol (m+p-Cresol)	NELAP	PA	12/12/2005
EPA 8270		3,3'-Dichlorobenzidine	NELAP	PA	12/12/2005
EPA 8270		3,3'-Dimethylbenzidine	NELAP	PA	7/3/2007
EPA 8270		3-Methylcholanthrene	NELAP	PA	12/12/2005
EPA 8270		3-Nitroaniline	NELAP	PA	12/12/2005
EPA 8270		4,4'-Methylenebis(2-chloroaniline)	NELAP	PA	12/12/2005
EPA 8270		4-Aminobiphenyl	NELAP	PA	12/12/2005
EPA 8270		4-Bromophenyl phenyl ether	NELAP	PA	12/12/2005
EPA 8270		4-Chloro-3-methylphenol	NELAP	PA	12/12/2005
EPA 8270		4-Chloroaniline	NELAP	PA	12/12/2005
EPA 8270		4-Chlorophenyl phenyl ether	NELAP	PA	12/12/2005
EPA 8270		4-Nitroaniline	NELAP	PA	12/12/2005
EPA 8270		4-Nitrophenol	NELAP	PA	12/12/2005
EPA 8270		4-Nitroquinnline-1-oxide	NELAP	PA	7/3/2007
EPA 8270		5-Nitro-o-toluidine	NELAP	PA	12/12/2005
EPA 8270		6-Methylchrysene	NELAP	PA	1/19/2011
EPA 8270		7,12-Dimethylbenz(a)anthracene	NELAP	PA	12/12/2005
EPA 8270		Acenaphthene	NELAP	PA	12/12/2005
EPA 8270		Acenaphthylene	NELAP	PA	12/12/2005
EPA 8270		Acetophenone	NELAP	PA	12/12/2005
EPA 8270		Aniline	NELAP	PA	12/12/2005
EPA 8270		Anthracene	NELAP	PA	12/12/2005
EPA 8270		Aramite	NELAP	PA	12/12/2005
EPA 8270		Atrazine	NELAP	PA	1/22/2007
EPA 8270		Benzaldehyde	NELAP	PA	4/17/2009
EPA 8270		Benzenethiol	NELAP	PA	4/17/2009

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		Benzidine	NELAP	PA	12/12/2005
EPA 8270		Benzo[a]anthracene	NELAP	PA	12/12/2005
EPA 8270		Benzo[a]pyrene	NELAP	PA	12/12/2005
EPA 8270		Benzo[b]fluoranthene	NELAP	PA	12/12/2005
EPA 8270		Benzo[ghi]perylene	NELAP	PA	12/12/2005
EPA 8270		Benzo[k]fluoranthene	NELAP	PA	12/12/2005
EPA 8270		Benzoic acid	NELAP	PA	12/12/2005
EPA 8270		Benzyl alcohol	NELAP	PA	12/12/2005
EPA 8270		Butyl benzyl phthalate (Benzyl butyl phthalate)	NELAP	PA	12/12/2005
EPA 8270		Caprolactam	NELAP	PA	4/17/2009
EPA 8270		Carbazole	NELAP	PA	12/12/2005
EPA 8270		Chlorobenzilate	NELAP	PA	12/12/2005
EPA 8270		Chrysene (Benzo[a]phenanthrene)	NELAP	PA	12/12/2005
EPA 8270		Di-n-butyl phthalate	NELAP	PA	12/12/2005
EPA 8270		Di-n-octyl phthalate	NELAP	PA	12/12/2005
EPA 8270		Diallate (cis or trans)	NELAP	PA	12/12/2005
EPA 8270		Dibenz[a,b]acridine	NELAP	PA	4/17/2009
EPA 8270		Dibenz[a,j]acridine	NELAP	PA	12/12/2005
EPA 8270		Dibenzo[a,h]anthracene	NELAP	PA	12/12/2005
EPA 8270		Dibenzofuran	NELAP	PA	12/12/2005
EPA 8270		Diethyl phthalate	NELAP	PA	12/12/2005
EPA 8270		Dimethoate	NELAP	PA	12/12/2005
EPA 8270		Dimethyl phthalate	NELAP	PA	12/12/2005
EPA 8270		Dimethylaminoazobenzene (4-Dimethylaminoazobenzene)	NELAP	PA	5/2/2006
EPA 8270		Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	NELAP	PA	12/12/2005
EPA 8270		Diphenylamine	NELAP	PA	12/12/2005
EPA 8270		Disulfoton	NELAP	PA	12/12/2005
EPA 8270		Ethyl methanesulfonate	NELAP	PA	12/12/2005
EPA 8270		Famphur	NELAP	PA	12/12/2005
EPA 8270		Fluoranthene	NELAP	PA	12/12/2005
EPA 8270		Fluorene	NELAP	PA	12/12/2005
EPA 8270		Hexachlorobenzene	NELAP	PA	12/12/2005
EPA 8270		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	12/12/2005
EPA 8270		Hexachlorocyclopentadiene	NELAP	PA	12/12/2005
EPA 8270		Hexachloroethane	NELAP	PA	12/12/2005
EPA 8270		Hexachloropropene	NELAP	PA	12/12/2005
EPA 8270		Indene	NELAP	PA	4/17/2009
EPA 8270		Indeno(1,2,3-cd)pyrene	NELAP	PA	12/12/2005
EPA 8270		Isodrin	NELAP	PA	12/12/2005
EPA 8270		Isopborone	NELAP	PA	12/12/2005
EPA 8270		Isosafrole	NELAP	PA	12/12/2005
EPA 8270		Kepone	NELAP	PA	12/12/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		Methapyrilene	NELAP	PA	12/12/2005
EPA 8270		Methyl methanesulfonate	NELAP	PA	12/12/2005
EPA 8270		Methyl parathion (Parathion, methyl)	NELAP	PA	5/25/2007
EPA 8270		N,N-Dimethylacetamide	NELAP	PA	4/17/2009
EPA 8270		N,N-Dimethylformamide	NELAP	PA	4/17/2009
EPA 8270		N-Nitrosodi-n-butylamine	NELAP	PA	12/12/2005
EPA 8270		N-Nitrosodi-n-propylamine	NELAP	PA	12/12/2005
EPA 8270		N-Nitrosodiethylamine	NELAP	PA	12/12/2005
EPA 8270		N-Nitrosodimethylamine	NELAP	PA	12/12/2005
EPA 8270		N-Nitrosodiphenylamine	NELAP	PA	12/12/2005
EPA 8270		N-Nitrosomethylethylamine	NELAP	PA	12/12/2005
EPA 8270		N-Nitrosomorpholine	NELAP	PA	12/12/2005
EPA 8270		N-Nitrosopiperidine	NELAP	PA	12/12/2005
EPA 8270		N-Nitrosopyrrolidine	NELAP	PA	12/12/2005
EPA 8270		Naphthalene	NELAP	PA	12/12/2005
EPA 8270		Nitrobenzene	NELAP	PA	12/12/2005
EPA 8270		O,O,O-Triethyl phosphorothioate	NELAP	PA	12/12/2005
EPA 8270		Parathion, ethyl (Ethyl parathion, Parathion)	NELAP	PA	5/25/2007
EPA 8270		Pentachlorohenzene	NELAP	PA	12/12/2005
EPA 8270		Pentachloronitrobenzene (PCNB)	NELAP	PA	12/12/2005
EPA 8270		Pentachlorophenol (PCP)	NELAP	PA	12/12/2005
EPA 8270		Phenacetin	NELAP	PA	12/12/2005
EPA 8270		Phenanthrene	NELAP	PA	12/12/2005
EPA 8270		Phenol	NELAP	PA	12/12/2005
EPA 8270		Phorate (Thimet)	NELAP	PA	12/12/2005
EPA 8270		Phthalic anhydride	NELAP	PA	1/21/2009
EPA 8270		Pronamide (Kerb)	NELAP	PA	12/12/2005
EPA 8270		Pyrene	NELAP	PA	12/12/2005
EPA 8270		Pyridine	NELAP	PA	12/12/2005
EPA 8270		Quinoline	NELAP	PA	4/17/2009
EPA 8270	C	SOCs by GC/MS	NELAP	PA	3/26/2012
EPA 8270	D	SOCs by GC/MS	NELAP	PA	3/26/2012
EPA 8270		Safrole	NELAP	PA	12/12/2005
EPA 8270		Sulfotepp (Tetraethyl dithiopyrophosphate)	NELAP	PA	4/17/2009
EPA 8270		Tetraethyl lead	NELAP	PA	3/7/2012
EPA 8270		Thionazine (Thionazin, Zinophos)	NELAP	PA	12/12/2005
EPA 8270		a,a-Dimethylphenethylamine (Phentermine)	NELAP	PA	12/12/2005
EPA 8270		a-Methylstyrene	NELAP	PA	4/17/2009
EPA 8270		bis(2-Chloroethoxy)methane	NELAP	PA	12/12/2005
EPA 8270		bis(2-Chloroethyl) ether	NELAP	PA	12/12/2005
EPA 8270		bis(2-Chloroisopropyl) ether	NELAP	PA	12/12/2005
EPA 8270		bis(2-Chloromethyl) ether	NELAP	PA	1/21/2009
EPA 8270		bis(2-Ethylhexyl) phthalate (DEHP)	NELAP	PA	12/12/2005
EPA 8270		o-Toluidine (2-Toluidine, 2-Methylaniline)	NELAP	PA	12/12/2005
EPA 8270		p-(Dimethylamino)azobenzene	NELAP	PA	4/17/2009

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		tris-(2,3-Dibromopropyl) phosphate (tris-BP)	NELAP	PA	4/17/2009
EPA 8270 SIM		1-Methylnaphthalene	NELAP	PA	7/25/2011
EPA 8270 SIM		2-Methylnaphthalene	NELAP	PA	5/23/2012
EPA 8270 SIM		Acenaphthene	NELAP	PA	12/4/2007
EPA 8270 SIM		Acenaphthylene	NELAP	PA	12/4/2007
EPA 8270 SIM		Anthracene	NELAP	PA	12/4/2007
EPA 8270 SIM		Benzo[a]anthracene	NELAP	PA	12/4/2007
EPA 8270 SIM		Benzo[a]pyrene	NELAP	PA	12/4/2007
EPA 8270 SIM		Benzo[b]fluoranthene	NELAP	PA	12/4/2007
EPA 8270 SIM		Benzo[ghi]perylene	NELAP	PA	12/4/2007
EPA 8270 SIM		Benzo[k]fluoranthene	NELAP	PA	12/4/2007
EPA 8270 SIM		Chrysene (Benzo[a]phenanthrene)	NELAP	PA	12/4/2007
EPA 8270 SIM		Dibenzo[a,h]anthracene	NELAP	PA	12/4/2007
EPA 8270 SIM		Fluoranthene	NELAP	PA	12/4/2007
EPA 8270 SIM		Fluorene	NELAP	PA	12/4/2007
EPA 8270 SIM		Indeno(1,2,3-cd)pyrene	NELAP	PA	12/4/2007
EPA 8270 SIM		Naphthalene	NELAP	PA	12/4/2007
EPA 8270 SIM		Phenanthrene	NELAP	PA	12/4/2007
EPA 8270 SIM		Pyrene	NELAP	PA	12/4/2007
EPA 8290		1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	8/6/2010
EPA 8290		1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	NELAP	PA	6/30/2010
EPA 8290		2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 8290		2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	NELAP	PA	8/6/2010

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8290		2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)(Dioxin)	NELAP	PA	6/30/2010
EPA 8290		2,3,7,8-Tetrachlorodibenzofuran (TCDF)	NELAP	PA	6/30/2010
EPA 8290	A	PCDDs and PCDFs by HRGC-HRMS	NELAP	PA	3/4/2015
EPA 8290		PCDDs and PCDFs by HRGC-HRMS	NELAP	PA	3/26/2012
EPA 8290		Total TCDD	NELAP	PA	6/30/2010
EPA 8290		Total TCDF	NELAP	PA	6/30/2010
EPA 8290		Total heptachlorodibenzo-p-dioxin (HpCDD)	NELAP	PA	6/30/2010
EPA 8290		Total heptachlorodibenzofuran (HpCDF)	NELAP	PA	6/30/2010
EPA 8290		Total hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 8290		Total hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 8290		Total pentachlorodibenzo-p-dioxin (PeCDD)	NELAP	PA	6/30/2010
EPA 8290		Total pentachlorodibenzofuran (PeCDF)	NELAP	PA	6/30/2010
EPA 8315		2,5-Dimethylbenzaldebyde	NELAP	PA	12/12/2005
EPA 8315		Acetaldehyde	NELAP	PA	12/12/2005
EPA 8315		Benzaldehyde	NELAP	PA	12/12/2005
EPA 8315		Butanal (Butyraldehyde)	NELAP	PA	5/2/2006
EPA 8315	A	Carbonyl compounds by HPLC	NELAP	PA	3/26/2012
EPA 8315		Crotonaldehyde	NELAP	PA	12/12/2005
EPA 8315		Formaldehyde	NELAP	PA	12/12/2005
EPA 8315		Hexanal (Hexaldehyde)	NELAP	PA	1/21/2009
EPA 8315		Isovaleraldehyde	NELAP	PA	12/12/2005
EPA 8315		Pentanal (Valeraldehyde)	NELAP	PA	12/12/2005
EPA 8315		Propanal (Propionaldehyde)	NELAP	PA	1/21/2009
EPA 8315		m-Tolualdehyde (1,3-Tolualdehyde)	NELAP	PA	5/2/2006
EPA 8315		o-Tolualdehyde (1,2-Tolualdehyde)	NELAP	PA	1/24/2007
EPA 8315		p-Tolualdehyde (1,4-Tolualdehyde)	NELAP	PA	1/24/2007
EPA 8330		1,3,5-Trinitrobenzene (1,3,5-TNB)	NELAP	PA	12/12/2005
EPA 8330		1,3-Dinitrobenzene (1,3-DNB)	NELAP	PA	12/12/2005
EPA 8330		2,4,6-Trinitrotoluene (2,4,6-TNT)	NELAP	PA	12/12/2005
EPA 8330		2,4-Diamino-6-nitrotoluene	NELAP	PA	7/29/2015
EPA 8330		2,4-Dinitrotoluene (2,4-DNT)	NELAP	PA	6/11/2007
EPA 8330		2,6-Diamino-4-nitrotoluene	NELAP	PA	7/29/2015
EPA 8330		2,6-Dinitrotoluene (2,6-DNT)	NELAP	PA	6/11/2007
EPA 8330		2-Amino-4,6-dinitrotoluene (2-Am-DNT)	NELAP	PA	12/12/2005
EPA 8330		2-Nitrotoluene	NELAP	PA	12/12/2005
EPA 8330		3,5-Dinitroaniline	NELAP	PA	7/29/2015
EPA 8330		3-Nitrotoluene	NELAP	PA	12/12/2005
EPA 8330		4-Amino-2,6-dinitrotoluene (4-Am-DNT)	NELAP	PA	12/12/2005
EPA 8330		4-Nitrotoluene	NELAP	PA	12/12/2005
EPA 8330		Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	NELAP	PA	12/12/2005
EPA 8330		Nitroaromatics and nitramines by HPLC/UV	NELAP	PA	3/26/2012
EPA 8330	B	Nitroaromatics and nitramines by HPLC/UV	NELAP	PA	7/29/2015
EPA 8330	A	Nitroaromatics and nitramines by HPLC/UV	NELAP	PA	3/26/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8330		Nitrobenzene	NELAP	PA	6/11/2007
EPA 8330		Nitroglycerin	NELAP	PA	1/24/2007
EPA 8330		Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	NELAP	PA	12/12/2005
EPA 8330		Pentaerythritol tetranitrate (PETN)	NELAP	PA	5/2/2006
EPA 8330		RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	NELAP	PA	12/12/2005
EPA 9012		Total cyanide	NELAP	PA	12/12/2005
EPA 9040		pH	NELAP	PA	12/12/2005
EPA 9050	A	Conductivity	NELAP	PA	1/27/2014
EPA 9050		Conductivity	NELAP	PA	12/12/2005
EPA 9056	A	Anions by IC	NELAP	PA	3/19/2015
EPA 9056		Bromide	NELAP	PA	12/12/2005
EPA 9056		Chloride	NELAP	PA	12/12/2005
EPA 9056		Fluoride	NELAP	PA	12/12/2005
EPA 9056		Nitrate as N	NELAP	PA	12/12/2005
EPA 9056		Nitrite as N	NELAP	PA	1/19/2005
EPA 9056		Sulfate	NELAP	PA	12/12/2005
EPA 9060		Total organic carbon (TOC)	NELAP	PA	12/12/2005
EPA 9066		Total phenolics	NELAP	PA	12/12/2005
FL-PRO		Total petroleum hydrocarbons (TPH)	NELAP	PA	12/12/2005
MA DEP EPH	1.1	C11-C22 Aromatics	NELAP	PA	7/15/2013
MA DEP EPH	1.1	C19-C36 Aliphatics	NELAP	PA	7/15/2013
MA DEP EPH	1.1	C9-C18 Aliphatics	NELAP	PA	7/15/2013
MA DEP VPH	1.1	C5-C8 Aliphatics	NELAP	PA	7/15/2013
MA DEP VPH	1.1	C9-C10 Aromatics	NELAP	PA	7/29/2015
MA DEP VPH	1.1	C9-C12 Aliphatics	NELAP	PA	7/15/2013
NWTPH-Dx		Diesel-range organics (DRO)	NELAP	PA	12/12/2005
NWTPH-Gx		Gasoline-range organics (GRO)	NELAP	PA	12/12/2005
OIA 1677		Available cyanide	NELAP	PA	10/9/2013
OIA 1677		Free cyanide	NELAP	PA	10/9/2013
RSK-175		Acetylene (Ethyne)	NELAP	PA	1/20/2012
RSK-175		Ethane	NELAP	PA	6/29/2010
RSK-175		Ethene	NELAP	PA	6/29/2010
RSK-175		Methane	NELAP	PA	6/29/2010
RSK-175		Propane	NELAP	PA	6/29/2010
RSK-175		n-Butane	NELAP	PA	12/22/2011
SM 2120 B		Color	NELAP	PA	4/17/2007
SM 2310 B		Acidity as CaCO3	NELAP	PA	4/17/2007
SM 2320 B		Alkalinity as CaCO3	NELAP	PA	1/19/2005
SM 2340 C		Total hardness as CaCO3	NELAP	PA	4/17/2007
SM 2510 B		Conductivity	NELAP	PA	12/12/2005
SM 2540 B		Residue, total	NELAP	PA	4/17/2007
SM 2540 C		Residue, filterable (TDS)	NELAP	PA	4/17/2007
SM 2540 D		Residue, nonfilterable (TSS)	NELAP	PA	4/17/2007
SM 2540 F		Residue, settleable	NELAP	PA	4/17/2007

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
SM 2580B		Oxidation-reduction potential	NELAP	PA	3/4/2015
SM 3500-Cr B	20-22	Chromium VI	NELAP	PA	5/24/2007
SM 3500-Fe B	20/21	Ferrous iron	NELAP	PA	6/15/2009
SM 4500-CN- G		Amenable cyanide	NELAP	PA	5/24/2007
SM 4500-Cl F		Total residual chlorine	NELAP	PA	1/11/2012
SM 4500-Cl- C		Chloride	NELAP	PA	4/17/2007
SM 4500-F- B		Preliminary distillation of fluoride	NELAP	PA	4/28/2010
SM 4500-F- C		Flnoride	NELAP	PA	1/19/2005
SM 4500-H+ B		pH	NELAP	PA	4/17/2007
SM 4500-NH3 B		Ammonia distillation	NELAP	PA	4/17/2007
SM 4500-NH3 C		Ammonia as N	NELAP	PA	4/17/2007
SM 4500-NH3 D		Ammonia as N	NELAP	PA	4/17/2007
SM 4500-O G		Oxygen (dissolved)	NELAP	PA	4/17/2007
SM 4500-P B		Phosphorus, total	NELAP	PA	4/28/2010
SM 4500-P E		Orthophosphate as P	NELAP	PA	12/12/2005
SM 4500-P F		Phosphorus, total	NELAP	PA	4/28/2010
SM 4500-S D		Sulfide	NELAP	PA	4/17/2007
SM 4500-S F		Sulfide	NELAP	PA	4/17/2007
SM 4500-SO3 B		Sulfite, SO3	NELAP	PA	4/17/2007
SM 4500-SiO2 C	20-22	Silica, as SiO2	NELAP	PA	5/25/2007
SM 4500-SiO2 C	20-22	Silica, dissolved	NELAP	PA	5/24/2007
SM 5210 B		Biochemical oxygen demand (BOD)	NELAP	PA	4/4/2005
SM 5210 B		Carbonaceous BOD (CBOD)	NELAP	PA	1/19/2005
SM 5310 C		Total organic carbon (TOC)	NELAP	PA	5/24/2007
SM 5540 C		Surfactants as MBAS	NELAP	PA	4/17/2007
SM 9222 D		Fecal coliform (Enumeration)	NELAP	PA	7/6/2007
TX1005 (TNRCC)		Total petroleum hydrocarbons (TPH)	NELAP	PA	12/12/2005
TX1006 (TNRCC)		Total petroleum hydrocarbons (TPH)	NELAP	PA	12/12/2005
WA-EPH		Diesel-range organics (DRO)	NELAP	PA	12/12/2005
WA-VPH		Gasoline-range organics (GRO)	NELAP	PA	12/12/2005
WI-DRO		Diesel-range organics (DRO)	NELAP	PA	12/12/2005
WI-GRO		Gasoline-range organics (GRO)	NELAP	PA	12/12/2005

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
AK-101		Gasoline-range organics (GRO)	NELAP	PA	12/12/2005
AK-102		Diesel-range organics (DRO)	NELAP	PA	12/12/2005
AK-103		Residual-range organics (RRO)	NELAP	PA	3/19/2015
EPA 1010		Ignitability	NELAP	PA	1/19/2005
EPA 1311		Toxicity characteristic leaching procedure (TCLP)	NELAP	PA	12/12/2005
EPA 1312		Synthetic precipitation leaching procedure (SPLP)	NELAP	PA	12/12/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ 194)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ 196)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ 207)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ 195)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',5-Heptacblorobiphenyl (BZ 170)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',6,6'-Octacblorobiphenyl (BZ 197)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4',6-Heptacblorobiphenyl (BZ 171)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,4'-Hexachlorobiphenyl (BZ 128)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5',6'-Heptachlorobipbenyl (BZ 177)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ 201)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5',6-Heptacblorobiphenyl (BZ 175)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5'-Hexachlorobiphenyl (BZ 130)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,5',6-Octachlorobiphenyl (BZ 199)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ 208)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,5',6-Octachlorobiphenyl (BZ 198)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ 172)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ 174)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,6,6'-Octachlorobipbenyl (BZ 200)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ 173)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,5-Hexachlorobipbenyl (BZ 129)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,6'-Hexachlorobiphenyl (BZ 132)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,6,6'-Heptachlorobipbenyl (BZ 176)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4,6-Hexachlorobipbenyl (BZ 131)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',4-Pentachlorohiphenyl (BZ 82)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ 202)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ 178)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5,5'-Hexachlorobiphenyl (BZ 133)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5,6'-Hexachlorohiphenyl (BZ 135)	NELAP	PA	12/17/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ 179)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5,6-Hexachlorobiphenyl (BZ 134)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',5-Pentachlorobiphenyl (BZ 83)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',6,6'-Hexachlorobiphenyl (BZ 136)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3',6-Pentachlorobiphenyl (BZ 84)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,3'-Tetrachlorobiphenyl (BZ 40)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5',6-Hexachlorobiphenyl (BZ 149)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5'-Pentachlorobipbenyl (BZ 97)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5,5'-Hexachlorobiphenyl (BZ 146)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5,6'-Hexachlorobiphenyl (BZ 148)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ 188)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5,6-Hexachlorobiphenyl (BZ 147)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',5-Pentachlorobiphenyl (BZ 90)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',6'-Pentachlorobiphenyl (BZ 98)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',6,6'-Hexachlorobiphenyl (BZ 150)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4',6-Pentachlorobiphenyl (BZ 91)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4'-Tetrachlorobiphenyl (BZ 42)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ 183)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5'-Hexachlorobipbenyl (BZ 138)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ 203)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5,5'-Heptachlorobipbenyl (BZ 180)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ 182)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5,6,6'-Octachlorobipbenyl (BZ 204)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ 181)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',5-Hexachlorobipbenyl (BZ 137)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',6'-Hexachlorobiphenyl (BZ 140)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',6,6'-Heptachlorobipbenyl (BZ 184)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4',6-Hexachlorobipbenyl (BZ 139)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,4'-Pentachlorobiphenyl (BZ 85)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5',6-Hexachlorobiphenyl (BZ 144)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5'-Pentachlorobipbenyl (BZ 87)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ 185)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5,6'-Hexachlorobiphenyl (BZ 143)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ 186)	NELAP	PA	12/17/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		2,2',3,4,5,6-Hexachlorobiphenyl (BZ 142)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,5-Pentachlorobiphenyl (BZ 86)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,6'-Pentachlorobiphenyl (BZ 89)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,6,6'-Hexachlorobiphenyl (BZ 145)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4,6-Pentachlorobiphenyl (BZ 88)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,4-Tetrachlorobiphenyl (BZ 41)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5',6-Pentachlorobiphenyl (BZ 95)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5'-Tetrachlorobiphenyl (BZ 44)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5,5',6-Hexachlorobiphenyl (BZ 151)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5,5'-Pentachlorobiphenyl (BZ 92)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5,6'-Pentachlorobiphenyl (BZ 94)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5,6,6'-Hexachlorobiphenyl (BZ 152)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5,6-Pentachlorobiphenyl (BZ 93)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,5-Tetrachlorobiphenyl (BZ 43)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,6'-Tetrachlorobiphenyl (BZ 46)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,6,6'-Pentachlorobiphenyl (BZ 96)	NELAP	PA	12/17/2012
EPA 1668		2,2',3,6-Tetrachlorobiphenyl (BZ 45)	NELAP	PA	12/17/2012
EPA 1668		2,2',3-Trichlorobiphenyl (BZ 16)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4',5,5'-Hexachlorobiphenyl (BZ 153)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4',5,6'-Hexachlorobiphenyl (BZ 154)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4',5-Pentachlorobiphenyl (BZ 99)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4',6,6'-Hexachlorobiphenyl (BZ 155)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4',6-Pentachlorobiphenyl (BZ 100)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,4'-Tetrachlorobiphenyl (BZ 47)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,5',6-Pentachlorobiphenyl (BZ 103)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,5'-Tetrachlorobiphenyl (BZ 49)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,5,5'-Pentachlorobiphenyl (BZ 101)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,5,6'-Pentachlorohiphenyl (BZ 102)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,5-Tetrachlorobiphenyl (BZ 48)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,6'-Tetrachlorobiphenyl (BZ 51)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,6,6'-Pentachlorohiphenyl (BZ 104)	NELAP	PA	12/17/2012
EPA 1668		2,2',4,6-Tetrachlorohiphenyl (BZ 50)	NELAP	PA	12/17/2012
EPA 1668		2,2',4-Trichlorobiphenyl (BZ 17)	NELAP	PA	12/17/2012
EPA 1668		2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	NELAP	PA	12/17/2012
EPA 1668		2,2',5,6'-Tetrachlorobiphenyl (BZ 53)	NELAP	PA	12/17/2012
EPA 1668		2,2',5-Trichlorobiphenyl (BZ 18)	NELAP	PA	12/17/2012
EPA 1668		2,2',6,6'-Tetrachlorobiphenyl (BZ 54)	NELAP	PA	12/17/2012
EPA 1668		2,2',6-Trichlorobiphenyl (BZ 19)	NELAP	PA	12/17/2012
EPA 1668		2,2'-Dichlorobiphenyl (BZ 4)	NELAP	PA	12/17/2012
EPA 1668		2,3',4',5',6-Pentachlorobiphenyl (BZ 125)	NELAP	PA	12/17/2012
EPA 1668		2,3',4',5'-Tetrachlorobiphenyl (BZ 76)	NELAP	PA	12/17/2012
EPA 1668		2,3',4',5,5'-Pentachlorobiphenyl (BZ 124)	NELAP	PA	12/17/2012
EPA 1668		2,3',4',5-Tetrachlorobiphenyl (BZ 70)	NELAP	PA	12/17/2012
EPA 1668		2,3',4',6-Tetrachlorobiphenyl (BZ 71)	NELAP	PA	12/17/2012
EPA 1668		2,3',4'-Trichlorobiphenyl (BZ 33)	NELAP	PA	12/17/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300

PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		2,3',4,4',5',6-Hexachlorobiphenyl (BZ 168)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4',5'-Pentachlorobiphenyl (BZ 123)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4',5,5'-Hexachlorobiphenyl (BZ 167)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4',5-Pentachlorobiphenyl (BZ 118)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4',6-Pentachlorohiphenyl (BZ 119)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,4'-Tetrachlorohiphenyl (BZ 66)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,5',6-Pentachlorobiphenyl (BZ 121)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,5'-Tetrachlorobiphenyl (BZ 68)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,5,5'-Pentachlorohiphenyl (BZ 120)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,5-Tetrachlorohiphenyl (BZ 67)	NELAP	PA	12/17/2012
EPA 1668		2,3',4,6-Tetrachlorobiphenyl (BZ 69)	NELAP	PA	12/17/2012
EPA 1668		2,3',4-Trichlorobiphenyl (BZ 25)	NELAP	PA	12/17/2012
EPA 1668		2,3',5',6-Tetrachlorohiphenyl (BZ 73)	NELAP	PA	12/17/2012
EPA 1668		2,3',5'-Trichlorohiphenyl (BZ 34)	NELAP	PA	12/17/2012
EPA 1668		2,3',5,5'-Tetrachlorohiphenyl (BZ 72)	NELAP	PA	12/17/2012
EPA 1668		2,3',5-Trichlorohiphenyl (BZ 26)	NELAP	PA	12/17/2012
EPA 1668		2,3',6-Trichlorohiphenyl (BZ 27)	NELAP	PA	12/17/2012
EPA 1668		2,3'-Dichlorobiphenyl (BZ 6)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5',6-Hexachlorobiphenyl (BZ 164)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5'-Pentachlorobiphenyl (BZ 122)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5,5',6-Heptachlorohiphenyl (BZ 193)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5,5'-Hexachlorobiphenyl (BZ 162)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5,6-Hexachlorobiphenyl (BZ 163)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',5-Pentachlorobiphenyl (BZ 107)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4',6-Pentachlorobiphenyl (BZ 110)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4'-Tetrachlorohiphenyl (BZ 56)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ 191)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5'-Hexachlorohiphenyl (BZ 157)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ 205)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ 189)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ 190)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',5-Hexachlorohiphenyl (BZ 156)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4',6-Hexachlorobiphenyl (BZ 158)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,4'-Pentachlorobiphenyl (BZ 105)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5',6-Hexachlorohiphenyl (BZ 161)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5'-Pentachlorobiphenyl (BZ 108)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ 192)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5,5'-Hexachlorohiphenyl (BZ 159)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5,6-Hexachlorohiphenyl (BZ 160)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,5-Pentachlorobiphenyl (BZ 106)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',4,6-Pentachlorobiphenyl (BZ 109)	NELAP	PA	12/17/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		2,3,3',4-Tetrachlorobiphenyl (BZ 55)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5',6-Pentachlorobiphenyl (BZ 113)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5'-Tetrachlorobiphenyl (BZ 58)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5,5',6-Hexachlorobiphenyl (BZ 165)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5,5'-Pentachlorobiphenyl (BZ 111)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5,6-Pentachlorobiphenyl (BZ 112)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',5-Tetrachlorobiphenyl (BZ 57)	NELAP	PA	12/17/2012
EPA 1668		2,3,3',6-Tetrachlorobiphenyl (BZ 59)	NELAP	PA	12/17/2012
EPA 1668		2,3,3'-Trichlorobiphenyl (BZ 20)	NELAP	PA	12/17/2012
EPA 1668		2,3,4',5,6-Pentachlorobiphenyl (BZ 117)	NELAP	PA	12/17/2012
EPA 1668		2,3,4',5-Tetrachlorobiphenyl (BZ 63)	NELAP	PA	12/17/2012
EPA 1668		2,3,4',6-Tetrachlorobiphenyl (BZ 64)	NELAP	PA	12/17/2012
EPA 1668		2,3,4'-Trichlorobiphenyl (BZ 22)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,4',5,6-Hexachlorobiphenyl (BZ 166)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,4',5-Pentachlorobiphenyl (BZ 114)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,4',6-Pentachlorobiphenyl (BZ 115)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,4'-Tetrachlorobiphenyl (BZ 60)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,5,6-Pentachlorobiphenyl (BZ 116)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,5-Tetrachlorobiphenyl (BZ 61)	NELAP	PA	12/17/2012
EPA 1668		2,3,4,6-Tetrachlorobiphenyl (BZ 62)	NELAP	PA	12/17/2012
EPA 1668		2,3,4-Trichlorobiphenyl (BZ 21)	NELAP	PA	12/17/2012
EPA 1668		2,3,5,6-Tetrachlorobiphenyl (BZ 65)	NELAP	PA	12/17/2012
EPA 1668		2,3,5-Trichlorobiphenyl (BZ 23)	NELAP	PA	12/17/2012
EPA 1668		2,3,6-Trichlorobiphenyl (BZ 24)	NELAP	PA	12/17/2012
EPA 1668		2,3-Dichlorobiphenyl (BZ 5)	NELAP	PA	12/17/2012
EPA 1668		2,4',5-Trichlorobiphenyl (BZ 31)	NELAP	PA	12/17/2012
EPA 1668		2,4',6-Trichlorobiphenyl (BZ 32)	NELAP	PA	12/17/2012
EPA 1668		2,4'-Dichlorobiphenyl (BZ 8)	NELAP	PA	12/17/2012
EPA 1668		2,4,4',5-Tetrachlorobiphenyl (BZ 74)	NELAP	PA	12/17/2012
EPA 1668		2,4,4',6-Tetrachlorobiphenyl (BZ 75)	NELAP	PA	12/17/2012
EPA 1668		2,4,4'-Trichlorobiphenyl (BZ 28)	NELAP	PA	12/17/2012
EPA 1668		2,4,5-Trichlorobiphenyl (BZ 29)	NELAP	PA	12/17/2012
EPA 1668		2,4,6-Trichlorobiphenyl (BZ 30)	NELAP	PA	12/17/2012
EPA 1668		2,4-Dichlorobiphenyl (BZ 7)	NELAP	PA	12/17/2012
EPA 1668		2,5-Dichlorobiphenyl (BZ 9)	NELAP	PA	12/17/2012
EPA 1668		2,6-Dichlorobiphenyl (BZ 10)	NELAP	PA	12/17/2012
EPA 1668		2-Chlorobiphenyl (BZ 1)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,4',5,5'-Hexachlorobiphenyl (BZ 169)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,4',5-Pentachlorobiphenyl (BZ 126)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,4'-Tetrachlorobiphenyl (BZ 77)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,5'-Tetrachlorobiphenyl (BZ 79)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,5,5'-Pentachlorobiphenyl (BZ 127)	NELAP	PA	12/17/2012
EPA 1668		3,3',4,5-Tetrachlorobiphenyl (BZ 78)	NELAP	PA	12/17/2012
EPA 1668		3,3',4-Trichlorobiphenyl (BZ 35)	NELAP	PA	12/17/2012
EPA 1668		3,3',5,5'-Tetrachlorobiphenyl (BZ 80)	NELAP	PA	12/17/2012

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1668		3,3',5-Trichlorobiphenyl (BZ 36)	NELAP	PA	12/17/2012
EPA 1668		3,3'-Dichlorobiphenyl (BZ 11)	NELAP	PA	12/17/2012
EPA 1668		3,4',5-Trichlorobiphenyl (BZ 39)	NELAP	PA	12/17/2012
EPA 1668		3,4'-Dichlorobiphenyl (BZ 13)	NELAP	PA	12/17/2012
EPA 1668		3,4,4',5-Tetrachlorobiphenyl (BZ 81)	NELAP	PA	12/17/2012
EPA 1668		3,4,4'-Trichlorobiphenyl (BZ 37)	NELAP	PA	12/17/2012
EPA 1668		3,4,5-Trichlorobiphenyl (BZ 38)	NELAP	PA	12/17/2012
EPA 1668		3,4-Dichlorobiphenyl (BZ 12)	NELAP	PA	12/17/2012
EPA 1668		3,5-Dichlorobiphenyl (BZ 14)	NELAP	PA	12/17/2012
EPA 1668		3-Chlorobiphenyl (BZ 2)	NELAP	PA	12/17/2012
EPA 1668		4,4'-Dichlorobiphenyl (BZ 15)	NELAP	PA	12/17/2012
EPA 1668		4-Chlorobiphenyl (BZ 3)	NELAP	PA	12/17/2012
EPA 1668		Decachlorobiphenyl	NELAP	PA	12/17/2012
EPA 1668	C	PCBs as congeners by HRGC/HRMS	NELAP	PA	3/4/2015
EPA 1668	A	PCBs as congeners by HRGC/HRMS	NELAP	PA	3/4/2015
EPA 300.0	2.1	Bromide	NELAP	PA	10/16/2012
EPA 300.0	2.1	Chloride	NELAP	PA	10/30/2014
EPA 300.0	2.1	Fluoride	NELAP	PA	10/16/2012
EPA 300.0	2.1	Nitrate as N	NELAP	PA	10/16/2012
EPA 300.0	2.1	Nitrite as N	NELAP	PA	10/16/2012
EPA 300.0	2.1	Sulfate	NELAP	PA	10/16/2012
EPA 3050	B	Acid digestion of solids	NELAP	PA	4/4/2005
EPA 3060	A	Alkaline digestion of Cr(VI)	NELAP	PA	4/4/2005
EPA 350.3		Ammonia as N	NELAP	PA	12/8/2014
EPA 3510	C	Separatory funnel liquid-liquid extraction	NELAP	PA	4/4/2005
EPA 3540	C	Soxhlet extraction	NELAP	PA	4/4/2005
EPA 3546		Microwave extraction	NELAP	PA	9/25/2009
EPA 3550		Ultrasonic extraction	NELAP	PA	4/4/2005
EPA 3550	C	Ultrasonic extraction	NELAP	PA	3/4/2015
EPA 3620	B	Florisil cleanup	NELAP	PA	4/4/2005
EPA 3630	C	Silica gel cleanup	NELAP	PA	4/4/2005
EPA 3640	A	Gel permeation cleanup (GPC)	NELAP	PA	4/4/2005
EPA 3660	B	Sulfur cleanup	NELAP	PA	4/4/2005
EPA 3665	A	Sulfuric acid/permanganate clean-up	NELAP	PA	4/4/2005
EPA 5030		Bulk purge-and-trap (methanol)	NELAP	PA	12/4/2007
EPA 5035		Closed-system purge-and-trap (bisulfate option)	NELAP	PA	12/12/2005
EPA 5035		Closed-system purge-and-trap (methanol option)	NELAP	PA	4/4/2005
EPA 5035		Closed-system purge-and-trap (unpreserved)	NELAP	PA	4/4/2005
EPA 6010		Aluminum	NELAP	PA	1/19/2005
EPA 6010		Antimony	NELAP	PA	1/19/2005
EPA 6010		Arsenic	NELAP	PA	1/19/2005
EPA 6010		Barium	NELAP	PA	1/19/2005
EPA 6010		Beryllium	NELAP	PA	1/19/2005
EPA 6010		Boron	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 6010		Cadmium	NELAP	PA	1/19/2005
EPA 6010		Calcium	NELAP	PA	1/19/2005
EPA 6010		Chromium	NELAP	PA	1/19/2005
EPA 6010		Cobalt	NELAP	PA	1/19/2005
EPA 6010		Copper	NELAP	PA	1/19/2005
EPA 6010		Iron	NELAP	PA	1/19/2005
EPA 6010		Lead	NELAP	PA	1/19/2005
EPA 6010		Lithium	NELAP	PA	1/20/2012
EPA 6010		Magnesium	NELAP	PA	1/19/2005
EPA 6010		Manganese	NELAP	PA	1/19/2005
EPA 6010	C	Metals by ICP/AES	NELAP	PA	3/26/2012
EPA 6010	B	Metals by ICP/AES	NELAP	PA	3/26/2012
EPA 6010		Molybdenum	NELAP	PA	1/19/2005
EPA 6010		Nickel	NELAP	PA	1/19/2005
EPA 6010		Potassium	NELAP	PA	1/19/2005
EPA 6010		Selenium	NELAP	PA	1/19/2005
EPA 6010		Silica, as SiO2	NELAP	PA	1/20/2012
EPA 6010		Silver	NELAP	PA	1/19/2005
EPA 6010		Sodium	NELAP	PA	1/19/2005
EPA 6010		Strontium	NELAP	PA	1/19/2005
EPA 6010		Sulfur	NELAP	PA	12/19/2011
EPA 6010		Thallium	NELAP	PA	1/19/2005
EPA 6010		Tin	NELAP	PA	1/19/2005
EPA 6010		Titanium	NELAP	PA	1/19/2005
EPA 6010		Vanadium	NELAP	PA	1/19/2005
EPA 6010		Zinc	NELAP	PA	1/19/2005
EPA 6010		Zirconium	NELAP	PA	7/29/2015
EPA 6020		Aluminum	NELAP	PA	4/29/2010
EPA 6020		Antimony	NELAP	PA	1/19/2005
EPA 6020		Arsenic	NELAP	PA	1/19/2005
EPA 6020		Barium	NELAP	PA	1/20/2012
EPA 6020		Beryllium	NELAP	PA	1/19/2005
EPA 6020		Boron	NELAP	PA	4/29/2010
EPA 6020		Cadmium	NELAP	PA	1/19/2005
EPA 6020		Calcium	NELAP	PA	4/29/2010
EPA 6020		Chromium	NELAP	PA	1/19/2005
EPA 6020		Cobalt	NELAP	PA	4/29/2010
EPA 6020		Copper	NELAP	PA	1/19/2005
EPA 6020		Iron	NELAP	PA	4/29/2010
EPA 6020		Lead	NELAP	PA	1/19/2005
EPA 6020		Magnesium	NELAP	PA	4/29/2010
EPA 6020		Manganese	NELAP	PA	4/29/2010
EPA 6020	A	Metals by ICP/MS	NELAP	PA	3/26/2012
EPA 6020		Molybdenum	NELAP	PA	7/25/2011
EPA 6020		Nickel	NELAP	PA	4/4/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 6020		Potassium	NELAP	PA	4/29/2010
EPA 6020		Selenium	NELAP	PA	4/4/2005
EPA 6020		Silver	NELAP	PA	2/23/2010
EPA 6020		Sodium	NELAP	PA	4/29/2010
EPA 6020		Strontium	NELAP	PA	4/29/2010
EPA 6020		Thallium	NELAP	PA	1/19/2005
EPA 6020		Tin	NELAP	PA	4/29/2010
EPA 6020		Titanium	NELAP	PA	4/29/2010
EPA 6020		Vanadium	NELAP	PA	1/7/2010
EPA 6020		Zinc	NELAP	PA	2/1/2011
EPA 6850		Perchlorate	NELAP	PA	1/19/2011
EPA 7.3.3.2		Reactive cyanide	NELAP	PA	12/12/2005
EPA 7.3.4.2		Reactive sulfide	NELAP	PA	12/12/2005
EPA 7196		Chromium VI	NELAP	PA	1/19/2005
EPA 7199		Chromium VI	NELAP	PA	5/2/2006
EPA 7471		Mercury	NELAP	PA	10/17/2007
EPA 8011		1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	PA	3/19/2015
EPA 8011		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	PA	3/19/2015
EPA 8011		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	PA	6/12/2015
EPA 8015		Diesel-range organics (DRO)	NELAP	PA	4/4/2005
EPA 8015		Ethanol	NELAP	PA	1/19/2005
EPA 8015		Ethylene glycol	NELAP	PA	12/4/2007
EPA 8015		Gasoline-range organics (GRO)	NELAP	PA	4/4/2005
EPA 8015		Isopropyl alcohol (2-Propanol)	NELAP	PA	12/4/2007
EPA 8015		Methanol	NELAP	PA	1/19/2005
EPA 8015	C	Nonhalogenated organics by GC/FID	NELAP	PA	3/26/2012
EPA 8015	B	Nonhalogenated organics by GC/FID	NELAP	PA	3/26/2012
EPA 8015	D	Nonhalogenated organics by GC/FID	NELAP	PA	7/29/2015
EPA 8021		Benzene	NELAP	PA	1/19/2005
EPA 8021		Ethylbenzene	NELAP	PA	1/19/2005
EPA 8021		Isopropylbenzene (Cumene)	NELAP	PA	1/24/2007
EPA 8021		Methyl tert-butyl ether (MTBE)	NELAP	PA	5/2/2006
EPA 8021		Naphthalene	NELAP	PA	12/4/2007
EPA 8021		Toluene	NELAP	PA	1/19/2005
EPA 8021	B	VOCs by GC/PID/ELCD	NELAP	PA	3/26/2012
EPA 8021		Xylenes, total	NELAP	PA	1/19/2005
EPA 8021		m-Xylene	NELAP	PA	1/24/2007
EPA 8021		o-Xylene	NELAP	PA	1/24/2007
EPA 8021		p-Xylene	NELAP	PA	1/24/2007
EPA 8081		4,4'-DDD	NELAP	PA	1/19/2005
EPA 8081		4,4'-DDE	NELAP	PA	1/19/2005
EPA 8081		4,4'-DDT	NELAP	PA	1/19/2005
EPA 8081		Aldrin (HHDN)	NELAP	PA	1/19/2005
EPA 8081		Chlordane (tech.)	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8081		Dieldrin	NELAP	PA	1/19/2005
EPA 8081		Endosulfan I	NELAP	PA	1/19/2005
EPA 8081		Endosulfan II	NELAP	PA	1/19/2005
EPA 8081		Endosulfan sulfate	NELAP	PA	1/19/2005
EPA 8081		Endrin	NELAP	PA	1/19/2005
EPA 8081		Endrin aldehyde	NELAP	PA	1/19/2005
EPA 8081		Endrin ketone	NELAP	PA	1/19/2005
EPA 8081		Heptachlor	NELAP	PA	1/19/2005
EPA 8081		Heptachlor epoxide	NELAP	PA	1/19/2005
EPA 8081		Kepone	NELAP	PA	1/19/2005
EPA 8081		Methoxychlor	NELAP	PA	1/19/2005
EPA 8081		Mirex	NELAP	PA	1/19/2005
EPA 8081	A	Organochlorine pesticides by GC/ECD	NELAP	PA	3/26/2012
EPA 8081	B	Organochlorine pesticides by GC/ECD	NELAP	PA	1/1/2013
EPA 8081		Toxaphene (Chlorinated camphene)	NELAP	PA	1/19/2005
EPA 8081		alpha-BHC (alpha-Hexachlorocyclohexane)	NELAP	PA	1/19/2005
EPA 8081		alpha-Chlordane	NELAP	PA	4/4/2005
EPA 8081		beta-BHC (beta-Hexachlorocyclohexane)	NELAP	PA	1/19/2005
EPA 8081		delta-BHC (delta-Hexachlorocyclohexane)	NELAP	PA	1/19/2005
EPA 8081		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	PA	1/19/2005
EPA 8081		gamma-Chlordane	NELAP	PA	4/4/2005
EPA 8082		Aroclor-1016 (PCB-1016)	NELAP	PA	1/2/2007
EPA 8082		Aroclor-1016 (in oil)	NELAP	PA	5/24/2011
EPA 8082		Aroclor-1221 (PCB-1221)	NELAP	PA	1/2/2007
EPA 8082		Aroclor-1221 (in oil)	NELAP	PA	5/24/2011
EPA 8082		Aroclor-1232 (PCB-1232)	NELAP	PA	1/2/2007
EPA 8082		Aroclor-1232 (in oil)	NELAP	PA	5/24/2011
EPA 8082		Aroclor-1242 (PCB-1242)	NELAP	PA	1/2/2007
EPA 8082		Aroclor-1242 (in oil)	NELAP	PA	5/24/2011
EPA 8082		Aroclor-1248 (PCB-1248)	NELAP	PA	1/2/2007
EPA 8082		Aroclor-1248 (in oil)	NELAP	PA	5/24/2011
EPA 8082		Aroclor-1254 (PCB-1254)	NELAP	PA	1/2/2007
EPA 8082		Aroclor-1254 (in oil)	NELAP	PA	5/24/2011
EPA 8082		Aroclor-1260 (PCB-1260)	NELAP	PA	1/2/2007
EPA 8082		Aroclor-1260 (in oil)	NELAP	PA	5/24/2011
EPA 8082		Aroclor-1262 (PCB-1262)	NELAP	PA	7/23/2008
EPA 8082		Aroclor-1268 (PCB-1268)	NELAP	PA	7/23/2008
EPA 8082		Decachlorobiphenyl	NELAP	PA	12/17/2012
EPA 8082	A	PCBs by GC/ECD	NELAP	PA	3/26/2012
EPA 8141		Alachlor (Lasso)	NELAP	PA	1/21/2009
EPA 8141		Atrazine	NELAP	PA	1/19/2005
EPA 8141		Azinphos-methyl (Guthion)	NELAP	PA	4/4/2005
EPA 8141		Bolstar (Sulprofos)	NELAP	PA	1/19/2005
EPA 8141		Carbophenothion (Trithion)	NELAP	PA	11/9/2012
EPA 8141		Chlorpyrifos	NELAP	PA	4/4/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8141		Coumaphos	NELAP	PA	1/19/2005
EPA 8141		Demeton-O	NELAP	PA	1/19/2005
EPA 8141		Demeton-S	NELAP	PA	1/19/2005
EPA 8141		Diazinon (Spectracide)	NELAP	PA	1/19/2005
EPA 8141		Dichlorovos (DDVP, Dichlorvos)	NELAP	PA	1/19/2005
EPA 8141		Disulfoton	NELAP	PA	1/19/2005
EPA 8141		EPN (Santox)	NELAP	PA	1/19/2005
EPA 8141		Ethion	NELAP	PA	1/19/2005
EPA 8141		Ethoprop (Prophos)	NELAP	PA	1/19/2005
EPA 8141		Famphur	NELAP	PA	1/19/2005
EPA 8141		Fensulfothion	NELAP	PA	1/19/2005
EPA 8141		Fenthion	NELAP	PA	4/4/2005
EPA 8141		Malathion	NELAP	PA	1/19/2005
EPA 8141		Merphos	NELAP	PA	1/19/2005
EPA 8141		Methyl parathion (Parathion, methyl)	NELAP	PA	5/25/2005
EPA 8141		Mevinphos	NELAP	PA	1/19/2005
EPA 8141		Naled	NELAP	PA	1/19/2005
EPA 8141	A	Organophosphorus compounds by GC/NPD	NELAP	PA	3/26/2012
EPA 8141	B	Organophosphorus compounds by GC/NPD	NELAP	PA	3/26/2012
EPA 8141		Parathion, ethyl (Ethyl parathion, Parathion)	NELAP	PA	1/19/2005
EPA 8141		Phorate (Thimet)	NELAP	PA	1/19/2005
EPA 8141		Ronnel	NELAP	PA	1/19/2005
EPA 8141		Simazine	NELAP	PA	1/4/2006
EPA 8141		Stirophos (Tetrachlorovinphos)	NELAP	PA	1/19/2005
EPA 8141		Tokuthion (Prothiophos)	NELAP	PA	1/19/2005
EPA 8141		Trichloronate	NELAP	PA	1/19/2005
EPA 8151		2,4,5-T	NELAP	PA	1/19/2005
EPA 8151		2,4,5-TP (Silvex)	NELAP	PA	1/19/2005
EPA 8151		2,4-D	NELAP	PA	1/19/2005
EPA 8151		2,4-DB (Butoxon)	NELAP	PA	4/4/2005
EPA 8151	A	Chlorinated herbicides by GC/ECD	NELAP	PA	3/26/2012
EPA 8151		Dalapon (2,2-Dichloropropionic acid)	NELAP	PA	1/19/2005
EPA 8151		Dicamba	NELAP	PA	1/19/2005
EPA 8151		Dichloroprop (Dichlorprop)	NELAP	PA	1/19/2005
EPA 8151		Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	NELAP	PA	1/19/2005
EPA 8151		MCPA	NELAP	PA	1/19/2005
EPA 8151		MCPP (Mecoprop)	NELAP	PA	5/2/2006
EPA 8151		Pentachlorophenol (PCP)	NELAP	PA	1/19/2005
EPA 8151		Picloram (4-Amino-3,5,6-trichloro-2-pyridinecarboxylic acid)	NELAP	PA	1/19/2005
EPA 8260		1,1,1,2-Tetrachloroethane	NELAP	PA	1/19/2005
EPA 8260		1,1,1-Trichloroethane	NELAP	PA	1/19/2005
EPA 8260		1,1,2,2-Tetrachloroethane	NELAP	PA	1/19/2005
EPA 8260		1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	NELAP	PA	5/2/2006

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8260		1,1,2-Trichloroethane	NELAP	PA	1/19/2005
EPA 8260		1,1-Dichloroethane	NELAP	PA	1/19/2005
EPA 8260		1,1-Dichloroethene (1,1-Dichloroethylene)	NELAP	PA	1/19/2005
EPA 8260		1,1-Dichloropropene	NELAP	PA	1/19/2005
EPA 8260		1,2,3-Trichlorobenzene	NELAP	PA	1/19/2005
EPA 8260		1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	PA	1/19/2005
EPA 8260		1,2,4-Trichlorobenzene	NELAP	PA	1/19/2005
EPA 8260		1,2,4-Trimethylbenzene	NELAP	PA	1/19/2005
EPA 8260		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	PA	1/19/2005
EPA 8260		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	PA	1/19/2005
EPA 8260		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 8260		1,2-Dichloroethane	NELAP	PA	1/19/2005
EPA 8260		1,2-Dichloropropane	NELAP	PA	1/19/2005
EPA 8260		1,3,5-Trimethylbenzene	NELAP	PA	1/19/2005
EPA 8260		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 8260		1,3-Dichloropropane	NELAP	PA	1/19/2005
EPA 8260		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 8260		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	1/19/2005
EPA 8260		2,2-Dichloropropane	NELAP	PA	1/19/2005
EPA 8260		2-Butanone (Methyl ethyl ketone, MEK)	NELAP	PA	1/19/2005
EPA 8260		2-Chloroethyl vinyl ether	NELAP	PA	1/19/2005
EPA 8260		2-Chlorotoluene	NELAP	PA	5/2/2006
EPA 8260		2-Hexanone	NELAP	PA	1/19/2005
EPA 8260		2-Nitropropane	NELAP	PA	12/17/2012
EPA 8260		3,3'-Dimethyl-1-butanol	NELAP	PA	4/17/2009
EPA 8260		4-Chloro-2-nitrophenol	NELAP	PA	5/2/2006
EPA 8260		4-Chlorotoluene	NELAP	PA	1/19/2005
EPA 8260		4-Methyl-2-pentanone (MIBK)	NELAP	PA	1/19/2005
EPA 8260		Acetone	NELAP	PA	1/19/2005
EPA 8260		Acetonitrile	NELAP	PA	1/4/2006
EPA 8260		Acrolein (Propenal)	NELAP	PA	1/19/2005
EPA 8260		Acrylonitrile	NELAP	PA	1/19/2005
EPA 8260		Allyl chloride (3-Chloropropene)	NELAP	PA	1/19/2005
EPA 8260		Benzene	NELAP	PA	1/19/2005
EPA 8260		Benzyl chloride	NELAP	PA	1/4/2006
EPA 8260		Bromobenzene	NELAP	PA	1/19/2005
EPA 8260		Bromochloromethane	NELAP	PA	1/19/2005
EPA 8260		Bromodichloromethane	NELAP	PA	1/19/2005
EPA 8260		Bromoform	NELAP	PA	1/19/2005
EPA 8260		Carbon disulfide	NELAP	PA	1/19/2005
EPA 8260		Carbon tetrachloride	NELAP	PA	1/19/2005
EPA 8260		Chlorobenzene	NELAP	PA	1/19/2005
EPA 8260		Chloroethane	NELAP	PA	1/19/2005
EPA 8260		Chloroform	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8260		Chloroprene (2-Chloro-1,3-butadiene)	NELAP	PA	4/17/2009
EPA 8260		Crotonaldehyde	NELAP	PA	10/30/2014
EPA 8260		Cyclohexane	NELAP	PA	6/29/2010
EPA 8260		Cyclohexanone	NELAP	PA	7/3/2007
EPA 8260		Dibromochloromethane	NELAP	PA	1/19/2005
EPA 8260		Dibromomethane	NELAP	PA	1/19/2005
EPA 8260		Dichlorodifluoromethane (Freon 12)	NELAP	PA	1/19/2005
EPA 8260		Diisopropyl ether (DIPE)	NELAP	PA	7/3/2007
EPA 8260		Epichlorohydrin (1-Chloro-2,3-epoxypropane)	NELAP	PA	1/4/2006
EPA 8260		Ethanol	NELAP	PA	1/4/2006
EPA 8260		Ethyl acetate	NELAP	PA	1/4/2006
EPA 8260		Ethyl methacrylate	NELAP	PA	1/4/2006
EPA 8260		Ethyl tert-butyl ether (ETBE)	NELAP	PA	7/3/2007
EPA 8260		Ethylbenzene	NELAP	PA	1/19/2005
EPA 8260		Ethylene oxide	NELAP	PA	10/30/2014
EPA 8260		Gasoline-range organics (GRO)	NELAP	PA	6/8/2006
EPA 8260		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	1/19/2005
EPA 8260		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	PA	7/3/2007
EPA 8260		Isopropyl alcohol (2-Propanol)	NELAP	PA	1/19/2005
EPA 8260		Isopropylbenzene (Cumene)	NELAP	PA	8/7/2005
EPA 8260		Methacrylonitrile	NELAP	PA	1/24/2007
EPA 8260		Methyl acetate	NELAP	PA	6/29/2010
EPA 8260		Methyl bromide (Bromomethane)	NELAP	PA	1/19/2005
EPA 8260		Methyl chloride (Chloromethane)	NELAP	PA	1/19/2005
EPA 8260		Methyl iodide (Iodomethane)	NELAP	PA	5/2/2006
EPA 8260		Methyl tert-butyl ether (MTBE)	NELAP	PA	1/19/2005
EPA 8260		Methylcyclohexane	NELAP	PA	1/21/2009
EPA 8260		Methylene chloride (Dichloromethane)	NELAP	PA	1/19/2005
EPA 8260		Methylmethacrylate	NELAP	PA	5/2/2006
EPA 8260		Naphthalene	NELAP	PA	1/19/2005
EPA 8260		Pentachloroethane	NELAP	PA	1/24/2007
EPA 8260		Propionitrile (Ethyl cyanide)	NELAP	PA	1/24/2007
EPA 8260		Styrene	NELAP	PA	1/19/2005
EPA 8260		Tetrachloroethene (PCE, Perchloroethylene)	NELAP	PA	1/19/2005
EPA 8260		Tetrahydrofuran (THF)	NELAP	PA	6/7/2012
EPA 8260		Toluene	NELAP	PA	1/19/2005
EPA 8260		Trichloroethene (TCE, Trichloroethylene)	NELAP	PA	1/19/2005
EPA 8260		Trichlorofluoromethane (Freon 11)	NELAP	PA	1/19/2005
EPA 8260	B	VOCs by GC/MS	NELAP	PA	3/26/2012
EPA 8260	C	VOCs by GC/MS	NELAP	PA	3/26/2012
EPA 8260		Vinyl acetate	NELAP	PA	1/19/2005
EPA 8260		Vinyl chloride (Chloroethene)	NELAP	PA	1/19/2005
EPA 8260		Xylenes, total	NELAP	PA	1/19/2005
EPA 8260		cis-1,2-Dichloroethene	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8260		cis-1,3-Dichloropropene	NELAP	PA	1/19/2005
EPA 8260		m+p-Xylene	NELAP	PA	1/24/2007
EPA 8260		n-Butyl alcohol (n-Butanol, 1-Butanol)	NELAP	PA	1/19/2005
EPA 8260		n-Butylbenzene	NELAP	PA	1/19/2005
EPA 8260		n-Propylbenzene	NELAP	PA	1/4/2006
EPA 8260		o-Xylene	NELAP	PA	1/24/2007
EPA 8260		p-Isopropyltoluene (4-Isopropyltoluene)	NELAP	PA	1/24/2007
EPA 8260		sec-Butylbenzene	NELAP	PA	1/19/2005
EPA 8260		tert-Amyl alcohol (2-Methyl-2-butanol)	NELAP	PA	4/17/2009
EPA 8260		tert-Amyl methyl ether (TAME)	NELAP	PA	7/3/2007
EPA 8260		tert-Butyl alcohol (2-Methyl-2-propanol)	NELAP	PA	1/19/2005
EPA 8260		tert-Butyl ethyl ether	NELAP	PA	5/25/2007
EPA 8260		tert-Butyl formate	NELAP	PA	4/17/2009
EPA 8260		tert-Butylbenzene	NELAP	PA	1/19/2005
EPA 8260		trans-1,2-Dichloroethene	NELAP	PA	1/19/2005
EPA 8260		trans-1,3-Dichloropropene	NELAP	PA	1/19/2005
EPA 8260		trans-1,4-Dichloro-2-butene	NELAP	PA	7/3/2007
EPA 8260 SIM		1,4-Dioxane (1,4-Diethylenoxide)	NELAP	PA	4/17/2009
EPA 8270		1,1'-Biphenyl (Biphenyl, Lemonene)	NELAP	PA	12/4/2007
EPA 8270		1,2,3,4-Tetrachlorobenzene	NELAP	PA	7/3/2007
EPA 8270		1,2,3,4-Tetrahydronaphthalene	NELAP	PA	12/4/2007
EPA 8270		1,2,3,5-Tetrachlorobenzene	NELAP	PA	7/3/2007
EPA 8270		1,2,4,5-Tetrachlorobenzene	NELAP	PA	4/4/2005
EPA 8270		1,2,4-Trichlorobenzene	NELAP	PA	1/19/2005
EPA 8270		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 8270		1,2-Dinitrobenzene (1,2-DNB)	NELAP	PA	1/19/2005
EPA 8270		1,2-Diphenylhydrazine	NELAP	PA	5/2/2006
EPA 8270		1,3,5-Trinitrobenzene (1,3,5-TNB)	NELAP	PA	1/4/2006
EPA 8270		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 8270		1,3-Dinitrobenzene (1,3-DNB)	NELAP	PA	1/19/2005
EPA 8270		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	PA	1/19/2005
EPA 8270		1,4-Dinitrobenzene (1,4-DNB)	NELAP	PA	5/2/2006
EPA 8270		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	PA	12/4/2007
EPA 8270		1,4-Naphthoquinone	NELAP	PA	1/19/2005
EPA 8270		1,4-Phenylenediamine	NELAP	PA	1/19/2005
EPA 8270		1-Chloronaphthalene	NELAP	PA	1/4/2006
EPA 8270		1-Methylnaphthalene	NELAP	PA	12/4/2007
EPA 8270		1-Naphthylamine (alpha-Naphthylamine)	NELAP	PA	4/4/2005
EPA 8270		2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl) ether)	NELAP	PA	10/30/2014
EPA 8270		2,3,4,6-Tetrachlorophenol	NELAP	PA	1/19/2005
EPA 8270		2,4,5-Trichlorophenol	NELAP	PA	1/19/2005
EPA 8270		2,4,6-Trichlorophenol	NELAP	PA	1/19/2005
EPA 8270		2,4-Dichlorophenol	NELAP	PA	1/19/2005
EPA 8270		2,4-Dimethylphenol	NELAP	PA	1/19/2005
EPA 8270		2,4-Dinitrophenol	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		2,4-Dinitrotoluene (2,4-DNT)	NELAP	PA	1/19/2005
EPA 8270		2,6-Dichlorophenol	NELAP	PA	1/19/2005
EPA 8270		2,6-Dinitrotoluene (2,6-DNT)	NELAP	PA	1/19/2005
EPA 8270		2-Acetylaminofluorene	NELAP	PA	1/19/2005
EPA 8270		2-Chloronaphthalene	NELAP	PA	1/19/2005
EPA 8270		2-Chlorophenol	NELAP	PA	1/19/2005
EPA 8270		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	NELAP	PA	1/19/2005
EPA 8270		2-Methylnaphthalene	NELAP	PA	1/19/2005
EPA 8270		2-Methylphenol (o-Cresol)	NELAP	PA	1/19/2005
EPA 8270		2-Naphthylamine (beta-Naphthylamine)	NELAP	PA	5/17/2005
EPA 8270		2-Nitroaniline	NELAP	PA	4/4/2005
EPA 8270		2-Nitrophenol	NELAP	PA	1/19/2005
EPA 8270		2-Picoline (2-Methylpyridine)	NELAP	PA	1/19/2005
EPA 8270		3+4-Methylphenol (m+p-Cresol)	NELAP	PA	1/19/2005
EPA 8270		3,3'-Dichlorobenzidine	NELAP	PA	1/19/2005
EPA 8270		3,3'-Dimethoxybenzidine	NELAP	PA	4/17/2009
EPA 8270		3,3'-Dimethylbenzidine	NELAP	PA	1/19/2005
EPA 8270		3-Methylcholanthrene	NELAP	PA	1/19/2005
EPA 8270		3-Nitroaniline	NELAP	PA	1/19/2005
EPA 8270		4,4'-Methylenebis(2-chloroaniline)	NELAP	PA	1/19/2005
EPA 8270		4-Aminobiphenyl	NELAP	PA	1/19/2005
EPA 8270		4-Bromopbenyl phenyl ether	NELAP	PA	1/19/2005
EPA 8270		4-Chloro-3-methylphenol	NELAP	PA	1/19/2005
EPA 8270		4-Chloroaniline	NELAP	PA	1/19/2005
EPA 8270		4-Chloropbenyl pbenyl ether	NELAP	PA	1/19/2005
EPA 8270		4-Nitroaniline	NELAP	PA	4/4/2005
EPA 8270		4-Nitrophenol	NELAP	PA	1/19/2005
EPA 8270		4-Nitroquinoline-1-oxide	NELAP	PA	7/3/2007
EPA 8270		5-Nitro-o-toluidine	NELAP	PA	4/4/2005
EPA 8270		6-Methylchrysene	NELAP	PA	12/4/2007
EPA 8270		7,12-Dimethylbenz(a)anthracene	NELAP	PA	1/19/2005
EPA 8270		Acenaphthene	NELAP	PA	1/19/2005
EPA 8270		Acenaphthylene	NELAP	PA	1/19/2005
EPA 8270		Acetophenone	NELAP	PA	1/19/2005
EPA 8270		Acrylamide	NELAP	PA	1/21/2009
EPA 8270		Aniline	NELAP	PA	1/19/2005
EPA 8270		Anthracene	NELAP	PA	1/19/2005
EPA 8270		Aramite	NELAP	PA	5/17/2005
EPA 8270		Atrazine	NELAP	PA	1/12/2007
EPA 8270		Benzaldehyde	NELAP	PA	12/4/2007
EPA 8270		Benzenethiol	NELAP	PA	12/4/2007
EPA 8270		Benzidine	NELAP	PA	1/19/2005
EPA 8270		Benzo[a]anthracene	NELAP	PA	1/19/2005
EPA 8270		Benzo[a]pyrene	NELAP	PA	1/19/2005
EPA 8270		Benzo[b]fluoranthene	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		Benzo[ghi]perylene	NELAP	PA	1/19/2005
EPA 8270		Benzo[k]fluoranthene	NELAP	PA	1/19/2005
EPA 8270		Benzoic acid	NELAP	PA	1/19/2005
EPA 8270		Benzyl alcohol	NELAP	PA	1/19/2005
EPA 8270		Butyl benzyl phthalate (Benzyl butyl phthalate)	NELAP	PA	5/17/2005
EPA 8270		Caprolactam	NELAP	PA	12/4/2007
EPA 8270		Carbazole	NELAP	PA	1/19/2005
EPA 8270		Chlorobenzilate	NELAP	PA	5/2/2006
EPA 8270		Chrysene (Benzo[a]phenanthrene)	NELAP	PA	1/19/2005
EPA 8270		Di-n-butyl phthalate	NELAP	PA	1/19/2005
EPA 8270		Di-n-octyl phthalate	NELAP	PA	1/19/2005
EPA 8270		Diallate (cis or trans)	NELAP	PA	5/2/2006
EPA 8270		Dibenz[a,h]acridine	NELAP	PA	12/4/2007
EPA 8270		Dibenz[a,j]acridine	NELAP	PA	5/17/2005
EPA 8270		Dibenzo[a,h]anthracene	NELAP	PA	1/19/2005
EPA 8270		Dibenzofuran	NELAP	PA	1/19/2005
EPA 8270		Diethyl phthalate	NELAP	PA	1/19/2005
EPA 8270		Dimethoate	NELAP	PA	5/2/2006
EPA 8270		Dimethyl phthalate	NELAP	PA	1/19/2005
EPA 8270		Diphenylamine	NELAP	PA	5/2/2006
EPA 8270		Disulfoton	NELAP	PA	7/1/2007
EPA 8270		Ethyl methanesulfonate	NELAP	PA	1/19/2005
EPA 8270		Famphur	NELAP	PA	5/2/2006
EPA 8270		Fluoranthene	NELAP	PA	1/19/2005
EPA 8270		Fluorene	NELAP	PA	1/19/2005
EPA 8270		Hexachlorobenzene	NELAP	PA	1/19/2005
EPA 8270		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	PA	1/19/2005
EPA 8270		Hexachlorocyclopentadiene	NELAP	PA	1/19/2005
EPA 8270		Hexachloroethane	NELAP	PA	1/19/2005
EPA 8270		Hexachloropropene	NELAP	PA	1/19/2005
EPA 8270		Indene	NELAP	PA	12/4/2007
EPA 8270		Indeno(1,2,3-cd)pyrene	NELAP	PA	1/19/2005
EPA 8270		Isodrin	NELAP	PA	5/2/2006
EPA 8270		Isophorone	NELAP	PA	1/19/2005
EPA 8270		Isosafrole	NELAP	PA	1/19/2005
EPA 8270		Kepone	NELAP	PA	5/2/2006
EPA 8270		Malononitrile	NELAP	PA	5/23/2013
EPA 8270		Methapyrilene	NELAP	PA	1/19/2005
EPA 8270		Methyl methanesulfonate	NELAP	PA	1/19/2005
EPA 8270		Methyl parathion (Parathion, methyl)	NELAP	PA	5/25/2007
EPA 8270		N,N-Dimethylacetamide	NELAP	PA	12/4/2007
EPA 8270		N,N-Dimethylformamide	NELAP	PA	12/4/2007
EPA 8270		N-Nitrosodi-n-butylamine	NELAP	PA	1/19/2005
EPA 8270		N-Nitrosodi-n-propylamine	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		N-Nitrosodiethylamine	NELAP	PA	1/19/2005
EPA 8270		N-Nitrosodimethylamine	NELAP	PA	1/19/2005
EPA 8270		N-Nitrosodiphenylamine	NELAP	PA	1/19/2005
EPA 8270		N-Nitrosomethylethylamine	NELAP	PA	1/19/2005
EPA 8270		N-Nitrosomorpholine	NELAP	PA	1/19/2005
EPA 8270		N-Nitrosopiperidine	NELAP	PA	1/19/2005
EPA 8270		N-Nitrosopyrrolidine	NELAP	PA	1/19/2005
EPA 8270		Naphthalene	NELAP	PA	1/19/2005
EPA 8270		Nitrobenzene	NELAP	PA	1/4/2006
EPA 8270		O,O,O-Triethyl phosphorothioate	NELAP	PA	5/2/2006
EPA 8270		Parathion, ethyl (Ethyl parathion, Parathion)	NELAP	PA	5/25/2007
EPA 8270		Pentachlorobenzene	NELAP	PA	1/19/2005
EPA 8270		Pentachloronitrobenzene (PCNB)	NELAP	PA	1/19/2005
EPA 8270		Pentachlorophenol (PCP)	NELAP	PA	1/19/2005
EPA 8270		Phenacetin	NELAP	PA	1/19/2005
EPA 8270		Phenanthrene	NELAP	PA	1/19/2005
EPA 8270		Phenol	NELAP	PA	1/19/2005
EPA 8270		Phorate (Thimet)	NELAP	PA	5/2/2006
EPA 8270		Phthalic anhydride	NELAP	PA	1/21/2009
EPA 8270		Pronamide (Kerb)	NELAP	PA	1/19/2005
EPA 8270		Pyrene	NELAP	PA	1/19/2005
EPA 8270		Pyridine	NELAP	PA	4/4/2005
EPA 8270		Quinoline	NELAP	PA	12/4/2007
EPA 8270	C	SOCs by GC/MS	NELAP	PA	3/26/2012
EPA 8270	D	SOCs by GC/MS	NELAP	PA	3/26/2012
EPA 8270		Safrole	NELAP	PA	1/19/2005
EPA 8270		Sulfotepp (Tetraethyl dithiopyrophosphate)	NELAP	PA	12/4/2007
EPA 8270		Tetraethyl lead	NELAP	PA	3/7/2012
EPA 8270		Thionazine (Thionazin, Zinophos)	NELAP	PA	5/2/2006
EPA 8270		a,a-Dimethylphenethylamine (Phentermine)	NELAP	PA	5/2/2006
EPA 8270		bis(2-Chloroethoxy)methane	NELAP	PA	1/19/2005
EPA 8270		bis(2-Chloroethyl) ether	NELAP	PA	1/19/2005
EPA 8270		bis(2-Chloroisopropyl) ether	NELAP	PA	1/4/2006
EPA 8270		bis(2-Chloromethyl) ether	NELAP	PA	1/21/2009
EPA 8270		bis(2-Ethylhexyl) adipate (di(2-Ethylhexyl) adipate)	NELAP	PA	1/21/2009
EPA 8270		bis(2-Ethylhexyl) phthalate (DEHP)	NELAP	PA	1/19/2005
EPA 8270		o-Toluidine (2-Toluidine, 2-Methylaniline)	NELAP	PA	1/19/2005
EPA 8270		p-(Dimethylamino)azobenzene	NELAP	PA	5/2/2006
EPA 8270		p-Chloronitrobenzene	NELAP	PA	1/21/2009
EPA 8270		tris-(2,3-Dibromopropyl) phosphate (tris-BP)	NELAP	PA	12/4/2007
EPA 8270 SIM		1-Methylnaphthalene	NELAP	PA	7/25/2011
EPA 8270 SIM		2-Methylnaphthalene	NELAP	PA	5/23/2012
EPA 8270 SIM		Acenaphthene	NELAP	PA	12/4/2007
EPA 8270 SIM		Acenaphthylene	NELAP	PA	12/4/2007

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270 SIM		Anthracene	NELAP	PA	12/4/2007
EPA 8270 SIM		Benzo[a]anthracene	NELAP	PA	12/4/2007
EPA 8270 SIM		Benzo[a]pyrene	NELAP	PA	12/4/2007
EPA 8270 SIM		Benzo[b]fluoranthene	NELAP	PA	12/4/2007
EPA 8270 SIM		Benzo[ghi]perylene	NELAP	PA	12/4/2007
EPA 8270 SIM		Benzo[k]fluoranthene	NELAP	PA	12/4/2007
EPA 8270 SIM		Chrysene (Benzo[a]phenanthrene)	NELAP	PA	12/4/2007
EPA 8270 SIM		Dibenzo[a,h]anthracene	NELAP	PA	12/4/2007
EPA 8270 SIM		Fluoranthene	NELAP	PA	12/4/2007
EPA 8270 SIM		Fluorene	NELAP	PA	12/4/2007
EPA 8270 SIM		Indeno(1,2,3-cd)pyrene	NELAP	PA	12/4/2007
EPA 8270 SIM		Naphthalene	NELAP	PA	12/4/2007
EPA 8270 SIM		Phenanthrene	NELAP	PA	12/4/2007
EPA 8270 SIM		Pyrene	NELAP	PA	12/4/2007
EPA 8290		1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	8/6/2010
EPA 8290		1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	NELAP	PA	6/30/2010
EPA 8290		1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	NELAP	PA	6/30/2010
EPA 8290		2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 8290		2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	NELAP	PA	8/6/2010
EPA 8290		2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)(Dioxin)	NELAP	PA	6/30/2010
EPA 8290		2,3,7,8-Tetrachlorodibenzofuran (TCDF)	NELAP	PA	6/30/2010
EPA 8290		PCDDs and PCDFs by HRGC-HRMS	NELAP	PA	3/26/2012
EPA 8290	A	PCDDs and PCDFs by HRGC-HRMS	NELAP	PA	3/4/2015
EPA 8290		Total TCDD	NELAP	PA	6/30/2010

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8290		Total TCDF	NELAP	PA	6/30/2010
EPA 8290		Total heptachlorodibenzo-p-dioxin (HpCDD)	NELAP	PA	6/30/2010
EPA 8290		Total heptachlorodibenzofuran (HpCDF)	NELAP	PA	6/30/2010
EPA 8290		Total hexachlorodibenzo-p-dioxin (HxCDD)	NELAP	PA	6/30/2010
EPA 8290		Total hexachlorodibenzofuran (HxCDF)	NELAP	PA	6/30/2010
EPA 8290		Total pentachlorodibenzo-p-dioxin (PeCDD)	NELAP	PA	6/30/2010
EPA 8290		Total pentachlorodibenzofuran (PeCDF)	NELAP	PA	6/30/2010
EPA 8315		2,5-Dimethylbenzaldehyde	NELAP	PA	1/21/2009
EPA 8315		Acetaldehyde	NELAP	PA	1/21/2009
EPA 8315		Benzaldehyde	NELAP	PA	1/21/2009
EPA 8315		Butanal (Butyraldehyde)	NELAP	PA	1/21/2009
EPA 8315	A	Carbonyl compounds by HPLC	NELAP	PA	3/26/2012
EPA 8315		Crotonaldehyde	NELAP	PA	1/21/2009
EPA 8315		Formaldehyde	NELAP	PA	1/19/2005
EPA 8315		Hexanal (Hexaldehyde)	NELAP	PA	1/21/2009
EPA 8315		Isovaleraldehyde	NELAP	PA	1/21/2009
EPA 8315		Pentanal (Valeraldehyde)	NELAP	PA	1/21/2009
EPA 8315		Propanal (Propionaldehyde)	NELAP	PA	1/21/2009
EPA 8315		m-Tolualdehyde (1,3-Tolualdehyde)	NELAP	PA	1/21/2009
EPA 8315		o-Tolualdehyde (1,2-Tolualdehyde)	NELAP	PA	1/21/2009
EPA 8315		p-Tolualdehyde (1,4-Tolualdehyde)	NELAP	PA	1/21/2009
EPA 8318		3-Hydroxycarbofuran	NELAP	PA	4/4/2005
EPA 8318		Aldicarb (Temik)	NELAP	PA	4/4/2005
EPA 8318		Aldicarb sulfone	NELAP	PA	4/4/2005
EPA 8318		Aldicarb sulfoxide	NELAP	PA	12/12/2005
EPA 8318		Carbaryl (Sevin)	NELAP	PA	4/4/2005
EPA 8318		Carbofuran (Furaden)	NELAP	PA	4/4/2005
EPA 8318		Methiocarb (Mesurol)	NELAP	PA	4/4/2005
EPA 8318		Methomyl (Lannate)	NELAP	PA	4/4/2005
EPA 8318	A	N-Methylcarbamates by HPLC	NELAP	PA	10/15/2012
EPA 8318		Oxamyl (Vydate)	NELAP	PA	12/12/2005
EPA 8318		Propoxur (Baygon)	NELAP	PA	4/4/2005
EPA 8330		1,3,5-Trinitrobenzene (1,3,5-TNB)	NELAP	PA	1/19/2005
EPA 8330		1,3-Dinitrobenzene (1,3-DNB)	NELAP	PA	1/19/2005
EPA 8330		2,4,6-Trinitrotoluene (2,4,6-TNT)	NELAP	PA	1/19/2005
EPA 8330		2,4-Diamino-6-nitrotoluene	NELAP	PA	7/29/2015
EPA 8330		2,4-Dinitrotoluene (2,4-DNT)	NELAP	PA	1/19/2005
EPA 8330		2,6-Diamino-4-nitrotoluene	NELAP	PA	7/29/2015
EPA 8330		2,6-Dinitrotoluene (2,6-DNT)	NELAP	PA	1/19/2005
EPA 8330		2-Amino-4,6-dinitrotoluene (2-Am-DNT)	NELAP	PA	1/19/2005
EPA 8330		2-Nitrotoluene	NELAP	PA	1/19/2005
EPA 8330		3,5-Dinitroaniline	NELAP	PA	7/29/2015
EPA 8330		3-Nitrotoluene	NELAP	PA	1/19/2005
EPA 8330		4-Amino-2,6-dinitrotoluene (4-Am-DNT)	NELAP	PA	1/19/2005
EPA 8330		4-Nitrotoluene	NELAP	PA	1/19/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 014-006 expiration date January 31, 2016. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 36-00037 EPA Lab Code: PA00009 TNI Code: (717) 656-2300
PADWIS ID: 36037

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8330		Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	NELAP	PA	1/19/2005
EPA 8330		Nitroaromatics and nitramines by HPLC/UV	NELAP	PA	3/26/2012
EPA 8330	A	Nitroaromatics and nitramines by HPLC/UV	NELAP	PA	3/26/2012
EPA 8330	B	Nitroaromatics and nitramines by HPLC/UV	NELAP	PA	7/29/2015
EPA 8330		Nitrobenzene	NELAP	PA	1/19/2005
EPA 8330		Nitroglycerin	NELAP	PA	10/9/2013
EPA 8330		Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	NELAP	PA	1/24/2006
EPA 8330		Pentaerythritol tetranitrate (PETN)	NELAP	PA	11/21/2005
EPA 8330		RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	NELAP	PA	1/19/2005
EPA 9012		Total cyanide	NELAP	PA	4/18/2013
EPA 9045		pH	NELAP	PA	11/19/2008
EPA 9050	A	Conductivity	NELAP	PA	1/27/2014
EPA 9050		Conductivity	NELAP	PA	5/17/2005
EPA 9060		Total organic carbon (TOC)	NELAP	PA	1/19/2005
EPA 9066		Total phenolics	NELAP	PA	4/4/2005
EPA 9071	B	Oil and grease	NELAP	PA	1/19/2005
EPA 9081		Cation exchange capacity of soils (Ammonium acetate)	NELAP	PA	5/25/2005
EPA 9095	A	Paint filter liquids test	NELAP	PA	1/24/2007
EPA Lloyd Kahn Method		Total organic carbon (TOC)	NELAP	PA	10/9/2013
FL-PRO		Total petroleum hydrocarbons (TPH)	NELAP	PA	12/12/2005
MA DEP EPH	1.1	C11-C22 Aromatics	NELAP	PA	7/15/2013
MA DEP EPH	1.1	C19-C36 Aliphatics	NELAP	PA	7/15/2013
MA DEP EPH	1.1	C9-C18 Aliphatics	NELAP	PA	7/15/2013
MA DEP VPH	1.1	C5-C8 Aliphatics	NELAP	PA	7/15/2013
MA DEP VPH	1.1	C9-C10 Aromatics	NELAP	PA	7/15/2013
MA DEP VPH	1.1	C9-C12 Aliphatics	NELAP	PA	7/15/2013
NWTPH-Dx		Diesel-range organics (DRO)	NELAP	PA	12/12/2005
NWTPH-Gx		Gasoline-range organics (GRO)	NELAP	PA	12/12/2005
SM 2540 G		Residue, total	NELAP	PA	2/25/2014
SM 2540 G		Total, fixed, and volatile residue	NELAP	PA	3/19/2015
SM 5310 B		Total organic carbon (TOC)	NELAP	PA	10/9/2013
TX1005 (TNRCC)		Total petroleum hydrocarbons (TPH)	NELAP	PA	12/12/2005
TX1006 (TNRCC)		Total petroleum hydrocarbons (TPH)	NELAP	PA	12/12/2005
WA-EPH		Diesel-range organics (DRO)	NELAP	PA	12/12/2005
WA-VPH		Gasoline-range organics (GRO)	NELAP	PA	12/12/2005
WI-DRO		Diesel-range organics (DRO)	NELAP	PA	12/12/2005
WI-GRO		Gasoline-range organics (GRO)	NELAP	PA	12/12/2005

The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY
Issue Date: July 1, 2015

Eurofins Lancaster Laboratories Inc
AI Number: 30729
Expiration Date: June 30, 2016

2425 New Holland Pike, Lancaster, Pennsylvania 17601-5994

Certificate Number: 02055

Air Emissions

Analyte	Method Name	Method Code	Type	AB
4385 - Bromobenzene	EPA TO-15 (extended)	2368	NELAP	LA
4577 - Chlorodifluoromethane (Freon-22)	EPA TO-15 (extended)	2368	NELAP	LA
4627 - Dichlorofluoromethane (Freon 21)	EPA TO-15 (extended)	2368	NELAP	LA
4645 - cis-1,2-Dichloroethylene	EPA TO-15 (extended)	2368	NELAP	LA
5027 - n-Octane	EPA TO-15 (extended)	2368	NELAP	LA
5028 - n-Pentane	EPA TO-15 (extended)	2368	NELAP	LA
100170 - Gaseous Organic Compound Emissions	EPA 18	10246636	NELAP	LA
100077 - Gaseous Nonmethane Organic Emissions	EPA Method 25	10246738	NELAP	LA
5105 - 1,1,1,2-Tetrachloroethane	EPA TO-15	10248803	NELAP	LA
5160 - 1,1,1-Trichloroethane	EPA TO-15	10248803	NELAP	LA
5110 - 1,1,2,2-Tetrachloroethane	EPA TO-15	10248803	NELAP	LA
5195 - 1,1,2-Trichloro-1,2,2-trifluoroethane	EPA TO-15	10248803	NELAP	LA
5165 - 1,1,2-Trichloroethane	EPA TO-15	10248803	NELAP	LA
4630 - 1,1-Dichloroethane	EPA TO-15	10248803	NELAP	LA
4640 - 1,1-Dichloroethylene	EPA TO-15	10248803	NELAP	LA
5155 - 1,2,4-Trichlorobenzene	EPA TO-15	10248803	NELAP	LA
5210 - 1,2,4-Trimethylbenzene	EPA TO-15	10248803	NELAP	LA
4570 - 1,2-Dibromo-3-chloropropane (DBCP)	EPA TO-15	10248803	NELAP	LA
4585 - 1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-15	10248803	NELAP	LA
4695 - 1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon-114)	EPA TO-15	10248803	NELAP	LA
4610 - 1,2-Dichlorobenzene	EPA TO-15	10248803	NELAP	LA
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA TO-15	10248803	NELAP	LA
4655 - 1,2-Dichloropropane	EPA TO-15	10248803	NELAP	LA
5215 - 1,3,5-Trimethylbenzene	EPA TO-15	10248803	NELAP	LA
9318 - 1,3-Butadiene	EPA TO-15	10248803	NELAP	LA
4615 - 1,3-Dichlorobenzene	EPA TO-15	10248803	NELAP	LA
4620 - 1,4-Dichlorobenzene	EPA TO-15	10248803	NELAP	LA
4735 - 1,4-Dioxane (1,4- Diethyleneoxide)	EPA TO-15	10248803	NELAP	LA
5220 - 2,2,4-Trimethylpentane (Isooctane)	EPA TO-15	10248803	NELAP	LA
4410 - 2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-15	10248803	NELAP	LA
4535 - 2-Chlorotoluene	EPA TO-15	10248803	NELAP	LA
4860 - 2-Hexanone	EPA TO-15	10248803	NELAP	LA
4542 - 4-Ethyltoluene	EPA TO-15	10248803	NELAP	LA
4995 - 4-Methyl-2-pentanone (MIBK)	EPA TO-15	10248803	NELAP	LA
4315 - Acetone	EPA TO-15	10248803	NELAP	LA
4320 - Acetonitrile	EPA TO-15	10248803	NELAP	LA
4325 - Acrolein (Propenal)	EPA TO-15	10248803	NELAP	LA
4340 - Acrylonitrile	EPA TO-15	10248803	NELAP	LA
4355 - Allyl chloride (3-Chloropropene)	EPA TO-15	10248803	NELAP	LA
4375 - Benzene	EPA TO-15	10248803	NELAP	LA
5635 - Benzyl chloride	EPA TO-15	10248803	NELAP	LA
4395 - Bromodichloromethane	EPA TO-15	10248803	NELAP	LA
4400 - Bromoform	EPA TO-15	10248803	NELAP	LA

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Air Emissions

Analyte	Method Name	Method Code	Type	AB
4450 - Carbon disulfide	EPA TO-15	10248803	NELAP	LA
4455 - Carbon tetrachloride	EPA TO-15	10248803	NELAP	LA
4475 - Chlorobenzene	EPA TO-15	10248803	NELAP	LA
4575 - Chlorodibromomethane	EPA TO-15	10248803	NELAP	LA
4485 - Chloroethane (Ethyl chloride)	EPA TO-15	10248803	NELAP	LA
4505 - Chloroform	EPA TO-15	10248803	NELAP	LA
4555 - Cyclohexane	EPA TO-15	10248803	NELAP	LA
9375 - Di-isopropylether (DIPE) (Isopropyl ether)	EPA TO-15	10248803	NELAP	LA
4595 - Dibromomethane (Methylene bromide)	EPA TO-15	10248803	NELAP	LA
4625 - Dichlorodifluoromethane (Freon-12)	EPA TO-15	10248803	NELAP	LA
4750 - Ethanol	EPA TO-15	10248803	NELAP	LA
4755 - Ethyl acetate	EPA TO-15	10248803	NELAP	LA
4760 - Ethyl acrylate	EPA TO-15	10248803	NELAP	LA
4810 - Ethyl methacrylate	EPA TO-15	10248803	NELAP	LA
4770 - Ethyl-t-butyl ether (ETBE) (2-Ethoxy-2-methylpropane)	EPA TO-15	10248803	NELAP	LA
4765 - Ethylbenzene	EPA TO-15	10248803	NELAP	LA
4835 - Hexachlorobutadiene	EPA TO-15	10248803	NELAP	LA
4840 - Hexachloroethane	EPA TO-15	10248803	NELAP	LA
4870 - Iodomethane (Methyl iodide)	EPA TO-15	10248803	NELAP	LA
4900 - Isopropylbenzene	EPA TO-15	10248803	NELAP	LA
4945 - Methyl acrylate	EPA TO-15	10248803	NELAP	LA
4950 - Methyl bromide (Bromomethane)	EPA TO-15	10248803	NELAP	LA
4960 - Methyl chloride (Chloromethane)	EPA TO-15	10248803	NELAP	LA
100201 - Methyl isobutyl ketone (Hexanone)	EPA TO-15	10248803	NELAP	LA
4990 - Methyl methacrylate	EPA TO-15	10248803	NELAP	LA
5000 - Methyl tert-butyl ether (MTBE)	EPA TO-15	10248803	NELAP	LA
4975 - Methylene chloride (Dichloromethane)	EPA TO-15	10248803	NELAP	LA
5005 - Naphthalene	EPA TO-15	10248803	NELAP	LA
4836 - Propylene	EPA TO-15	10248803	NELAP	LA
5100 - Styrene	EPA TO-15	10248803	NELAP	LA
4370 - T-amylmethylether (TAME)	EPA TO-15	10248803	NELAP	LA
5115 - Tetrachloroethylene (Perchloroethylene)	EPA TO-15	10248803	NELAP	LA
5120 - Tetrahydrofuran (THF)	EPA TO-15	10248803	NELAP	LA
5140 - Toluene	EPA TO-15	10248803	NELAP	LA
5170 - Trichloroethene (Trichloroethylene)	EPA TO-15	10248803	NELAP	LA
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA TO-15	10248803	NELAP	LA
5225 - Vinyl acetate	EPA TO-15	10248803	NELAP	LA
5230 - Vinyl bromide (Bromoethane)	EPA TO-15	10248803	NELAP	LA
5235 - Vinyl chloride	EPA TO-15	10248803	NELAP	LA
5260 - Xylene (total)	EPA TO-15	10248803	NELAP	LA
4705 - cis & trans-1,2-Dichloroethene	EPA TO-15	10248803	NELAP	LA
4645 - cis-1,2-Dichloroethylene	EPA TO-15	10248803	NELAP	LA
4680 - cis-1,3-Dichloropropene	EPA TO-15	10248803	NELAP	LA
5240 - m+p-xylene	EPA TO-15	10248803	NELAP	LA
5245 - m-Xylene	EPA TO-15	10248803	NELAP	LA
4435 - n-Butylbenzene	EPA TO-15	10248803	NELAP	LA
4825 - n-Heptane	EPA TO-15	10248803	NELAP	LA
4855 - n-Hexane	EPA TO-15	10248803	NELAP	LA
5090 - n-Propylbenzene	EPA TO-15	10248803	NELAP	LA

Air Emissions

Analyte	Method Name	Method Code	Type	AB
5250 - o-Xylene	EPA TO-15	10248803	NELAP	LA
5255 - p-Xylene	EPA TO-15	10248803	NELAP	LA
4440 - sec-Butylbenzene	EPA TO-15	10248803	NELAP	LA
4420 - tert-Butyl alcohol	EPA TO-15	10248803	NELAP	LA
4445 - tert-Butylbenzene	EPA TO-15	10248803	NELAP	LA
4700 - trans-1,2-Dichloroethylene	EPA TO-15	10248803	NELAP	LA
4685 - trans-1,3-Dichloropropylene	EPA TO-15	10248803	NELAP	LA
5105 - 1,1,1,2-Tetrachloroethane	EPA TO-14A, Rev.2	10312002	NELAP	LA
5160 - 1,1,1-Trichloroethane	EPA TO-14A, Rev.2	10312002	NELAP	LA
5110 - 1,1,2,2-Tetrachloroethane	EPA TO-14A, Rev.2	10312002	NELAP	LA
5195 - 1,1,2-Trichloro-1,2,2-trifluoroethane	EPA TO-14A, Rev.2	10312002	NELAP	LA
5165 - 1,1,2-Trichloroethane	EPA TO-14A, Rev.2	10312002	NELAP	LA
4630 - 1,1-Dichloroethane	EPA TO-14A, Rev.2	10312002	NELAP	LA
4640 - 1,1-Dichloroethylene	EPA TO-14A, Rev.2	10312002	NELAP	LA
5180 - 1,2,3-Trichloropropane	EPA TO-14A, Rev.2	10312002	NELAP	LA
5155 - 1,2,4-Trichlorobenzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
5210 - 1,2,4-Trimethylbenzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4585 - 1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4695 - 1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon-114)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4610 - 1,2-Dichlorobenzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4655 - 1,2-Dichloropropane	EPA TO-14A, Rev.2	10312002	NELAP	LA
5215 - 1,3,5-Trimethylbenzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4615 - 1,3-Dichlorobenzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4835 - 1,3-Hexachlorobutadiene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4620 - 1,4-Dichlorobenzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4735 - 1,4-Dioxane (1,4- Diethyleneoxide)	EPA TO-14A, Rev.2	10312002	NELAP	LA
5220 - 2,2,4-Trimethylpentane (Isooctane)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4410 - 2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4860 - 2-Hexanone	EPA TO-14A, Rev.2	10312002	NELAP	LA
4542 - 4-Ethyltoluene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4995 - 4-Methyl-2-pentanone (MIBK)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4315 - Acetone	EPA TO-14A, Rev.2	10312002	NELAP	LA
4375 - Benzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
5635 - Benzyl chloride	EPA TO-14A, Rev.2	10312002	NELAP	LA
4385 - Bromobenzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4395 - Bromodichloromethane	EPA TO-14A, Rev.2	10312002	NELAP	LA
4400 - Bromoform	EPA TO-14A, Rev.2	10312002	NELAP	LA
4450 - Carbon disulfide	EPA TO-14A, Rev.2	10312002	NELAP	LA
4455 - Carbon tetrachloride	EPA TO-14A, Rev.2	10312002	NELAP	LA
4475 - Chlorobenzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4485 - Chloroethane (Ethyl chloride)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4505 - Chloroform	EPA TO-14A, Rev.2	10312002	NELAP	LA
4555 - Cyclohexane	EPA TO-14A, Rev.2	10312002	NELAP	LA
4625 - Dichlorodifluoromethane (Freon-12)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4755 - Ethyl acetate	EPA TO-14A, Rev.2	10312002	NELAP	LA
4765 - Ethylbenzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4835 - Hexachlorobutadiene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4950 - Methyl bromide (Bromomethane)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4960 - Methyl chloride (Chloromethane)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4990 - Methyl methacrylate	EPA TO-14A, Rev.2	10312002	NELAP	LA
5000 - Methyl tert-butyl ether (MTBE)	EPA TO-14A, Rev.2	10312002	NELAP	LA

Air Emissions

Analyte	Method Name	Method Code	Type	AB
4975 - Methylene chloride (Dichloromethane)	EPA TO-14A, Rev.2	10312002	NELAP	LA
5100 - Styrene	EPA TO-14A, Rev.2	10312002	NELAP	LA
5115 - Tetrachloroethylene (Perchloroethylene)	EPA TO-14A, Rev.2	10312002	NELAP	LA
5140 - Toluene	EPA TO-14A, Rev.2	10312002	NELAP	LA
5170 - Trichloroethene (Trichloroethylene)	EPA TO-14A, Rev.2	10312002	NELAP	LA
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA TO-14A, Rev.2	10312002	NELAP	LA
5225 - Vinyl acetate	EPA TO-14A, Rev.2	10312002	NELAP	LA
5235 - Vinyl chloride	EPA TO-14A, Rev.2	10312002	NELAP	LA
5260 - Xylene (total)	EPA TO-14A, Rev.2	10312002	NELAP	LA
4645 - cis-1,2-Dichloroethylene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4680 - cis-1,3-Dichloropropene	EPA TO-14A, Rev.2	10312002	NELAP	LA
5240 - m+p-xylene	EPA TO-14A, Rev.2	10312002	NELAP	LA
5027 - n-Octane	EPA TO-14A, Rev.2	10312002	NELAP	LA
5028 - n-Pentane	EPA TO-14A, Rev.2	10312002	NELAP	LA
5090 - n-Propylbenzene	EPA TO-14A, Rev.2	10312002	NELAP	LA
5250 - o-Xylene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4700 - trans-1,2-Dichloroethylene	EPA TO-14A, Rev.2	10312002	NELAP	LA
4685 - trans-1,3-Dichloropropylene	EPA TO-14A, Rev.2	10312002	NELAP	LA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9369 - Diesel range organics (DRO)	Texas 1006	867	NELAP	PA
6211 - EPH Aliphatic >C10-C12	Texas 1006	867	NELAP	PA
6212 - EPH Aliphatic >C12-C16	Texas 1006	867	NELAP	PA
6214 - EPH Aliphatic >C16-C21	Texas 1006	867	NELAP	PA
6216 - EPH Aliphatic >C21-C34	Texas 1006	867	NELAP	PA
6224 - EPH Aromatic >C10-C12	Texas 1006	867	NELAP	PA
6226 - EPH Aromatic >C12-C16	Texas 1006	867	NELAP	PA
6228 - EPH Aromatic >C16-C21	Texas 1006	867	NELAP	PA
6231 - EPH Aromatic >C21-C34	Texas 1006	867	NELAP	PA
6236 - EPH Aromatic C8-C10	Texas 1006	867	NELAP	PA
100163 - 1,5-pentanediol	EPA 625 (extended)	2326	NELAP	PA
100164 - 1,6-hexanediol	EPA 625 (extended)	2326	NELAP	PA
5145 - 2-Methylaniline (o-Toluidine)	EPA 625 (extended)	2326	NELAP	PA
6205 - Diphenylamine	EPA 625 (extended)	2326	NELAP	PA
6298 - Hexanoic acid	EPA 625 (extended)	2326	NELAP	PA
6335 - Maleic anhydride	EPA 625 (extended)	2326	NELAP	PA
5035 - Pentachloroethane	EPA 625 (extended)	2326	NELAP	PA
9547 - Pentanoic Acid	EPA 625 (extended)	2326	NELAP	PA
100199 - Sulfolane	EPA 625 (extended)	2326	NELAP	PA
100253 - Toluene diamines (total)	EPA 625 (extended)	2326	NELAP	PA
8262 - Tributyl phosphate	EPA 625 (extended)	2326	NELAP	PA
100252 - p-Toluidine	EPA 625 (extended)	2326	NELAP	PA
4720 - Diethylene glycol	EPA 8015C (extended)	2331	NELAP	PA
6657 - Propylene Glycol	EPA 8015C (extended)	2331	NELAP	PA
9646 - Triethylene Glycol	EPA 8015C (extended)	2331	NELAP	PA
4670 - 1,1-Dichloropropene	EPA 624 (extended)	2337	NELAP	PA
5150 - 1,2,3-Trichlorobenzene	EPA 624 (extended)	2337	NELAP	PA
4660 - 1,3-Dichloropropane	EPA 624 (extended)	2337	NELAP	PA
4675 - 1,3-Dichloropropene	EPA 624 (extended)	2337	NELAP	PA
4665 - 2,2-Dichloropropane	EPA 624 (extended)	2337	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
4535 - 2-Chlorotoluene	EPA 624 (extended)	2337	NELAP	PA
4540 - 4-Chlorotoluene	EPA 624 (extended)	2337	NELAP	PA
4910 - 4-Isopropyltoluene (p-Cymene)	EPA 624 (extended)	2337	NELAP	PA
4385 - Bromobenzene	EPA 624 (extended)	2337	NELAP	PA
4870 - Iodomethane (Methyl iodide)	EPA 624 (extended)	2337	NELAP	PA
4900 - Isopropylbenzene	EPA 624 (extended)	2337	NELAP	PA
4435 - n-Butylbenzene	EPA 624 (extended)	2337	NELAP	PA
5090 - n-Propylbenzene	EPA 624 (extended)	2337	NELAP	PA
4440 - sec-Butylbenzene	EPA 624 (extended)	2337	NELAP	PA
4445 - tert-Butylbenzene	EPA 624 (extended)	2337	NELAP	PA
1605 - Color	EPA 110.2	10005400	NELAP	PA
1755 - Total hardness as CaCO3	EPA 120.1	10006209	NELAP	PA
1610 - Conductivity	EPA 120.1	10006403	NELAP	PA
1750 - Hardness	EPA 130.2	10007202	NELAP	PA
1755 - Total hardness as CaCO3	EPA 130.2	10007202	NELAP	PA
1900 - pH	EPA 150.1	10008205	NELAP	PA
1955 - Residue-filterable (TDS)	EPA 160.1	10009004	NELAP	PA
1955 - Residue-filterable (TDS)	EPA 160.1	10009208	NELAP	PA
1960 - Residue-nonfilterable (TSS)	EPA 160.2	10009402	NELAP	PA
1950 - Residue-total	EPA 160.3	10009800	NELAP	PA
1970 - Residue-volatile	EPA 160.4	10010205	NELAP	PA
1970 - Residue-volatile	EPA 160.4	10010409	NELAP	PA
2030 - Temperature, deg. C	EPA 170.1	10011004	NELAP	PA
2055 - Turbidity	EPA 180.1	10011402	NELAP	PA
2055 - Turbidity	EPA 180.1, Rev.2	10011800	NELAP	PA
1015 - Barium	EPA 200.7	10013408	NELAP	PA
1080 - Lithium	EPA 200.7	10013408	NELAP	PA
1000 - Aluminum	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1005 - Antimony	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1010 - Arsenic	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1015 - Barium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1020 - Beryllium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1025 - Boron	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1030 - Cadmium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1035 - Calcium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1040 - Chromium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1050 - Cobalt	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1055 - Copper	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1070 - Iron	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1075 - Lead	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1085 - Magnesium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1090 - Manganese	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1100 - Molybdenum	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1105 - Nickel	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1125 - Potassium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1140 - Selenium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1150 - Silver	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1155 - Sodium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1160 - Strontium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1165 - Thallium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1175 - Tin	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1180 - Titanium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1185 - Vanadium	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1190 - Zinc	EPA 200.7, Rev.4.4	10013806	NELAP	PA
1000 - Aluminum	EPA 200.7	10014207	NELAP	PA
1005 - Antimony	EPA 200.7	10014207	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
1010 - Arsenic	EPA 200.7	10014207	NELAP	PA
1015 - Barium	EPA 200.7	10014207	NELAP	PA
1020 - Beryllium	EPA 200.7	10014207	NELAP	PA
1025 - Boron	EPA 200.7	10014207	NELAP	PA
1030 - Cadmium	EPA 200.7	10014207	NELAP	PA
1035 - Calcium	EPA 200.7	10014207	NELAP	PA
1040 - Chromium	EPA 200.7	10014207	NELAP	PA
1050 - Cobalt	EPA 200.7	10014207	NELAP	PA
1055 - Copper	EPA 200.7	10014207	NELAP	PA
1070 - Iron	EPA 200.7	10014207	NELAP	PA
1075 - Lead	EPA 200.7	10014207	NELAP	PA
1085 - Magnesium	EPA 200.7	10014207	NELAP	PA
1090 - Manganese	EPA 200.7	10014207	NELAP	PA
1100 - Molybdenum	EPA 200.7	10014207	NELAP	PA
1105 - Nickel	EPA 200.7	10014207	NELAP	PA
1125 - Potassium	EPA 200.7	10014207	NELAP	PA
1140 - Selenium	EPA 200.7	10014207	NELAP	PA
1150 - Silver	EPA 200.7	10014207	NELAP	PA
1155 - Sodium	EPA 200.7	10014207	NELAP	PA
1165 - Thallium	EPA 200.7	10014207	NELAP	PA
1175 - Tin	EPA 200.7	10014207	NELAP	PA
1185 - Vanadium	EPA 200.7	10014207	NELAP	PA
1190 - Zinc	EPA 200.7	10014207	NELAP	PA
1000 - Aluminum	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1005 - Antimony	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1010 - Arsenic	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1015 - Barium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1020 - Beryllium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1025 - Boron	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1030 - Cadmium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1035 - Calcium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1040 - Chromium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1050 - Cobalt	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1055 - Copper	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1070 - Iron	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1075 - Lead	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1085 - Magnesium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1090 - Manganese	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1100 - Molybdenum	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1105 - Nickel	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1125 - Potassium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1140 - Selenium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1150 - Silver	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1155 - Sodium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1160 - Strontium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1165 - Thallium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1175 - Tin	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1180 - Titanium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1185 - Vanadium	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1190 - Zinc	EPA 200.8, Rev.5.4	10014605	NELAP	PA
1045 - Chromium VI	EPA 218.6	10027802	NELAP	PA
1045 - Chromium VI	EPA 218.6, Rev.3.3	10028009	NELAP	PA
1095 - Mercury	EPA 245.1, Rev.3	10036609	NELAP	PA
1540 - Bromide	EPA 300.0	10053006	NELAP	PA
1730 - Fluoride	EPA 300.0	10053006	NELAP	PA
1810 - Nitrate as N	EPA 300.0	10053006	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
1540 - Bromide	EPA 300.0, Rev.2.1	10053200	NELAP	PA
1575 - Chloride	EPA 300.0, Rev.2.1	10053200	NELAP	PA
1730 - Fluoride	EPA 300.0, Rev.2.1	10053200	NELAP	PA
1810 - Nitrate as N	EPA 300.0, Rev.2.1	10053200	NELAP	PA
1835 - Nitrite	EPA 300.0, Rev.2.1	10053200	NELAP	PA
1840 - Nitrite as N	EPA 300.0, Rev.2.1	10053200	NELAP	PA
2000 - Sulfate	EPA 300.0, Rev.2.1	10053200	NELAP	PA
1505 - Alkalinity as CaCO3	EPA 310.1	10054601	NELAP	PA
1575 - Chloride	EPA 325.3	10057406	NELAP	PA
1645 - Total Cyanide	EPA 335.4	10061402	NELAP	PA
1515 - Ammonia as N	EPA 350.1, Rev.2	10063602	NELAP	PA
1515 - Ammonia as N	EPA 350.2	10063806	NELAP	PA
1515 - Ammonia as N	EPA 350.3	10064207	NELAP	PA
1795 - Kjeldahl nitrogen - total	EPA 351.2	10065006	NELAP	PA
1795 - Kjeldahl nitrogen - total	EPA 351.2, Rev.2	10065404	NELAP	PA
1810 - Nitrate as N	EPA 353.2	10067206	NELAP	PA
1840 - Nitrite as N	EPA 353.2	10067206	NELAP	PA
1825 - Total Nitrate+Nitrite	EPA 353.2	10067206	NELAP	PA
1810 - Nitrate as N	EPA 353.2, Rev.2	10067604	NELAP	PA
1820 - Nitrate-Nitrite	EPA 353.2, Rev.2	10067604	NELAP	PA
1840 - Nitrite as N	EPA 353.2, Rev.2	10067604	NELAP	PA
1880 - Oxygen, dissolved	EPA 360.1	10069008	NELAP	PA
1910 - Total Phosphorus	EPA 365.1, Rev.2	10070005	NELAP	PA
1870 - Orthophosphate as P	EPA 365.3	10070607	NELAP	PA
1870 - Orthophosphate as P	EPA 365.3	10070801	NELAP	PA
2000 - Sulfate	EPA 375.4	10073606	NELAP	PA
2005 - Sulfide	EPA 376.2	10074405	NELAP	PA
1555 - Carbonaceous BOD, CBOD	EPA 405.1	10075408	NELAP	PA
1565 - Chemical oxygen demand	EPA 410.1	10075806	NELAP	PA
1565 - Chemical oxygen demand	EPA 410.4	10077006	NELAP	PA
1565 - Chemical oxygen demand	EPA 410.4, Rev.2	10077404	NELAP	PA
2040 - Total Organic Carbon	EPA 415.1	10078203	NELAP	PA
2040 - Total Organic Carbon	EPA 415.1	10078407	NELAP	PA
1905 - Total Phenolics	EPA 420.4, Rev.1	10080203	NELAP	PA
2025 - Surfactants - MBAS	EPA 425.1	10080601	NELAP	PA
4375 - Benzene	EPA 602	10102202	NELAP	PA
4765 - Ethylbenzene	EPA 602	10102202	NELAP	PA
5000 - Methyl tert-butyl ether (MTBE)	EPA 602	10102202	NELAP	PA
5005 - Naphthalene	EPA 602	10102202	NELAP	PA
5100 - Styrene	EPA 602	10102202	NELAP	PA
5140 - Toluene	EPA 602	10102202	NELAP	PA
5260 - Xylene (total)	EPA 602	10102202	NELAP	PA
5250 - o-Xylene	EPA 602	10102202	NELAP	PA
5255 - p-Xylene	EPA 602	10102202	NELAP	PA
7355 - 4,4'-DDD	EPA 608	10103603	NELAP	PA
7360 - 4,4'-DDE	EPA 608	10103603	NELAP	PA
7365 - 4,4'-DDT	EPA 608	10103603	NELAP	PA
7025 - Aldrin	EPA 608	10103603	NELAP	PA
8880 - Aroclor-1016 (PCB-1016)	EPA 608	10103603	NELAP	PA
8885 - Aroclor-1221 (PCB-1221)	EPA 608	10103603	NELAP	PA
8890 - Aroclor-1232 (PCB-1232)	EPA 608	10103603	NELAP	PA
8895 - Aroclor-1242 (PCB-1242)	EPA 608	10103603	NELAP	PA
8900 - Aroclor-1248 (PCB-1248)	EPA 608	10103603	NELAP	PA
8905 - Aroclor-1254 (PCB-1254)	EPA 608	10103603	NELAP	PA
8910 - Aroclor-1260 (PCB-1260)	EPA 608	10103603	NELAP	PA
7250 - Chlordane (tech.)	EPA 608	10103603	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
7470 - Dieldrin	EPA 608	10103603	NELAP	PA
7510 - Endosulfan I	EPA 608	10103603	NELAP	PA
7515 - Endosulfan II	EPA 608	10103603	NELAP	PA
7520 - Endosulfan sulfate	EPA 608	10103603	NELAP	PA
7540 - Endrin	EPA 608	10103603	NELAP	PA
7530 - Endrin aldehyde	EPA 608	10103603	NELAP	PA
7685 - Heptachlor	EPA 608	10103603	NELAP	PA
7690 - Heptachlor epoxide	EPA 608	10103603	NELAP	PA
8250 - Toxaphene (Chlorinated camphene)	EPA 608	10103603	NELAP	PA
7110 - alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 608	10103603	NELAP	PA
7115 - beta-BHC (beta-Hexachlorocyclohexane)	EPA 608	10103603	NELAP	PA
7120 - gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	EPA 608	10103603	NELAP	PA
7075 - Azinphos-methyl (Guthion)	EPA 622	10106806	NELAP	PA
7125 - Bolstar (Sulprofos)	EPA 622	10106806	NELAP	PA
7220 - Carbophenothion	EPA 622	10106806	NELAP	PA
7300 - Chlorpyrifos	EPA 622	10106806	NELAP	PA
7315 - Coumaphos	EPA 622	10106806	NELAP	PA
7395 - Demeton-o	EPA 622	10106806	NELAP	PA
7385 - Demeton-s	EPA 622	10106806	NELAP	PA
7410 - Diazinon	EPA 622	10106806	NELAP	PA
8610 - Dichlorovos (DDVP, Dichlorvos)	EPA 622	10106806	NELAP	PA
7495 - Dioxathion	EPA 622	10106806	NELAP	PA
8625 - Disulfoton	EPA 622	10106806	NELAP	PA
7550 - EPN	EPA 622	10106806	NELAP	PA
7565 - Ethion	EPA 622	10106806	NELAP	PA
7570 - Ethoprop	EPA 622	10106806	NELAP	PA
7580 - Famphur	EPA 622	10106806	NELAP	PA
7600 - Fensulfothion	EPA 622	10106806	NELAP	PA
7605 - Fenthion	EPA 622	10106806	NELAP	PA
7640 - Fonophos (Fonofos)	EPA 622	10106806	NELAP	PA
7770 - Malathion	EPA 622	10106806	NELAP	PA
7785 - Merphos	EPA 622	10106806	NELAP	PA
7795 - Methamidophos	EPA 622	10106806	NELAP	PA
7825 - Methyl parathion (Parathion, methyl)	EPA 622	10106806	NELAP	PA
7850 - Mevinphos	EPA 622	10106806	NELAP	PA
7880 - Monocrotophos	EPA 622	10106806	NELAP	PA
7905 - Naled	EPA 622	10106806	NELAP	PA
7955 - Parathion, ethyl	EPA 622	10106806	NELAP	PA
7985 - Phorate	EPA 622	10106806	NELAP	PA
8000 - Phosmet (Imidan)	EPA 622	10106806	NELAP	PA
8110 - Ronnel	EPA 622	10106806	NELAP	PA
8140 - Stirophos	EPA 622	10106806	NELAP	PA
8185 - Terbufos	EPA 622	10106806	NELAP	PA
8245 - Tokuthion (Prothiophos)	EPA 622	10106806	NELAP	PA
8275 - Trichloronate	EPA 622	10106806	NELAP	PA
5160 - 1,1,1-Trichloroethane	EPA 624	10107207	NELAP	PA
5110 - 1,1,2,2-Tetrachloroethane	EPA 624	10107207	NELAP	PA
5165 - 1,1,2-Trichloroethane	EPA 624	10107207	NELAP	PA
4630 - 1,1-Dichloroethane	EPA 624	10107207	NELAP	PA
4640 - 1,1-Dichloroethylene	EPA 624	10107207	NELAP	PA
4670 - 1,1-Dichloropropene	EPA 624	10107207	NELAP	PA
5150 - 1,2,3-Trichlorobenzene	EPA 624	10107207	NELAP	PA
4610 - 1,2-Dichlorobenzene	EPA 624	10107207	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA 624	10107207	NELAP	PA
4655 - 1,2-Dichloropropane	EPA 624	10107207	NELAP	PA
4615 - 1,3-Dichlorobenzene	EPA 624	10107207	NELAP	PA
4660 - 1,3-Dichloropropane	EPA 624	10107207	NELAP	PA
4620 - 1,4-Dichlorobenzene	EPA 624	10107207	NELAP	PA
4480 - 1-Chlorobutane	EPA 624	10107207	NELAP	PA
4665 - 2,2-Dichloropropane	EPA 624	10107207	NELAP	PA
4500 - 2-Chloroethyl vinyl ether	EPA 624	10107207	NELAP	PA
4535 - 2-Chlorotoluene	EPA 624	10107207	NELAP	PA
6412 - 3+4 Methylphenol	EPA 624	10107207	NELAP	PA
100256 - 3,4-dichloro-1-butene	EPA 624	10107207	NELAP	PA
4540 - 4-Chlorotoluene	EPA 624	10107207	NELAP	PA
4910 - 4-Isopropyltoluene (p-Cymene)	EPA 624	10107207	NELAP	PA
4325 - Acrolein (Propenal)	EPA 624	10107207	NELAP	PA
4340 - Acrylonitrile	EPA 624	10107207	NELAP	PA
4355 - Allyl chloride (3-Chloropropene)	EPA 624	10107207	NELAP	PA
4375 - Benzene	EPA 624	10107207	NELAP	PA
4385 - Bromobenzene	EPA 624	10107207	NELAP	PA
4390 - Bromochloromethane	EPA 624	10107207	NELAP	PA
4395 - Bromodichloromethane	EPA 624	10107207	NELAP	PA
4397 - Bromoethane (Ethyl Bromide)	EPA 624	10107207	NELAP	PA
4398 - Bromoethene	EPA 624	10107207	NELAP	PA
4400 - Bromoform	EPA 624	10107207	NELAP	PA
4455 - Carbon tetrachloride	EPA 624	10107207	NELAP	PA
4475 - Chlorobenzene	EPA 624	10107207	NELAP	PA
4485 - Chloroethane (Ethyl chloride)	EPA 624	10107207	NELAP	PA
4505 - Chloroform	EPA 624	10107207	NELAP	PA
9375 - Di-isopropylether (DIPE) (Isopropyl ether)	EPA 624	10107207	NELAP	PA
4595 - Dibromomethane (Methylene bromide)	EPA 624	10107207	NELAP	PA
4725 - Diethyl ether	EPA 624	10107207	NELAP	PA
4737 - Divinylbenzene (vinylstyrene)	EPA 624	10107207	NELAP	PA
4755 - Ethyl acetate	EPA 624	10107207	NELAP	PA
4810 - Ethyl methacrylate	EPA 624	10107207	NELAP	PA
4765 - Ethylbenzene	EPA 624	10107207	NELAP	PA
4840 - Hexachloroethane	EPA 624	10107207	NELAP	PA
4870 - Iodomethane (Methyl iodide)	EPA 624	10107207	NELAP	PA
4900 - Isopropylbenzene	EPA 624	10107207	NELAP	PA
4925 - Methacrylonitrile	EPA 624	10107207	NELAP	PA
4950 - Methyl bromide (Bromomethane)	EPA 624	10107207	NELAP	PA
4960 - Methyl chloride (Chloromethane)	EPA 624	10107207	NELAP	PA
4975 - Methylene chloride (Dichloromethane)	EPA 624	10107207	NELAP	PA
5035 - Pentachloroethane	EPA 624	10107207	NELAP	PA
5080 - Propionitrile (Ethyl cyanide)	EPA 624	10107207	NELAP	PA
5115 - Tetrachloroethylene (Perchloroethylene)	EPA 624	10107207	NELAP	PA
5140 - Toluene	EPA 624	10107207	NELAP	PA
5170 - Trichloroethene (Trichloroethylene)	EPA 624	10107207	NELAP	PA
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA 624	10107207	NELAP	PA
5235 - Vinyl chloride	EPA 624	10107207	NELAP	PA
5260 - Xylene (total)	EPA 624	10107207	NELAP	PA
4705 - cis & trans-1,2-Dichloroethene	EPA 624	10107207	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
100290 - cis & trans-1,3-Dichloropropylene	EPA 624	10107207	NELAP	PA
4680 - cis-1,3-Dichloropropene	EPA 624	10107207	NELAP	PA
4435 - n-Butylbenzene	EPA 624	10107207	NELAP	PA
4855 - n-Hexane	EPA 624	10107207	NELAP	PA
5090 - n-Propylbenzene	EPA 624	10107207	NELAP	PA
4440 - sec-Butylbenzene	EPA 624	10107207	NELAP	PA
4445 - tert-Butylbenzene	EPA 624	10107207	NELAP	PA
100544 - total 1,3-dichloropropene	EPA 624	10107207	NELAP	PA
4700 - trans-1,2-Dichloroethylene	EPA 624	10107207	NELAP	PA
4685 - trans-1,3-Dichloropropylene	EPA 624	10107207	NELAP	PA
6715 - 1,2,4,5-Tetrachlorobenzene	EPA 625	10107401	NELAP	PA
5155 - 1,2,4-Trichlorobenzene	EPA 625	10107401	NELAP	PA
4610 - 1,2-Dichlorobenzene	EPA 625	10107401	NELAP	PA
6220 - 1,2-Diphenylhydrazine	EPA 625	10107401	NELAP	PA
6800 - 1,3,5-Trichlorobenzene	EPA 625	10107401	NELAP	PA
4615 - 1,3-Dichlorobenzene	EPA 625	10107401	NELAP	PA
6160 - 1,3-Dinitrobenzene (1,3-DNB)	EPA 625	10107401	NELAP	PA
4620 - 1,4-Dichlorobenzene	EPA 625	10107401	NELAP	PA
6165 - 1,4-Dinitrobenzene	EPA 625	10107401	NELAP	PA
5790 - 1-Chloronaphthalene	EPA 625	10107401	NELAP	PA
6380 - 1-Methylnaphthalene	EPA 625	10107401	NELAP	PA
9501 - 1-Methylphenanthrene	EPA 625	10107401	NELAP	PA
6735 - 2,3,4,6-Tetrachlorophenol	EPA 625	10107401	NELAP	PA
9363 - 2,3-Dichloroaniline	EPA 625	10107401	NELAP	PA
5983 - 2,3-Dichlorophenol	EPA 625	10107401	NELAP	PA
6835 - 2,4,5-Trichlorophenol	EPA 625	10107401	NELAP	PA
6840 - 2,4,6-Trichlorophenol	EPA 625	10107401	NELAP	PA
6000 - 2,4-Dichlorophenol	EPA 625	10107401	NELAP	PA
6130 - 2,4-Dimethylphenol	EPA 625	10107401	NELAP	PA
6175 - 2,4-Dinitrophenol	EPA 625	10107401	NELAP	PA
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 625	10107401	NELAP	PA
5992 - 2,5-Dichlorophenol	EPA 625	10107401	NELAP	PA
6005 - 2,6-Dichlorophenol	EPA 625	10107401	NELAP	PA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 625	10107401	NELAP	PA
9322 - 2-Butoxyethanol	EPA 625	10107401	NELAP	PA
5795 - 2-Chloronaphthalene	EPA 625	10107401	NELAP	PA
5800 - 2-Chlorophenol	EPA 625	10107401	NELAP	PA
6360 - 2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	EPA 625	10107401	NELAP	PA
6400 - 2-Methylphenol (o-Cresol)	EPA 625	10107401	NELAP	PA
6460 - 2-Nitroaniline	EPA 625	10107401	NELAP	PA
6490 - 2-Nitrophenol	EPA 625	10107401	NELAP	PA
6412 - 3+4 Methylphenol	EPA 625	10107401	NELAP	PA
5945 - 3,3'-Dichlorobenzidine	EPA 625	10107401	NELAP	PA
5997 - 3,4-Dichlorophenol	EPA 625	10107401	NELAP	PA
6397 - 3,5-Dichlorophenol	EPA 625	10107401	NELAP	PA
6405 - 3-Methylphenol (m-Cresol)	EPA 625	10107401	NELAP	PA
6465 - 3-Nitroaniline	EPA 625	10107401	NELAP	PA
6495 - 3-Nitrophenol	EPA 625	10107401	NELAP	PA
7355 - 4,4'-DDD	EPA 625	10107401	NELAP	PA
7360 - 4,4'-DDE	EPA 625	10107401	NELAP	PA
7365 - 4,4'-DDT	EPA 625	10107401	NELAP	PA
5660 - 4-Bromophenyl phenyl ether	EPA 625	10107401	NELAP	PA
5700 - 4-Chloro-3-methylphenol	EPA 625	10107401	NELAP	PA
5745 - 4-Chloroaniline	EPA 625	10107401	NELAP	PA
5825 - 4-Chlorophenyl phenylether	EPA 625	10107401	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
6410 - 4-Methylphenol (p-Cresol)	EPA 625	10107401	NELAP	PA
6470 - 4-Nitroaniline	EPA 625	10107401	NELAP	PA
6500 - 4-Nitrophenol	EPA 625	10107401	NELAP	PA
5500 - Acenaphthene	EPA 625	10107401	NELAP	PA
5505 - Acenaphthylene	EPA 625	10107401	NELAP	PA
5510 - Acetophenone	EPA 625	10107401	NELAP	PA
7025 - Aldrin	EPA 625	10107401	NELAP	PA
5545 - Aniline	EPA 625	10107401	NELAP	PA
5555 - Anthracene	EPA 625	10107401	NELAP	PA
8880 - Aroclor-1016 (PCB-1016)	EPA 625	10107401	NELAP	PA
8885 - Aroclor-1221 (PCB-1221)	EPA 625	10107401	NELAP	PA
8890 - Aroclor-1232 (PCB-1232)	EPA 625	10107401	NELAP	PA
8895 - Aroclor-1242 (PCB-1242)	EPA 625	10107401	NELAP	PA
8900 - Aroclor-1248 (PCB-1248)	EPA 625	10107401	NELAP	PA
8905 - Aroclor-1254 (PCB-1254)	EPA 625	10107401	NELAP	PA
8910 - Aroclor-1260 (PCB-1260)	EPA 625	10107401	NELAP	PA
7075 - Azinphos-methyl (Guthion)	EPA 625	10107401	NELAP	PA
5562 - Azobenzene	EPA 625	10107401	NELAP	PA
5595 - Benzidine	EPA 625	10107401	NELAP	PA
5575 - Benzo(a)anthracene	EPA 625	10107401	NELAP	PA
5580 - Benzo(a)pyrene	EPA 625	10107401	NELAP	PA
5585 - Benzo(b)fluoranthene	EPA 625	10107401	NELAP	PA
5590 - Benzo(g,h,i)perylene	EPA 625	10107401	NELAP	PA
5600 - Benzo(k)fluoranthene	EPA 625	10107401	NELAP	PA
5610 - Benzoic acid	EPA 625	10107401	NELAP	PA
5630 - Benzyl alcohol	EPA 625	10107401	NELAP	PA
5670 - Butyl benzyl phthalate	EPA 625	10107401	NELAP	PA
5680 - Carbazole	EPA 625	10107401	NELAP	PA
7220 - Carbophenothion	EPA 625	10107401	NELAP	PA
7250 - Chlordane (tech.)	EPA 625	10107401	NELAP	PA
7300 - Chlorpyrifos	EPA 625	10107401	NELAP	PA
5855 - Chrysene	EPA 625	10107401	NELAP	PA
6065 - Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	EPA 625	10107401	NELAP	LA
5925 - Di-n-butyl phthalate	EPA 625	10107401	NELAP	PA
6200 - Di-n-octyl phthalate	EPA 625	10107401	NELAP	PA
7410 - Diazinon	EPA 625	10107401	NELAP	PA
5895 - Dibenz(a,h) anthracene	EPA 625	10107401	NELAP	PA
5905 - Dibenzofuran	EPA 625	10107401	NELAP	PA
8610 - Dichlorovos (DDVP, Dichlorvos)	EPA 625	10107401	NELAP	PA
7470 - Dieldrin	EPA 625	10107401	NELAP	PA
6070 - Diethyl phthalate	EPA 625	10107401	NELAP	PA
6135 - Dimethyl phthalate	EPA 625	10107401	NELAP	PA
7495 - Dioxathion	EPA 625	10107401	NELAP	PA
6205 - Diphenylamine	EPA 625	10107401	NELAP	PA
8625 - Disulfoton	EPA 625	10107401	NELAP	PA
7550 - EPN	EPA 625	10107401	NELAP	PA
7510 - Endosulfan I	EPA 625	10107401	NELAP	PA
7515 - Endosulfan II	EPA 625	10107401	NELAP	PA
7520 - Endosulfan sulfate	EPA 625	10107401	NELAP	PA
7540 - Endrin	EPA 625	10107401	NELAP	PA
7530 - Endrin aldehyde	EPA 625	10107401	NELAP	PA
7535 - Endrin ketone	EPA 625	10107401	NELAP	PA
7565 - Ethion	EPA 625	10107401	NELAP	PA
7570 - Ethoprop	EPA 625	10107401	NELAP	PA
4769 - Ethylene glycol dimethacrylate	EPA 625	10107401	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
7580 - Famphur	EPA 625	10107401	NELAP	PA
6265 - Fluoranthene	EPA 625	10107401	NELAP	PA
6270 - Fluorene	EPA 625	10107401	NELAP	PA
7640 - Fonophos (Fonofos)	EPA 625	10107401	NELAP	PA
7685 - Heptachlor	EPA 625	10107401	NELAP	PA
7690 - Heptachlor epoxide	EPA 625	10107401	NELAP	PA
6275 - Hexachlorobenzene	EPA 625	10107401	NELAP	PA
4835 - Hexachlorobutadiene	EPA 625	10107401	NELAP	PA
6285 - Hexachlorocyclopentadiene	EPA 625	10107401	NELAP	PA
4840 - Hexachloroethane	EPA 625	10107401	NELAP	PA
6315 - Indeno(1,2,3-cd) pyrene	EPA 625	10107401	NELAP	PA
6320 - Isophorone	EPA 625	10107401	NELAP	PA
7770 - Malathion	EPA 625	10107401	NELAP	PA
7810 - Methoxychlor	EPA 625	10107401	NELAP	PA
7880 - Monocrotophos	EPA 625	10107401	NELAP	PA
5005 - Naphthalene	EPA 625	10107401	NELAP	PA
5015 - Nitrobenzene	EPA 625	10107401	NELAP	PA
6590 - Pentachlorobenzene	EPA 625	10107401	NELAP	PA
6605 - Pentachlorophenol	EPA 625	10107401	NELAP	PA
6615 - Phenanthrene	EPA 625	10107401	NELAP	PA
6625 - Phenol	EPA 625	10107401	NELAP	PA
7985 - Phorate	EPA 625	10107401	NELAP	PA
8000 - Phosmet (Imidan)	EPA 625	10107401	NELAP	PA
6665 - Pyrene	EPA 625	10107401	NELAP	PA
5095 - Pyridine	EPA 625	10107401	NELAP	PA
8185 - Terbufos	EPA 625	10107401	NELAP	PA
9662 - Total Tetrachlorobenzenes	EPA 625	10107401	NELAP	PA
1940 - Total residual chlorine	EPA 625	10107401	NELAP	PA
8250 - Toxaphene (Chlorinated camphene)	EPA 625	10107401	NELAP	PA
7110 - alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 625	10107401	NELAP	PA
7240 - alpha-Chlordane	EPA 625	10107401	NELAP	PA
7115 - beta-BHC (beta-Hexachlorocyclohexane)	EPA 625	10107401	NELAP	PA
5760 - bis(2-Chloroethoxy)methane	EPA 625	10107401	NELAP	PA
5765 - bis(2-Chloroethyl) ether	EPA 625	10107401	NELAP	PA
5780 - bis(2-Chloroisopropyl) ether	EPA 625	10107401	NELAP	PA
6245 - bis(2-Ethoxyethyl) phthalate	EPA 625	10107401	NELAP	PA
6062 - bis(2-Ethylhexyl)adipate	EPA 625	10107401	NELAP	PA
6350 - bis(2-Methoxyethyl) phthalate	EPA 625	10107401	NELAP	PA
7105 - delta-BHC	EPA 625	10107401	NELAP	PA
7120 - gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 625	10107401	NELAP	PA
7245 - gamma-Chlordane	EPA 625	10107401	NELAP	PA
100149 - m+p chlorophenols	EPA 625	10107401	NELAP	PA
5875 - n-Decane	EPA 625	10107401	NELAP	PA
6545 - n-Nitrosodi-n-propylamine	EPA 625	10107401	NELAP	PA
6530 - n-Nitrosodimethylamine	EPA 625	10107401	NELAP	PA
6535 - n-Nitrosodiphenylamine	EPA 625	10107401	NELAP	PA
6565 - n-Nitrosopyrrolidine	EPA 625	10107401	NELAP	PA
6580 - n-Octadecane	EPA 625	10107401	NELAP	PA
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 1613B	10120602	NELAP	PA
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 1613B	10120602	NELAP	PA
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-	EPA 1613B	10120602	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
dioxin (1,2,3,4,6,7,8-hpcdd)				
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 1613B	10120602	NELAP	PA
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 1613B	10120602	NELAP	PA
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 1613B	10120602	NELAP	PA
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 1613B	10120602	NELAP	PA
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 1613B	10120602	NELAP	PA
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA 1613B	10120602	NELAP	PA
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA 1613B	10120602	NELAP	PA
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 1613B	10120602	NELAP	PA
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 1613B	10120602	NELAP	PA
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 1613B	10120602	NELAP	PA
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 1613B	10120602	NELAP	PA
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 1613B	10120602	NELAP	PA
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 1613B	10120602	NELAP	PA
9438 - Total Hpcdd	EPA 1613B	10120602	NELAP	PA
9444 - Total Hpcdf	EPA 1613B	10120602	NELAP	PA
9468 - Total Hxcdd	EPA 1613B	10120602	NELAP	PA
9483 - Total Hxcdf	EPA 1613B	10120602	NELAP	PA
9555 - Total Pecdd	EPA 1613B	10120602	NELAP	PA
9552 - Total Pecdf	EPA 1613B	10120602	NELAP	PA
9609 - Total TCDD	EPA 1613B	10120602	NELAP	PA
9615 - Total TCDF	EPA 1613B	10120602	NELAP	PA
1860 - Oil & Grease	EPA 1664A	10127409	NELAP	PA
1860 - Oil & Grease	EPA 1664A (HEM)	10127807	NELAP	PA
2050 - Total Petroleum Hydrocarbons (TPH)	EPA 1664A (HEM)	10127807	NELAP	PA
8954 - 2,2',3,3'+2,3',4',6-Tetrachlorobiphenyl (BZ-40+71)	EPA 1668	10129201	NELAP	PA
8919 - 2,2',3,3',4,4'+2,3,4,4',5,6-Hexachlorobiphenyl (BZ-128+166)	EPA 1668	10129201	NELAP	PA
9105 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (BZ-209)	EPA 1668	10129201	NELAP	PA
9095 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ-206)	EPA 1668	10129201	NELAP	PA
9090 - 2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ-194)	EPA 1668	10129201	NELAP	PA
9102 - 2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ-196)	EPA 1668	10129201	NELAP	PA
9101 - 2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ-207)	EPA 1668	10129201	NELAP	PA
9103 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ-195)	EPA 1668	10129201	NELAP	PA
9065 - 2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)	EPA 1668	10129201	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
8916 - 2,2',3,3',4,4',6+2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-171+173)	EPA 1668	10129201	NELAP	PA
9104 - 2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ-197)	EPA 1668	10129201	NELAP	PA
9106 - 2,2',3,3',4,4',6-Heptachlorobiphenyl (BZ-171)	EPA 1668	10129201	NELAP	PA
9020 - 2,2',3,3',4,4'-Hexachlorobiphenyl (BZ-128)	EPA 1668	10129201	NELAP	PA
9114 - 2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ-177)	EPA 1668	10129201	NELAP	PA
9112 - 2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ-201)	EPA 1668	10129201	NELAP	PA
9115 - 2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ-175)	EPA 1668	10129201	NELAP	PA
9117 - 2,2',3,3',4,5'-Hexachlorobiphenyl (BZ-130)	EPA 1668	10129201	NELAP	PA
8922 - 2,2',3,3',4,5+2,2',3,4,4',5'+2,3,3',4',5,6-Hexachlorobiphenyl (BZ-129+138+163)	EPA 1668	10129201	NELAP	PA
9108 - 2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ-199)	EPA 1668	10129201	NELAP	PA
8934 - 2,2',3,3',4,5,5',6+2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ-198+199)	EPA 1668	10129201	NELAP	PA
9107 - 2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ-208)	EPA 1668	10129201	NELAP	PA
9110 - 2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ-172)	EPA 1668	10129201	NELAP	PA
9116 - 2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ-174)	EPA 1668	10129201	NELAP	PA
9111 - 2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ-200)	EPA 1668	10129201	NELAP	PA
9113 - 2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-173)	EPA 1668	10129201	NELAP	PA
9118 - 2,2',3,3',4,5-Hexachlorobiphenyl (BZ-129)	EPA 1668	10129201	NELAP	PA
9120 - 2,2',3,3',4,6'-Hexachlorobiphenyl (BZ-132)	EPA 1668	10129201	NELAP	PA
9119 - 2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ-176)	EPA 1668	10129201	NELAP	PA
9121 - 2,2',3,3',4,6-Hexachlorobiphenyl (BZ-131)	EPA 1668	10129201	NELAP	PA
9122 - 2,2',3,3',4-Pentachlorobiphenyl (BZ-82)	EPA 1668	10129201	NELAP	PA
9123 - 2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ-202)	EPA 1668	10129201	NELAP	PA
9124 - 2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ-178)	EPA 1668	10129201	NELAP	PA
9125 - 2,2',3,3',5,5'-Hexachlorobiphenyl (BZ-133)	EPA 1668	10129201	NELAP	PA
8927 - 2,2',3,3',5,6'+2,2',3,5,5',6-Hexachlorobiphenyls (BZ 135+151)	EPA 1668	10129201	NELAP	PA
9127 - 2,2',3,3',5,6'-Hexachlorobiphenyl (BZ-135)	EPA 1668	10129201	NELAP	PA
9126 - 2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ-179)	EPA 1668	10129201	NELAP	PA
9128 - 2,2',3,3',5,6-Hexachlorobiphenyl	EPA 1668	10129201	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
(BZ-134)				
9129 - 2,2',3,3',5-Pentachlorobiphenyl (BZ-83)	EPA 1668	10129201	NELAP	PA
9130 - 2,2',3,3',6,6'-Hexachlorobiphenyl (BZ-136)	EPA 1668	10129201	NELAP	PA
9131 - 2,2',3,3',6-Pentachlorobiphenyl (BZ-84)	EPA 1668	10129201	NELAP	PA
9132 - 2,2',3,3'-Tetrachlorobiphenyl (BZ-40)	EPA 1668	10129201	NELAP	PA
9151 - 2,2',3,4',5',6-Hexachlorobiphenyl (BZ-149)	EPA 1668	10129201	NELAP	PA
9154 - 2,2',3,4',5'-Pentachlorobiphenyl (BZ-97)	EPA 1668	10129201	NELAP	PA
8948 - 2,2',3,4',5+2,2',4,5,5'+2,3,3',5',6-Pentachlorobiphenyl (BZ-90+101+113)	EPA 1668	10129201	NELAP	PA
9080 - 2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ-187)	EPA 1668	10129201	NELAP	PA
9144 - 2,2',3,4',5,5'-Hexachlorobiphenyl (BZ-146)	EPA 1668	10129201	NELAP	PA
9147 - 2,2',3,4',5,6'-Hexachlorobiphenyl (BZ-148)	EPA 1668	10129201	NELAP	PA
8929 - 2,2',3,4',5,6+2,2',3,4',5',6-Hexachlorobiphenyl (BZ-147+149)	EPA 1668	10129201	NELAP	PA
9146 - 2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ-188)	EPA 1668	10129201	NELAP	PA
9149 - 2,2',3,4',5,6-Hexachlorobiphenyl (BZ-147)	EPA 1668	10129201	NELAP	PA
9155 - 2,2',3,4',5-Pentachlorobiphenyl (BZ-90)	EPA 1668	10129201	NELAP	PA
9159 - 2,2',3,4',6'-Pentachlorobiphenyl (BZ-98)	EPA 1668	10129201	NELAP	PA
9157 - 2,2',3,4',6,6'-Hexachlorobiphenyl (BZ-150)	EPA 1668	10129201	NELAP	PA
9160 - 2,2',3,4',6-Pentachlorobiphenyl (BZ-91)	EPA 1668	10129201	NELAP	PA
9162 - 2,2',3,4'-Tetrachlorobiphenyl (BZ-42)	EPA 1668	10129201	NELAP	PA
8942 - 2,2',3,4,4'+2,3,4,5,6-Pentachlorobiphenyl (BZ-85+116)	EPA 1668	10129201	NELAP	PA
9075 - 2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ-183)	EPA 1668	10129201	NELAP	PA
9025 - 2,2',3,4,4',5'-Hexachlorobiphenyl (BZ-138)	EPA 1668	10129201	NELAP	PA
8917 - 2,2',3,4,4',5,5'+2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-180+193)	EPA 1668	10129201	NELAP	PA
9133 - 2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ-203)	EPA 1668	10129201	NELAP	PA
9134 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ-180)	EPA 1668	10129201	NELAP	PA
9136 - 2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ-182)	EPA 1668	10129201	NELAP	PA
9135 - 2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ-204)	EPA 1668	10129201	NELAP	PA
9137 - 2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ-181)	EPA 1668	10129201	NELAP	PA
9138 - 2,2',3,4,4',5-Hexachlorobiphenyl	EPA 1668	10129201	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
(BZ-137)				
9140 - 2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-140)	EPA 1668	10129201	NELAP	PA
8928 - 2,2',3,4,4',6+2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-139+140)	EPA 1668	10129201	NELAP	PA
9139 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ-184)	EPA 1668	10129201	NELAP	PA
9141 - 2,2',3,4,4',6-Hexachlorobiphenyl (BZ-139)	EPA 1668	10129201	NELAP	PA
9142 - 2,2',3,4,4'-Pentachlorobiphenyl (BZ-85)	EPA 1668	10129201	NELAP	PA
9150 - 2,2',3,4,5',6-Hexachlorobiphenyl (BZ-144)	EPA 1668	10129201	NELAP	PA
8975 - 2,2',3,4,5'-Pentachlorobiphenyl (BZ-87)	EPA 1668	10129201	NELAP	PA
8946 - 2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,5'+2,3',4,4'6+2,3',4',5'6-Pentachlorobiphenyl (BZ 86+87+97+108+119+125)	EPA 1668	10129201	NELAP	PA
9143 - 2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ-185)	EPA 1668	10129201	NELAP	PA
9030 - 2,2',3,4,5,5'-Hexachlorobiphenyl (BZ-141)	EPA 1668	10129201	NELAP	PA
9152 - 2,2',3,4,5,6'-Hexachlorobiphenyl (BZ-143)	EPA 1668	10129201	NELAP	PA
9145 - 2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ-186)	EPA 1668	10129201	NELAP	PA
9148 - 2,2',3,4,5,6-Hexachlorobiphenyl (BZ-142)	EPA 1668	10129201	NELAP	PA
9153 - 2,2',3,4,5-Pentachlorobiphenyl (BZ-86)	EPA 1668	10129201	NELAP	PA
9161 - 2,2',3,4,6'-Pentachlorobiphenyl (BZ-89)	EPA 1668	10129201	NELAP	PA
9156 - 2,2',3,4,6,6'-Hexachlorobiphenyl (BZ-145)	EPA 1668	10129201	NELAP	PA
9158 - 2,2',3,4,6-Pentachlorobiphenyl (BZ-88)	EPA 1668	10129201	NELAP	PA
9163 - 2,2',3,4-Tetrachlorobiphenyl (BZ-41)	EPA 1668	10129201	NELAP	PA
8957 - 2,2',3,5'+2,2',4,4'+2,3,5,6-Tetrachlorobiphenyl (BZ-44+47+65)	EPA 1668	10129201	NELAP	PA
9166 - 2,2',3,5',6-Pentachlorobiphenyl (BZ-95)	EPA 1668	10129201	NELAP	PA
8945 - 2,2',3,5'-Tetrachlorobiphenyl (BZ-44)	EPA 1668	10129201	NELAP	PA
9035 - 2,2',3,5,5',6-Hexachlorobiphenyl (BZ-151)	EPA 1668	10129201	NELAP	PA
9164 - 2,2',3,5,5'-Pentachlorobiphenyl (BZ-92)	EPA 1668	10129201	NELAP	PA
9167 - 2,2',3,5,6'-Pentachlorobiphenyl (BZ-94)	EPA 1668	10129201	NELAP	PA
8949 - 2,2',3,5,6+2,2',4,4',6-Pentachlorobiphenyl (BZ-93+100)	EPA 1668	10129201	NELAP	PA
9165 - 2,2',3,5,6,6'-Hexachlorobiphenyl (BZ-152)	EPA 1668	10129201	NELAP	PA
9168 - 2,2',3,5,6-Pentachlorobiphenyl (BZ-	EPA 1668	10129201	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
93)				
9169 - 2,2',3,5-Tetrachlorobiphenyl (BZ-43)	EPA 1668	10129201	NELAP	PA
9171 - 2,2',3,6'-Tetrachlorobiphenyl (BZ-46)	EPA 1668	10129201	NELAP	PA
9170 - 2,2',3,6,6'-Pentachlorobiphenyl (BZ-96)	EPA 1668	10129201	NELAP	PA
9172 - 2,2',3,6-Tetrachlorobiphenyl (BZ-45)	EPA 1668	10129201	NELAP	PA
9173 - 2,2',3-Trichlorobiphenyl (BZ-16)	EPA 1668	10129201	NELAP	PA
8931 - 2,2',4,4',5,5'+2,3',4,4',5',6-Hexachlorobiphenyl (BZ-153+168)	EPA 1668	10129201	NELAP	PA
9040 - 2,2',4,4',5,5'-Hexachlorobiphenyl (BZ-153)	EPA 1668	10129201	NELAP	PA
9174 - 2,2',4,4',5,6'-Hexachlorobiphenyl (BZ-154)	EPA 1668	10129201	NELAP	PA
9175 - 2,2',4,4',5-Pentachlorobiphenyl (BZ-99)	EPA 1668	10129201	NELAP	PA
9176 - 2,2',4,4',6,6'-Hexachlorobiphenyl (BZ-155)	EPA 1668	10129201	NELAP	PA
9177 - 2,2',4,4',6-Pentachlorobiphenyl (BZ-100)	EPA 1668	10129201	NELAP	PA
9178 - 2,2',4,4'-Tetrachlorobiphenyl (BZ-47)	EPA 1668	10129201	NELAP	PA
8959 - 2,2',4,5'+2,3',4,6-Tetrachlorobiphenyl (BZ-49+69)	EPA 1668	10129201	NELAP	PA
9179 - 2,2',4,5',6-Pentachlorobiphenyl (BZ-103)	EPA 1668	10129201	NELAP	PA
8950 - 2,2',4,5'-Tetrachlorobiphenyl (BZ-49)	EPA 1668	10129201	NELAP	PA
8980 - 2,2',4,5,5'-Pentachlorobiphenyl (BZ-101)	EPA 1668	10129201	NELAP	PA
9180 - 2,2',4,5,6'-Pentachlorobiphenyl (BZ-102)	EPA 1668	10129201	NELAP	PA
9181 - 2,2',4,5-Tetrachlorobiphenyl (BZ-48)	EPA 1668	10129201	NELAP	PA
9183 - 2,2',4,6'-Tetrachlorobiphenyl (BZ-51)	EPA 1668	10129201	NELAP	PA
8961 - 2,2',4,6+2,2',5,6'-Tetrachlorobiphenyl (BZ-50+53)	EPA 1668	10129201	NELAP	PA
9182 - 2,2',4,6,6'-Pentachlorobiphenyl (BZ-104)	EPA 1668	10129201	NELAP	PA
9184 - 2,2',4,6-Tetrachlorobiphenyl (BZ-50)	EPA 1668	10129201	NELAP	PA
9185 - 2,2',4-Trichlorobiphenyl (BZ-17)	EPA 1668	10129201	NELAP	PA
8966 - 2,2',5+2,4,6-Trichlorobiphenyl (BZ-18+30)	EPA 1668	10129201	NELAP	PA
8955 - 2,2',5,5'-Tetrachlorobiphenyl (BZ-52)	EPA 1668	10129201	NELAP	PA
9186 - 2,2',5,6'-Tetrachlorobiphenyl (BZ-53)	EPA 1668	10129201	NELAP	PA
8930 - 2,2',5-Trichlorobiphenyl (BZ-18)	EPA 1668	10129201	NELAP	PA
9187 - 2,2',6,6'-Tetrachlorobiphenyl (BZ-54)	EPA 1668	10129201	NELAP	PA
9188 - 2,2',6-Trichlorobiphenyl (BZ-19)	EPA 1668	10129201	NELAP	PA
9189 - 2,2'-Dichlorobiphenyl (BZ-4)	EPA 1668	10129201	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9224 - 2,3',4',5',6-Pentachlorobiphenyl (BZ-125)	EPA 1668	10129201	NELAP	PA
9229 - 2,3',4',5'-Tetrachlorobiphenyl (BZ-76)	EPA 1668	10129201	NELAP	PA
9222 - 2,3',4',5,5'-Pentachlorobiphenyl (BZ-124)	EPA 1668	10129201	NELAP	PA
9230 - 2,3',4',5-Tetrachlorobiphenyl (BZ-70)	EPA 1668	10129201	NELAP	PA
9237 - 2,3',4',6-Tetrachlorobiphenyl (BZ-71)	EPA 1668	10129201	NELAP	PA
9239 - 2,3',4'-Trichlorobiphenyl (BZ-33)	EPA 1668	10129201	NELAP	PA
9218 - 2,3',4,4',5',6-Hexachlorobiphenyl (BZ-168)	EPA 1668	10129201	NELAP	PA
9000 - 2,3',4,4',5'-Pentachlorobiphenyl (BZ-123)	EPA 1668	10129201	NELAP	PA
9055 - 2,3',4,4',5,5'-Hexachlorobiphenyl (BZ-167)	EPA 1668	10129201	NELAP	PA
8995 - 2,3',4,4',5-Pentachlorobiphenyl (BZ-118)	EPA 1668	10129201	NELAP	PA
9220 - 2,3',4,4',6-Pentachlorobiphenyl (BZ-119)	EPA 1668	10129201	NELAP	PA
8960 - 2,3',4,4'-Tetrachlorobiphenyl (BZ-66)	EPA 1668	10129201	NELAP	PA
9226 - 2,3',4,5',6-Pentachlorobiphenyl (BZ-121)	EPA 1668	10129201	NELAP	PA
9231 - 2,3',4,5'-Tetrachlorobiphenyl (BZ-68)	EPA 1668	10129201	NELAP	PA
9223 - 2,3',4,5,5'-Pentachlorobiphenyl (BZ-120)	EPA 1668	10129201	NELAP	PA
9232 - 2,3',4,5-Tetrachlorobiphenyl (BZ-67)	EPA 1668	10129201	NELAP	PA
9235 - 2,3',4,6-Tetrachlorobiphenyl (BZ-69)	EPA 1668	10129201	NELAP	PA
9240 - 2,3',4-Trichlorobiphenyl (BZ-25)	EPA 1668	10129201	NELAP	PA
9244 - 2,3',5',6-Tetrachlorobiphenyl (BZ-73)	EPA 1668	10129201	NELAP	PA
9246 - 2,3',5'-Trichlorobiphenyl (BZ-34)	EPA 1668	10129201	NELAP	PA
8969 - 2,3',5+2,4,5-Trichlorobiphenyl (BZ-26+29)	EPA 1668	10129201	NELAP	PA
9242 - 2,3',5,5'-Tetrachlorobiphenyl (BZ-72)	EPA 1668	10129201	NELAP	PA
8935 - 2,3',5-Trichlorobiphenyl (BZ-26)	EPA 1668	10129201	NELAP	PA
9248 - 2,3',6-Trichlorobiphenyl (BZ-27)	EPA 1668	10129201	NELAP	PA
9249 - 2,3'-Dichlorobiphenyl (BZ-6)	EPA 1668	10129201	NELAP	PA
9201 - 2,3,3',4',5',6-Hexachlorobiphenyl (BZ-164)	EPA 1668	10129201	NELAP	PA
9202 - 2,3,3',4',5'-Pentachlorobiphenyl (BZ-122)	EPA 1668	10129201	NELAP	PA
9195 - 2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-193)	EPA 1668	10129201	NELAP	PA
9197 - 2,3,3',4',5,5'-Hexachlorobiphenyl (BZ-162)	EPA 1668	10129201	NELAP	PA
9199 - 2,3,3',4',5,6-Hexachlorobiphenyl (BZ-163)	EPA 1668	10129201	NELAP	PA
9205 - 2,3,3',4',5-Pentachlorobiphenyl (BZ-107)	EPA 1668	10129201	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
8990 - 2,3,3',4',6-Pentachlorobiphenyl (BZ-110)	EPA 1668	10129201	NELAP	PA
9207 - 2,3,3',4'-Tetrachlorobiphenyl (BZ-56)	EPA 1668	10129201	NELAP	PA
9192 - 2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ-191)	EPA 1668	10129201	NELAP	PA
9045 - 2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-157)	EPA 1668	10129201	NELAP	PA
8932 - 2,3,3',4,4',5+2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-156+157)	EPA 1668	10129201	NELAP	PA
9190 - 2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ-205)	EPA 1668	10129201	NELAP	PA
9085 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ-189)	EPA 1668	10129201	NELAP	PA
9191 - 2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ-190)	EPA 1668	10129201	NELAP	PA
9050 - 2,3,3',4,4',5-Hexachlorobiphenyl (BZ-156)	EPA 1668	10129201	NELAP	PA
9193 - 2,3,3',4,4',6-Hexachlorobiphenyl (BZ-158)	EPA 1668	10129201	NELAP	PA
8985 - 2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)	EPA 1668	10129201	NELAP	PA
9200 - 2,3,3',4,5',6-Hexachlorobiphenyl (BZ-161)	EPA 1668	10129201	NELAP	PA
9203 - 2,3,3',4,5'-Pentachlorobiphenyl (BZ-108)	EPA 1668	10129201	NELAP	PA
9194 - 2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ-192)	EPA 1668	10129201	NELAP	PA
9196 - 2,3,3',4,5,5'-Hexachlorobiphenyl (BZ-159)	EPA 1668	10129201	NELAP	PA
9198 - 2,3,3',4,5,6-Hexachlorobiphenyl (BZ-160)	EPA 1668	10129201	NELAP	PA
9204 - 2,3,3',4,5-Pentachlorobiphenyl (BZ-106)	EPA 1668	10129201	NELAP	PA
9206 - 2,3,3',4,6-Pentachlorobiphenyl (BZ-109)	EPA 1668	10129201	NELAP	PA
9208 - 2,3,3',4-Tetrachlorobiphenyl (BZ-55)	EPA 1668	10129201	NELAP	PA
9212 - 2,3,3',5',6-Pentachlorobiphenyl (BZ-113)	EPA 1668	10129201	NELAP	PA
9213 - 2,3,3',5'-Tetrachlorobiphenyl (BZ-58)	EPA 1668	10129201	NELAP	PA
9209 - 2,3,3',5,5',6-Hexachlorobiphenyl (BZ-165)	EPA 1668	10129201	NELAP	PA
9210 - 2,3,3',5,5'-Pentachlorobiphenyl (BZ-111)	EPA 1668	10129201	NELAP	PA
9211 - 2,3,3',5,6-Pentachlorobiphenyl (BZ-112)	EPA 1668	10129201	NELAP	PA
9214 - 2,3,3',5-Tetrachlorobiphenyl (BZ-57)	EPA 1668	10129201	NELAP	PA
9216 - 2,3,3'-Trichlorobiphenyl (BZ-20)	EPA 1668	10129201	NELAP	PA
9227 - 2,3,4',5,6-Pentachlorobiphenyl (BZ-117)	EPA 1668	10129201	NELAP	PA
9233 - 2,3,4',5-Tetrachlorobiphenyl (BZ-63)	EPA 1668	10129201	NELAP	PA
9236 - 2,3,4',6-Tetrachlorobiphenyl (BZ-	EPA 1668	10129201	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
64)				
9241 - 2,3,4'-Trichlorobiphenyl (BZ-22)	EPA 1668	10129201	NELAP	PA
8968 - 2,3,4+2,3',4'-Trichlorobiphenyl (BZ-21+33)	EPA 1668	10129201	NELAP	PA
9217 - 2,3,4,4',5,6-Hexachlorobiphenyl (BZ-166)	EPA 1668	10129201	NELAP	PA
9005 - 2,3,4,4',5-Pentachlorobiphenyl (BZ-114)	EPA 1668	10129201	NELAP	PA
9219 - 2,3,4,4',6-Pentachlorobiphenyl (BZ-115)	EPA 1668	10129201	NELAP	PA
9221 - 2,3,4,4'-Tetrachlorobiphenyl (BZ-60)	EPA 1668	10129201	NELAP	PA
8963 - 2,3,4,5+2,3',4',5+2,4,4',5+2,3',4',5'-Tetrachlorobiphenyls (BZ 61+70+74+76)	EPA 1668	10129201	NELAP	PA
9225 - 2,3,4,5,6-Pentachlorobiphenyl (BZ-116)	EPA 1668	10129201	NELAP	PA
9228 - 2,3,4,5-Tetrachlorobiphenyl (BZ-61)	EPA 1668	10129201	NELAP	PA
9234 - 2,3,4,6-Tetrachlorobiphenyl (BZ-62)	EPA 1668	10129201	NELAP	PA
9238 - 2,3,4-Trichlorobiphenyl (BZ-21)	EPA 1668	10129201	NELAP	PA
9243 - 2,3,5,6-Tetrachlorobiphenyl (BZ-65)	EPA 1668	10129201	NELAP	PA
9245 - 2,3,5-Trichlorobiphenyl (BZ-23)	EPA 1668	10129201	NELAP	PA
6742 - 2,3,5-Trichlorophenol	EPA 1668	10129201	NELAP	PA
9247 - 2,3,6-Trichlorobiphenyl (BZ-24)	EPA 1668	10129201	NELAP	PA
8920 - 2,3-Dichlorobiphenyl (BZ-5)	EPA 1668	10129201	NELAP	PA
8940 - 2,4',5-Trichlorobiphenyl (BZ-31)	EPA 1668	10129201	NELAP	PA
9255 - 2,4',6-Trichlorobiphenyl (BZ-32)	EPA 1668	10129201	NELAP	PA
9256 - 2,4'-Dichlorobiphenyl (BZ-8)	EPA 1668	10129201	NELAP	PA
9250 - 2,4,4',5-Tetrachlorobiphenyl (BZ-74)	EPA 1668	10129201	NELAP	PA
9251 - 2,4,4',6-Tetrachlorobiphenyl (BZ-75)	EPA 1668	10129201	NELAP	PA
9252 - 2,4,4'-Trichlorobiphenyl (BZ-28)	EPA 1668	10129201	NELAP	PA
9253 - 2,4,5-Trichlorobiphenyl (BZ-29)	EPA 1668	10129201	NELAP	PA
9254 - 2,4,6-Trichlorobiphenyl (BZ-30)	EPA 1668	10129201	NELAP	PA
9257 - 2,4-Dichlorobiphenyl (BZ-7)	EPA 1668	10129201	NELAP	PA
9258 - 2,5-Dichlorobiphenyl (BZ-9)	EPA 1668	10129201	NELAP	PA
9259 - 2,6-Dichlorobiphenyl (BZ-10)	EPA 1668	10129201	NELAP	PA
8915 - 2-Chlorobiphenyl (BZ-1)	EPA 1668	10129201	NELAP	PA
9060 - 3,3',4,4',5,5'-Hexachlorobiphenyl (BZ-169)	EPA 1668	10129201	NELAP	PA
9015 - 3,3',4,4',5-Pentachlorobiphenyl (BZ-126)	EPA 1668	10129201	NELAP	PA
8965 - 3,3',4,4'-Tetrachlorobiphenyl (BZ-77)	EPA 1668	10129201	NELAP	PA
9261 - 3,3',4,5'-Tetrachlorobiphenyl (BZ-79)	EPA 1668	10129201	NELAP	PA
9260 - 3,3',4,5,5'-Pentachlorobiphenyl (BZ-127)	EPA 1668	10129201	NELAP	PA
9262 - 3,3',4,5-Tetrachlorobiphenyl (BZ-78)	EPA 1668	10129201	NELAP	PA
9263 - 3,3',4-Trichlorobiphenyl (BZ-35)	EPA 1668	10129201	NELAP	PA
9264 - 3,3',5,5'-Tetrachlorobiphenyl (BZ-80)	EPA 1668	10129201	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9265 - 3,3',5-Trichlorobiphenyl (BZ-36)	EPA 1668	10129201	NELAP	PA
8925 - 3,3'-Dichlorobiphenyl (BZ-11)	EPA 1668	10129201	NELAP	PA
9268 - 3,4',5-Trichlorobiphenyl (BZ-39)	EPA 1668	10129201	NELAP	PA
9269 - 3,4'-Dichlorobiphenyl (BZ-13)	EPA 1668	10129201	NELAP	PA
100098 - 3,4+3,4'-Dichlorobiphenyl (BZ-12+13)	EPA 1668	10129201	NELAP	PA
8970 - 3,4,4',5-Tetrachlorobiphenyl (BZ-81)	EPA 1668	10129201	NELAP	PA
9266 - 3,4,4'-Trichlorobiphenyl (BZ-37)	EPA 1668	10129201	NELAP	PA
9267 - 3,4,5-Trichlorobiphenyl (BZ-38)	EPA 1668	10129201	NELAP	PA
9270 - 3,4-Dichlorobiphenyl (BZ-12)	EPA 1668	10129201	NELAP	PA
9271 - 3,5-Dichlorobiphenyl (BZ-14)	EPA 1668	10129201	NELAP	PA
9272 - 3-Chlorobiphenyl (BZ-2)	EPA 1668	10129201	NELAP	PA
100368 - 3-Monochlorobiphenyl (BZ 2)	EPA 1668	10129201	NELAP	PA
9273 - 4,4'-Dichlorobiphenyl (BZ-15)	EPA 1668	10129201	NELAP	PA
9274 - 4-Chlorobiphenyl (BZ-3)	EPA 1668	10129201	NELAP	PA
8954 - 2,2',3,3'+2,3',4',6-Tetrachlorobiphenyl (BZ-40+71)	EPA 1668A	10129405	NELAP	PA
8919 - 2,2',3,3',4,4'+2,3,4,4',5,6-Hexachlorobiphenyl (BZ-128+166)	EPA 1668A	10129405	NELAP	PA
9105 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (BZ-209)	EPA 1668A	10129405	NELAP	PA
9095 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ-206)	EPA 1668A	10129405	NELAP	PA
9090 - 2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ-194)	EPA 1668A	10129405	NELAP	PA
9102 - 2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ-196)	EPA 1668A	10129405	NELAP	PA
9101 - 2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ-207)	EPA 1668A	10129405	NELAP	PA
9103 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ-195)	EPA 1668A	10129405	NELAP	PA
9065 - 2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)	EPA 1668A	10129405	NELAP	PA
8916 - 2,2',3,3',4,4',6+2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-171+173)	EPA 1668A	10129405	NELAP	PA
8933 - 2,2',3,3',4,4',6,6'+2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ 197+200)	EPA 1668A	10129405	NELAP	PA
9104 - 2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ-197)	EPA 1668A	10129405	NELAP	PA
9106 - 2,2',3,3',4,4',6-Heptachlorobiphenyl (BZ-171)	EPA 1668A	10129405	NELAP	PA
9020 - 2,2',3,3',4,4'-Hexachlorobiphenyl (BZ-128)	EPA 1668A	10129405	NELAP	PA
9114 - 2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ-177)	EPA 1668A	10129405	NELAP	PA
9112 - 2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ-201)	EPA 1668A	10129405	NELAP	PA
9115 - 2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ-175)	EPA 1668A	10129405	NELAP	PA
9117 - 2,2',3,3',4,5'-Hexachlorobiphenyl (BZ-130)	EPA 1668A	10129405	NELAP	PA
8922 - 2,2',3,3',4,5+2,2',3,4,4',5'+2,3,3',4',5,6-Hexachlorobiphenyl (BZ-129+138+163)	EPA 1668A	10129405	NELAP	PA
9108 - 2,2',3,3',4,5,5',6'-Octachlorobiphenyl	EPA 1668A	10129405	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
(BZ-199)				
8934 - 2,2',3,3',4,5,5',6+2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ-198+199)	EPA 1668A	10129405	NELAP	PA
9107 - 2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ-208)	EPA 1668A	10129405	NELAP	PA
9109 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl (BZ-198)	EPA 1668A	10129405	NELAP	PA
9110 - 2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ-172)	EPA 1668A	10129405	NELAP	PA
9116 - 2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ-174)	EPA 1668A	10129405	NELAP	PA
9111 - 2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ-200)	EPA 1668A	10129405	NELAP	PA
9113 - 2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-173)	EPA 1668A	10129405	NELAP	PA
9118 - 2,2',3,3',4,5-Hexachlorobiphenyl (BZ-129)	EPA 1668A	10129405	NELAP	PA
9120 - 2,2',3,3',4,6'-Hexachlorobiphenyl (BZ-132)	EPA 1668A	10129405	NELAP	PA
9119 - 2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ-176)	EPA 1668A	10129405	NELAP	PA
9121 - 2,2',3,3',4,6-Hexachlorobiphenyl (BZ-131)	EPA 1668A	10129405	NELAP	PA
9122 - 2,2',3,3',4-Pentachlorobiphenyl (BZ-82)	EPA 1668A	10129405	NELAP	PA
9123 - 2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ-202)	EPA 1668A	10129405	NELAP	PA
9124 - 2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ-178)	EPA 1668A	10129405	NELAP	PA
9125 - 2,2',3,3',5,5'-Hexachlorobiphenyl (BZ-133)	EPA 1668A	10129405	NELAP	PA
8926 - 2,2',3,3',5,6'+2,2',3,5,5',6+2,2',4,4',5,6'-Hexachlorobiphenyl (BZ-135+151+154)	EPA 1668A	10129405	NELAP	PA
9127 - 2,2',3,3',5,6'-Hexachlorobiphenyl (BZ-135)	EPA 1668A	10129405	NELAP	PA
9126 - 2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ-179)	EPA 1668A	10129405	NELAP	PA
9128 - 2,2',3,3',5,6-Hexachlorobiphenyl (BZ-134)	EPA 1668A	10129405	NELAP	PA
9129 - 2,2',3,3',5-Pentachlorobiphenyl (BZ-83)	EPA 1668A	10129405	NELAP	PA
9130 - 2,2',3,3',6,6'-Hexachlorobiphenyl (BZ-136)	EPA 1668A	10129405	NELAP	PA
9131 - 2,2',3,3',6-Pentachlorobiphenyl (BZ-84)	EPA 1668A	10129405	NELAP	PA
9132 - 2,2',3,3'-Tetrachlorobiphenyl (BZ-40)	EPA 1668A	10129405	NELAP	PA
9151 - 2,2',3,4',5',6-Hexachlorobiphenyl (BZ-149)	EPA 1668A	10129405	NELAP	PA
9154 - 2,2',3,4',5'-Pentachlorobiphenyl (BZ-97)	EPA 1668A	10129405	NELAP	PA
8948 - 2,2',3,4',5+2,2',4,5,5'+2,3,3',5',6-Pentachlorobiphenyl (BZ-90+101+113)	EPA 1668A	10129405	NELAP	PA
9080 - 2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ-187)	EPA 1668A	10129405	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9144 - 2,2',3,4',5,5'-Hexachlorobiphenyl (BZ-146)	EPA 1668A	10129405	NELAP	PA
9147 - 2,2',3,4',5,6'-Hexachlorobiphenyl (BZ-148)	EPA 1668A	10129405	NELAP	PA
8929 - 2,2',3,4',5,6+2,2',3,4',5',6-Hexachlorobiphenyl (BZ-147+149)	EPA 1668A	10129405	NELAP	PA
9146 - 2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ-188)	EPA 1668A	10129405	NELAP	PA
9149 - 2,2',3,4',5,6-Hexachlorobiphenyl (BZ-147)	EPA 1668A	10129405	NELAP	PA
9155 - 2,2',3,4',5-Pentachlorobiphenyl (BZ-90)	EPA 1668A	10129405	NELAP	PA
8951 - 2,2',3,4',6'+2,2',4,5,6'-Pentachlorobiphenyl (BZ-98+102)	EPA 1668A	10129405	NELAP	PA
9159 - 2,2',3,4',6'-Pentachlorobiphenyl (BZ-98)	EPA 1668A	10129405	NELAP	PA
9157 - 2,2',3,4',6,6'-Hexachlorobiphenyl (BZ-150)	EPA 1668A	10129405	NELAP	PA
9160 - 2,2',3,4',6-Pentachlorobiphenyl (BZ-91)	EPA 1668A	10129405	NELAP	PA
9162 - 2,2',3,4'-Tetrachlorobiphenyl (BZ-42)	EPA 1668A	10129405	NELAP	PA
8941 - 2,2',3,4,4'+2,3,4,5,6+2,3,4',5,6-Pentachlorobiphenyl (BZ-85+116+117)	EPA 1668A	10129405	NELAP	PA
8918 - 2,2',3,4,4',5',6+2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ-183+185)	EPA 1668A	10129405	NELAP	PA
9075 - 2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ-183)	EPA 1668A	10129405	NELAP	PA
9025 - 2,2',3,4,4',5'-Hexachlorobiphenyl (BZ-138)	EPA 1668A	10129405	NELAP	PA
8917 - 2,2',3,4,4',5,5'+2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-180+193)	EPA 1668A	10129405	NELAP	PA
9133 - 2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ-203)	EPA 1668A	10129405	NELAP	PA
9134 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ-180)	EPA 1668A	10129405	NELAP	PA
9136 - 2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ-182)	EPA 1668A	10129405	NELAP	PA
9135 - 2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ-204)	EPA 1668A	10129405	NELAP	PA
9137 - 2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ-181)	EPA 1668A	10129405	NELAP	PA
9138 - 2,2',3,4,4',5-Hexachlorobiphenyl (BZ-137)	EPA 1668A	10129405	NELAP	PA
9140 - 2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-140)	EPA 1668A	10129405	NELAP	PA
8928 - 2,2',3,4,4',6+2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-139+140)	EPA 1668A	10129405	NELAP	PA
9139 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ-184)	EPA 1668A	10129405	NELAP	PA
9141 - 2,2',3,4,4',6-Hexachlorobiphenyl (BZ-139)	EPA 1668A	10129405	NELAP	PA
9142 - 2,2',3,4,4'-Pentachlorobiphenyl (BZ-85)	EPA 1668A	10129405	NELAP	PA
9150 - 2,2',3,4,5',6-Hexachlorobiphenyl (BZ-144)	EPA 1668A	10129405	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
8975 - 2,2',3,4,5'-Pentachlorobiphenyl (BZ-87)	EPA 1668A	10129405	NELAP	PA
8944 - 2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,2',4,4',6-Pentachlorobiphenyl (BZ-86+87+97+100)	EPA 1668A	10129405	NELAP	PA
8946 - 2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,5'+2,3',4,4'6+2,3',4',5'6-Pentachlorobiphenyl (BZ 86+87+97+108+119+125)	EPA 1668A	10129405	NELAP	PA
9143 - 2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ-185)	EPA 1668A	10129405	NELAP	PA
9030 - 2,2',3,4,5,5'-Hexachlorobiphenyl (BZ-141)	EPA 1668A	10129405	NELAP	PA
9152 - 2,2',3,4,5,6'-Hexachlorobiphenyl (BZ-143)	EPA 1668A	10129405	NELAP	PA
9145 - 2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ-186)	EPA 1668A	10129405	NELAP	PA
9148 - 2,2',3,4,5,6-Hexachlorobiphenyl (BZ-142)	EPA 1668A	10129405	NELAP	PA
9153 - 2,2',3,4,5-Pentachlorobiphenyl (BZ-86)	EPA 1668A	10129405	NELAP	PA
9161 - 2,2',3,4,6'-Pentachlorobiphenyl (BZ-89)	EPA 1668A	10129405	NELAP	PA
8947 - 2,2',3,4,6+2,2',3,4',6-Pentachlorobiphenyl (BZ-88+91)	EPA 1668A	10129405	NELAP	PA
9156 - 2,2',3,4,6,6'-Hexachlorobiphenyl (BZ-145)	EPA 1668A	10129405	NELAP	PA
9158 - 2,2',3,4,6-Pentachlorobiphenyl (BZ-88)	EPA 1668A	10129405	NELAP	PA
9163 - 2,2',3,4-Tetrachlorobiphenyl (BZ-41)	EPA 1668A	10129405	NELAP	PA
8957 - 2,2',3,5'+2,2',4,4'+2,3,5,6-Tetrachlorobiphenyl (BZ-44+47+65)	EPA 1668A	10129405	NELAP	PA
9166 - 2,2',3,5',6-Pentachlorobiphenyl (BZ-95)	EPA 1668A	10129405	NELAP	PA
8945 - 2,2',3,5'-Tetrachlorobiphenyl (BZ-44)	EPA 1668A	10129405	NELAP	PA
8956 - 2,2',3,5+2,3',5',6-Tetrachlorobiphenyl (BZ-43+73)	EPA 1668A	10129405	NELAP	PA
9035 - 2,2',3,5,5',6-Hexachlorobiphenyl (BZ-151)	EPA 1668A	10129405	NELAP	PA
9164 - 2,2',3,5,5'-Pentachlorobiphenyl (BZ-92)	EPA 1668A	10129405	NELAP	PA
9167 - 2,2',3,5,6'-Pentachlorobiphenyl (BZ-94)	EPA 1668A	10129405	NELAP	PA
8949 - 2,2',3,5,6+2,2',4,4',6-Pentachlorobiphenyl (BZ-93+100)	EPA 1668A	10129405	NELAP	PA
9165 - 2,2',3,5,6,6'-Hexachlorobiphenyl (BZ-152)	EPA 1668A	10129405	NELAP	PA
9168 - 2,2',3,5,6-Pentachlorobiphenyl (BZ-93)	EPA 1668A	10129405	NELAP	PA
9169 - 2,2',3,5-Tetrachlorobiphenyl (BZ-43)	EPA 1668A	10129405	NELAP	PA
9171 - 2,2',3,6'-Tetrachlorobiphenyl (BZ-46)	EPA 1668A	10129405	NELAP	PA
8958 - 2,2',3,6+2,2',4,6'-	EPA 1668A	10129405	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
Tetrachlorobiphenyls (BZ 45 + 51)				
9170 - 2,2',3,6,6'-Pentachlorobiphenyl (BZ-96)	EPA 1668A	10129405	NELAP	PA
9172 - 2,2',3,6-Tetrachlorobiphenyl (BZ-45)	EPA 1668A	10129405	NELAP	PA
9173 - 2,2',3-Trichlorobiphenyl (BZ-16)	EPA 1668A	10129405	NELAP	PA
8931 - 2,2',4,4',5,5'+2,3',4,4',5',6-Hexachlorobiphenyl (BZ-153+168)	EPA 1668A	10129405	NELAP	PA
9040 - 2,2',4,4',5,5'-Hexachlorobiphenyl (BZ-153)	EPA 1668A	10129405	NELAP	PA
9174 - 2,2',4,4',5,6'-Hexachlorobiphenyl (BZ-154)	EPA 1668A	10129405	NELAP	PA
9175 - 2,2',4,4',5-Pentachlorobiphenyl (BZ-99)	EPA 1668A	10129405	NELAP	PA
9176 - 2,2',4,4',6,6'-Hexachlorobiphenyl (BZ-155)	EPA 1668A	10129405	NELAP	PA
9177 - 2,2',4,4',6-Pentachlorobiphenyl (BZ-100)	EPA 1668A	10129405	NELAP	PA
9178 - 2,2',4,4'-Tetrachlorobiphenyl (BZ-47)	EPA 1668A	10129405	NELAP	PA
8959 - 2,2',4,5'+2,3',4,6-Tetrachlorobiphenyl (BZ-49+69)	EPA 1668A	10129405	NELAP	PA
9179 - 2,2',4,5',6-Pentachlorobiphenyl (BZ-103)	EPA 1668A	10129405	NELAP	PA
8950 - 2,2',4,5'-Tetrachlorobiphenyl (BZ-49)	EPA 1668A	10129405	NELAP	PA
8980 - 2,2',4,5,5'-Pentachlorobiphenyl (BZ-101)	EPA 1668A	10129405	NELAP	PA
9180 - 2,2',4,5,6'-Pentachlorobiphenyl (BZ-102)	EPA 1668A	10129405	NELAP	PA
9181 - 2,2',4,5-Tetrachlorobiphenyl (BZ-48)	EPA 1668A	10129405	NELAP	PA
9183 - 2,2',4,6'-Tetrachlorobiphenyl (BZ-51)	EPA 1668A	10129405	NELAP	PA
8961 - 2,2',4,6+2,2',5,6'-Tetrachlorobiphenyl (BZ-50+53)	EPA 1668A	10129405	NELAP	PA
9182 - 2,2',4,6,6'-Pentachlorobiphenyl (BZ-104)	EPA 1668A	10129405	NELAP	PA
9184 - 2,2',4,6-Tetrachlorobiphenyl (BZ-50)	EPA 1668A	10129405	NELAP	PA
9185 - 2,2',4-Trichlorobiphenyl (BZ-17)	EPA 1668A	10129405	NELAP	PA
8966 - 2,2',5+2,4,6-Trichlorobiphenyl (BZ-18+30)	EPA 1668A	10129405	NELAP	PA
8955 - 2,2',5,5'-Tetrachlorobiphenyl (BZ-52)	EPA 1668A	10129405	NELAP	PA
9186 - 2,2',5,6'-Tetrachlorobiphenyl (BZ-53)	EPA 1668A	10129405	NELAP	PA
8930 - 2,2',5-Trichlorobiphenyl (BZ-18)	EPA 1668A	10129405	NELAP	PA
9187 - 2,2',6,6'-Tetrachlorobiphenyl (BZ-54)	EPA 1668A	10129405	NELAP	PA
9188 - 2,2',6-Trichlorobiphenyl (BZ-19)	EPA 1668A	10129405	NELAP	PA
9189 - 2,2'-Dichlorobiphenyl (BZ-4)	EPA 1668A	10129405	NELAP	PA
9224 - 2,3',4',5',6-Pentachlorobiphenyl (BZ-125)	EPA 1668A	10129405	NELAP	PA
9229 - 2,3',4',5'-Tetrachlorobiphenyl (BZ-76)	EPA 1668A	10129405	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
8964 - 2,3',4',5+2,4,4',5+2,3',4',5'-Tetrachlorobiphenyl (BZ-70+74+76)	EPA 1668A	10129405	NELAP	PA
9222 - 2,3',4',5,5'-Pentachlorobiphenyl (BZ-124)	EPA 1668A	10129405	NELAP	PA
9230 - 2,3',4',5-Tetrachlorobiphenyl (BZ-70)	EPA 1668A	10129405	NELAP	PA
9237 - 2,3',4',6-Tetrachlorobiphenyl (BZ-71)	EPA 1668A	10129405	NELAP	PA
9239 - 2,3',4'-Trichlorobiphenyl (BZ-33)	EPA 1668A	10129405	NELAP	PA
9218 - 2,3',4,4',5',6-Hexachlorobiphenyl (BZ-168)	EPA 1668A	10129405	NELAP	PA
9000 - 2,3',4,4',5'-Pentachlorobiphenyl (BZ-123)	EPA 1668A	10129405	NELAP	PA
9055 - 2,3',4,4',5,5'-Hexachlorobiphenyl (BZ-167)	EPA 1668A	10129405	NELAP	PA
8995 - 2,3',4,4',5-Pentachlorobiphenyl (BZ-118)	EPA 1668A	10129405	NELAP	PA
9220 - 2,3',4,4',6-Pentachlorobiphenyl (BZ-119)	EPA 1668A	10129405	NELAP	PA
8960 - 2,3',4,4'-Tetrachlorobiphenyl (BZ-66)	EPA 1668A	10129405	NELAP	PA
9226 - 2,3',4,5',6-Pentachlorobiphenyl (BZ-121)	EPA 1668A	10129405	NELAP	PA
9231 - 2,3',4,5'-Tetrachlorobiphenyl (BZ-68)	EPA 1668A	10129405	NELAP	PA
9223 - 2,3',4,5,5'-Pentachlorobiphenyl (BZ-120)	EPA 1668A	10129405	NELAP	PA
9232 - 2,3',4,5-Tetrachlorobiphenyl (BZ-67)	EPA 1668A	10129405	NELAP	PA
9235 - 2,3',4,6-Tetrachlorobiphenyl (BZ-69)	EPA 1668A	10129405	NELAP	PA
9240 - 2,3',4-Trichlorobiphenyl (BZ-25)	EPA 1668A	10129405	NELAP	PA
9244 - 2,3',5',6-Tetrachlorobiphenyl (BZ-73)	EPA 1668A	10129405	NELAP	PA
9246 - 2,3',5'-Trichlorobiphenyl (BZ-34)	EPA 1668A	10129405	NELAP	PA
8969 - 2,3',5+2,4,5-Trichlorobiphenyl (BZ-26+29)	EPA 1668A	10129405	NELAP	PA
9242 - 2,3',5,5'-Tetrachlorobiphenyl (BZ-72)	EPA 1668A	10129405	NELAP	PA
8935 - 2,3',5-Trichlorobiphenyl (BZ-26)	EPA 1668A	10129405	NELAP	PA
9248 - 2,3',6-Trichlorobiphenyl (BZ-27)	EPA 1668A	10129405	NELAP	PA
9249 - 2,3'-Dichlorobiphenyl (BZ-6)	EPA 1668A	10129405	NELAP	PA
8967 - 2,3,3'+2,4,4'-Trichlorobiphenyl (BZ-20+28)	EPA 1668A	10129405	NELAP	PA
9201 - 2,3,3',4',5',6-Hexachlorobiphenyl (BZ-164)	EPA 1668A	10129405	NELAP	PA
9202 - 2,3,3',4',5'-Pentachlorobiphenyl (BZ-122)	EPA 1668A	10129405	NELAP	PA
8936 - 2,3,3',4',5+2,3',4',5,5'-Pentachlorobiphenyl (BZ-107+124)	EPA 1668A	10129405	NELAP	PA
9195 - 2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-193)	EPA 1668A	10129405	NELAP	PA
9197 - 2,3,3',4',5,5'-Hexachlorobiphenyl (BZ-162)	EPA 1668A	10129405	NELAP	PA
9199 - 2,3,3',4',5,6-Hexachlorobiphenyl (BZ-163)	EPA 1668A	10129405	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9205 - 2,3,3',4',5-Pentachlorobiphenyl (BZ-107)	EPA 1668A	10129405	NELAP	PA
8938 - 2,3,3',4',6+2,3,4,4',6-Pentachlorobiphenyl (BZ-110+115)	EPA 1668A	10129405	NELAP	PA
8990 - 2,3,3',4',6-Pentachlorobiphenyl (BZ-110)	EPA 1668A	10129405	NELAP	PA
9207 - 2,3,3',4'-Tetrachlorobiphenyl (BZ-56)	EPA 1668A	10129405	NELAP	PA
9192 - 2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ-191)	EPA 1668A	10129405	NELAP	PA
9045 - 2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-157)	EPA 1668A	10129405	NELAP	PA
8932 - 2,3,3',4,4',5+2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-156+157)	EPA 1668A	10129405	NELAP	PA
9190 - 2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ-205)	EPA 1668A	10129405	NELAP	PA
9085 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ-189)	EPA 1668A	10129405	NELAP	PA
9191 - 2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ-190)	EPA 1668A	10129405	NELAP	PA
9050 - 2,3,3',4,4',5-Hexachlorobiphenyl (BZ-156)	EPA 1668A	10129405	NELAP	PA
9193 - 2,3,3',4,4',6-Hexachlorobiphenyl (BZ-158)	EPA 1668A	10129405	NELAP	PA
8985 - 2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)	EPA 1668A	10129405	NELAP	PA
9200 - 2,3,3',4,5',6-Hexachlorobiphenyl (BZ-161)	EPA 1668A	10129405	NELAP	PA
9203 - 2,3,3',4,5'-Pentachlorobiphenyl (BZ-108)	EPA 1668A	10129405	NELAP	PA
9194 - 2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ-192)	EPA 1668A	10129405	NELAP	PA
9196 - 2,3,3',4,5,5'-Hexachlorobiphenyl (BZ-159)	EPA 1668A	10129405	NELAP	PA
9198 - 2,3,3',4,5,6-Hexachlorobiphenyl (BZ-160)	EPA 1668A	10129405	NELAP	PA
9204 - 2,3,3',4,5-Pentachlorobiphenyl (BZ-106)	EPA 1668A	10129405	NELAP	PA
9206 - 2,3,3',4,6-Pentachlorobiphenyl (BZ-109)	EPA 1668A	10129405	NELAP	PA
9208 - 2,3,3',4-Tetrachlorobiphenyl (BZ-55)	EPA 1668A	10129405	NELAP	PA
9212 - 2,3,3',5',6-Pentachlorobiphenyl (BZ-113)	EPA 1668A	10129405	NELAP	PA
9213 - 2,3,3',5'-Tetrachlorobiphenyl (BZ-58)	EPA 1668A	10129405	NELAP	PA
9209 - 2,3,3',5,5',6-Hexachlorobiphenyl (BZ-165)	EPA 1668A	10129405	NELAP	PA
9210 - 2,3,3',5,5'-Pentachlorobiphenyl (BZ-111)	EPA 1668A	10129405	NELAP	PA
9211 - 2,3,3',5,6-Pentachlorobiphenyl (BZ-112)	EPA 1668A	10129405	NELAP	PA
9214 - 2,3,3',5-Tetrachlorobiphenyl (BZ-57)	EPA 1668A	10129405	NELAP	PA
8962 - 2,3,3',6+2,3,4,6+2,4,4',6-Tetrachlorobiphenyl (BZ-59+62+75)	EPA 1668A	10129405	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9215 - 2,3,3',6-Tetrachlorobiphenyl (BZ-59)	EPA 1668A	10129405	NELAP	PA
9216 - 2,3,3'-Trichlorobiphenyl (BZ-20)	EPA 1668A	10129405	NELAP	PA
9227 - 2,3,4',5,6-Pentachlorobiphenyl (BZ-117)	EPA 1668A	10129405	NELAP	PA
9233 - 2,3,4',5-Tetrachlorobiphenyl (BZ-63)	EPA 1668A	10129405	NELAP	PA
9236 - 2,3,4',6-Tetrachlorobiphenyl (BZ-64)	EPA 1668A	10129405	NELAP	PA
9241 - 2,3,4'-Trichlorobiphenyl (BZ-22)	EPA 1668A	10129405	NELAP	PA
8968 - 2,3,4+2,3',4'-Trichlorobiphenyl (BZ-21+33)	EPA 1668A	10129405	NELAP	PA
9217 - 2,3,4,4',5,6-Hexachlorobiphenyl (BZ-166)	EPA 1668A	10129405	NELAP	PA
9005 - 2,3,4,4',5-Pentachlorobiphenyl (BZ-114)	EPA 1668A	10129405	NELAP	PA
9219 - 2,3,4,4',6-Pentachlorobiphenyl (BZ-115)	EPA 1668A	10129405	NELAP	PA
9221 - 2,3,4,4'-Tetrachlorobiphenyl (BZ-60)	EPA 1668A	10129405	NELAP	PA
8963 - 2,3,4,5+2,3',4',5+2,4,4',5+2,3',4',5'-Tetrachlorobiphenyls (BZ 61+70+74+76)	EPA 1668A	10129405	NELAP	PA
9225 - 2,3,4,5,6-Pentachlorobiphenyl (BZ-116)	EPA 1668A	10129405	NELAP	PA
9228 - 2,3,4,5-Tetrachlorobiphenyl (BZ-61)	EPA 1668A	10129405	NELAP	PA
9234 - 2,3,4,6-Tetrachlorobiphenyl (BZ-62)	EPA 1668A	10129405	NELAP	PA
9238 - 2,3,4-Trichlorobiphenyl (BZ-21)	EPA 1668A	10129405	NELAP	PA
9243 - 2,3,5,6-Tetrachlorobiphenyl (BZ-65)	EPA 1668A	10129405	NELAP	PA
9245 - 2,3,5-Trichlorobiphenyl (BZ-23)	EPA 1668A	10129405	NELAP	PA
9247 - 2,3,6-Trichlorobiphenyl (BZ-24)	EPA 1668A	10129405	NELAP	PA
8920 - 2,3-Dichlorobiphenyl (BZ-5)	EPA 1668A	10129405	NELAP	PA
8940 - 2,4',5-Trichlorobiphenyl (BZ-31)	EPA 1668A	10129405	NELAP	PA
9255 - 2,4',6-Trichlorobiphenyl (BZ-32)	EPA 1668A	10129405	NELAP	PA
9256 - 2,4'-Dichlorobiphenyl (BZ-8)	EPA 1668A	10129405	NELAP	PA
9250 - 2,4,4',5-Tetrachlorobiphenyl (BZ-74)	EPA 1668A	10129405	NELAP	PA
9251 - 2,4,4',6-Tetrachlorobiphenyl (BZ-75)	EPA 1668A	10129405	NELAP	PA
9252 - 2,4,4'-Trichlorobiphenyl (BZ-28)	EPA 1668A	10129405	NELAP	PA
9253 - 2,4,5-Trichlorobiphenyl (BZ-29)	EPA 1668A	10129405	NELAP	PA
9254 - 2,4,6-Trichlorobiphenyl (BZ-30)	EPA 1668A	10129405	NELAP	PA
9257 - 2,4-Dichlorobiphenyl (BZ-7)	EPA 1668A	10129405	NELAP	PA
9258 - 2,5-Dichlorobiphenyl (BZ-9)	EPA 1668A	10129405	NELAP	PA
9259 - 2,6-Dichlorobiphenyl (BZ-10)	EPA 1668A	10129405	NELAP	PA
8915 - 2-Chlorobiphenyl (BZ-1)	EPA 1668A	10129405	NELAP	PA
9060 - 3,3',4,4',5,5'-Hexachlorobiphenyl (BZ-169)	EPA 1668A	10129405	NELAP	PA
9015 - 3,3',4,4',5-Pentachlorobiphenyl (BZ-126)	EPA 1668A	10129405	NELAP	PA
8965 - 3,3',4,4'-Tetrachlorobiphenyl (BZ-77)	EPA 1668A	10129405	NELAP	PA
9261 - 3,3',4,5'-Tetrachlorobiphenyl (BZ-79)	EPA 1668A	10129405	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9260 - 3,3',4,5,5'-Pentachlorobiphenyl (BZ-127)	EPA 1668A	10129405	NELAP	PA
9262 - 3,3',4,5-Tetrachlorobiphenyl (BZ-78)	EPA 1668A	10129405	NELAP	PA
9263 - 3,3',4-Trichlorobiphenyl (BZ-35)	EPA 1668A	10129405	NELAP	PA
9264 - 3,3',5,5'-Tetrachlorobiphenyl (BZ-80)	EPA 1668A	10129405	NELAP	PA
9265 - 3,3',5-Trichlorobiphenyl (BZ-36)	EPA 1668A	10129405	NELAP	PA
8925 - 3,3'-Dichlorobiphenyl (BZ-11)	EPA 1668A	10129405	NELAP	PA
9268 - 3,4',5-Trichlorobiphenyl (BZ-39)	EPA 1668A	10129405	NELAP	PA
9269 - 3,4'-Dichlorobiphenyl (BZ-13)	EPA 1668A	10129405	NELAP	PA
100098 - 3,4+3,4'-Dichlorobiphenyl (BZ-12+13)	EPA 1668A	10129405	NELAP	PA
8970 - 3,4,4',5-Tetrachlorobiphenyl (BZ-81)	EPA 1668A	10129405	NELAP	PA
9266 - 3,4,4'-Trichlorobiphenyl (BZ-37)	EPA 1668A	10129405	NELAP	PA
9267 - 3,4,5-Trichlorobiphenyl (BZ-38)	EPA 1668A	10129405	NELAP	PA
9270 - 3,4-Dichlorobiphenyl (BZ-12)	EPA 1668A	10129405	NELAP	PA
9271 - 3,5-Dichlorobiphenyl (BZ-14)	EPA 1668A	10129405	NELAP	PA
9272 - 3-Chlorobiphenyl (BZ-2)	EPA 1668A	10129405	NELAP	PA
9273 - 4,4'-Dichlorobiphenyl (BZ-15)	EPA 1668A	10129405	NELAP	PA
9274 - 4-Chlorobiphenyl (BZ-3)	EPA 1668A	10129405	NELAP	PA
8872 - PCB Aroclor Identification	EPA 1668A	10129405	NELAP	PA
8870 - PCBs	EPA 1668A	10129405	NELAP	PA
8875 - PCBs, as congeners	EPA 1668A	10129405	NELAP	PA
8876 - Total Dichlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8877 - Total Heptachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8888 - Total Hexachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8889 - Total Monochlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8891 - Total Nonachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8892 - Total Octachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8896 - Total Pentachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8893 - Total Tetrachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8894 - Total Trichlorobiphenyls	EPA 1668A	10129405	NELAP	PA
100003 - Acid Digestion of waters for Total Recoverable or Dissolved Metals	EPA 3005A	10133207	NELAP	PA
1401 - Acid Digestion of Aqueous samples and Extracts for Total Metals	EPA 3010	10133401	NELAP	PA
100004 - Acid Digestion of Aqueous samples and Extracts for Total Metals	EPA 3010A	10133605	NELAP	PA
100642 - Acid Digestion of Aqueous samples and Extracts for Total Metals (HNO3 only)	EPA 3020A	10134404	NELAP	PA
100005 - Acid Digestion of Aqueous samples and Extracts for Total Metals for Analysis by GFAA	EPA 3020A	10134404	NELAP	PA
1444 - Separatory Funnel Liquid-liquid extraction	EPA 3510C	10138202	NELAP	PA
1410 - Continuous Liquid-liquid extraction	EPA 3520	10138406	NELAP	PA
1406 - Purge and trap for aqueous phase samples	EPA 5030A	10153205	NELAP	PA
1000 - Aluminum	EPA 6010B	10155609	NELAP	PA
1005 - Antimony	EPA 6010B	10155609	NELAP	PA
1010 - Arsenic	EPA 6010B	10155609	NELAP	PA
1015 - Barium	EPA 6010B	10155609	NELAP	PA
1020 - Beryllium	EPA 6010B	10155609	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
1025 - Boron	EPA 6010B	10155609	NELAP	PA
1030 - Cadmium	EPA 6010B	10155609	NELAP	PA
1035 - Calcium	EPA 6010B	10155609	NELAP	PA
1040 - Chromium	EPA 6010B	10155609	NELAP	PA
1050 - Cobalt	EPA 6010B	10155609	NELAP	PA
1055 - Copper	EPA 6010B	10155609	NELAP	PA
1070 - Iron	EPA 6010B	10155609	NELAP	PA
1075 - Lead	EPA 6010B	10155609	NELAP	PA
1080 - Lithium	EPA 6010B	10155609	NELAP	PA
1085 - Magnesium	EPA 6010B	10155609	NELAP	PA
1090 - Manganese	EPA 6010B	10155609	NELAP	PA
1100 - Molybdenum	EPA 6010B	10155609	NELAP	PA
1105 - Nickel	EPA 6010B	10155609	NELAP	PA
1125 - Potassium	EPA 6010B	10155609	NELAP	PA
1140 - Selenium	EPA 6010B	10155609	NELAP	PA
1150 - Silver	EPA 6010B	10155609	NELAP	PA
1155 - Sodium	EPA 6010B	10155609	NELAP	PA
1160 - Strontium	EPA 6010B	10155609	NELAP	PA
1165 - Thallium	EPA 6010B	10155609	NELAP	PA
1175 - Tin	EPA 6010B	10155609	NELAP	PA
1180 - Titanium	EPA 6010B	10155609	NELAP	PA
1185 - Vanadium	EPA 6010B	10155609	NELAP	PA
1190 - Zinc	EPA 6010B	10155609	NELAP	PA
1000 - Aluminum	EPA 6010C	10155803	NELAP	PA
1005 - Antimony	EPA 6010C	10155803	NELAP	PA
1010 - Arsenic	EPA 6010C	10155803	NELAP	PA
1015 - Barium	EPA 6010C	10155803	NELAP	PA
1020 - Beryllium	EPA 6010C	10155803	NELAP	PA
1025 - Boron	EPA 6010C	10155803	NELAP	PA
1030 - Cadmium	EPA 6010C	10155803	NELAP	PA
1035 - Calcium	EPA 6010C	10155803	NELAP	PA
1040 - Chromium	EPA 6010C	10155803	NELAP	PA
1050 - Cobalt	EPA 6010C	10155803	NELAP	PA
1055 - Copper	EPA 6010C	10155803	NELAP	PA
1070 - Iron	EPA 6010C	10155803	NELAP	PA
1075 - Lead	EPA 6010C	10155803	NELAP	PA
1080 - Lithium	EPA 6010C	10155803	NELAP	PA
1085 - Magnesium	EPA 6010C	10155803	NELAP	PA
1090 - Manganese	EPA 6010C	10155803	NELAP	PA
1100 - Molybdenum	EPA 6010C	10155803	NELAP	PA
1105 - Nickel	EPA 6010C	10155803	NELAP	PA
1125 - Potassium	EPA 6010C	10155803	NELAP	PA
1140 - Selenium	EPA 6010C	10155803	NELAP	PA
1150 - Silver	EPA 6010C	10155803	NELAP	PA
1155 - Sodium	EPA 6010C	10155803	NELAP	PA
1160 - Strontium	EPA 6010C	10155803	NELAP	PA
2017 - Sulfur	EPA 6010C	10155803	NELAP	PA
1165 - Thallium	EPA 6010C	10155803	NELAP	PA
1175 - Tin	EPA 6010C	10155803	NELAP	PA
1180 - Titanium	EPA 6010C	10155803	NELAP	PA
1185 - Vanadium	EPA 6010C	10155803	NELAP	PA
1190 - Zinc	EPA 6010C	10155803	NELAP	PA
1000 - Aluminum	EPA 6020	10156000	NELAP	PA
1005 - Antimony	EPA 6020	10156000	NELAP	PA
1010 - Arsenic	EPA 6020	10156000	NELAP	PA
1015 - Barium	EPA 6020	10156000	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
1020 - Beryllium	EPA 6020	10156000	NELAP	PA
1025 - Boron	EPA 6020	10156000	NELAP	PA
1030 - Cadmium	EPA 6020	10156000	NELAP	PA
1035 - Calcium	EPA 6020	10156000	NELAP	PA
1055 - Copper	EPA 6020	10156000	NELAP	PA
1075 - Lead	EPA 6020	10156000	NELAP	PA
1085 - Magnesium	EPA 6020	10156000	NELAP	PA
1090 - Manganese	EPA 6020	10156000	NELAP	PA
1100 - Molybdenum	EPA 6020	10156000	NELAP	PA
1105 - Nickel	EPA 6020	10156000	NELAP	PA
1125 - Potassium	EPA 6020	10156000	NELAP	PA
1140 - Selenium	EPA 6020	10156000	NELAP	PA
1150 - Silver	EPA 6020	10156000	NELAP	PA
1155 - Sodium	EPA 6020	10156000	NELAP	PA
1160 - Strontium	EPA 6020	10156000	NELAP	PA
1165 - Thallium	EPA 6020	10156000	NELAP	PA
1175 - Tin	EPA 6020	10156000	NELAP	PA
1180 - Titanium	EPA 6020	10156000	NELAP	PA
1185 - Vanadium	EPA 6020	10156000	NELAP	PA
1040 - Chromium	EPA 6020	10156204	NELAP	PA
1050 - Cobalt	EPA 6020	10156204	NELAP	PA
1070 - Iron	EPA 6020	10156204	NELAP	PA
1190 - Zinc	EPA 6020	10156204	NELAP	PA
1000 - Aluminum	EPA 6020A	10156408	NELAP	PA
1005 - Antimony	EPA 6020A	10156408	NELAP	PA
1010 - Arsenic	EPA 6020A	10156408	NELAP	PA
1015 - Barium	EPA 6020A	10156408	NELAP	PA
1020 - Beryllium	EPA 6020A	10156408	NELAP	PA
1025 - Boron	EPA 6020A	10156408	NELAP	PA
1030 - Cadmium	EPA 6020A	10156408	NELAP	PA
1035 - Calcium	EPA 6020A	10156408	NELAP	PA
1040 - Chromium	EPA 6020A	10156408	NELAP	PA
1050 - Cobalt	EPA 6020A	10156408	NELAP	PA
1055 - Copper	EPA 6020A	10156408	NELAP	PA
1070 - Iron	EPA 6020A	10156408	NELAP	PA
1075 - Lead	EPA 6020A	10156408	NELAP	PA
1085 - Magnesium	EPA 6020A	10156408	NELAP	PA
1090 - Manganese	EPA 6020A	10156408	NELAP	PA
1100 - Molybdenum	EPA 6020A	10156408	NELAP	PA
1105 - Nickel	EPA 6020A	10156408	NELAP	PA
1125 - Potassium	EPA 6020A	10156408	NELAP	PA
1140 - Selenium	EPA 6020A	10156408	NELAP	PA
1150 - Silver	EPA 6020A	10156408	NELAP	PA
1155 - Sodium	EPA 6020A	10156408	NELAP	PA
1160 - Strontium	EPA 6020A	10156408	NELAP	PA
1165 - Thallium	EPA 6020A	10156408	NELAP	PA
1175 - Tin	EPA 6020A	10156408	NELAP	PA
1180 - Titanium	EPA 6020A	10156408	NELAP	PA
1185 - Vanadium	EPA 6020A	10156408	NELAP	PA
1190 - Zinc	EPA 6020A	10156408	NELAP	PA
1045 - Chromium VI	EPA 7196A	10162400	NELAP	PA
1045 - Chromium VI	EPA 7199	10163005	NELAP	PA
1095 - Mercury	EPA 7470A	10165807	NELAP	PA
4570 - 1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011	10173009	NELAP	PA
4585 - 1,2-Dibromoethane (EDB, Ethylene	EPA 8011	10173009	NELAP	PA

Eurofins Lancaster Laboratories Inc
Issue Date: July 1, 2015

Certificate Number: 02055

AI Number: 30729
Expiration Date: June 30, 2016

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
dibromide)				
4750 - Ethanol	EPA 8015	10173203	NELAP	PA
4785 - Ethylene glycol	EPA 8015	10173203	NELAP	PA
4895 - Isopropyl alcohol (2-Propanol, Isopropanol)	EPA 8015	10173203	NELAP	PA
4930 - Methanol	EPA 8015	10173203	NELAP	PA
4420 - tert-Butyl alcohol	EPA 8015	10173203	NELAP	PA
9369 - Diesel range organics (DRO)	EPA 8015B	10173601	NELAP	PA
4720 - Diethylene glycol	EPA 8015B	10173601	NELAP	PA
9408 - Gasoline range organics (GRO)	EPA 8015B	10173601	NELAP	PA
4875 - Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8015B	10173601	NELAP	PA
6657 - Propylene Glycol	EPA 8015B	10173601	NELAP	PA
4003 - Total Petroleum Hydrocarbons (Aviation Gasoline Range)	EPA 8015B	10173601	NELAP	PA
4004 - Total Petroleum Hydrocarbons (Jet Fuel Range)	EPA 8015B	10173601	NELAP	PA
9506 - Total Petroleum Hydrocarbons (Oil Range)	EPA 8015B	10173601	NELAP	PA
2050 - Total Petroleum Hydrocarbons (TPH)	EPA 8015B	10173601	NELAP	PA
9646 - Triethylene Glycol	EPA 8015B	10173601	NELAP	PA
4425 - n-Butyl alcohol (1-Butanol, n-Butanol)	EPA 8015B	10173601	NELAP	PA
5055 - n-Propanol (1-Propanol)	EPA 8015B	10173601	NELAP	PA
9369 - Diesel range organics (DRO)	EPA 8015C	10173805	NELAP	PA
9408 - Gasoline range organics (GRO)	EPA 8015C	10173805	NELAP	PA
4875 - Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8015C	10173805	NELAP	PA
1935 - Total recoverable petroleum hydrocarbons (TRPH)	EPA 8015C	10173805	NELAP	PA
4425 - n-Butyl alcohol (1-Butanol, n-Butanol)	EPA 8015C	10173805	NELAP	PA
5055 - n-Propanol (1-Propanol)	EPA 8015C	10173805	NELAP	PA
4375 - Benzene	EPA 8021B	10174808	NELAP	PA
4765 - Ethylbenzene	EPA 8021B	10174808	NELAP	PA
4900 - Isopropylbenzene	EPA 8021B	10174808	NELAP	PA
5000 - Methyl tert-butyl ether (MTBE)	EPA 8021B	10174808	NELAP	PA
5005 - Naphthalene	EPA 8021B	10174808	NELAP	PA
5140 - Toluene	EPA 8021B	10174808	NELAP	PA
5260 - Xylene (total)	EPA 8021B	10174808	NELAP	PA
5245 - m-Xylene	EPA 8021B	10174808	NELAP	PA
5250 - o-Xylene	EPA 8021B	10174808	NELAP	PA
5255 - p-Xylene	EPA 8021B	10174808	NELAP	PA
7740 - Kepone	EPA 8081A	10178606	NELAP	PA
7355 - 4,4'-DDD	EPA 8081B	10178800	NELAP	PA
7360 - 4,4'-DDE	EPA 8081B	10178800	NELAP	PA
7365 - 4,4'-DDT	EPA 8081B	10178800	NELAP	PA
7025 - Aldrin	EPA 8081B	10178800	NELAP	PA
7250 - Chlordane (tech.)	EPA 8081B	10178800	NELAP	PA
7470 - Dieldrin	EPA 8081B	10178800	NELAP	PA
7510 - Endosulfan I	EPA 8081B	10178800	NELAP	PA
7515 - Endosulfan II	EPA 8081B	10178800	NELAP	PA
7520 - Endosulfan sulfate	EPA 8081B	10178800	NELAP	PA
7540 - Endrin	EPA 8081B	10178800	NELAP	PA
7530 - Endrin aldehyde	EPA 8081B	10178800	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
7535 - Endrin ketone	EPA 8081B	10178800	NELAP	PA
7685 - Heptachlor	EPA 8081B	10178800	NELAP	PA
7690 - Heptachlor epoxide	EPA 8081B	10178800	NELAP	PA
7740 - Kepone	EPA 8081B	10178800	NELAP	PA
7810 - Methoxychlor	EPA 8081B	10178800	NELAP	PA
8250 - Toxaphene (Chlorinated camphene)	EPA 8081B	10178800	NELAP	PA
7110 - alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081B	10178800	NELAP	PA
7115 - beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081B	10178800	NELAP	PA
7105 - delta-BHC	EPA 8081B	10178800	NELAP	PA
7120 - gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	EPA 8081B	10178800	NELAP	PA
8880 - Aroclor-1016 (PCB-1016)	EPA 8082	10179007	NELAP	PA
8885 - Aroclor-1221 (PCB-1221)	EPA 8082	10179007	NELAP	PA
8890 - Aroclor-1232 (PCB-1232)	EPA 8082	10179007	NELAP	PA
8895 - Aroclor-1242 (PCB-1242)	EPA 8082	10179007	NELAP	PA
8900 - Aroclor-1248 (PCB-1248)	EPA 8082	10179007	NELAP	PA
8905 - Aroclor-1254 (PCB-1254)	EPA 8082	10179007	NELAP	PA
8910 - Aroclor-1260 (PCB-1260)	EPA 8082	10179007	NELAP	PA
8912 - Aroclor-1262 (PCB-1262)	EPA 8082	10179007	NELAP	PA
8913 - Aroclor-1268 (PCB-1268)	EPA 8082	10179007	NELAP	PA
7005 - Alachlor	EPA 8141	10181803	NELAP	PA
7065 - Atrazine	EPA 8141	10181803	NELAP	PA
7075 - Azinphos-methyl (Guthion)	EPA 8141	10181803	NELAP	PA
7125 - Bolstar (Sulprofos)	EPA 8141	10181803	NELAP	PA
7300 - Chlorpyrifos	EPA 8141	10181803	NELAP	PA
7315 - Coumaphos	EPA 8141	10181803	NELAP	PA
7395 - Demeton-o	EPA 8141	10181803	NELAP	PA
7385 - Demeton-s	EPA 8141	10181803	NELAP	PA
7410 - Diazinon	EPA 8141	10181803	NELAP	PA
8610 - Dichlorovos (DDVP, Dichlorvos)	EPA 8141	10181803	NELAP	PA
8625 - Disulfoton	EPA 8141	10181803	NELAP	PA
7550 - EPN	EPA 8141	10181803	NELAP	PA
7565 - Ethion	EPA 8141	10181803	NELAP	PA
7570 - Ethoprop	EPA 8141	10181803	NELAP	PA
7580 - Famphur	EPA 8141	10181803	NELAP	PA
7600 - Fensulfothion	EPA 8141	10181803	NELAP	PA
7770 - Malathion	EPA 8141	10181803	NELAP	PA
7785 - Merphos	EPA 8141	10181803	NELAP	PA
7825 - Methyl parathion (Parathion, methyl)	EPA 8141	10181803	NELAP	PA
7835 - Metolachlor	EPA 8141	10181803	NELAP	PA
7850 - Mevinphos	EPA 8141	10181803	NELAP	PA
7905 - Naled	EPA 8141	10181803	NELAP	PA
7955 - Parathion, ethyl	EPA 8141	10181803	NELAP	PA
7985 - Phorate	EPA 8141	10181803	NELAP	PA
8110 - Ronnel	EPA 8141	10181803	NELAP	PA
8125 - Simazine	EPA 8141	10181803	NELAP	PA
8140 - Stirophos	EPA 8141	10181803	NELAP	PA
8245 - Tokuthion (Prothiophos)	EPA 8141	10181803	NELAP	PA
8275 - Trichloronate	EPA 8141	10181803	NELAP	PA
7005 - Alachlor	EPA 8141A	10182000	NELAP	PA
7065 - Atrazine	EPA 8141A	10182000	NELAP	PA
7075 - Azinphos-methyl (Guthion)	EPA 8141A	10182000	NELAP	PA
7125 - Bolstar (Sulprofos)	EPA 8141A	10182000	NELAP	PA
7300 - Chlorpyrifos	EPA 8141A	10182000	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
7315 - Coumaphos	EPA 8141A	10182000	NELAP	PA
7395 - Demeton-o	EPA 8141A	10182000	NELAP	PA
7385 - Demeton-s	EPA 8141A	10182000	NELAP	PA
7410 - Diazinon	EPA 8141A	10182000	NELAP	PA
8610 - Dichlorovos (DDVP, Dichlorvos)	EPA 8141A	10182000	NELAP	PA
8625 - Disulfoton	EPA 8141A	10182000	NELAP	PA
7550 - EPN	EPA 8141A	10182000	NELAP	PA
7565 - Ethion	EPA 8141A	10182000	NELAP	PA
7570 - Ethoprop	EPA 8141A	10182000	NELAP	PA
7580 - Famphur	EPA 8141A	10182000	NELAP	PA
7600 - Fensulfothion	EPA 8141A	10182000	NELAP	PA
7770 - Malathion	EPA 8141A	10182000	NELAP	PA
7785 - Merphos	EPA 8141A	10182000	NELAP	PA
7825 - Methyl parathion (Parathion, methyl)	EPA 8141A	10182000	NELAP	PA
7835 - Metolachlor	EPA 8141A	10182000	NELAP	PA
7850 - Mevinphos	EPA 8141A	10182000	NELAP	PA
7905 - Naled	EPA 8141A	10182000	NELAP	PA
7955 - Parathion, ethyl	EPA 8141A	10182000	NELAP	PA
7985 - Phorate	EPA 8141A	10182000	NELAP	PA
8110 - Ronnel	EPA 8141A	10182000	NELAP	PA
8125 - Simazine	EPA 8141A	10182000	NELAP	PA
8140 - Stirophos	EPA 8141A	10182000	NELAP	PA
8245 - Tokuthion (Prothiophos)	EPA 8141A	10182000	NELAP	PA
8275 - Trichloronate	EPA 8141A	10182000	NELAP	PA
8655 - 2,4,5-T	EPA 8151	10183003	NELAP	PA
8545 - 2,4-D	EPA 8151	10183003	NELAP	PA
8560 - 2,4-DB	EPA 8151	10183003	NELAP	PA
8555 - Dalapon	EPA 8151	10183003	NELAP	PA
8595 - Dicamba	EPA 8151	10183003	NELAP	PA
8605 - Dichloroprop (Dichlorprop)	EPA 8151	10183003	NELAP	PA
7775 - MCPA	EPA 8151	10183003	NELAP	PA
7780 - MCPP	EPA 8151	10183003	NELAP	PA
6605 - Pentachlorophenol	EPA 8151	10183003	NELAP	PA
8645 - Picloram	EPA 8151	10183003	NELAP	PA
8650 - Silvex (2,4,5-TP)	EPA 8151	10183003	NELAP	PA
5105 - 1,1,1,2-Tetrachloroethane	EPA 8260B	10184802	NELAP	PA
5160 - 1,1,1-Trichloroethane	EPA 8260B	10184802	NELAP	PA
5110 - 1,1,2,2-Tetrachloroethane	EPA 8260B	10184802	NELAP	PA
5195 - 1,1,2-Trichloro-1,2,2-trifluoroethane	EPA 8260B	10184802	NELAP	PA
5185 - 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 8260B	10184802	NELAP	PA
5165 - 1,1,2-Trichloroethane	EPA 8260B	10184802	NELAP	PA
4630 - 1,1-Dichloroethane	EPA 8260B	10184802	NELAP	PA
4640 - 1,1-Dichloroethylene	EPA 8260B	10184802	NELAP	PA
4670 - 1,1-Dichloropropene	EPA 8260B	10184802	NELAP	PA
5150 - 1,2,3-Trichlorobenzene	EPA 8260B	10184802	NELAP	PA
5180 - 1,2,3-Trichloropropane	EPA 8260B	10184802	NELAP	PA
5155 - 1,2,4-Trichlorobenzene	EPA 8260B	10184802	NELAP	PA
5210 - 1,2,4-Trimethylbenzene	EPA 8260B	10184802	NELAP	PA
4570 - 1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260B	10184802	NELAP	PA
4585 - 1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260B	10184802	NELAP	PA
4610 - 1,2-Dichlorobenzene	EPA 8260B	10184802	NELAP	PA
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA 8260B	10184802	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
4655 - 1,2-Dichloropropane	EPA 8260B	10184802	NELAP	PA
5215 - 1,3,5-Trimethylbenzene	EPA 8260B	10184802	NELAP	PA
4615 - 1,3-Dichlorobenzene	EPA 8260B	10184802	NELAP	PA
4660 - 1,3-Dichloropropane	EPA 8260B	10184802	NELAP	PA
4620 - 1,4-Dichlorobenzene	EPA 8260B	10184802	NELAP	PA
4735 - 1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8260B	10184802	NELAP	PA
4665 - 2,2-Dichloropropane	EPA 8260B	10184802	NELAP	PA
4410 - 2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260B	10184802	NELAP	PA
4500 - 2-Chloroethyl vinyl ether	EPA 8260B	10184802	NELAP	PA
4535 - 2-Chlorotoluene	EPA 8260B	10184802	NELAP	PA
4860 - 2-Hexanone	EPA 8260B	10184802	NELAP	PA
5020 - 2-Nitropropane	EPA 8260B	10184802	NELAP	PA
4540 - 4-Chlorotoluene	EPA 8260B	10184802	NELAP	PA
4910 - 4-Isopropyltoluene (p-Cymene)	EPA 8260B	10184802	NELAP	PA
4995 - 4-Methyl-2-pentanone (MIBK)	EPA 8260B	10184802	NELAP	PA
4315 - Acetone	EPA 8260B	10184802	NELAP	PA
4320 - Acetonitrile	EPA 8260B	10184802	NELAP	PA
4325 - Acrolein (Propenal)	EPA 8260B	10184802	NELAP	PA
4340 - Acrylonitrile	EPA 8260B	10184802	NELAP	PA
4350 - Allyl alcohol	EPA 8260B	10184802	NELAP	PA
4355 - Allyl chloride (3-Chloropropene)	EPA 8260B	10184802	NELAP	PA
4375 - Benzene	EPA 8260B	10184802	NELAP	PA
5635 - Benzyl chloride	EPA 8260B	10184802	NELAP	PA
4385 - Bromobenzene	EPA 8260B	10184802	NELAP	PA
4390 - Bromochloromethane	EPA 8260B	10184802	NELAP	PA
4395 - Bromodichloromethane	EPA 8260B	10184802	NELAP	PA
4400 - Bromoform	EPA 8260B	10184802	NELAP	PA
4450 - Carbon disulfide	EPA 8260B	10184802	NELAP	PA
4455 - Carbon tetrachloride	EPA 8260B	10184802	NELAP	PA
4475 - Chlorobenzene	EPA 8260B	10184802	NELAP	PA
4575 - Chlorodibromomethane	EPA 8260B	10184802	NELAP	PA
4485 - Chloroethane (Ethyl chloride)	EPA 8260B	10184802	NELAP	PA
4505 - Chloroform	EPA 8260B	10184802	NELAP	PA
4525 - Chloroprene (2-Chloro-1,3-butadiene)	EPA 8260B	10184802	NELAP	PA
4555 - Cyclohexane	EPA 8260B	10184802	NELAP	PA
9375 - Di-isopropylether (DIPE) (Isopropyl ether)	EPA 8260B	10184802	NELAP	PA
4580 - Dibromochloropropane	EPA 8260B	10184802	NELAP	PA
4590 - Dibromofluoromethane	EPA 8260B	10184802	NELAP	PA
4595 - Dibromomethane (Methylene bromide)	EPA 8260B	10184802	NELAP	PA
4625 - Dichlorodifluoromethane (Freon-12)	EPA 8260B	10184802	NELAP	PA
4745 - Epichlorohydrin (1-Chloro-2,3-epoxypropane)	EPA 8260B	10184802	NELAP	PA
4750 - Ethanol	EPA 8260B	10184802	NELAP	PA
4755 - Ethyl acetate	EPA 8260B	10184802	NELAP	PA
4810 - Ethyl methacrylate	EPA 8260B	10184802	NELAP	PA
4770 - Ethyl-t-butyl ether (ETBE) (2-Ethoxy-2-methylpropane)	EPA 8260B	10184802	NELAP	PA
4765 - Ethylbenzene	EPA 8260B	10184802	NELAP	PA
9408 - Gasoline range organics (GRO)	EPA 8260B	10184802	NELAP	PA
4835 - Hexachlorobutadiene	EPA 8260B	10184802	NELAP	PA
4870 - Iodomethane (Methyl iodide)	EPA 8260B	10184802	NELAP	PA
4875 - Isobutyl alcohol (2-Methyl-1-	EPA 8260B	10184802	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
propanol)				
4900 - Isopropylbenzene	EPA 8260B	10184802	NELAP	PA
4925 - Methacrylonitrile	EPA 8260B	10184802	NELAP	PA
4940 - Methyl acetate	EPA 8260B	10184802	NELAP	PA
4950 - Methyl bromide (Bromomethane)	EPA 8260B	10184802	NELAP	PA
4960 - Methyl chloride (Chloromethane)	EPA 8260B	10184802	NELAP	PA
5000 - Methyl tert-butyl ether (MTBE)	EPA 8260B	10184802	NELAP	PA
4975 - Methylene chloride (Dichloromethane)	EPA 8260B	10184802	NELAP	PA
5005 - Naphthalene	EPA 8260B	10184802	NELAP	PA
5035 - Pentachloroethane	EPA 8260B	10184802	NELAP	PA
5080 - Propionitrile (Ethyl cyanide)	EPA 8260B	10184802	NELAP	PA
5100 - Styrene	EPA 8260B	10184802	NELAP	PA
4370 - T-amylmethylether (TAME)	EPA 8260B	10184802	NELAP	PA
5115 - Tetrachloroethylene (Perchloroethylene)	EPA 8260B	10184802	NELAP	PA
5120 - Tetrahydrofuran (THF)	EPA 8260B	10184802	NELAP	PA
5140 - Toluene	EPA 8260B	10184802	NELAP	PA
5170 - Trichloroethene (Trichloroethylene)	EPA 8260B	10184802	NELAP	PA
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA 8260B	10184802	NELAP	PA
5225 - Vinyl acetate	EPA 8260B	10184802	NELAP	PA
5235 - Vinyl chloride	EPA 8260B	10184802	NELAP	PA
5260 - Xylene (total)	EPA 8260B	10184802	NELAP	PA
4705 - cis & trans-1,2-Dichloroethene	EPA 8260B	10184802	NELAP	PA
4645 - cis-1,2-Dichloroethylene	EPA 8260B	10184802	NELAP	PA
4680 - cis-1,3-Dichloropropene	EPA 8260B	10184802	NELAP	PA
5240 - m+p-xylene	EPA 8260B	10184802	NELAP	PA
4425 - n-Butyl alcohol (1-Butanol, n-Butanol)	EPA 8260B	10184802	NELAP	PA
4435 - n-Butylbenzene	EPA 8260B	10184802	NELAP	PA
5085 - n-Propylamine	EPA 8260B	10184802	NELAP	PA
5090 - n-Propylbenzene	EPA 8260B	10184802	NELAP	PA
5250 - o-Xylene	EPA 8260B	10184802	NELAP	PA
4440 - sec-Butylbenzene	EPA 8260B	10184802	NELAP	PA
4420 - tert-Butyl alcohol	EPA 8260B	10184802	NELAP	PA
4445 - tert-Butylbenzene	EPA 8260B	10184802	NELAP	PA
4700 - trans-1,2-Dichloroethylene	EPA 8260B	10184802	NELAP	PA
4685 - trans-1,3-Dichloropropylene	EPA 8260B	10184802	NELAP	PA
4605 - trans-1,4-Dichloro-2-butene	EPA 8260B	10184802	NELAP	PA
6705 - 1,2,3,4-Tetrachlorobenzene	EPA 8270C	10185805	NELAP	PA
6710 - 1,2,3,5-Tetrachlorobenzene	EPA 8270C	10185805	NELAP	PA
6715 - 1,2,4,5-Tetrachlorobenzene	EPA 8270C	10185805	NELAP	PA
5155 - 1,2,4-Trichlorobenzene	EPA 8270C	10185805	NELAP	PA
4610 - 1,2-Dichlorobenzene	EPA 8270C	10185805	NELAP	PA
6220 - 1,2-Diphenylhydrazine	EPA 8270C	10185805	NELAP	PA
6885 - 1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270C	10185805	NELAP	PA
4615 - 1,3-Dichlorobenzene	EPA 8270C	10185805	NELAP	PA
6160 - 1,3-Dinitrobenzene (1,3-DNB)	EPA 8270C	10185805	NELAP	PA
4620 - 1,4-Dichlorobenzene	EPA 8270C	10185805	NELAP	PA
6165 - 1,4-Dinitrobenzene	EPA 8270C	10185805	NELAP	PA
4735 - 1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8270C	10185805	NELAP	PA
6420 - 1,4-Naphthoquinone	EPA 8270C	10185805	NELAP	PA
6630 - 1,4-Phenylenediamine	EPA 8270C	10185805	NELAP	PA
5790 - 1-Chloronaphthalene	EPA 8270C	10185805	NELAP	PA
6380 - 1-Methylnaphthalene	EPA 8270C	10185805	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
6425 - 1-Naphthylamine	EPA 8270C	10185805	NELAP	PA
6735 - 2,3,4,6-Tetrachlorophenol	EPA 8270C	10185805	NELAP	PA
6835 - 2,4,5-Trichlorophenol	EPA 8270C	10185805	NELAP	PA
6840 - 2,4,6-Trichlorophenol	EPA 8270C	10185805	NELAP	PA
6000 - 2,4-Dichlorophenol	EPA 8270C	10185805	NELAP	PA
6130 - 2,4-Dimethylphenol	EPA 8270C	10185805	NELAP	PA
6175 - 2,4-Dinitrophenol	EPA 8270C	10185805	NELAP	PA
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8270C	10185805	NELAP	PA
6005 - 2,6-Dichlorophenol	EPA 8270C	10185805	NELAP	PA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8270C	10185805	NELAP	PA
5515 - 2-Acetylaminofluorene	EPA 8270C	10185805	NELAP	PA
9322 - 2-Butoxyethanol	EPA 8270C	10185805	NELAP	PA
5795 - 2-Chloronaphthalene	EPA 8270C	10185805	NELAP	PA
5800 - 2-Chlorophenol	EPA 8270C	10185805	NELAP	PA
6360 - 2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	EPA 8270C	10185805	NELAP	PA
5145 - 2-Methylaniline (o-Toluidine)	EPA 8270C	10185805	NELAP	PA
6385 - 2-Methylnaphthalene	EPA 8270C	10185805	NELAP	PA
6400 - 2-Methylphenol (o-Cresol)	EPA 8270C	10185805	NELAP	PA
6430 - 2-Naphthylamine	EPA 8270C	10185805	NELAP	PA
6460 - 2-Nitroaniline	EPA 8270C	10185805	NELAP	PA
6490 - 2-Nitrophenol	EPA 8270C	10185805	NELAP	PA
5050 - 2-Picoline (2-Methylpyridine)	EPA 8270C	10185805	NELAP	PA
5945 - 3,3'-Dichlorobenzidine	EPA 8270C	10185805	NELAP	PA
6120 - 3,3'-Dimethylbenzidine	EPA 8270C	10185805	NELAP	PA
6355 - 3-Methylcholanthrene	EPA 8270C	10185805	NELAP	PA
6405 - 3-Methylphenol (m-Cresol)	EPA 8270C	10185805	NELAP	PA
6465 - 3-Nitroaniline	EPA 8270C	10185805	NELAP	PA
5540 - 4-Aminobiphenyl	EPA 8270C	10185805	NELAP	PA
5660 - 4-Bromophenyl phenyl ether	EPA 8270C	10185805	NELAP	PA
5700 - 4-Chloro-3-methylphenol	EPA 8270C	10185805	NELAP	PA
5745 - 4-Chloroaniline	EPA 8270C	10185805	NELAP	PA
5825 - 4-Chlorophenyl phenylether	EPA 8270C	10185805	NELAP	PA
6105 - 4-Dimethyl aminoazobenzene	EPA 8270C	10185805	NELAP	PA
6410 - 4-Methylphenol (p-Cresol)	EPA 8270C	10185805	NELAP	PA
6470 - 4-Nitroaniline	EPA 8270C	10185805	NELAP	PA
6500 - 4-Nitrophenol	EPA 8270C	10185805	NELAP	PA
6510 - 4-Nitroquinoline 1-oxide	EPA 8270C	10185805	NELAP	PA
6570 - 5-Nitro-o-toluidine	EPA 8270C	10185805	NELAP	PA
6115 - 7,12-Dimethylbenz(a) anthracene	EPA 8270C	10185805	NELAP	PA
5500 - Acenaphthene	EPA 8270C	10185805	NELAP	PA
5505 - Acenaphthylene	EPA 8270C	10185805	NELAP	PA
5510 - Acetophenone	EPA 8270C	10185805	NELAP	PA
5545 - Aniline	EPA 8270C	10185805	NELAP	PA
5555 - Anthracene	EPA 8270C	10185805	NELAP	PA
5560 - Aramite	EPA 8270C	10185805	NELAP	PA
5567 - Benzenethiol	EPA 8270C	10185805	NELAP	PA
5595 - Benzidine	EPA 8270C	10185805	NELAP	PA
5575 - Benzo(a)anthracene	EPA 8270C	10185805	NELAP	PA
5580 - Benzo(a)pyrene	EPA 8270C	10185805	NELAP	PA
5585 - Benzo(b)fluoranthene	EPA 8270C	10185805	NELAP	PA
5590 - Benzo(g,h,i)perylene	EPA 8270C	10185805	NELAP	PA
5600 - Benzo(k)fluoranthene	EPA 8270C	10185805	NELAP	PA
5610 - Benzoic acid	EPA 8270C	10185805	NELAP	PA
5630 - Benzyl alcohol	EPA 8270C	10185805	NELAP	PA
5640 - Biphenyl	EPA 8270C	10185805	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
5670 - Butyl benzyl phthalate	EPA 8270C	10185805	NELAP	PA
7180 - Caprolactam	EPA 8270C	10185805	NELAP	PA
5680 - Carbazole	EPA 8270C	10185805	NELAP	PA
7260 - Chlorobenzilate	EPA 8270C	10185805	NELAP	PA
5855 - Chrysene	EPA 8270C	10185805	NELAP	PA
6065 - Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	EPA 8270C	10185805	NELAP	PA
5925 - Di-n-butyl phthalate	EPA 8270C	10185805	NELAP	PA
6200 - Di-n-octyl phthalate	EPA 8270C	10185805	NELAP	PA
7405 - Diallate	EPA 8270C	10185805	NELAP	PA
9354 - Dibenz(a, h) acridine	EPA 8270C	10185805	NELAP	PA
5900 - Dibenz(a, j) acridine	EPA 8270C	10185805	NELAP	PA
5895 - Dibenz(a,h) anthracene	EPA 8270C	10185805	NELAP	PA
5905 - Dibenzofuran	EPA 8270C	10185805	NELAP	PA
7475 - Dimethoate	EPA 8270C	10185805	NELAP	PA
6135 - Dimethyl phthalate	EPA 8270C	10185805	NELAP	PA
8620 - Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8270C	10185805	NELAP	PA
6205 - Diphenylamine	EPA 8270C	10185805	NELAP	PA
8625 - Disulfoton	EPA 8270C	10185805	NELAP	PA
6260 - Ethyl methanesulfonate	EPA 8270C	10185805	NELAP	PA
7580 - Famphur	EPA 8270C	10185805	NELAP	PA
6265 - Fluoranthene	EPA 8270C	10185805	NELAP	PA
6270 - Fluorene	EPA 8270C	10185805	NELAP	PA
6275 - Hexachlorobenzene	EPA 8270C	10185805	NELAP	PA
4835 - Hexachlorobutadiene	EPA 8270C	10185805	NELAP	PA
6285 - Hexachlorocyclopentadiene	EPA 8270C	10185805	NELAP	PA
4840 - Hexachloroethane	EPA 8270C	10185805	NELAP	PA
6295 - Hexachloropropene	EPA 8270C	10185805	NELAP	PA
6312 - Indene	EPA 8270C	10185805	NELAP	PA
6315 - Indeno(1,2,3-cd) pyrene	EPA 8270C	10185805	NELAP	PA
7725 - Isodrin	EPA 8270C	10185805	NELAP	PA
6320 - Isophorone	EPA 8270C	10185805	NELAP	PA
6325 - Isosafrole	EPA 8270C	10185805	NELAP	PA
7740 - Kepone	EPA 8270C	10185805	NELAP	PA
6345 - Methapyrilene	EPA 8270C	10185805	NELAP	PA
6375 - Methyl methanesulfonate	EPA 8270C	10185805	NELAP	PA
7825 - Methyl parathion (Parathion, methyl)	EPA 8270C	10185805	NELAP	PA
5005 - Naphthalene	EPA 8270C	10185805	NELAP	PA
5015 - Nitrobenzene	EPA 8270C	10185805	NELAP	PA
7955 - Parathion, ethyl	EPA 8270C	10185805	NELAP	PA
6600 - Pentachloronitrobenzene	EPA 8270C	10185805	NELAP	PA
6605 - Pentachlorophenol	EPA 8270C	10185805	NELAP	PA
6610 - Phenacetin	EPA 8270C	10185805	NELAP	PA
6615 - Phenanthrene	EPA 8270C	10185805	NELAP	PA
6625 - Phenol	EPA 8270C	10185805	NELAP	PA
7985 - Phorate	EPA 8270C	10185805	NELAP	PA
6640 - Phthalic anhydride	EPA 8270C	10185805	NELAP	PA
6650 - Pronamide (Kerb)	EPA 8270C	10185805	NELAP	PA
6665 - Pyrene	EPA 8270C	10185805	NELAP	PA
5095 - Pyridine	EPA 8270C	10185805	NELAP	PA
6670 - Quinoline	EPA 8270C	10185805	NELAP	PA
6685 - Safrole	EPA 8270C	10185805	NELAP	PA
8155 - Sulfotepp	EPA 8270C	10185805	NELAP	PA
8210 - Tetraethyl pyrophosphate (TEPP)	EPA 8270C	10185805	NELAP	PA
8235 - Thionazin (Zinophos)	EPA 8270C	10185805	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
6750 - Thiophenol (Benzenethiol)	EPA 8270C	10185805	NELAP	PA
6755 - Tolualdehyde (1,2-Tolualdehyde)	EPA 8270C	10185805	NELAP	PA
6125 - a-a-Dimethylphenethylamine	EPA 8270C	10185805	NELAP	PA
5760 - bis(2-Chloroethoxy)methane	EPA 8270C	10185805	NELAP	PA
5765 - bis(2-Chloroethyl) ether	EPA 8270C	10185805	NELAP	PA
5780 - bis(2-Chloroisopropyl) ether	EPA 8270C	10185805	NELAP	PA
5025 - n-Nitroso-di-n-butylamine	EPA 8270C	10185805	NELAP	PA
6545 - n-Nitrosodi-n-propylamine	EPA 8270C	10185805	NELAP	PA
6525 - n-Nitrosodiethylamine	EPA 8270C	10185805	NELAP	PA
6530 - n-Nitrosodimethylamine	EPA 8270C	10185805	NELAP	PA
6535 - n-Nitrosodiphenylamine	EPA 8270C	10185805	NELAP	PA
6550 - n-Nitrosomethylethylamine	EPA 8270C	10185805	NELAP	PA
6555 - n-Nitrosomorpholine	EPA 8270C	10185805	NELAP	PA
6560 - n-Nitrosopiperidine	EPA 8270C	10185805	NELAP	PA
6565 - n-Nitrosopyrrolidine	EPA 8270C	10185805	NELAP	PA
8290 - o,o,o-Triethyl phosphorothioate	EPA 8270C	10185805	NELAP	PA
6105 - p-Dimethylaminoazobenzene	EPA 8270C	10185805	NELAP	PA
8310 - tris-(2,3-Dibromopropyl) phosphate (tris-BP)	EPA 8270C	10185805	NELAP	PA
6715 - 1,2,4,5-Tetrachlorobenzene	EPA 8270D	10186002	NELAP	PA
5155 - 1,2,4-Trichlorobenzene	EPA 8270D	10186002	NELAP	PA
4610 - 1,2-Dichlorobenzene	EPA 8270D	10186002	NELAP	PA
6220 - 1,2-Diphenylhydrazine	EPA 8270D	10186002	NELAP	PA
6885 - 1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270D	10186002	NELAP	PA
4615 - 1,3-Dichlorobenzene	EPA 8270D	10186002	NELAP	PA
6160 - 1,3-Dinitrobenzene (1,3-DNB)	EPA 8270D	10186002	NELAP	PA
4620 - 1,4-Dichlorobenzene	EPA 8270D	10186002	NELAP	PA
6165 - 1,4-Dinitrobenzene	EPA 8270D	10186002	NELAP	PA
4735 - 1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8270D	10186002	NELAP	PA
6420 - 1,4-Naphthoquinone	EPA 8270D	10186002	NELAP	PA
6630 - 1,4-Phenylenediamine	EPA 8270D	10186002	NELAP	PA
5790 - 1-Chloronaphthalene	EPA 8270D	10186002	NELAP	PA
6380 - 1-Methylnaphthalene	EPA 8270D	10186002	NELAP	PA
6425 - 1-Naphthylamine	EPA 8270D	10186002	NELAP	PA
6735 - 2,3,4,6-Tetrachlorophenol	EPA 8270D	10186002	NELAP	PA
6835 - 2,4,5-Trichlorophenol	EPA 8270D	10186002	NELAP	PA
6840 - 2,4,6-Trichlorophenol	EPA 8270D	10186002	NELAP	PA
6000 - 2,4-Dichlorophenol	EPA 8270D	10186002	NELAP	PA
6130 - 2,4-Dimethylphenol	EPA 8270D	10186002	NELAP	PA
6175 - 2,4-Dinitrophenol	EPA 8270D	10186002	NELAP	PA
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8270D	10186002	NELAP	PA
6005 - 2,6-Dichlorophenol	EPA 8270D	10186002	NELAP	PA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8270D	10186002	NELAP	PA
5515 - 2-Acetylaminofluorene	EPA 8270D	10186002	NELAP	PA
5795 - 2-Chloronaphthalene	EPA 8270D	10186002	NELAP	PA
5800 - 2-Chlorophenol	EPA 8270D	10186002	NELAP	PA
6360 - 2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	EPA 8270D	10186002	NELAP	PA
5145 - 2-Methylaniline (o-Toluidine)	EPA 8270D	10186002	NELAP	PA
6385 - 2-Methylnaphthalene	EPA 8270D	10186002	NELAP	PA
6400 - 2-Methylphenol (o-Cresol)	EPA 8270D	10186002	NELAP	PA
6430 - 2-Naphthylamine	EPA 8270D	10186002	NELAP	PA
6460 - 2-Nitroaniline	EPA 8270D	10186002	NELAP	PA
6490 - 2-Nitrophenol	EPA 8270D	10186002	NELAP	PA
5050 - 2-Picoline (2-Methylpyridine)	EPA 8270D	10186002	NELAP	PA
5945 - 3,3'-Dichlorobenzidine	EPA 8270D	10186002	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
6120 - 3,3'-Dimethylbenzidine	EPA 8270D	10186002	NELAP	PA
6355 - 3-Methylcholanthrene	EPA 8270D	10186002	NELAP	PA
6405 - 3-Methylphenol (m-Cresol)	EPA 8270D	10186002	NELAP	PA
6465 - 3-Nitroaniline	EPA 8270D	10186002	NELAP	PA
5540 - 4-Aminobiphenyl	EPA 8270D	10186002	NELAP	PA
5660 - 4-Bromophenyl phenyl ether	EPA 8270D	10186002	NELAP	PA
5700 - 4-Chloro-3-methylphenol	EPA 8270D	10186002	NELAP	PA
5745 - 4-Chloroaniline	EPA 8270D	10186002	NELAP	PA
5825 - 4-Chlorophenyl phenylether	EPA 8270D	10186002	NELAP	PA
6410 - 4-Methylphenol (p-Cresol)	EPA 8270D	10186002	NELAP	PA
6470 - 4-Nitroaniline	EPA 8270D	10186002	NELAP	PA
6500 - 4-Nitrophenol	EPA 8270D	10186002	NELAP	PA
6510 - 4-Nitroquinoline 1-oxide	EPA 8270D	10186002	NELAP	PA
6570 - 5-Nitro-o-toluidine	EPA 8270D	10186002	NELAP	PA
6115 - 7,12-Dimethylbenz(a) anthracene	EPA 8270D	10186002	NELAP	PA
5500 - Acenaphthene	EPA 8270D	10186002	NELAP	PA
5505 - Acenaphthylene	EPA 8270D	10186002	NELAP	PA
5510 - Acetophenone	EPA 8270D	10186002	NELAP	PA
5545 - Aniline	EPA 8270D	10186002	NELAP	PA
5555 - Anthracene	EPA 8270D	10186002	NELAP	PA
5560 - Aramite	EPA 8270D	10186002	NELAP	PA
5567 - Benzenethiol	EPA 8270D	10186002	NELAP	PA
5595 - Benzidine	EPA 8270D	10186002	NELAP	PA
5575 - Benzo(a)anthracene	EPA 8270D	10186002	NELAP	PA
5580 - Benzo(a)pyrene	EPA 8270D	10186002	NELAP	PA
5585 - Benzo(b)fluoranthene	EPA 8270D	10186002	NELAP	PA
5590 - Benzo(g,h,i)perylene	EPA 8270D	10186002	NELAP	PA
5600 - Benzo(k)fluoranthene	EPA 8270D	10186002	NELAP	PA
5610 - Benzoic acid	EPA 8270D	10186002	NELAP	PA
5630 - Benzyl alcohol	EPA 8270D	10186002	NELAP	PA
5635 - Benzyl chloride	EPA 8270D	10186002	NELAP	PA
5670 - Butyl benzyl phthalate	EPA 8270D	10186002	NELAP	PA
7180 - Caprolactam	EPA 8270D	10186002	NELAP	PA
5680 - Carbazole	EPA 8270D	10186002	NELAP	PA
5855 - Chrysene	EPA 8270D	10186002	NELAP	PA
6065 - Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	EPA 8270D	10186002	NELAP	PA
5925 - Di-n-butyl phthalate	EPA 8270D	10186002	NELAP	PA
6200 - Di-n-octyl phthalate	EPA 8270D	10186002	NELAP	PA
7405 - Diallate	EPA 8270D	10186002	NELAP	PA
5895 - Dibenz(a,h) anthracene	EPA 8270D	10186002	NELAP	PA
5905 - Dibenzofuran	EPA 8270D	10186002	NELAP	PA
6135 - Dimethyl phthalate	EPA 8270D	10186002	NELAP	PA
8620 - Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8270D	10186002	NELAP	PA
6205 - Diphenylamine	EPA 8270D	10186002	NELAP	PA
8625 - Disulfoton	EPA 8270D	10186002	NELAP	PA
6260 - Ethyl methanesulfonate	EPA 8270D	10186002	NELAP	PA
7580 - Famphur	EPA 8270D	10186002	NELAP	PA
6265 - Fluoranthene	EPA 8270D	10186002	NELAP	PA
6270 - Fluorene	EPA 8270D	10186002	NELAP	PA
6275 - Hexachlorobenzene	EPA 8270D	10186002	NELAP	PA
4835 - Hexachlorobutadiene	EPA 8270D	10186002	NELAP	PA
6285 - Hexachlorocyclopentadiene	EPA 8270D	10186002	NELAP	PA
4840 - Hexachloroethane	EPA 8270D	10186002	NELAP	PA
6295 - Hexachloropropene	EPA 8270D	10186002	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
6315 - Indeno(1,2,3-cd) pyrene	EPA 8270D	10186002	NELAP	PA
7725 - Isodrin	EPA 8270D	10186002	NELAP	PA
6320 - Isophorone	EPA 8270D	10186002	NELAP	PA
6325 - Isosafrole	EPA 8270D	10186002	NELAP	PA
7740 - Kepone	EPA 8270D	10186002	NELAP	PA
6345 - Methapyrilene	EPA 8270D	10186002	NELAP	PA
6375 - Methyl methanesulfonate	EPA 8270D	10186002	NELAP	PA
7825 - Methyl parathion (Parathion, methyl)	EPA 8270D	10186002	NELAP	PA
5005 - Naphthalene	EPA 8270D	10186002	NELAP	PA
5015 - Nitrobenzene	EPA 8270D	10186002	NELAP	PA
7955 - Parathion, ethyl	EPA 8270D	10186002	NELAP	PA
6600 - Pentachloronitrobenzene	EPA 8270D	10186002	NELAP	PA
6605 - Pentachlorophenol	EPA 8270D	10186002	NELAP	PA
6610 - Phenacetin	EPA 8270D	10186002	NELAP	PA
6615 - Phenanthrene	EPA 8270D	10186002	NELAP	PA
6625 - Phenol	EPA 8270D	10186002	NELAP	PA
7985 - Phorate	EPA 8270D	10186002	NELAP	PA
6650 - Pronamide (Kerb)	EPA 8270D	10186002	NELAP	PA
5095 - Pyridine	EPA 8270D	10186002	NELAP	PA
6670 - Quinoline	EPA 8270D	10186002	NELAP	PA
6685 - Safrole	EPA 8270D	10186002	NELAP	PA
8155 - Sulfotepp	EPA 8270D	10186002	NELAP	PA
8235 - Thionazin (Zinophos)	EPA 8270D	10186002	NELAP	PA
6750 - Thiophenol (Benzenethiol)	EPA 8270D	10186002	NELAP	PA
6125 - a-a-Dimethylphenethylamine	EPA 8270D	10186002	NELAP	PA
5760 - bis(2-Chloroethoxy)methane	EPA 8270D	10186002	NELAP	PA
5765 - bis(2-Chloroethyl) ether	EPA 8270D	10186002	NELAP	PA
5780 - bis(2-Chloroisopropyl) ether	EPA 8270D	10186002	NELAP	PA
5025 - n-Nitroso-di-n-butylamine	EPA 8270D	10186002	NELAP	PA
6545 - n-Nitrosodi-n-propylamine	EPA 8270D	10186002	NELAP	PA
6525 - n-Nitrosodiethylamine	EPA 8270D	10186002	NELAP	PA
6530 - n-Nitrosodimethylamine	EPA 8270D	10186002	NELAP	PA
6535 - n-Nitrosodiphenylamine	EPA 8270D	10186002	NELAP	PA
6550 - n-Nitrosomethylethylamine	EPA 8270D	10186002	NELAP	PA
6555 - n-Nitrosomorpholine	EPA 8270D	10186002	NELAP	PA
6560 - n-Nitrosopiperidine	EPA 8270D	10186002	NELAP	PA
6565 - n-Nitrosopyrrolidine	EPA 8270D	10186002	NELAP	PA
8290 - o,o,o-Triethyl phosphorothioate	EPA 8270D	10186002	NELAP	PA
8310 - tris-(2,3-Dibromopropyl) phosphate (tris-BP)	EPA 8270D	10186002	NELAP	PA
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A	10187403	NELAP	PA
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A	10187403	NELAP	PA
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 8290A	10187403	NELAP	PA
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 8290A	10187403	NELAP	PA
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 8290A	10187403	NELAP	PA
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 8290A	10187403	NELAP	PA
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 8290A	10187403	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 8290A	10187403	NELAP	PA
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA 8290A	10187403	NELAP	PA
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA 8290A	10187403	NELAP	PA
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 8290A	10187403	NELAP	PA
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 8290A	10187403	NELAP	PA
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 8290A	10187403	NELAP	PA
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 8290A	10187403	NELAP	PA
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 8290A	10187403	NELAP	PA
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 8290A	10187403	NELAP	PA
9438 - Total Hpcdd	EPA 8290A	10187403	NELAP	PA
9444 - Total Hpcdf	EPA 8290A	10187403	NELAP	PA
9468 - Total Hxcdd	EPA 8290A	10187403	NELAP	PA
9483 - Total Hxcdf	EPA 8290A	10187403	NELAP	PA
9555 - Total Pecdd	EPA 8290A	10187403	NELAP	PA
9552 - Total Pecdf	EPA 8290A	10187403	NELAP	PA
9609 - Total TCDD	EPA 8290A	10187403	NELAP	PA
9615 - Total TCDF	EPA 8290A	10187403	NELAP	PA
5500 - Acenaphthene	EPA 8310	10187607	NELAP	PA
5505 - Acenaphthylene	EPA 8310	10187607	NELAP	PA
5555 - Anthracene	EPA 8310	10187607	NELAP	PA
5575 - Benzo(a)anthracene	EPA 8310	10187607	NELAP	PA
5580 - Benzo(a)pyrene	EPA 8310	10187607	NELAP	PA
5585 - Benzo(b)fluoranthene	EPA 8310	10187607	NELAP	PA
5590 - Benzo(g,h,i)perylene	EPA 8310	10187607	NELAP	PA
5600 - Benzo(k)fluoranthene	EPA 8310	10187607	NELAP	PA
5855 - Chrysene	EPA 8310	10187607	NELAP	PA
5895 - Dibenz(a,h) anthracene	EPA 8310	10187607	NELAP	PA
6265 - Fluoranthene	EPA 8310	10187607	NELAP	PA
6270 - Fluorene	EPA 8310	10187607	NELAP	PA
6315 - Indeno(1,2,3-cd) pyrene	EPA 8310	10187607	NELAP	PA
5005 - Naphthalene	EPA 8310	10187607	NELAP	PA
6615 - Phenanthrene	EPA 8310	10187607	NELAP	PA
6665 - Pyrene	EPA 8310	10187607	NELAP	PA
6110 - 2,5-Dimethylbenzaldehyde	EPA 8315	10187801	NELAP	PA
4300 - Acetaldehyde	EPA 8315	10187801	NELAP	PA
4325 - Acrolein (Propenal)	EPA 8315	10187801	NELAP	PA
5570 - Benzaldehyde	EPA 8315	10187801	NELAP	PA
4430 - Butylaldehyde (Butanal)	EPA 8315	10187801	NELAP	PA
4545 - Crotonaldehyde	EPA 8315	10187801	NELAP	PA
4815 - Formaldehyde	EPA 8315	10187801	NELAP	PA
3825 - Hexanaldehyde (Hexanal)	EPA 8315	10187801	NELAP	PA
6330 - Isovaleraldehyde	EPA 8315	10187801	NELAP	PA
3965 - Propionaldehyde (Propanal)	EPA 8315	10187801	NELAP	PA
4040 - Valeraldehyde (Pentanal, Pentanaldehyde)	EPA 8315	10187801	NELAP	PA
4300 - Acetaldehyde	EPA 8315A	10188008	NELAP	PA
4815 - Formaldehyde	EPA 8315A	10188008	NELAP	PA
6885 - 1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	10189807	NELAP	PA
6160 - 1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	10189807	NELAP	PA
9651 - 2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	10189807	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	10189807	NELAP	PA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	10189807	NELAP	PA
9303 - 2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	10189807	NELAP	PA
9507 - 2-Nitrotoluene	EPA 8330	10189807	NELAP	PA
9510 - 3-Nitrotoluene	EPA 8330	10189807	NELAP	PA
9306 - 4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	10189807	NELAP	PA
9513 - 4-Nitrotoluene	EPA 8330	10189807	NELAP	PA
6415 - Methyl-2,4,6-trinitrophenylnitramine (tetryl)	EPA 8330	10189807	NELAP	PA
5015 - Nitrobenzene	EPA 8330	10189807	NELAP	PA
6485 - Nitroglycerin	EPA 8330	10189807	NELAP	PA
9522 - Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	10189807	NELAP	PA
9558 - Pentaerythritoltetranitrate	EPA 8330	10189807	NELAP	PA
9432 - RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	10189807	NELAP	PA
6885 - 1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330A	10190008	NELAP	PA
6160 - 1,3-Dinitrobenzene (1,3-DNB)	EPA 8330A	10190008	NELAP	PA
9651 - 2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330A	10190008	NELAP	PA
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8330A	10190008	NELAP	PA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8330A	10190008	NELAP	PA
9303 - 2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330A	10190008	NELAP	PA
9507 - 2-Nitrotoluene	EPA 8330A	10190008	NELAP	PA
9510 - 3-Nitrotoluene	EPA 8330A	10190008	NELAP	PA
9306 - 4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330A	10190008	NELAP	PA
9513 - 4-Nitrotoluene	EPA 8330A	10190008	NELAP	PA
6415 - Methyl-2,4,6-trinitrophenylnitramine (tetryl)	EPA 8330A	10190008	NELAP	PA
5015 - Nitrobenzene	EPA 8330A	10190008	NELAP	PA
6485 - Nitroglycerin	EPA 8330A	10190008	NELAP	PA
9522 - Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330A	10190008	NELAP	PA
9558 - Pentaerythritoltetranitrate	EPA 8330A	10190008	NELAP	PA
9432 - RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330A	10190008	NELAP	PA
6485 - Nitroglycerin	EPA 8332	10190406	NELAP	PA
1645 - Total Cyanide	EPA 9012	10193201	NELAP	PA
1635 - Cyanide	EPA 9012A	10193405	NELAP	PA
1645 - Total Cyanide	EPA 9012A	10193405	NELAP	PA
1900 - pH	EPA 9040B	10197203	NELAP	PA
1625 - Corrosivity (pH)	EPA 9045	10197805	NELAP	PA
1900 - pH	EPA 9045	10197805	NELAP	PA
1610 - Conductivity	EPA 9050	10198604	NELAP	PA
1610 - Conductivity	EPA 9050A	10198808	NELAP	PA
1540 - Bromide	EPA 9056	10199005	NELAP	PA
1575 - Chloride	EPA 9056	10199005	NELAP	PA
1730 - Fluoride	EPA 9056	10199005	NELAP	PA
1805 - Nitrate	EPA 9056	10199005	NELAP	PA
1835 - Nitrite	EPA 9056	10199005	NELAP	PA
2000 - Sulfate	EPA 9056	10199005	NELAP	PA
1540 - Bromide	EPA 9056	10199209	NELAP	PA
1575 - Chloride	EPA 9056	10199209	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
1730 - Fluoride	EPA 9056	10199209	NELAP	PA
2000 - Sulfate	EPA 9056	10199209	NELAP	PA
1575 - Chloride	EPA 9056	10199403	NELAP	PA
1730 - Fluoride	EPA 9056	10199403	NELAP	PA
1805 - Nitrate	EPA 9056	10199403	NELAP	PA
1835 - Nitrite	EPA 9056	10199403	NELAP	PA
2000 - Sulfate	EPA 9056	10199403	NELAP	PA
1575 - Chloride	EPA 9056A	10199607	NELAP	PA
1730 - Fluoride	EPA 9056A	10199607	NELAP	PA
1805 - Nitrate	EPA 9056A	10199607	NELAP	PA
1835 - Nitrite	EPA 9056A	10199607	NELAP	PA
1840 - Nitrite as N	EPA 9056A	10199607	NELAP	PA
2000 - Sulfate	EPA 9056A	10199607	NELAP	PA
2040 - Total Organic Carbon	EPA 9060	10200201	NELAP	PA
1905 - Total Phenolics	EPA 9066	10200609	NELAP	PA
4747 - Ethane	EPA RSK-175 (GC/FID)	10212905	NELAP	PA
4752 - Ethene	EPA RSK-175 (GC/FID)	10212905	NELAP	PA
4926 - Methane	EPA RSK-175 (GC/FID)	10212905	NELAP	PA
100263 - Propane	EPA RSK-175 (GC/FID)	10212905	NELAP	PA
5007 - n-Butane	EPA RSK-175 (GC/FID)	10212905	NELAP	PA
5029 - n-Propane	EPA RSK-175 (GC/FID)	10212905	NELAP	PA
1095 - Mercury	EPA 1631E	10237204	NELAP	PA
1810 - Nitrate as N	EPA 353.2 (calc.)	10238809	NELAP	PA
6380 - 1-Methylnaphthalene	EPA 8270C SIM	10242407	NELAP	PA
5500 - Acenaphthene	EPA 8270C SIM	10242407	NELAP	PA
5505 - Acenaphthylene	EPA 8270C SIM	10242407	NELAP	PA
5555 - Anthracene	EPA 8270C SIM	10242407	NELAP	PA
5575 - Benzo(a)anthracene	EPA 8270C SIM	10242407	NELAP	PA
5580 - Benzo(a)pyrene	EPA 8270C SIM	10242407	NELAP	PA
5585 - Benzo(b)fluoranthene	EPA 8270C SIM	10242407	NELAP	PA
5590 - Benzo(g,h,i)perylene	EPA 8270C SIM	10242407	NELAP	PA
5600 - Benzo(k)fluoranthene	EPA 8270C SIM	10242407	NELAP	PA
5855 - Chrysene	EPA 8270C SIM	10242407	NELAP	PA
5895 - Dibenz(a,h) anthracene	EPA 8270C SIM	10242407	NELAP	PA
6265 - Fluoranthene	EPA 8270C SIM	10242407	NELAP	PA
6270 - Fluorene	EPA 8270C SIM	10242407	NELAP	PA
6315 - Indeno(1,2,3-cd) pyrene	EPA 8270C SIM	10242407	NELAP	PA
5005 - Naphthalene	EPA 8270C SIM	10242407	NELAP	PA
6615 - Phenanthrene	EPA 8270C SIM	10242407	NELAP	PA
6665 - Pyrene	EPA 8270C SIM	10242407	NELAP	PA
6380 - 1-Methylnaphthalene	EPA 8270D SIM	10242509	NELAP	PA
9501 - 1-Methylphenanthrene	EPA 8270D SIM	10242509	NELAP	PA
5500 - Acenaphthene	EPA 8270D SIM	10242509	NELAP	PA
5505 - Acenaphthylene	EPA 8270D SIM	10242509	NELAP	PA
5555 - Anthracene	EPA 8270D SIM	10242509	NELAP	PA
5575 - Benzo(a)anthracene	EPA 8270D SIM	10242509	NELAP	PA
5580 - Benzo(a)pyrene	EPA 8270D SIM	10242509	NELAP	PA
5585 - Benzo(b)fluoranthene	EPA 8270D SIM	10242509	NELAP	PA
5590 - Benzo(g,h,i)perylene	EPA 8270D SIM	10242509	NELAP	PA
5600 - Benzo(k)fluoranthene	EPA 8270D SIM	10242509	NELAP	PA
5855 - Chrysene	EPA 8270D SIM	10242509	NELAP	PA
5895 - Dibenz(a,h) anthracene	EPA 8270D SIM	10242509	NELAP	PA
6265 - Fluoranthene	EPA 8270D SIM	10242509	NELAP	PA
6270 - Fluorene	EPA 8270D SIM	10242509	NELAP	PA
6315 - Indeno(1,2,3-cd) pyrene	EPA 8270D SIM	10242509	NELAP	PA
5005 - Naphthalene	EPA 8270D SIM	10242509	NELAP	PA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
6615 - Phenanthrene	EPA 8270D SIM	10242509	NELAP	PA
6665 - Pyrene	EPA 8270D SIM	10242509	NELAP	PA
1635 - Cyanide	EPA 9012B	10243206	NELAP	PA
1645 - Total Cyanide	EPA 9012B	10243206	NELAP	PA
1900 - pH	EPA 9040C	10244403	NELAP	PA
8946 - 2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,5'+2,3',4,4'6+2,3',4',5'6-Pentachlorobiphenyl (BZ 86+87+97+108+119+125)	EPA 1668A	10262007	NELAP	PA
8958 - 2,2',3,6+2,2',4,6'-Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668A	10262007	NELAP	PA
8963 - 2,3,4,5+2,3',4',5+2,4,4',5+2,3',4',5'-Tetrachlorobiphenyls (BZ 61+70+74+76)	EPA 1668A	10262007	NELAP	PA
1575 - Chloride	EPA 300.0	10275408	NELAP	PA
1840 - Nitrite as N	EPA 300.0	10275408	NELAP	PA
2000 - Sulfate	EPA 300.0	10275408	NELAP	PA
1895 - Perchlorate	EPA 6850	10304606	NELAP	PA
1730 - Fluoride	SM 4500-F B	20012606	NELAP	PA
1605 - Color	SM 2120 B-1993, Online Edition	20039207	NELAP	PA
1500 - Acidity, as CaCO3	SM 2310 B, 20th ED	20044206	NELAP	PA
100410 - Alkalinity, bicarbonate	SM 2320 B, 18th ED	20044808	NELAP	LA
100411 - Alkalinity, carbonate	SM 2320 B, 18th ED	20044808	NELAP	LA
1505 - Alkalinity as CaCO3	SM 2320 B, 20th ED	20045209	NELAP	PA
1755 - Total hardness as CaCO3	SM 2340 B, 19th ED	20046008	NELAP	PA
1755 - Total hardness as CaCO3	SM 2340 B, 20th ED	20046202	NELAP	PA
1955 - Residue-filterable (TDS)	SM 2340 C, 20th ED	20047205	NELAP	PA
1610 - Conductivity	SM 2510 B, 20th ED	20048208	NELAP	PA
1610 - Conductivity	SM 2510 B, 21st ED	20048402	NELAP	PA
1950 - Residue-total	SM 2540 B, 20th ED	20049007	NELAP	PA
1950 - Residue-total	SM 2540 B-97, Online Edition	20049405	NELAP	PA
1955 - Residue-filterable (TDS)	SM 2540 C, 20th ED	20050004	NELAP	PA
1960 - Residue-nonfilterable (TSS)	SM 2540 D, 20th ED	20050800	NELAP	PA
1965 - Residue-settleable	SM 2540 F, 20th ED	20051803	NELAP	PA
2030 - Temperature, deg. C	SM 2550 B, 20th ED	20052806	NELAP	PA
1575 - Chloride	SM 4500-Cl^- C, 20th ED	20084804	NELAP	PA
1940 - Total residual chlorine	SM 4500-Cl^- F, 20th ED	20087201	NELAP	PA
1645 - Total Cyanide	SM 4500-CN^- C, 20th ED	20091605	NELAP	PA
1635 - Cyanide	SM 4500-CN^- E, 20th ED	20092404	NELAP	PA
1510 - Amenable cyanide	SM 4500-CN^- G, 20th ED	20093203	NELAP	PA
1635 - Cyanide	SM 4500-CN^- C, 21st ED	20095403	NELAP	PA
1730 - Fluoride	SM 4500-F^- B, 20th ED	20101002	NELAP	PA
1730 - Fluoride	SM 4500-F^- C, 20th ED	20102005	NELAP	OR
1730 - Fluoride	SM 4500-F C, 21st ED	20102209	NELAP	PA
1900 - pH	SM 4500-H+ B, 20th ED	20104807	NELAP	PA
1515 - Ammonia as N	SM 4500-NH3 B, 20th ED	20105606	NELAP	PA
1515 - Ammonia as N	SM 4500-NH3 C, 20th ED	20106405	NELAP	PA
1515 - Ammonia as N	SM 4500-NH3 D, 20th ED	20109006	NELAP	PA
1880 - Oxygen, dissolved	SM 4500-O G, 20th ED	20121204	NELAP	PA
1910 - Total Phosphorus	SM 4500-P B, 21st ED	20122809	NELAP	PA
1910 - Total Phosphorus	SM 4500-P B 5, 20th ED	20123200	NELAP	PA
1910 - Total Phosphorus	SM 4500-P E, 20th ED	20123802	NELAP	PA
1910 - Total Phosphorus	SM 4500-P F, 20th ED	20124601	NELAP	PA
2005 - Sulfide	SM 4500-$S2^-$ D, 20th ED	20125400	NELAP	PA
2005 - Sulfide	SM 4500-$S2^-$ F, 20th ED	20126209	NELAP	PA
1990 - Silica as SiO2	SM 4500-SiO2 C, 20th ED	20128205	NELAP	PA
2015 - Sulfite-SO3	SM 4500-SO3 B, 20th ED	20130205	NELAP	PA

Eurofins Lancaster Laboratories Inc
Issue Date: July 1, 2015

Certificate Number: 02055

AI Number: 30729
Expiration Date: June 30, 2016

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Page 45 of 83

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
2015 - Sulfite-SO3	SM 4500-SO3 B, 21st ED	20130409	NELAP	PA
1530 - Biochemical oxygen demand	SM 5210 B, 20th ED	20134809	NELAP	PA
1555 - Carbonaceous BOD, CBOD	SM 5210 B, 20th ED	20134809	NELAP	PA
2040 - Total Organic Carbon	SM 5310 B, 20th ED	20137400	NELAP	PA
2040 - Total Organic Carbon	SM 5310 C, 20th ED	20138403	NELAP	PA
2025 - Surfactants - MBAS	SM 5540 C, 20th ED	20144609	NELAP	PA
1605 - Color	SM 2120 B, 20th ED	20224004	NELAP	PA
1645 - Total Cyanide	ASTM D7511-09	30032985	NELAP	PA
1523 - Available Cyanide	OIA 1677	60031405	NELAP	PA
1640 - Free cyanide	OIA 1677	60031405	NELAP	PA
6385 - 2-Methylnaphthalene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5500 - Acenaphthene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5505 - Acenaphthylene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5555 - Anthracene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5575 - Benzo(a)anthracene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5580 - Benzo(a)pyrene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5585 - Benzo(b)fluoranthene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5590 - Benzo(g,h,i)perylene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5600 - Benzo(k)fluoranthene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5855 - Chrysene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5895 - Dibenz(a,h) anthracene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6218 - EPH Aliphatic C19-C36	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6222 - EPH Aliphatic C9-C18	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6232 - EPH Aromatic C11-C22	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6234 - EPH Aromatic C11-C22 Unadjusted	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6265 - Fluoranthene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6270 - Fluorene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6315 - Indeno(1,2,3-cd) pyrene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5005 - Naphthalene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6615 - Phenanthrene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6665 - Pyrene	MADEP EPH, Rev.1.1	90017202	NELAP	PA
4375 - Benzene	MADEP VPH, Rev.1.1	90017406	NELAP	PA
4765 - Ethylbenzene	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5000 - Methyl tert-butyl ether (MTBE)	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5005 - Naphthalene	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5140 - Toluene	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5304 - VPH Aliphatic C5-C8	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5305 - VPH Aliphatic C5-C8 Unadjusted	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5306 - VPH Aliphatic C9-C12	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5307 - VPH Aliphatic C9-C12 Unadjusted	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5311 - VPH Aromatic C9-C10	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5240 - m+p-xylene	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5250 - o-Xylene	MADEP VPH, Rev.1.1	90017406	NELAP	PA
2050 - Total Petroleum Hydrocarbons (TPH)	TNRCC 1005, Rev.3	90019208	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
2050 - Total Petroleum Hydrocarbons (TPH)	Texas 1006	867	NELAP	PA
1540 - Bromide	EPA 300.0, Rev.2.1	10053200	NELAP	PA
1730 - Fluoride	EPA 300.0, Rev.2.1	10053200	NELAP	PA
1810 - Nitrate as N	EPA 300.0, Rev.2.1	10053200	NELAP	PA
1840 - Nitrite as N	EPA 300.0, Rev.2.1	10053200	NELAP	PA

Eurofins Lancaster Laboratories Inc
Issue Date: July 1, 2015

Certificate Number: 02055

AI Number: 30729
Expiration Date: June 30, 2016

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
2000 - Sulfate	EPA 300.0, Rev.2.1	10053200	NELAP	PA
1780 - Ignitability	EPA 1010	10116606	NELAP	PA
1466 - Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311	10118806	NELAP	PA
1460 - Synthetic Precipitation Leaching Procedure	EPA 1312	10119003	NELAP	PA
8954 - 2,2',3,3'+2,3',4',6-Tetrachlorobiphenyl (BZ-40+71)	EPA 1668	10129201	NELAP	PA
8919 - 2,2',3,3',4,4'+2,3,4,4',5,6-Hexachlorobiphenyl (BZ-128+166)	EPA 1668	10129201	NELAP	PA
9105 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (BZ-209)	EPA 1668	10129201	NELAP	PA
9095 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ-206)	EPA 1668	10129201	NELAP	PA
9090 - 2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ-194)	EPA 1668	10129201	NELAP	PA
9102 - 2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ-196)	EPA 1668	10129201	NELAP	PA
9101 - 2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ-207)	EPA 1668	10129201	NELAP	PA
9103 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ-195)	EPA 1668	10129201	NELAP	PA
9065 - 2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)	EPA 1668	10129201	NELAP	PA
8916 - 2,2',3,3',4,4',6+2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-171+173)	EPA 1668	10129201	NELAP	PA
8933 - 2,2',3,3',4,4',6,6'+2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ 197+200)	EPA 1668	10129201	NELAP	PA
9104 - 2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ-197)	EPA 1668	10129201	NELAP	PA
9106 - 2,2',3,3',4,4',6-Heptachlorobiphenyl (BZ-171)	EPA 1668	10129201	NELAP	PA
9020 - 2,2',3,3',4,4'-Hexachlorobiphenyl (BZ-128)	EPA 1668	10129201	NELAP	PA
9114 - 2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ-177)	EPA 1668	10129201	NELAP	PA
9112 - 2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ-201)	EPA 1668	10129201	NELAP	PA
9115 - 2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ-175)	EPA 1668	10129201	NELAP	PA
9117 - 2,2',3,3',4,5'-Hexachlorobiphenyl (BZ-130)	EPA 1668	10129201	NELAP	PA
8922 - 2,2',3,3',4,5+2,2',3,4,4',5'+2,3,3',4',5,6-Hexachlorobiphenyl (BZ-129+138+163)	EPA 1668	10129201	NELAP	PA
9108 - 2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ-199)	EPA 1668	10129201	NELAP	PA
8934 - 2,2',3,3',4,5,5',6+2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ-198+199)	EPA 1668	10129201	NELAP	PA
9107 - 2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ-208)	EPA 1668	10129201	NELAP	PA
9109 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl (BZ-198)	EPA 1668	10129201	NELAP	PA
9110 - 2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ-172)	EPA 1668	10129201	NELAP	PA
9116 - 2,2',3,3',4,5,6'-Heptachlorobiphenyl	EPA 1668	10129201	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
(BZ-174)				
9111 - 2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ-200)	EPA 1668	10129201	NELAP	PA
9113 - 2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-173)	EPA 1668	10129201	NELAP	PA
9118 - 2,2',3,3',4,5-Hexachlorobiphenyl (BZ-129)	EPA 1668	10129201	NELAP	PA
9120 - 2,2',3,3',4,6'-Hexachlorobiphenyl (BZ-132)	EPA 1668	10129201	NELAP	PA
9119 - 2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ-176)	EPA 1668	10129201	NELAP	PA
9121 - 2,2',3,3',4,6-Hexachlorobiphenyl (BZ-131)	EPA 1668	10129201	NELAP	PA
9122 - 2,2',3,3',4-Pentachlorobiphenyl (BZ-82)	EPA 1668	10129201	NELAP	PA
9123 - 2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ-202)	EPA 1668	10129201	NELAP	PA
9124 - 2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ-178)	EPA 1668	10129201	NELAP	PA
9125 - 2,2',3,3',5,5'-Hexachlorobiphenyl (BZ-133)	EPA 1668	10129201	NELAP	PA
8926 - 2,2',3,3',5,6'+2,2',3,5,5',6+2,2',4,4',5,6'-Hexachlorobiphenyl (BZ-135+151+154)	EPA 1668	10129201	NELAP	PA
8927 - 2,2',3,3',5,6'+2,2',3,5,5',6-Hexachlorobiphenyls (BZ 135+151)	EPA 1668	10129201	NELAP	PA
9127 - 2,2',3,3',5,6'-Hexachlorobiphenyl (BZ-135)	EPA 1668	10129201	NELAP	PA
9126 - 2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ-179)	EPA 1668	10129201	NELAP	PA
9128 - 2,2',3,3',5,6-Hexachlorobiphenyl (BZ-134)	EPA 1668	10129201	NELAP	PA
9129 - 2,2',3,3',5-Pentachlorobiphenyl (BZ-83)	EPA 1668	10129201	NELAP	PA
9130 - 2,2',3,3',6,6'-Hexachlorobiphenyl (BZ-136)	EPA 1668	10129201	NELAP	PA
9131 - 2,2',3,3',6-Pentachlorobiphenyl (BZ-84)	EPA 1668	10129201	NELAP	PA
9132 - 2,2',3,3'-Tetrachlorobiphenyl (BZ-40)	EPA 1668	10129201	NELAP	PA
9151 - 2,2',3,4',5',6-Hexachlorobiphenyl (BZ-149)	EPA 1668	10129201	NELAP	PA
9154 - 2,2',3,4',5'-Pentachlorobiphenyl (BZ-97)	EPA 1668	10129201	NELAP	PA
8948 - 2,2',3,4',5+2,2',4,5,5'+2,3,3',5',6-Pentachlorobiphenyl (BZ-90+101+113)	EPA 1668	10129201	NELAP	PA
9080 - 2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ-187)	EPA 1668	10129201	NELAP	PA
9144 - 2,2',3,4',5,5'-Hexachlorobiphenyl (BZ-146)	EPA 1668	10129201	NELAP	PA
9147 - 2,2',3,4',5,6'-Hexachlorobiphenyl (BZ-148)	EPA 1668	10129201	NELAP	PA
8929 - 2,2',3,4',5,6+2,2',3,4',5',6-Hexachlorobiphenyl (BZ-147+149)	EPA 1668	10129201	NELAP	PA
9146 - 2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ-188)	EPA 1668	10129201	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
9149 - 2,2',3,4',5,6-Hexachlorobiphenyl (BZ-147)	EPA 1668	10129201	NELAP	PA
9155 - 2,2',3,4',5-Pentachlorobiphenyl (BZ-90)	EPA 1668	10129201	NELAP	PA
8951 - 2,2',3,4',6'+2,2',4,5,6'-Pentachlorobiphenyl (BZ-98+102)	EPA 1668	10129201	NELAP	PA
9159 - 2,2',3,4',6'-Pentachlorobiphenyl (BZ-98)	EPA 1668	10129201	NELAP	PA
9157 - 2,2',3,4',6,6'-Hexachlorobiphenyl (BZ-150)	EPA 1668	10129201	NELAP	PA
9160 - 2,2',3,4',6-Pentachlorobiphenyl (BZ-91)	EPA 1668	10129201	NELAP	PA
9162 - 2,2',3,4'-Tetrachlorobiphenyl (BZ-42)	EPA 1668	10129201	NELAP	PA
8941 - 2,2',3,4,4'+2,3,4,5,6+2,3,4',5,6-Pentachlorobiphenyl (BZ-85+116+117)	EPA 1668	10129201	NELAP	PA
8942 - 2,2',3,4,4'+2,3,4,5,6-Pentachlorobiphenyl (BZ-85+116)	EPA 1668	10129201	NELAP	PA
8918 - 2,2',3,4,4',5',6+2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ-183+185)	EPA 1668	10129201	NELAP	PA
9075 - 2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ-183)	EPA 1668	10129201	NELAP	PA
9025 - 2,2',3,4,4',5'-Hexachlorobiphenyl (BZ-138)	EPA 1668	10129201	NELAP	PA
8917 - 2,2',3,4,4',5,5'+2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-180+193)	EPA 1668	10129201	NELAP	PA
9133 - 2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ-203)	EPA 1668	10129201	NELAP	PA
9134 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ-180)	EPA 1668	10129201	NELAP	PA
9136 - 2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ-182)	EPA 1668	10129201	NELAP	PA
9135 - 2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ-204)	EPA 1668	10129201	NELAP	PA
9137 - 2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ-181)	EPA 1668	10129201	NELAP	PA
9138 - 2,2',3,4,4',5-Hexachlorobiphenyl (BZ-137)	EPA 1668	10129201	NELAP	PA
9140 - 2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-140)	EPA 1668	10129201	NELAP	PA
8928 - 2,2',3,4,4',6+2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-139+140)	EPA 1668	10129201	NELAP	PA
9139 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ-184)	EPA 1668	10129201	NELAP	PA
9141 - 2,2',3,4,4',6-Hexachlorobiphenyl (BZ-139)	EPA 1668	10129201	NELAP	PA
9142 - 2,2',3,4,4'-Pentachlorobiphenyl (BZ-85)	EPA 1668	10129201	NELAP	PA
9150 - 2,2',3,4,5',6-Hexachlorobiphenyl (BZ-144)	EPA 1668	10129201	NELAP	PA
8975 - 2,2',3,4,5'-Pentachlorobiphenyl (BZ-87)	EPA 1668	10129201	NELAP	PA
8944 - 2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,2',4,4',6-Pentachlorobiphenyl (BZ-86+87+97+100)	EPA 1668	10129201	NELAP	PA
8946 -	EPA 1668	10129201	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,5'+2,3',4,4'6+2,3',4',5'6-Pentachlorobiphenyl (BZ 86+87+97+108+119+125)				
9143 - 2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ-185)	EPA 1668	10129201	NELAP	PA
9030 - 2,2',3,4,5,5'-Hexachlorobiphenyl (BZ-141)	EPA 1668	10129201	NELAP	PA
9152 - 2,2',3,4,5,6'-Hexachlorobiphenyl (BZ-143)	EPA 1668	10129201	NELAP	PA
9145 - 2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ-186)	EPA 1668	10129201	NELAP	PA
9148 - 2,2',3,4,5,6-Hexachlorobiphenyl (BZ-142)	EPA 1668	10129201	NELAP	PA
9153 - 2,2',3,4,5-Pentachlorobiphenyl (BZ-86)	EPA 1668	10129201	NELAP	PA
9161 - 2,2',3,4,6'-Pentachlorobiphenyl (BZ-89)	EPA 1668	10129201	NELAP	PA
8947 - 2,2',3,4,6+2,2',3,4',6-Pentachlorobiphenyl (BZ-88+91)	EPA 1668	10129201	NELAP	PA
9156 - 2,2',3,4,6,6'-Hexachlorobiphenyl (BZ-145)	EPA 1668	10129201	NELAP	PA
9158 - 2,2',3,4,6-Pentachlorobiphenyl (BZ-88)	EPA 1668	10129201	NELAP	PA
9163 - 2,2',3,4-Tetrachlorobiphenyl (BZ-41)	EPA 1668	10129201	NELAP	PA
8957 - 2,2',3,5'+2,2',4,4'+2,3,5,6-Tetrachlorobiphenyl (BZ-44+47+65)	EPA 1668	10129201	NELAP	PA
9166 - 2,2',3,5',6-Pentachlorobiphenyl (BZ-95)	EPA 1668	10129201	NELAP	PA
8945 - 2,2',3,5'-Tetrachlorobiphenyl (BZ-44)	EPA 1668	10129201	NELAP	PA
8956 - 2,2',3,5+2,3',5',6-Tetrachlorobiphenyl (BZ-43+73)	EPA 1668	10129201	NELAP	PA
9035 - 2,2',3,5,5',6-Hexachlorobiphenyl (BZ-151)	EPA 1668	10129201	NELAP	PA
9164 - 2,2',3,5,5'-Pentachlorobiphenyl (BZ-92)	EPA 1668	10129201	NELAP	PA
9167 - 2,2',3,5,6'-Pentachlorobiphenyl (BZ-94)	EPA 1668	10129201	NELAP	PA
8949 - 2,2',3,5,6+2,2',4,4',6-Pentachlorobiphenyl (BZ-93+100)	EPA 1668	10129201	NELAP	PA
9165 - 2,2',3,5,6,6'-Hexachlorobiphenyl (BZ-152)	EPA 1668	10129201	NELAP	PA
9168 - 2,2',3,5,6-Pentachlorobiphenyl (BZ-93)	EPA 1668	10129201	NELAP	PA
9169 - 2,2',3,5-Tetrachlorobiphenyl (BZ-43)	EPA 1668	10129201	NELAP	PA
9171 - 2,2',3,6'-Tetrachlorobiphenyl (BZ-46)	EPA 1668	10129201	NELAP	PA
9170 - 2,2',3,6,6'-Pentachlorobiphenyl (BZ-96)	EPA 1668	10129201	NELAP	PA
9172 - 2,2',3,6-Tetrachlorobiphenyl (BZ-45)	EPA 1668	10129201	NELAP	PA
9173 - 2,2',3-Trichlorobiphenyl (BZ-16)	EPA 1668	10129201	NELAP	PA
8931 - 2,2',4,4',5,5'+2,3',4,4',5',6-Hexachlorobiphenyl (BZ-153+168)	EPA 1668	10129201	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
9040 - 2,2',4,4',5,5'-Hexachlorobiphenyl (BZ-153)	EPA 1668	10129201	NELAP	PA
9174 - 2,2',4,4',5,6'-Hexachlorobiphenyl (BZ-154)	EPA 1668	10129201	NELAP	PA
9175 - 2,2',4,4',5-Pentachlorobiphenyl (BZ-99)	EPA 1668	10129201	NELAP	PA
9176 - 2,2',4,4',6,6'-Hexachlorobiphenyl (BZ-155)	EPA 1668	10129201	NELAP	PA
9177 - 2,2',4,4',6-Pentachlorobiphenyl (BZ-100)	EPA 1668	10129201	NELAP	PA
9178 - 2,2',4,4'-Tetrachlorobiphenyl (BZ-47)	EPA 1668	10129201	NELAP	PA
8959 - 2,2',4,5'+2,3',4,6-Tetrachlorobiphenyl (BZ-49+69)	EPA 1668	10129201	NELAP	PA
9179 - 2,2',4,5',6-Pentachlorobiphenyl (BZ-103)	EPA 1668	10129201	NELAP	PA
8950 - 2,2',4,5'-Tetrachlorobiphenyl (BZ-49)	EPA 1668	10129201	NELAP	PA
8980 - 2,2',4,5,5'-Pentachlorobiphenyl (BZ-101)	EPA 1668	10129201	NELAP	PA
9180 - 2,2',4,5,6'-Pentachlorobiphenyl (BZ-102)	EPA 1668	10129201	NELAP	PA
9181 - 2,2',4,5-Tetrachlorobiphenyl (BZ-48)	EPA 1668	10129201	NELAP	PA
9183 - 2,2',4,6'-Tetrachlorobiphenyl (BZ-51)	EPA 1668	10129201	NELAP	PA
8961 - 2,2',4,6+2,2',5,6'-Tetrachlorobiphenyl (BZ-50+53)	EPA 1668	10129201	NELAP	PA
9182 - 2,2',4,6,6'-Pentachlorobiphenyl (BZ-104)	EPA 1668	10129201	NELAP	PA
9184 - 2,2',4,6-Tetrachlorobiphenyl (BZ-50)	EPA 1668	10129201	NELAP	PA
9185 - 2,2',4-Trichlorobiphenyl (BZ-17)	EPA 1668	10129201	NELAP	PA
8966 - 2,2',5+2,4,6-Trichlorobiphenyl (BZ-18+30)	EPA 1668	10129201	NELAP	PA
8955 - 2,2',5,5'-Tetrachlorobiphenyl (BZ-52)	EPA 1668	10129201	NELAP	PA
9186 - 2,2',5,6'-Tetrachlorobiphenyl (BZ-53)	EPA 1668	10129201	NELAP	PA
8930 - 2,2',5-Trichlorobiphenyl (BZ-18)	EPA 1668	10129201	NELAP	PA
9187 - 2,2',6,6'-Tetrachlorobiphenyl (BZ-54)	EPA 1668	10129201	NELAP	PA
9188 - 2,2',6-Trichlorobiphenyl (BZ-19)	EPA 1668	10129201	NELAP	PA
9189 - 2,2'-Dichlorobiphenyl (BZ-4)	EPA 1668	10129201	NELAP	PA
9224 - 2,3',4',5',6-Pentachlorobiphenyl (BZ-125)	EPA 1668	10129201	NELAP	PA
9229 - 2,3',4',5'-Tetrachlorobiphenyl (BZ-76)	EPA 1668	10129201	NELAP	PA
8964 - 2,3',4',5+2,4,4',5+2,3',4',5'-Tetrachlorobiphenyl (BZ-70+74+76)	EPA 1668	10129201	NELAP	PA
9222 - 2,3',4',5,5'-Pentachlorobiphenyl (BZ-124)	EPA 1668	10129201	NELAP	PA
9230 - 2,3',4',5-Tetrachlorobiphenyl (BZ-70)	EPA 1668	10129201	NELAP	PA
9237 - 2,3',4',6-Tetrachlorobiphenyl (BZ-71)	EPA 1668	10129201	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
9239 - 2,3',4'-Trichlorobiphenyl (BZ-33)	EPA 1668	10129201	NELAP	PA
9218 - 2,3',4,4',5',6-Hexachlorobiphenyl (BZ-168)	EPA 1668	10129201	NELAP	PA
9000 - 2,3',4,4',5'-Pentachlorobiphenyl (BZ-123)	EPA 1668	10129201	NELAP	PA
9055 - 2,3',4,4',5,5'-Hexachlorobiphenyl (BZ-167)	EPA 1668	10129201	NELAP	PA
8995 - 2,3',4,4',5-Pentachlorobiphenyl (BZ-118)	EPA 1668	10129201	NELAP	PA
9220 - 2,3',4,4',6-Pentachlorobiphenyl (BZ-119)	EPA 1668	10129201	NELAP	PA
8960 - 2,3',4,4'-Tetrachlorobiphenyl (BZ-66)	EPA 1668	10129201	NELAP	PA
9226 - 2,3',4,5',6-Pentachlorobiphenyl (BZ-121)	EPA 1668	10129201	NELAP	PA
9231 - 2,3',4,5'-Tetrachlorobiphenyl (BZ-68)	EPA 1668	10129201	NELAP	PA
9223 - 2,3',4,5,5'-Pentachlorobiphenyl (BZ-120)	EPA 1668	10129201	NELAP	PA
9232 - 2,3',4,5-Tetrachlorobiphenyl (BZ-67)	EPA 1668	10129201	NELAP	PA
9235 - 2,3',4,6-Tetrachlorobiphenyl (BZ-69)	EPA 1668	10129201	NELAP	PA
9240 - 2,3',4-Trichlorobiphenyl (BZ-25)	EPA 1668	10129201	NELAP	PA
9244 - 2,3',5',6-Tetrachlorobiphenyl (BZ-73)	EPA 1668	10129201	NELAP	PA
9246 - 2,3',5'-Trichlorobiphenyl (BZ-34)	EPA 1668	10129201	NELAP	PA
8969 - 2,3',5+2,4,5-Trichlorobiphenyl (BZ-26+29)	EPA 1668	10129201	NELAP	PA
9242 - 2,3',5,5'-Tetrachlorobiphenyl (BZ-72)	EPA 1668	10129201	NELAP	PA
8935 - 2,3',5-Trichlorobiphenyl (BZ-26)	EPA 1668	10129201	NELAP	PA
9248 - 2,3',6-Trichlorobiphenyl (BZ-27)	EPA 1668	10129201	NELAP	PA
9249 - 2,3'-Dichlorobiphenyl (BZ-6)	EPA 1668	10129201	NELAP	PA
8967 - 2,3,3'+2,4,4'-Trichlorobiphenyl (BZ-20+28)	EPA 1668	10129201	NELAP	PA
9201 - 2,3,3',4',5',6-Hexachlorobiphenyl (BZ-164)	EPA 1668	10129201	NELAP	PA
9202 - 2,3,3',4',5'-Pentachlorobiphenyl (BZ-122)	EPA 1668	10129201	NELAP	PA
8936 - 2,3,3',4',5+2,3',4',5,5'-Pentachlorobiphenyl (BZ-107+124)	EPA 1668	10129201	NELAP	PA
9195 - 2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-193)	EPA 1668	10129201	NELAP	PA
9197 - 2,3,3',4',5,5'-Hexachlorobiphenyl (BZ-162)	EPA 1668	10129201	NELAP	PA
9199 - 2,3,3',4',5,6-Hexachlorobiphenyl (BZ-163)	EPA 1668	10129201	NELAP	PA
9205 - 2,3,3',4',5-Pentachlorobiphenyl (BZ-107)	EPA 1668	10129201	NELAP	PA
8938 - 2,3,3',4',6+2,3,4,4',6-Pentachlorobiphenyl (BZ-110+115)	EPA 1668	10129201	NELAP	PA
8990 - 2,3,3',4',6-Pentachlorobiphenyl (BZ-110)	EPA 1668	10129201	NELAP	PA
9207 - 2,3,3',4'-Tetrachlorobiphenyl (BZ-56)	EPA 1668	10129201	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
9192 - 2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ-191)	EPA 1668	10129201	NELAP	PA
9045 - 2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-157)	EPA 1668	10129201	NELAP	PA
8932 - 2,3,3',4,4',5+2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-156+157)	EPA 1668	10129201	NELAP	PA
9190 - 2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ-205)	EPA 1668	10129201	NELAP	PA
9085 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ-189)	EPA 1668	10129201	NELAP	PA
9191 - 2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ-190)	EPA 1668	10129201	NELAP	PA
9050 - 2,3,3',4,4',5-Hexachlorobiphenyl (BZ-156)	EPA 1668	10129201	NELAP	PA
9193 - 2,3,3',4,4',6-Hexachlorobiphenyl (BZ-158)	EPA 1668	10129201	NELAP	PA
8985 - 2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)	EPA 1668	10129201	NELAP	PA
9200 - 2,3,3',4,5',6-Hexachlorobiphenyl (BZ-161)	EPA 1668	10129201	NELAP	PA
9203 - 2,3,3',4,5'-Pentachlorobiphenyl (BZ-108)	EPA 1668	10129201	NELAP	PA
9196 - 2,3,3',4,5,5'-Hexachlorobiphenyl (BZ-159)	EPA 1668	10129201	NELAP	PA
9198 - 2,3,3',4,5,6-Hexachlorobiphenyl (BZ-160)	EPA 1668	10129201	NELAP	PA
9204 - 2,3,3',4,5-Pentachlorobiphenyl (BZ-106)	EPA 1668	10129201	NELAP	PA
9206 - 2,3,3',4,6-Pentachlorobiphenyl (BZ-109)	EPA 1668	10129201	NELAP	PA
9208 - 2,3,3',4-Tetrachlorobiphenyl (BZ-55)	EPA 1668	10129201	NELAP	PA
9212 - 2,3,3',5',6-Pentachlorobiphenyl (BZ-113)	EPA 1668	10129201	NELAP	PA
9213 - 2,3,3',5'-Tetrachlorobiphenyl (BZ-58)	EPA 1668	10129201	NELAP	PA
9209 - 2,3,3',5,5',6-Hexachlorobiphenyl (BZ-165)	EPA 1668	10129201	NELAP	PA
9210 - 2,3,3',5,5'-Pentachlorobiphenyl (BZ-111)	EPA 1668	10129201	NELAP	PA
9211 - 2,3,3',5,6-Pentachlorobiphenyl (BZ-112)	EPA 1668	10129201	NELAP	PA
9214 - 2,3,3',5-Tetrachlorobiphenyl (BZ-57)	EPA 1668	10129201	NELAP	PA
8962 - 2,3,3',6+2,3,4,6+2,4,4',6-Tetrachlorobiphenyl (BZ-59+62+75)	EPA 1668	10129201	NELAP	PA
9215 - 2,3,3',6-Tetrachlorobiphenyl (BZ-59)	EPA 1668	10129201	NELAP	PA
9216 - 2,3,3'-Trichlorobiphenyl (BZ-20)	EPA 1668	10129201	NELAP	PA
9227 - 2,3,4',5,6-Pentachlorobiphenyl (BZ-117)	EPA 1668	10129201	NELAP	PA
9233 - 2,3,4',5-Tetrachlorobiphenyl (BZ-63)	EPA 1668	10129201	NELAP	PA
9236 - 2,3,4',6-Tetrachlorobiphenyl (BZ-64)	EPA 1668	10129201	NELAP	PA
9241 - 2,3,4'-Trichlorobiphenyl (BZ-22)	EPA 1668	10129201	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
8968 - 2,3,4+2,3',4'-Trichlorobiphenyl (BZ-21+33)	EPA 1668	10129201	NELAP	PA
9217 - 2,3,4,4',5,6-Hexachlorobiphenyl (BZ-166)	EPA 1668	10129201	NELAP	PA
9005 - 2,3,4,4',5-Pentachlorobiphenyl (BZ-114)	EPA 1668	10129201	NELAP	PA
9219 - 2,3,4,4',6-Pentachlorobiphenyl (BZ-115)	EPA 1668	10129201	NELAP	PA
9221 - 2,3,4,4'-Tetrachlorobiphenyl (BZ-60)	EPA 1668	10129201	NELAP	PA
8963 - 2,3,4,5+2,3',4',5+2,4,4',5+2,3',4',5'-Tetrachlorobiphenyls (BZ 61+70+74+76)	EPA 1668	10129201	NELAP	PA
9225 - 2,3,4,5,6-Pentachlorobiphenyl (BZ-116)	EPA 1668	10129201	NELAP	PA
9228 - 2,3,4,5-Tetrachlorobiphenyl (BZ-61)	EPA 1668	10129201	NELAP	PA
9234 - 2,3,4,6-Tetrachlorobiphenyl (BZ-62)	EPA 1668	10129201	NELAP	PA
9238 - 2,3,4-Trichlorobiphenyl (BZ-21)	EPA 1668	10129201	NELAP	PA
9243 - 2,3,5,6-Tetrachlorobiphenyl (BZ-65)	EPA 1668	10129201	NELAP	PA
9245 - 2,3,5-Trichlorobiphenyl (BZ-23)	EPA 1668	10129201	NELAP	PA
9247 - 2,3,6-Trichlorobiphenyl (BZ-24)	EPA 1668	10129201	NELAP	PA
8920 - 2,3-Dichlorobiphenyl (BZ-5)	EPA 1668	10129201	NELAP	PA
8940 - 2,4',5-Trichlorobiphenyl (BZ-31)	EPA 1668	10129201	NELAP	PA
9255 - 2,4',6-Trichlorobiphenyl (BZ-32)	EPA 1668	10129201	NELAP	PA
9256 - 2,4'-Dichlorobiphenyl (BZ-8)	EPA 1668	10129201	NELAP	PA
9250 - 2,4,4',5-Tetrachlorobiphenyl (BZ-74)	EPA 1668	10129201	NELAP	PA
9251 - 2,4,4',6-Tetrachlorobiphenyl (BZ-75)	EPA 1668	10129201	NELAP	PA
9252 - 2,4,4'-Trichlorobiphenyl (BZ-28)	EPA 1668	10129201	NELAP	PA
9253 - 2,4,5-Trichlorobiphenyl (BZ-29)	EPA 1668	10129201	NELAP	PA
9254 - 2,4,6-Trichlorobiphenyl (BZ-30)	EPA 1668	10129201	NELAP	PA
9257 - 2,4-Dichlorobiphenyl (BZ-7)	EPA 1668	10129201	NELAP	PA
9258 - 2,5-Dichlorobiphenyl (BZ-9)	EPA 1668	10129201	NELAP	PA
9259 - 2,6-Dichlorobiphenyl (BZ-10)	EPA 1668	10129201	NELAP	PA
8915 - 2-Chlorobiphenyl (BZ-1)	EPA 1668	10129201	NELAP	PA
9060 - 3,3',4,4',5,5'-Hexachlorobiphenyl (BZ-169)	EPA 1668	10129201	NELAP	PA
9015 - 3,3',4,4',5-Pentachlorobiphenyl (BZ-126)	EPA 1668	10129201	NELAP	PA
8965 - 3,3',4,4'-Tetrachlorobiphenyl (BZ-77)	EPA 1668	10129201	NELAP	PA
9261 - 3,3',4,5'-Tetrachlorobiphenyl (BZ-79)	EPA 1668	10129201	NELAP	PA
9260 - 3,3',4,5,5'-Pentachlorobiphenyl (BZ-127)	EPA 1668	10129201	NELAP	PA
9262 - 3,3',4,5-Tetrachlorobiphenyl (BZ-78)	EPA 1668	10129201	NELAP	PA
9263 - 3,3',4-Trichlorobiphenyl (BZ-35)	EPA 1668	10129201	NELAP	PA
9264 - 3,3',5,5'-Tetrachlorobiphenyl (BZ-80)	EPA 1668	10129201	NELAP	PA
9265 - 3,3',5-Trichlorobiphenyl (BZ-36)	EPA 1668	10129201	NELAP	PA
8925 - 3,3'-Dichlorobiphenyl (BZ-11)	EPA 1668	10129201	NELAP	PA
9268 - 3,4',5-Trichlorobiphenyl (BZ-39)	EPA 1668	10129201	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
9269 - 3,4'-Dichlorobiphenyl (BZ-13)	EPA 1668	10129201	NELAP	PA
100098 - 3,4+3,4'-Dichlorobiphenyl (BZ-12+13)	EPA 1668	10129201	NELAP	PA
8970 - 3,4,4',5-Tetrachlorobiphenyl (BZ-81)	EPA 1668	10129201	NELAP	PA
9266 - 3,4,4'-Trichlorobiphenyl (BZ-37)	EPA 1668	10129201	NELAP	PA
9267 - 3,4,5-Trichlorobiphenyl (BZ-38)	EPA 1668	10129201	NELAP	PA
9270 - 3,4-Dichlorobiphenyl (BZ-12)	EPA 1668	10129201	NELAP	PA
9271 - 3,5-Dichlorobiphenyl (BZ-14)	EPA 1668	10129201	NELAP	PA
9272 - 3-Chlorobiphenyl (BZ-2)	EPA 1668	10129201	NELAP	PA
100368 - 3-Monochlorobiphenyl (BZ 2)	EPA 1668	10129201	NELAP	PA
9273 - 4,4'-Dichlorobiphenyl (BZ-15)	EPA 1668	10129201	NELAP	PA
9274 - 4-Chlorobiphenyl (BZ-3)	EPA 1668	10129201	NELAP	PA
8954 - 2,2',3,3'+2,3',4',6-Tetrachlorobiphenyl (BZ-40+71)	EPA 1668A	10129405	NELAP	PA
8919 - 2,2',3,3',4,4'+2,3,4,4',5,6-Hexachlorobiphenyl (BZ-128+166)	EPA 1668A	10129405	NELAP	PA
9105 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (BZ-209)	EPA 1668A	10129405	NELAP	PA
9095 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ-206)	EPA 1668A	10129405	NELAP	PA
9090 - 2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ-194)	EPA 1668A	10129405	NELAP	PA
9102 - 2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ-196)	EPA 1668A	10129405	NELAP	PA
9101 - 2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ-207)	EPA 1668A	10129405	NELAP	PA
9103 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ-195)	EPA 1668A	10129405	NELAP	PA
9065 - 2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)	EPA 1668A	10129405	NELAP	PA
8916 - 2,2',3,3',4,4',6+2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-171+173)	EPA 1668A	10129405	NELAP	PA
8933 - 2,2',3,3',4,4',6,6'+2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ 197+200)	EPA 1668A	10129405	NELAP	PA
9104 - 2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ-197)	EPA 1668A	10129405	NELAP	PA
9106 - 2,2',3,3',4,4',6-Heptachlorobiphenyl (BZ-171)	EPA 1668A	10129405	NELAP	PA
9020 - 2,2',3,3',4,4'-Hexachlorobiphenyl (BZ-128)	EPA 1668A	10129405	NELAP	PA
9114 - 2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ-177)	EPA 1668A	10129405	NELAP	PA
9112 - 2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ-201)	EPA 1668A	10129405	NELAP	PA
9115 - 2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ-175)	EPA 1668A	10129405	NELAP	PA
9117 - 2,2',3,3',4,5'-Hexachlorobiphenyl (BZ-130)	EPA 1668A	10129405	NELAP	PA
8922 - 2,2',3,3',4,5+2,2',3,4,4',5'+2,3,3',4',5,6-Hexachlorobiphenyl (BZ-129+138+163)	EPA 1668A	10129405	NELAP	PA
9108 - 2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ-199)	EPA 1668A	10129405	NELAP	PA
8934 - 2,2',3,3',4,5,5',6+2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ-198+199)	EPA 1668A	10129405	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
9107 - 2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ-208)	EPA 1668A	10129405	NELAP	PA
9109 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl (BZ-198)	EPA 1668A	10129405	NELAP	PA
9110 - 2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ-172)	EPA 1668A	10129405	NELAP	PA
9116 - 2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ-174)	EPA 1668A	10129405	NELAP	PA
9111 - 2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ-200)	EPA 1668A	10129405	NELAP	PA
9113 - 2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-173)	EPA 1668A	10129405	NELAP	PA
9118 - 2,2',3,3',4,5-Hexachlorobiphenyl (BZ-129)	EPA 1668A	10129405	NELAP	PA
9120 - 2,2',3,3',4,6'-Hexachlorobiphenyl (BZ-132)	EPA 1668A	10129405	NELAP	PA
9119 - 2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ-176)	EPA 1668A	10129405	NELAP	PA
9121 - 2,2',3,3',4,6-Hexachlorobiphenyl (BZ-131)	EPA 1668A	10129405	NELAP	PA
9122 - 2,2',3,3',4-Pentachlorobiphenyl (BZ-82)	EPA 1668A	10129405	NELAP	PA
9123 - 2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ-202)	EPA 1668A	10129405	NELAP	PA
9124 - 2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ-178)	EPA 1668A	10129405	NELAP	PA
9125 - 2,2',3,3',5,5'-Hexachlorobiphenyl (BZ-133)	EPA 1668A	10129405	NELAP	PA
8926 - 2,2',3,3',5,6'+2,2',3,5,5',6+2,2',4,4',5,6'-Hexachlorobiphenyl (BZ-135+151+154)	EPA 1668A	10129405	NELAP	PA
8927 - 2,2',3,3',5,6'+2,2',3,5,5',6-Hexachlorobiphenyls (BZ 135+151)	EPA 1668A	10129405	NELAP	PA
9127 - 2,2',3,3',5,6'-Hexachlorobiphenyl (BZ-135)	EPA 1668A	10129405	NELAP	PA
9126 - 2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ-179)	EPA 1668A	10129405	NELAP	PA
9128 - 2,2',3,3',5,6-Hexachlorobiphenyl (BZ-134)	EPA 1668A	10129405	NELAP	PA
9129 - 2,2',3,3',5-Pentachlorobiphenyl (BZ-83)	EPA 1668A	10129405	NELAP	PA
9130 - 2,2',3,3',6,6'-Hexachlorobiphenyl (BZ-136)	EPA 1668A	10129405	NELAP	PA
9131 - 2,2',3,3',6-Pentachlorobiphenyl (BZ-84)	EPA 1668A	10129405	NELAP	PA
9132 - 2,2',3,3'-Tetrachlorobiphenyl (BZ-40)	EPA 1668A	10129405	NELAP	PA
9151 - 2,2',3,4',5',6-Hexachlorobiphenyl (BZ-149)	EPA 1668A	10129405	NELAP	PA
9154 - 2,2',3,4',5'-Pentachlorobiphenyl (BZ-97)	EPA 1668A	10129405	NELAP	PA
8948 - 2,2',3,4',5+2,2',4,5,5'+2,3,3',5',6-Pentachlorobiphenyl (BZ-90+101+113)	EPA 1668A	10129405	NELAP	PA
9080 - 2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ-187)	EPA 1668A	10129405	NELAP	PA
9144 - 2,2',3,4',5,5'-Hexachlorobiphenyl	EPA 1668A	10129405	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
(BZ-146)				
9147 - 2,2',3,4',5,6'-Hexachlorobiphenyl (BZ-148)	EPA 1668A	10129405	NELAP	PA
8929 - 2,2',3,4',5,6+2,2',3,4',5',6-Hexachlorobiphenyl (BZ-147+149)	EPA 1668A	10129405	NELAP	PA
9146 - 2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ-188)	EPA 1668A	10129405	NELAP	PA
9149 - 2,2',3,4',5,6-Hexachlorobiphenyl (BZ-147)	EPA 1668A	10129405	NELAP	PA
9155 - 2,2',3,4',5-Pentachlorobiphenyl (BZ-90)	EPA 1668A	10129405	NELAP	PA
8951 - 2,2',3,4',6'+2,2',4,5,6'-Pentachlorobiphenyl (BZ-98+102)	EPA 1668A	10129405	NELAP	PA
9159 - 2,2',3,4',6'-Pentachlorobiphenyl (BZ-98)	EPA 1668A	10129405	NELAP	PA
9157 - 2,2',3,4',6,6'-Hexachlorobiphenyl (BZ-150)	EPA 1668A	10129405	NELAP	PA
9160 - 2,2',3,4',6-Pentachlorobiphenyl (BZ-91)	EPA 1668A	10129405	NELAP	PA
9162 - 2,2',3,4'-Tetrachlorobiphenyl (BZ-42)	EPA 1668A	10129405	NELAP	PA
8941 - 2,2',3,4,4'+2,3,4,5,6+2,3,4',5,6-Pentachlorobiphenyl (BZ-85+116+117)	EPA 1668A	10129405	NELAP	PA
8918 - 2,2',3,4,4',5',6+2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ-183+185)	EPA 1668A	10129405	NELAP	PA
9075 - 2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ-183)	EPA 1668A	10129405	NELAP	PA
9025 - 2,2',3,4,4',5'-Hexachlorobiphenyl (BZ-138)	EPA 1668A	10129405	NELAP	PA
8917 - 2,2',3,4,4',5,5'+2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-180+193)	EPA 1668A	10129405	NELAP	PA
9133 - 2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ-203)	EPA 1668A	10129405	NELAP	PA
9134 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ-180)	EPA 1668A	10129405	NELAP	PA
9136 - 2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ-182)	EPA 1668A	10129405	NELAP	PA
9135 - 2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ-204)	EPA 1668A	10129405	NELAP	PA
9137 - 2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ-181)	EPA 1668A	10129405	NELAP	PA
9138 - 2,2',3,4,4',5-Hexachlorobiphenyl (BZ-137)	EPA 1668A	10129405	NELAP	PA
9140 - 2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-140)	EPA 1668A	10129405	NELAP	PA
8928 - 2,2',3,4,4',6+2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-139+140)	EPA 1668A	10129405	NELAP	PA
9139 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ-184)	EPA 1668A	10129405	NELAP	PA
9141 - 2,2',3,4,4',6-Hexachlorobiphenyl (BZ-139)	EPA 1668A	10129405	NELAP	PA
9142 - 2,2',3,4,4'-Pentachlorobiphenyl (BZ-85)	EPA 1668A	10129405	NELAP	PA
9150 - 2,2',3,4,5',6-Hexachlorobiphenyl (BZ-144)	EPA 1668A	10129405	NELAP	PA
8975 - 2,2',3,4,5'-Pentachlorobiphenyl	EPA 1668A	10129405	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
(BZ-87)				
8944 - 2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,2',4,4',6-Pentachlorobiphenyl (BZ-86+87+97+100)	EPA 1668A	10129405	NELAP	PA
8946 - 2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,5'+2,3',4,4'6+2,3',4',5'6-Pentachlorobiphenyl (BZ 86+87+97+108+119+125)	EPA 1668A	10129405	NELAP	PA
9143 - 2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ-185)	EPA 1668A	10129405	NELAP	PA
9030 - 2,2',3,4,5,5'-Hexachlorobiphenyl (BZ-141)	EPA 1668A	10129405	NELAP	PA
9152 - 2,2',3,4,5,6'-Hexachlorobiphenyl (BZ-143)	EPA 1668A	10129405	NELAP	PA
9145 - 2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ-186)	EPA 1668A	10129405	NELAP	PA
9148 - 2,2',3,4,5,6-Hexachlorobiphenyl (BZ-142)	EPA 1668A	10129405	NELAP	PA
9153 - 2,2',3,4,5-Pentachlorobiphenyl (BZ-86)	EPA 1668A	10129405	NELAP	PA
9161 - 2,2',3,4,6'-Pentachlorobiphenyl (BZ-89)	EPA 1668A	10129405	NELAP	PA
8947 - 2,2',3,4,6+2,2',3,4',6-Pentachlorobiphenyl (BZ-88+91)	EPA 1668A	10129405	NELAP	PA
9156 - 2,2',3,4,6,6'-Hexachlorobiphenyl (BZ-145)	EPA 1668A	10129405	NELAP	PA
9158 - 2,2',3,4,6-Pentachlorobiphenyl (BZ-88)	EPA 1668A	10129405	NELAP	PA
9163 - 2,2',3,4-Tetrachlorobiphenyl (BZ-41)	EPA 1668A	10129405	NELAP	PA
8957 - 2,2',3,5'+2,2',4,4'+2,3,5,6-Tetrachlorobiphenyl (BZ-44+47+65)	EPA 1668A	10129405	NELAP	PA
9166 - 2,2',3,5',6-Pentachlorobiphenyl (BZ-95)	EPA 1668A	10129405	NELAP	PA
8945 - 2,2',3,5'-Tetrachlorobiphenyl (BZ-44)	EPA 1668A	10129405	NELAP	PA
8956 - 2,2',3,5+2,3',5',6-Tetrachlorobiphenyl (BZ-43+73)	EPA 1668A	10129405	NELAP	PA
9035 - 2,2',3,5,5',6-Hexachlorobiphenyl (BZ-151)	EPA 1668A	10129405	NELAP	PA
9164 - 2,2',3,5,5'-Pentachlorobiphenyl (BZ-92)	EPA 1668A	10129405	NELAP	PA
9167 - 2,2',3,5,6'-Pentachlorobiphenyl (BZ-94)	EPA 1668A	10129405	NELAP	PA
8949 - 2,2',3,5,6+2,2',4,4',6-Pentachlorobiphenyl (BZ-93+100)	EPA 1668A	10129405	NELAP	PA
9165 - 2,2',3,5,6,6'-Hexachlorobiphenyl (BZ-152)	EPA 1668A	10129405	NELAP	PA
9168 - 2,2',3,5,6-Pentachlorobiphenyl (BZ-93)	EPA 1668A	10129405	NELAP	PA
9169 - 2,2',3,5-Tetrachlorobiphenyl (BZ-43)	EPA 1668A	10129405	NELAP	PA
9171 - 2,2',3,6'-Tetrachlorobiphenyl (BZ-46)	EPA 1668A	10129405	NELAP	PA
8958 - 2,2',3,6+2,2',4,6'-Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668A	10129405	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
9170 - 2,2',3,6,6'-Pentachlorobiphenyl (BZ-96)	EPA 1668A	10129405	NELAP	PA
9172 - 2,2',3,6-Tetrachlorobiphenyl (BZ-45)	EPA 1668A	10129405	NELAP	PA
9173 - 2,2',3-Trichlorobiphenyl (BZ-16)	EPA 1668A	10129405	NELAP	PA
8931 - 2,2',4,4',5,5'+2,3',4,4',5',6-Hexachlorobiphenyl (BZ-153+168)	EPA 1668A	10129405	NELAP	PA
9040 - 2,2',4,4',5,5'-Hexachlorobiphenyl (BZ-153)	EPA 1668A	10129405	NELAP	PA
9174 - 2,2',4,4',5,6'-Hexachlorobiphenyl (BZ-154)	EPA 1668A	10129405	NELAP	PA
9175 - 2,2',4,4',5-Pentachlorobiphenyl (BZ-99)	EPA 1668A	10129405	NELAP	PA
9176 - 2,2',4,4',6,6'-Hexachlorobiphenyl (BZ-155)	EPA 1668A	10129405	NELAP	PA
9177 - 2,2',4,4',6-Pentachlorobiphenyl (BZ-100)	EPA 1668A	10129405	NELAP	PA
9178 - 2,2',4,4'-Tetrachlorobiphenyl (BZ-47)	EPA 1668A	10129405	NELAP	PA
8959 - 2,2',4,5'+2,3',4,6-Tetrachlorobiphenyl (BZ-49+69)	EPA 1668A	10129405	NELAP	PA
9179 - 2,2',4,5',6-Pentachlorobiphenyl (BZ-103)	EPA 1668A	10129405	NELAP	PA
8950 - 2,2',4,5'-Tetrachlorobiphenyl (BZ-49)	EPA 1668A	10129405	NELAP	PA
8980 - 2,2',4,5,5'-Pentachlorobiphenyl (BZ-101)	EPA 1668A	10129405	NELAP	PA
9180 - 2,2',4,5,6'-Pentachlorobiphenyl (BZ-102)	EPA 1668A	10129405	NELAP	PA
9181 - 2,2',4,5-Tetrachlorobiphenyl (BZ-48)	EPA 1668A	10129405	NELAP	PA
9183 - 2,2',4,6'-Tetrachlorobiphenyl (BZ-51)	EPA 1668A	10129405	NELAP	PA
8961 - 2,2',4,6+2,2',5,6'-Tetrachlorobiphenyl (BZ-50+53)	EPA 1668A	10129405	NELAP	PA
9182 - 2,2',4,6,6'-Pentachlorobiphenyl (BZ-104)	EPA 1668A	10129405	NELAP	PA
9184 - 2,2',4,6-Tetrachlorobiphenyl (BZ-50)	EPA 1668A	10129405	NELAP	PA
9185 - 2,2',4-Trichlorobiphenyl (BZ-17)	EPA 1668A	10129405	NELAP	PA
8966 - 2,2',5+2,4,6-Trichlorobiphenyl (BZ-18+30)	EPA 1668A	10129405	NELAP	PA
8955 - 2,2',5,5'-Tetrachlorobiphenyl (BZ-52)	EPA 1668A	10129405	NELAP	PA
9186 - 2,2',5,6'-Tetrachlorobiphenyl (BZ-53)	EPA 1668A	10129405	NELAP	PA
8930 - 2,2',5-Trichlorobiphenyl (BZ-18)	EPA 1668A	10129405	NELAP	PA
9187 - 2,2',6,6'-Tetrachlorobiphenyl (BZ-54)	EPA 1668A	10129405	NELAP	PA
9188 - 2,2',6-Trichlorobiphenyl (BZ-19)	EPA 1668A	10129405	NELAP	PA
9189 - 2,2'-Dichlorobiphenyl (BZ-4)	EPA 1668A	10129405	NELAP	PA
9224 - 2,3',4',5',6-Pentachlorobiphenyl (BZ-125)	EPA 1668A	10129405	NELAP	PA
9229 - 2,3',4',5'-Tetrachlorobiphenyl (BZ-76)	EPA 1668A	10129405	NELAP	PA
8964 - 2,3',4',5+2,4,4',5+2,3',4',5'-	EPA 1668A	10129405	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
Tetrachlorobiphenyl (BZ-70+74+76)				
9222 - 2,3',4',5,5'-Pentachlorobiphenyl (BZ-124)	EPA 1668A	10129405	NELAP	PA
9230 - 2,3',4',5-Tetrachlorobiphenyl (BZ-70)	EPA 1668A	10129405	NELAP	PA
9237 - 2,3',4',6-Tetrachlorobiphenyl (BZ-71)	EPA 1668A	10129405	NELAP	PA
9239 - 2,3',4'-Trichlorobiphenyl (BZ-33)	EPA 1668A	10129405	NELAP	PA
9218 - 2,3',4,4',5',6-Hexachlorobiphenyl (BZ-168)	EPA 1668A	10129405	NELAP	PA
9000 - 2,3',4,4',5'-Pentachlorobiphenyl (BZ-123)	EPA 1668A	10129405	NELAP	PA
9055 - 2,3',4,4',5,5'-Hexachlorobiphenyl (BZ-167)	EPA 1668A	10129405	NELAP	PA
8995 - 2,3',4,4',5-Pentachlorobiphenyl (BZ-118)	EPA 1668A	10129405	NELAP	PA
9220 - 2,3',4,4',6-Pentachlorobiphenyl (BZ-119)	EPA 1668A	10129405	NELAP	PA
8960 - 2,3',4,4'-Tetrachlorobiphenyl (BZ-66)	EPA 1668A	10129405	NELAP	PA
9226 - 2,3',4,5',6-Pentachlorobiphenyl (BZ-121)	EPA 1668A	10129405	NELAP	PA
9231 - 2,3',4,5'-Tetrachlorobiphenyl (BZ-68)	EPA 1668A	10129405	NELAP	PA
9223 - 2,3',4,5,5'-Pentachlorobiphenyl (BZ-120)	EPA 1668A	10129405	NELAP	PA
9232 - 2,3',4,5-Tetrachlorobiphenyl (BZ-67)	EPA 1668A	10129405	NELAP	PA
9235 - 2,3',4,6-Tetrachlorobiphenyl (BZ-69)	EPA 1668A	10129405	NELAP	PA
9240 - 2,3',4-Trichlorobiphenyl (BZ-25)	EPA 1668A	10129405	NELAP	PA
9244 - 2,3',5',6-Tetrachlorobiphenyl (BZ-73)	EPA 1668A	10129405	NELAP	PA
9246 - 2,3',5'-Trichlorobiphenyl (BZ-34)	EPA 1668A	10129405	NELAP	PA
8969 - 2,3',5+2,4,5-Trichlorobiphenyl (BZ-26+29)	EPA 1668A	10129405	NELAP	PA
9242 - 2,3',5,5'-Tetrachlorobiphenyl (BZ-72)	EPA 1668A	10129405	NELAP	PA
8935 - 2,3',5-Trichlorobiphenyl (BZ-26)	EPA 1668A	10129405	NELAP	PA
9248 - 2,3',6-Trichlorobiphenyl (BZ-27)	EPA 1668A	10129405	NELAP	PA
9249 - 2,3'-Dichlorobiphenyl (BZ-6)	EPA 1668A	10129405	NELAP	PA
8967 - 2,3,3'+2,4,4'-Trichlorobiphenyl (BZ-20+28)	EPA 1668A	10129405	NELAP	PA
9201 - 2,3,3',4',5',6-Hexachlorobiphenyl (BZ-164)	EPA 1668A	10129405	NELAP	PA
9202 - 2,3,3',4',5'-Pentachlorobiphenyl (BZ-122)	EPA 1668A	10129405	NELAP	PA
8936 - 2,3,3',4',5+2,3',4',5,5'-Pentachlorobiphenyl (BZ-107+124)	EPA 1668A	10129405	NELAP	PA
9195 - 2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-193)	EPA 1668A	10129405	NELAP	PA
9197 - 2,3,3',4',5,5'-Hexachlorobiphenyl (BZ-162)	EPA 1668A	10129405	NELAP	PA
9199 - 2,3,3',4',5,6-Hexachlorobiphenyl (BZ-163)	EPA 1668A	10129405	NELAP	PA
9205 - 2,3,3',4',5-Pentachlorobiphenyl	EPA 1668A	10129405	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
(BZ-107)				
8938 - 2,3,3',4',6+2,3,4,4',6-Pentachlorobiphenyl (BZ-110+115)	EPA 1668A	10129405	NELAP	PA
8990 - 2,3,3',4',6-Pentachlorobiphenyl (BZ-110)	EPA 1668A	10129405	NELAP	PA
9207 - 2,3,3',4'-Tetrachlorobiphenyl (BZ-56)	EPA 1668A	10129405	NELAP	PA
9192 - 2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ-191)	EPA 1668A	10129405	NELAP	PA
9045 - 2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-157)	EPA 1668A	10129405	NELAP	PA
8932 - 2,3,3',4,4',5+2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-156+157)	EPA 1668A	10129405	NELAP	PA
9190 - 2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ-205)	EPA 1668A	10129405	NELAP	PA
9085 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ-189)	EPA 1668A	10129405	NELAP	PA
9191 - 2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ-190)	EPA 1668A	10129405	NELAP	PA
9050 - 2,3,3',4,4',5-Hexachlorobiphenyl (BZ-156)	EPA 1668A	10129405	NELAP	PA
9193 - 2,3,3',4,4',6-Hexachlorobiphenyl (BZ-158)	EPA 1668A	10129405	NELAP	PA
8985 - 2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)	EPA 1668A	10129405	NELAP	PA
9200 - 2,3,3',4,5',6-Hexachlorobiphenyl (BZ-161)	EPA 1668A	10129405	NELAP	PA
9203 - 2,3,3',4,5'-Pentachlorobiphenyl (BZ-108)	EPA 1668A	10129405	NELAP	PA
9194 - 2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ-192)	EPA 1668A	10129405	NELAP	PA
9196 - 2,3,3',4,5,5'-Hexachlorobiphenyl (BZ-159)	EPA 1668A	10129405	NELAP	PA
9198 - 2,3,3',4,5,6-Hexachlorobiphenyl (BZ-160)	EPA 1668A	10129405	NELAP	PA
9204 - 2,3,3',4,5-Pentachlorobiphenyl (BZ-106)	EPA 1668A	10129405	NELAP	PA
9206 - 2,3,3',4,6-Pentachlorobiphenyl (BZ-109)	EPA 1668A	10129405	NELAP	PA
9208 - 2,3,3',4-Tetrachlorobiphenyl (BZ-55)	EPA 1668A	10129405	NELAP	PA
9212 - 2,3,3',5',6-Pentachlorobiphenyl (BZ-113)	EPA 1668A	10129405	NELAP	PA
9213 - 2,3,3',5'-Tetrachlorobiphenyl (BZ-58)	EPA 1668A	10129405	NELAP	PA
9209 - 2,3,3',5,5',6-Hexachlorobiphenyl (BZ-165)	EPA 1668A	10129405	NELAP	PA
9210 - 2,3,3',5,5'-Pentachlorobiphenyl (BZ-111)	EPA 1668A	10129405	NELAP	PA
9211 - 2,3,3',5,6-Pentachlorobiphenyl (BZ-112)	EPA 1668A	10129405	NELAP	PA
9214 - 2,3,3',5-Tetrachlorobiphenyl (BZ-57)	EPA 1668A	10129405	NELAP	PA
8962 - 2,3,3',6+2,3,4,6+2,4,4',6-Tetrachlorobiphenyl (BZ-59+62+75)	EPA 1668A	10129405	NELAP	PA
9215 - 2,3,3',6-Tetrachlorobiphenyl (BZ-	EPA 1668A	10129405	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
59)				
9216 - 2,3,3'-Trichlorobiphenyl (BZ-20)	EPA 1668A	10129405	NELAP	PA
9227 - 2,3,4',5,6-Pentachlorobiphenyl (BZ-117)	EPA 1668A	10129405	NELAP	PA
9233 - 2,3,4',5-Tetrachlorobiphenyl (BZ-63)	EPA 1668A	10129405	NELAP	PA
9236 - 2,3,4',6-Tetrachlorobiphenyl (BZ-64)	EPA 1668A	10129405	NELAP	PA
9241 - 2,3,4'-Trichlorobiphenyl (BZ-22)	EPA 1668A	10129405	NELAP	PA
8968 - 2,3,4+2,3',4'-Trichlorobiphenyl (BZ-21+33)	EPA 1668A	10129405	NELAP	PA
9217 - 2,3,4,4',5,6-Hexachlorobiphenyl (BZ-166)	EPA 1668A	10129405	NELAP	PA
9005 - 2,3,4,4',5-Pentachlorobiphenyl (BZ-114)	EPA 1668A	10129405	NELAP	PA
9219 - 2,3,4,4',6-Pentachlorobiphenyl (BZ-115)	EPA 1668A	10129405	NELAP	PA
9221 - 2,3,4,4'-Tetrachlorobiphenyl (BZ-60)	EPA 1668A	10129405	NELAP	PA
8963 - 2,3,4,5+2,3',4',5+2,4,4',5+2,3',4',5'-Tetrachlorobiphenyls (BZ 61+70+74+76)	EPA 1668A	10129405	NELAP	PA
9225 - 2,3,4,5,6-Pentachlorobiphenyl (BZ-116)	EPA 1668A	10129405	NELAP	PA
9228 - 2,3,4,5-Tetrachlorobiphenyl (BZ-61)	EPA 1668A	10129405	NELAP	PA
9234 - 2,3,4,6-Tetrachlorobiphenyl (BZ-62)	EPA 1668A	10129405	NELAP	PA
9238 - 2,3,4-Trichlorobiphenyl (BZ-21)	EPA 1668A	10129405	NELAP	PA
9243 - 2,3,5,6-Tetrachlorobiphenyl (BZ-65)	EPA 1668A	10129405	NELAP	PA
9245 - 2,3,5-Trichlorobiphenyl (BZ-23)	EPA 1668A	10129405	NELAP	PA
9247 - 2,3,6-Trichlorobiphenyl (BZ-24)	EPA 1668A	10129405	NELAP	PA
8920 - 2,3-Dichlorobiphenyl (BZ-5)	EPA 1668A	10129405	NELAP	PA
8940 - 2,4',5-Trichlorobiphenyl (BZ-31)	EPA 1668A	10129405	NELAP	PA
9255 - 2,4',6-Trichlorobiphenyl (BZ-32)	EPA 1668A	10129405	NELAP	PA
9256 - 2,4'-Dichlorobiphenyl (BZ-8)	EPA 1668A	10129405	NELAP	PA
9250 - 2,4,4',5-Tetrachlorobiphenyl (BZ-74)	EPA 1668A	10129405	NELAP	PA
9251 - 2,4,4',6-Tetrachlorobiphenyl (BZ-75)	EPA 1668A	10129405	NELAP	PA
9252 - 2,4,4'-Trichlorobiphenyl (BZ-28)	EPA 1668A	10129405	NELAP	PA
9253 - 2,4,5-Trichlorobiphenyl (BZ-29)	EPA 1668A	10129405	NELAP	PA
9254 - 2,4,6-Trichlorobiphenyl (BZ-30)	EPA 1668A	10129405	NELAP	PA
9257 - 2,4-Dichlorobiphenyl (BZ-7)	EPA 1668A	10129405	NELAP	PA
9258 - 2,5-Dichlorobiphenyl (BZ-9)	EPA 1668A	10129405	NELAP	PA
9259 - 2,6-Dichlorobiphenyl (BZ-10)	EPA 1668A	10129405	NELAP	PA
8915 - 2-Chlorobiphenyl (BZ-1)	EPA 1668A	10129405	NELAP	PA
9060 - 3,3',4,4',5,5'-Hexachlorobiphenyl (BZ-169)	EPA 1668A	10129405	NELAP	PA
9015 - 3,3',4,4',5-Pentachlorobiphenyl (BZ-126)	EPA 1668A	10129405	NELAP	PA
8965 - 3,3',4,4'-Tetrachlorobiphenyl (BZ-77)	EPA 1668A	10129405	NELAP	PA
9261 - 3,3',4,5'-Tetrachlorobiphenyl (BZ-79)	EPA 1668A	10129405	NELAP	PA
9260 - 3,3',4,5,5'-Pentachlorobiphenyl	EPA 1668A	10129405	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
(BZ-127)				
9262 - 3,3',4,4,5-Tetrachlorobiphenyl (BZ-78)	EPA 1668A	10129405	NELAP	PA
9263 - 3,3',4-Trichlorobiphenyl (BZ-35)	EPA 1668A	10129405	NELAP	PA
9264 - 3,3',5,5'-Tetrachlorobiphenyl (BZ-80)	EPA 1668A	10129405	NELAP	PA
9265 - 3,3',5-Trichlorobiphenyl (BZ-36)	EPA 1668A	10129405	NELAP	PA
8925 - 3,3'-Dichlorobiphenyl (BZ-11)	EPA 1668A	10129405	NELAP	PA
9268 - 3,4',5-Trichlorobiphenyl (BZ-39)	EPA 1668A	10129405	NELAP	PA
9269 - 3,4'-Dichlorobiphenyl (BZ-13)	EPA 1668A	10129405	NELAP	PA
100098 - 3,4+3,4'-Dichlorobiphenyl (BZ-12+13)	EPA 1668A	10129405	NELAP	PA
8970 - 3,4,4',5-Tetrachlorobiphenyl (BZ-81)	EPA 1668A	10129405	NELAP	PA
9266 - 3,4,4'-Trichlorobiphenyl (BZ-37)	EPA 1668A	10129405	NELAP	PA
9267 - 3,4,5-Trichlorobiphenyl (BZ-38)	EPA 1668A	10129405	NELAP	PA
9270 - 3,4-Dichlorobiphenyl (BZ-12)	EPA 1668A	10129405	NELAP	PA
9271 - 3,5-Dichlorobiphenyl (BZ-14)	EPA 1668A	10129405	NELAP	PA
9272 - 3-Chlorobiphenyl (BZ-2)	EPA 1668A	10129405	NELAP	PA
9273 - 4,4'-Dichlorobiphenyl (BZ-15)	EPA 1668A	10129405	NELAP	PA
9274 - 4-Chlorobiphenyl (BZ-3)	EPA 1668A	10129405	NELAP	PA
8872 - PCB Aroclor Identification	EPA 1668A	10129405	NELAP	PA
8870 - PCBs	EPA 1668A	10129405	NELAP	PA
8875 - PCBs, as congeners	EPA 1668A	10129405	NELAP	PA
8876 - Total Dichlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8877 - Total Heptachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8888 - Total Hexachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8889 - Total Monochlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8891 - Total Nonachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8892 - Total Octachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8896 - Total Pentachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8893 - Total Tetrachlorobiphenyls	EPA 1668A	10129405	NELAP	PA
8894 - Total Trichlorobiphenyls	EPA 1668A	10129405	NELAP	PA
100007 - Acid Digestion of Sediments, Sludges, and soils	EPA 3050B	10135601	NELAP	PA
1402 - Alkaline Digestion for Hexavalent Chromium	EPA 3060A	10136604	NELAP	PA
1444 - Separatory Funnel Liquid-liquid extraction	EPA 3510C	10138202	NELAP	PA
1452 - Soxhlet Extraction	EPA 3540C	10140202	NELAP	PA
1428 - Microwave Extraction	EPA 3546	10141205	NELAP	PA
1468 - Ultrasonic Extraction	EPA 3550C	10142004	NELAP	PA
1456 - Sulfur Clean-Up	EPA 3660B	10148400	NELAP	PA
2020 - Sulfuric acid/permanganate clean-up	EPA 3665	10148604	NELAP	PA
2020 - Sulfuric acid/permanganate clean-up	EPA 3665A	10148808	NELAP	PA
100017 - Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples	EPA 5030	10153001	NELAP	PA
1406 - Purge and trap for aqueous phase samples	EPA 5030	10153001	NELAP	PA
100017 - Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples	EPA 5035	10154004	NELAP	PA
1145 - Silicon	EPA 6010	10155201	NELAP	PA
1000 - Aluminum	EPA 6010B	10155609	NELAP	PA
1005 - Antimony	EPA 6010B	10155609	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
1010 - Arsenic	EPA 6010B	10155609	NELAP	PA
1015 - Barium	EPA 6010B	10155609	NELAP	PA
1020 - Beryllium	EPA 6010B	10155609	NELAP	PA
1025 - Boron	EPA 6010B	10155609	NELAP	PA
1030 - Cadmium	EPA 6010B	10155609	NELAP	PA
1035 - Calcium	EPA 6010B	10155609	NELAP	PA
1040 - Chromium	EPA 6010B	10155609	NELAP	PA
1050 - Cobalt	EPA 6010B	10155609	NELAP	PA
1055 - Copper	EPA 6010B	10155609	NELAP	PA
1070 - Iron	EPA 6010B	10155609	NELAP	PA
1075 - Lead	EPA 6010B	10155609	NELAP	PA
1080 - Lithium	EPA 6010B	10155609	NELAP	PA
1085 - Magnesium	EPA 6010B	10155609	NELAP	PA
1090 - Manganese	EPA 6010B	10155609	NELAP	PA
1100 - Molybdenum	EPA 6010B	10155609	NELAP	PA
1105 - Nickel	EPA 6010B	10155609	NELAP	PA
1125 - Potassium	EPA 6010B	10155609	NELAP	PA
1140 - Selenium	EPA 6010B	10155609	NELAP	PA
1150 - Silver	EPA 6010B	10155609	NELAP	PA
1155 - Sodium	EPA 6010B	10155609	NELAP	PA
1160 - Strontium	EPA 6010B	10155609	NELAP	PA
1165 - Thallium	EPA 6010B	10155609	NELAP	PA
1175 - Tin	EPA 6010B	10155609	NELAP	PA
1180 - Titanium	EPA 6010B	10155609	NELAP	PA
1185 - Vanadium	EPA 6010B	10155609	NELAP	PA
1190 - Zinc	EPA 6010B	10155609	NELAP	PA
1000 - Aluminum	EPA 6010C	10155803	NELAP	PA
1005 - Antimony	EPA 6010C	10155803	NELAP	PA
1010 - Arsenic	EPA 6010C	10155803	NELAP	PA
1015 - Barium	EPA 6010C	10155803	NELAP	PA
1020 - Beryllium	EPA 6010C	10155803	NELAP	PA
1025 - Boron	EPA 6010C	10155803	NELAP	PA
1030 - Cadmium	EPA 6010C	10155803	NELAP	PA
1035 - Calcium	EPA 6010C	10155803	NELAP	PA
1040 - Chromium	EPA 6010C	10155803	NELAP	PA
1050 - Cobalt	EPA 6010C	10155803	NELAP	PA
1055 - Copper	EPA 6010C	10155803	NELAP	PA
1070 - Iron	EPA 6010C	10155803	NELAP	PA
1075 - Lead	EPA 6010C	10155803	NELAP	PA
1080 - Lithium	EPA 6010C	10155803	NELAP	PA
1085 - Magnesium	EPA 6010C	10155803	NELAP	PA
1090 - Manganese	EPA 6010C	10155803	NELAP	PA
1100 - Molybdenum	EPA 6010C	10155803	NELAP	PA
1105 - Nickel	EPA 6010C	10155803	NELAP	PA
1125 - Potassium	EPA 6010C	10155803	NELAP	PA
1140 - Selenium	EPA 6010C	10155803	NELAP	PA
1150 - Silver	EPA 6010C	10155803	NELAP	PA
1155 - Sodium	EPA 6010C	10155803	NELAP	PA
1160 - Strontium	EPA 6010C	10155803	NELAP	PA
2017 - Sulfur	EPA 6010C	10155803	NELAP	PA
1165 - Thallium	EPA 6010C	10155803	NELAP	PA
1175 - Tin	EPA 6010C	10155803	NELAP	PA
1180 - Titanium	EPA 6010C	10155803	NELAP	PA
1185 - Vanadium	EPA 6010C	10155803	NELAP	PA
1190 - Zinc	EPA 6010C	10155803	NELAP	PA
1000 - Aluminum	EPA 6020	10156000	NELAP	PA

Eurofins Lancaster Laboratories Inc
Issue Date: July 1, 2015

Certificate Number: 02055

AI Number: 30729
Expiration Date: June 30, 2016

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Page 64 of 83

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
1005 - Antimony	EPA 6020	10156000	NELAP	PA
1010 - Arsenic	EPA 6020	10156000	NELAP	PA
1015 - Barium	EPA 6020	10156000	NELAP	PA
1020 - Beryllium	EPA 6020	10156000	NELAP	PA
1030 - Cadmium	EPA 6020	10156000	NELAP	PA
1035 - Calcium	EPA 6020	10156000	NELAP	PA
1040 - Chromium	EPA 6020	10156000	NELAP	PA
1050 - Cobalt	EPA 6020	10156000	NELAP	PA
1055 - Copper	EPA 6020	10156000	NELAP	PA
1070 - Iron	EPA 6020	10156000	NELAP	PA
1075 - Lead	EPA 6020	10156000	NELAP	PA
1085 - Magnesium	EPA 6020	10156000	NELAP	PA
1090 - Manganese	EPA 6020	10156000	NELAP	PA
1100 - Molybdenum	EPA 6020	10156000	NELAP	PA
1105 - Nickel	EPA 6020	10156000	NELAP	PA
1125 - Potassium	EPA 6020	10156000	NELAP	PA
1140 - Selenium	EPA 6020	10156000	NELAP	PA
1150 - Silver	EPA 6020	10156000	NELAP	PA
1155 - Sodium	EPA 6020	10156000	NELAP	PA
1160 - Strontium	EPA 6020	10156000	NELAP	PA
1165 - Thallium	EPA 6020	10156000	NELAP	PA
1175 - Tin	EPA 6020	10156000	NELAP	PA
1185 - Vanadium	EPA 6020	10156000	NELAP	PA
1190 - Zinc	EPA 6020	10156000	NELAP	PA
1155 - Sodium	EPA 6020	10156204	NELAP	PA
1000 - Aluminum	EPA 6020A	10156408	NELAP	PA
1005 - Antimony	EPA 6020A	10156408	NELAP	PA
1010 - Arsenic	EPA 6020A	10156408	NELAP	PA
1015 - Barium	EPA 6020A	10156408	NELAP	PA
1020 - Beryllium	EPA 6020A	10156408	NELAP	PA
1030 - Cadmium	EPA 6020A	10156408	NELAP	PA
1035 - Calcium	EPA 6020A	10156408	NELAP	PA
1040 - Chromium	EPA 6020A	10156408	NELAP	PA
1050 - Cobalt	EPA 6020A	10156408	NELAP	PA
1055 - Copper	EPA 6020A	10156408	NELAP	PA
1070 - Iron	EPA 6020A	10156408	NELAP	PA
1075 - Lead	EPA 6020A	10156408	NELAP	PA
1085 - Magnesium	EPA 6020A	10156408	NELAP	PA
1090 - Manganese	EPA 6020A	10156408	NELAP	PA
1100 - Molybdenum	EPA 6020A	10156408	NELAP	PA
1105 - Nickel	EPA 6020A	10156408	NELAP	PA
1125 - Potassium	EPA 6020A	10156408	NELAP	PA
1140 - Selenium	EPA 6020A	10156408	NELAP	PA
1150 - Silver	EPA 6020A	10156408	NELAP	PA
1155 - Sodium	EPA 6020A	10156408	NELAP	PA
1160 - Strontium	EPA 6020A	10156408	NELAP	PA
1165 - Thallium	EPA 6020A	10156408	NELAP	PA
1175 - Tin	EPA 6020A	10156408	NELAP	PA
1180 - Titanium	EPA 6020A	10156408	NELAP	PA
1185 - Vanadium	EPA 6020A	10156408	NELAP	PA
1190 - Zinc	EPA 6020A	10156408	NELAP	PA
1045 - Chromium VI	EPA 7196A	10162400	NELAP	PA
1045 - Chromium VI	EPA 7199	10163005	NELAP	PA
1095 - Mercury	EPA 7471A	10166208	NELAP	PA
1095 - Mercury	EPA 7471B	10166402	NELAP	PA
9369 - Diesel range organics (DRO)	EPA 8015B	10173601	NELAP	PA

Eurofins Lancaster Laboratories Inc
Issue Date: July 1, 2015

Certificate Number: 02055

AI Number: 30729
Expiration Date: June 30, 2016

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Page 65 of 83

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
4750 - Ethanol	EPA 8015B	10173601	NELAP	PA
4785 - Ethylene glycol	EPA 8015B	10173601	NELAP	PA
9408 - Gasoline range organics (GRO)	EPA 8015B	10173601	NELAP	PA
4895 - Isopropyl alcohol (2-Propanol, Isopropanol)	EPA 8015B	10173601	NELAP	PA
4930 - Methanol	EPA 8015B	10173601	NELAP	PA
9369 - Diesel range organics (DRO)	EPA 8015C	10173805	NELAP	PA
4750 - Ethanol	EPA 8015C	10173805	NELAP	PA
4785 - Ethylene glycol	EPA 8015C	10173805	NELAP	PA
9408 - Gasoline range organics (GRO)	EPA 8015C	10173805	NELAP	PA
4895 - Isopropyl alcohol (2-Propanol, Isopropanol)	EPA 8015C	10173805	NELAP	PA
4930 - Methanol	EPA 8015C	10173805	NELAP	PA
4375 - Benzene	EPA 8021B	10174808	NELAP	PA
4765 - Ethylbenzene	EPA 8021B	10174808	NELAP	PA
4900 - Isopropylbenzene	EPA 8021B	10174808	NELAP	PA
5000 - Methyl tert-butyl ether (MTBE)	EPA 8021B	10174808	NELAP	PA
5005 - Naphthalene	EPA 8021B	10174808	NELAP	PA
5140 - Toluene	EPA 8021B	10174808	NELAP	PA
5260 - Xylene (total)	EPA 8021B	10174808	NELAP	PA
5245 - m-Xylene	EPA 8021B	10174808	NELAP	PA
5250 - o-Xylene	EPA 8021B	10174808	NELAP	PA
5255 - p-Xylene	EPA 8021B	10174808	NELAP	PA
7355 - 4,4'-DDD	EPA 8081A	10178606	NELAP	PA
7360 - 4,4'-DDE	EPA 8081A	10178606	NELAP	PA
7365 - 4,4'-DDT	EPA 8081A	10178606	NELAP	PA
7025 - Aldrin	EPA 8081A	10178606	NELAP	PA
7250 - Chlordane (tech.)	EPA 8081A	10178606	NELAP	PA
7470 - Dieldrin	EPA 8081A	10178606	NELAP	PA
7510 - Endosulfan I	EPA 8081A	10178606	NELAP	PA
7515 - Endosulfan II	EPA 8081A	10178606	NELAP	PA
7520 - Endosulfan sulfate	EPA 8081A	10178606	NELAP	PA
7540 - Endrin	EPA 8081A	10178606	NELAP	PA
7530 - Endrin aldehyde	EPA 8081A	10178606	NELAP	PA
7535 - Endrin ketone	EPA 8081A	10178606	NELAP	PA
7685 - Heptachlor	EPA 8081A	10178606	NELAP	PA
7690 - Heptachlor epoxide	EPA 8081A	10178606	NELAP	PA
7740 - Kepone	EPA 8081A	10178606	NELAP	PA
7810 - Methoxychlor	EPA 8081A	10178606	NELAP	PA
7870 - Mirex	EPA 8081A	10178606	NELAP	PA
8250 - Toxaphene (Chlorinated camphene)	EPA 8081A	10178606	NELAP	PA
7110 - alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081A	10178606	NELAP	PA
7240 - alpha-Chlordane	EPA 8081A	10178606	NELAP	PA
7115 - beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081A	10178606	NELAP	PA
7105 - delta-BHC	EPA 8081A	10178606	NELAP	PA
7120 - gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	EPA 8081A	10178606	NELAP	PA
7245 - gamma-Chlordane	EPA 8081A	10178606	NELAP	PA
7355 - 4,4'-DDD	EPA 8081B	10178800	NELAP	PA
7360 - 4,4'-DDE	EPA 8081B	10178800	NELAP	PA
7365 - 4,4'-DDT	EPA 8081B	10178800	NELAP	PA
7025 - Aldrin	EPA 8081B	10178800	NELAP	PA
7250 - Chlordane (tech.)	EPA 8081B	10178800	NELAP	PA
7470 - Dieldrin	EPA 8081B	10178800	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
7510 - Endosulfan I	EPA 8081B	10178800	NELAP	PA
7515 - Endosulfan II	EPA 8081B	10178800	NELAP	PA
7520 - Endosulfan sulfate	EPA 8081B	10178800	NELAP	PA
7540 - Endrin	EPA 8081B	10178800	NELAP	PA
7530 - Endrin aldehyde	EPA 8081B	10178800	NELAP	PA
7535 - Endrin ketone	EPA 8081B	10178800	NELAP	PA
7685 - Heptachlor	EPA 8081B	10178800	NELAP	PA
7690 - Heptachlor epoxide	EPA 8081B	10178800	NELAP	PA
7740 - Kepone	EPA 8081B	10178800	NELAP	PA
7810 - Methoxychlor	EPA 8081B	10178800	NELAP	PA
7870 - Mirex	EPA 8081B	10178800	NELAP	PA
8250 - Toxaphene (Chlorinated camphene)	EPA 8081B	10178800	NELAP	PA
7110 - alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081B	10178800	NELAP	PA
7240 - alpha-Chlordane	EPA 8081B	10178800	NELAP	PA
7115 - beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081B	10178800	NELAP	PA
7105 - delta-BHC	EPA 8081B	10178800	NELAP	PA
7120 - gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	EPA 8081B	10178800	NELAP	PA
7245 - gamma-Chlordane	EPA 8081B	10178800	NELAP	PA
8880 - Aroclor-1016 (PCB-1016)	EPA 8082	10179007	NELAP	PA
8885 - Aroclor-1221 (PCB-1221)	EPA 8082	10179007	NELAP	PA
8890 - Aroclor-1232 (PCB-1232)	EPA 8082	10179007	NELAP	PA
8895 - Aroclor-1242 (PCB-1242)	EPA 8082	10179007	NELAP	PA
8900 - Aroclor-1248 (PCB-1248)	EPA 8082	10179007	NELAP	PA
8905 - Aroclor-1254 (PCB-1254)	EPA 8082	10179007	NELAP	PA
8910 - Aroclor-1260 (PCB-1260)	EPA 8082	10179007	NELAP	PA
8912 - Aroclor-1262 (PCB-1262)	EPA 8082	10179007	NELAP	PA
8913 - Aroclor-1268 (PCB-1268)	EPA 8082	10179007	NELAP	PA
8880 - Aroclor-1016 (PCB-1016)	EPA 8082A	10179201	NELAP	PA
8885 - Aroclor-1221 (PCB-1221)	EPA 8082A	10179201	NELAP	PA
8890 - Aroclor-1232 (PCB-1232)	EPA 8082A	10179201	NELAP	PA
8895 - Aroclor-1242 (PCB-1242)	EPA 8082A	10179201	NELAP	PA
8900 - Aroclor-1248 (PCB-1248)	EPA 8082A	10179201	NELAP	PA
8905 - Aroclor-1254 (PCB-1254)	EPA 8082A	10179201	NELAP	PA
8910 - Aroclor-1260 (PCB-1260)	EPA 8082A	10179201	NELAP	PA
8912 - Aroclor-1262 (PCB-1262)	EPA 8082A	10179201	NELAP	PA
8913 - Aroclor-1268 (PCB-1268)	EPA 8082A	10179201	NELAP	PA
7600 - Fensulfothion	EPA 8141	10181803	NELAP	PA
7785 - Merphos	EPA 8141	10181803	NELAP	PA
8140 - Stirophos	EPA 8141	10181803	NELAP	PA
7005 - Alachlor	EPA 8141A	10182000	NELAP	PA
7065 - Atrazine	EPA 8141A	10182000	NELAP	PA
7075 - Azinphos-methyl (Guthion)	EPA 8141A	10182000	NELAP	PA
7125 - Bolstar (Sulprofos)	EPA 8141A	10182000	NELAP	PA
7220 - Carbophenothion	EPA 8141A	10182000	NELAP	PA
7300 - Chlorpyrifos	EPA 8141A	10182000	NELAP	PA
7395 - Demeton-o	EPA 8141A	10182000	NELAP	PA
7385 - Demeton-s	EPA 8141A	10182000	NELAP	PA
7410 - Diazinon	EPA 8141A	10182000	NELAP	PA
8610 - Dichlorovos (DDVP, Dichlorvos)	EPA 8141A	10182000	NELAP	PA
8625 - Disulfoton	EPA 8141A	10182000	NELAP	PA
7550 - EPN	EPA 8141A	10182000	NELAP	PA
7565 - Ethion	EPA 8141A	10182000	NELAP	PA
7570 - Ethoprop	EPA 8141A	10182000	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
7580 - Famphur	EPA 8141A	10182000	NELAP	PA
7600 - Fensulfothion	EPA 8141A	10182000	NELAP	PA
7605 - Fenthion	EPA 8141A	10182000	NELAP	PA
7770 - Malathion	EPA 8141A	10182000	NELAP	PA
7785 - Merphos	EPA 8141A	10182000	NELAP	PA
7825 - Methyl parathion (Parathion, methyl)	EPA 8141A	10182000	NELAP	PA
7850 - Mevinphos	EPA 8141A	10182000	NELAP	PA
7905 - Naled	EPA 8141A	10182000	NELAP	PA
7955 - Parathion, ethyl	EPA 8141A	10182000	NELAP	PA
7985 - Phorate	EPA 8141A	10182000	NELAP	PA
8110 - Ronnel	EPA 8141A	10182000	NELAP	PA
8125 - Simazine	EPA 8141A	10182000	NELAP	PA
8140 - Stirophos	EPA 8141A	10182000	NELAP	PA
7005 - Alachlor	EPA 8141B	10182204	NELAP	PA
7065 - Atrazine	EPA 8141B	10182204	NELAP	PA
7075 - Azinphos-methyl (Guthion)	EPA 8141B	10182204	NELAP	PA
7125 - Bolstar (Sulprofos)	EPA 8141B	10182204	NELAP	PA
7220 - Carbophenothion	EPA 8141B	10182204	NELAP	PA
7300 - Chlorpyrifos	EPA 8141B	10182204	NELAP	PA
7395 - Demeton-o	EPA 8141B	10182204	NELAP	PA
7385 - Demeton-s	EPA 8141B	10182204	NELAP	PA
7410 - Diazinon	EPA 8141B	10182204	NELAP	PA
8610 - Dichlorovos (DDVP, Dichlorvos)	EPA 8141B	10182204	NELAP	PA
8625 - Disulfoton	EPA 8141B	10182204	NELAP	PA
7550 - EPN	EPA 8141B	10182204	NELAP	PA
7565 - Ethion	EPA 8141B	10182204	NELAP	PA
7570 - Ethoprop	EPA 8141B	10182204	NELAP	PA
7580 - Famphur	EPA 8141B	10182204	NELAP	PA
7600 - Fensulfothion	EPA 8141B	10182204	NELAP	PA
7605 - Fenthion	EPA 8141B	10182204	NELAP	PA
7770 - Malathion	EPA 8141B	10182204	NELAP	PA
7785 - Merphos	EPA 8141B	10182204	NELAP	PA
7825 - Methyl parathion (Parathion, methyl)	EPA 8141B	10182204	NELAP	PA
7850 - Mevinphos	EPA 8141B	10182204	NELAP	PA
7905 - Naled	EPA 8141B	10182204	NELAP	PA
7955 - Parathion, ethyl	EPA 8141B	10182204	NELAP	PA
7985 - Phorate	EPA 8141B	10182204	NELAP	PA
8110 - Ronnel	EPA 8141B	10182204	NELAP	PA
8125 - Simazine	EPA 8141B	10182204	NELAP	PA
8655 - 2,4,5-T	EPA 8151	10183003	NELAP	PA
8545 - 2,4-D	EPA 8151	10183003	NELAP	PA
8560 - 2,4-DB	EPA 8151	10183003	NELAP	PA
8555 - Dalapon	EPA 8151	10183003	NELAP	PA
8595 - Dicamba	EPA 8151	10183003	NELAP	PA
8605 - Dichloroprop (Dichlorprop)	EPA 8151	10183003	NELAP	PA
8620 - Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	10183003	NELAP	PA
7775 - MCPA	EPA 8151	10183003	NELAP	PA
7780 - MCPP	EPA 8151	10183003	NELAP	PA
6605 - Pentachlorophenol	EPA 8151	10183003	NELAP	PA
8645 - Picloram	EPA 8151	10183003	NELAP	PA
8650 - Silvex (2,4,5-TP)	EPA 8151	10183003	NELAP	PA
8655 - 2,4,5-T	EPA 8151A	10183207	NELAP	PA
8545 - 2,4-D	EPA 8151A	10183207	NELAP	PA
8560 - 2,4-DB	EPA 8151A	10183207	NELAP	PA
8555 - Dalapon	EPA 8151A	10183207	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
8595 - Dicamba	EPA 8151A	10183207	NELAP	PA
8605 - Dichloroprop (Dichlorprop)	EPA 8151A	10183207	NELAP	PA
8620 - Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151A	10183207	NELAP	PA
7775 - MCPA	EPA 8151A	10183207	NELAP	PA
7780 - MCPP	EPA 8151A	10183207	NELAP	PA
6605 - Pentachlorophenol	EPA 8151A	10183207	NELAP	PA
8645 - Picloram	EPA 8151A	10183207	NELAP	PA
8650 - Silvex (2,4,5-TP)	EPA 8151A	10183207	NELAP	PA
5105 - 1,1,1,2-Tetrachloroethane	EPA 8260	10184404	NELAP	PA
5160 - 1,1,1-Trichloroethane	EPA 8260	10184404	NELAP	PA
5110 - 1,1,2,2-Tetrachloroethane	EPA 8260	10184404	NELAP	PA
5185 - 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 8260	10184404	NELAP	PA
5165 - 1,1,2-Trichloroethane	EPA 8260	10184404	NELAP	PA
4630 - 1,1-Dichloroethane	EPA 8260	10184404	NELAP	PA
4640 - 1,1-Dichloroethylene	EPA 8260	10184404	NELAP	PA
4670 - 1,1-Dichloropropene	EPA 8260	10184404	NELAP	PA
5150 - 1,2,3-Trichlorobenzene	EPA 8260	10184404	NELAP	PA
5180 - 1,2,3-Trichloropropane	EPA 8260	10184404	NELAP	PA
5155 - 1,2,4-Trichlorobenzene	EPA 8260	10184404	NELAP	PA
5210 - 1,2,4-Trimethylbenzene	EPA 8260	10184404	NELAP	PA
4570 - 1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	10184404	NELAP	PA
4585 - 1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	10184404	NELAP	PA
4610 - 1,2-Dichlorobenzene	EPA 8260	10184404	NELAP	PA
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA 8260	10184404	NELAP	PA
4655 - 1,2-Dichloropropane	EPA 8260	10184404	NELAP	PA
5215 - 1,3,5-Trimethylbenzene	EPA 8260	10184404	NELAP	PA
4615 - 1,3-Dichlorobenzene	EPA 8260	10184404	NELAP	PA
4660 - 1,3-Dichloropropane	EPA 8260	10184404	NELAP	PA
4620 - 1,4-Dichlorobenzene	EPA 8260	10184404	NELAP	PA
4735 - 1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8260	10184404	NELAP	PA
4665 - 2,2-Dichloropropane	EPA 8260	10184404	NELAP	PA
4410 - 2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	10184404	NELAP	PA
4500 - 2-Chloroethyl vinyl ether	EPA 8260	10184404	NELAP	PA
4535 - 2-Chlorotoluene	EPA 8260	10184404	NELAP	PA
4860 - 2-Hexanone	EPA 8260	10184404	NELAP	PA
4540 - 4-Chlorotoluene	EPA 8260	10184404	NELAP	PA
4910 - 4-Isopropyltoluene (p-Cymene)	EPA 8260	10184404	NELAP	PA
4995 - 4-Methyl-2-pentanone (MIBK)	EPA 8260	10184404	NELAP	PA
4315 - Acetone	EPA 8260	10184404	NELAP	PA
4320 - Acetonitrile	EPA 8260	10184404	NELAP	PA
4325 - Acrolein (Propenal)	EPA 8260	10184404	NELAP	PA
4340 - Acrylonitrile	EPA 8260	10184404	NELAP	PA
4355 - Allyl chloride (3-Chloropropene)	EPA 8260	10184404	NELAP	PA
4375 - Benzene	EPA 8260	10184404	NELAP	PA
5635 - Benzyl chloride	EPA 8260	10184404	NELAP	PA
4385 - Bromobenzene	EPA 8260	10184404	NELAP	PA
4390 - Bromochloromethane	EPA 8260	10184404	NELAP	PA
4395 - Bromodichloromethane	EPA 8260	10184404	NELAP	PA
4400 - Bromoform	EPA 8260	10184404	NELAP	PA
4450 - Carbon disulfide	EPA 8260	10184404	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
4455 - Carbon tetrachloride	EPA 8260	10184404	NELAP	PA
4475 - Chlorobenzene	EPA 8260	10184404	NELAP	PA
4575 - Chlorodibromomethane	EPA 8260	10184404	NELAP	PA
4485 - Chloroethane (Ethyl chloride)	EPA 8260	10184404	NELAP	PA
4505 - Chloroform	EPA 8260	10184404	NELAP	PA
4525 - Chloroprene (2-Chloro-1,3-butadiene)	EPA 8260	10184404	NELAP	PA
4555 - Cyclohexane	EPA 8260	10184404	NELAP	PA
9375 - Di-isopropylether (DIPE) (Isopropyl ether)	EPA 8260	10184404	NELAP	PA
4580 - Dibromochloropropane	EPA 8260	10184404	NELAP	PA
4595 - Dibromomethane (Methylene bromide)	EPA 8260	10184404	NELAP	PA
4625 - Dichlorodifluoromethane (Freon-12)	EPA 8260	10184404	NELAP	PA
4750 - Ethanol	EPA 8260	10184404	NELAP	PA
4755 - Ethyl acetate	EPA 8260	10184404	NELAP	PA
4810 - Ethyl methacrylate	EPA 8260	10184404	NELAP	PA
4770 - Ethyl-t-butyl ether (ETBE) (2-Ethoxy-2-methylpropane)	EPA 8260	10184404	NELAP	PA
4765 - Ethylbenzene	EPA 8260	10184404	NELAP	PA
9408 - Gasoline range organics (GRO)	EPA 8260	10184404	NELAP	PA
4835 - Hexachlorobutadiene	EPA 8260	10184404	NELAP	PA
4875 - Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	10184404	NELAP	PA
4895 - Isopropyl alcohol (2-Propanol, Isopropanol)	EPA 8260	10184404	NELAP	PA
4900 - Isopropylbenzene	EPA 8260	10184404	NELAP	PA
4925 - Methacrylonitrile	EPA 8260	10184404	NELAP	PA
4950 - Methyl bromide (Bromomethane)	EPA 8260	10184404	NELAP	PA
4960 - Methyl chloride (Chloromethane)	EPA 8260	10184404	NELAP	PA
5000 - Methyl tert-butyl ether (MTBE)	EPA 8260	10184404	NELAP	PA
4965 - Methylcyclohexane	EPA 8260	10184404	NELAP	PA
4975 - Methylene chloride (Dichloromethane)	EPA 8260	10184404	NELAP	PA
5005 - Naphthalene	EPA 8260	10184404	NELAP	PA
5035 - Pentachloroethane	EPA 8260	10184404	NELAP	PA
5080 - Propionitrile (Ethyl cyanide)	EPA 8260	10184404	NELAP	PA
5100 - Styrene	EPA 8260	10184404	NELAP	PA
4370 - T-amylmethylether (TAME)	EPA 8260	10184404	NELAP	PA
5115 - Tetrachloroethylene (Perchloroethylene)	EPA 8260	10184404	NELAP	PA
5140 - Toluene	EPA 8260	10184404	NELAP	PA
5170 - Trichloroethene (Trichloroethylene)	EPA 8260	10184404	NELAP	PA
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA 8260	10184404	NELAP	PA
5225 - Vinyl acetate	EPA 8260	10184404	NELAP	PA
5235 - Vinyl chloride	EPA 8260	10184404	NELAP	PA
5260 - Xylene (total)	EPA 8260	10184404	NELAP	PA
4680 - cis-1,3-Dichloropropene	EPA 8260	10184404	NELAP	PA
5240 - m+p-xylene	EPA 8260	10184404	NELAP	PA
4425 - n-Butyl alcohol (1-Butanol, n-Butanol)	EPA 8260	10184404	NELAP	PA
4435 - n-Butylbenzene	EPA 8260	10184404	NELAP	PA
5090 - n-Propylbenzene	EPA 8260	10184404	NELAP	PA
5250 - o-Xylene	EPA 8260	10184404	NELAP	PA
4440 - sec-Butylbenzene	EPA 8260	10184404	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
4420 - tert-Butyl alcohol	EPA 8260	10184404	NELAP	PA
4445 - tert-Butylbenzene	EPA 8260	10184404	NELAP	PA
4700 - trans-1,2-Dichloroethylene	EPA 8260	10184404	NELAP	PA
4685 - trans-1,3-Dichloropropylene	EPA 8260	10184404	NELAP	PA
4605 - trans-1,4-Dichloro-2-butene	EPA 8260	10184404	NELAP	PA
5105 - 1,1,1,2-Tetrachloroethane	EPA 8260B	10184802	NELAP	PA
5160 - 1,1,1-Trichloroethane	EPA 8260B	10184802	NELAP	PA
5110 - 1,1,2,2-Tetrachloroethane	EPA 8260B	10184802	NELAP	PA
5195 - 1,1,2-Trichloro-1,2,2-trifluoroethane	EPA 8260B	10184802	NELAP	PA
5185 - 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 8260B	10184802	NELAP	PA
5165 - 1,1,2-Trichloroethane	EPA 8260B	10184802	NELAP	PA
4630 - 1,1-Dichloroethane	EPA 8260B	10184802	NELAP	PA
4640 - 1,1-Dichloroethylene	EPA 8260B	10184802	NELAP	PA
4670 - 1,1-Dichloropropene	EPA 8260B	10184802	NELAP	PA
5150 - 1,2,3-Trichlorobenzene	EPA 8260B	10184802	NELAP	PA
5180 - 1,2,3-Trichloropropane	EPA 8260B	10184802	NELAP	PA
5155 - 1,2,4-Trichlorobenzene	EPA 8260B	10184802	NELAP	PA
5210 - 1,2,4-Trimethylbenzene	EPA 8260B	10184802	NELAP	PA
4570 - 1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260B	10184802	NELAP	PA
4585 - 1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260B	10184802	NELAP	PA
4610 - 1,2-Dichlorobenzene	EPA 8260B	10184802	NELAP	PA
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA 8260B	10184802	NELAP	PA
4655 - 1,2-Dichloropropane	EPA 8260B	10184802	NELAP	PA
5215 - 1,3,5-Trimethylbenzene	EPA 8260B	10184802	NELAP	PA
4615 - 1,3-Dichlorobenzene	EPA 8260B	10184802	NELAP	PA
4660 - 1,3-Dichloropropane	EPA 8260B	10184802	NELAP	PA
4620 - 1,4-Dichlorobenzene	EPA 8260B	10184802	NELAP	PA
4735 - 1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8260B	10184802	NELAP	PA
4665 - 2,2-Dichloropropane	EPA 8260B	10184802	NELAP	PA
4410 - 2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260B	10184802	NELAP	PA
4500 - 2-Chloroethyl vinyl ether	EPA 8260B	10184802	NELAP	PA
4535 - 2-Chlorotoluene	EPA 8260B	10184802	NELAP	PA
4860 - 2-Hexanone	EPA 8260B	10184802	NELAP	PA
4368 - 2-methyl-2-butanol (tert-Amyl alcohol)	EPA 8260B	10184802	NELAP	PA
4540 - 4-Chlorotoluene	EPA 8260B	10184802	NELAP	PA
4910 - 4-Isopropyltoluene (p-Cymene)	EPA 8260B	10184802	NELAP	PA
4995 - 4-Methyl-2-pentanone (MIBK)	EPA 8260B	10184802	NELAP	PA
4315 - Acetone	EPA 8260B	10184802	NELAP	PA
4320 - Acetonitrile	EPA 8260B	10184802	NELAP	PA
4325 - Acrolein (Propenal)	EPA 8260B	10184802	NELAP	PA
4340 - Acrylonitrile	EPA 8260B	10184802	NELAP	PA
4355 - Allyl chloride (3-Chloropropene)	EPA 8260B	10184802	NELAP	PA
4375 - Benzene	EPA 8260B	10184802	NELAP	PA
5635 - Benzyl chloride	EPA 8260B	10184802	NELAP	PA
4380 - Bromoacetone	EPA 8260B	10184802	NELAP	PA
4385 - Bromobenzene	EPA 8260B	10184802	NELAP	PA
4390 - Bromochloromethane	EPA 8260B	10184802	NELAP	PA
4395 - Bromodichloromethane	EPA 8260B	10184802	NELAP	PA
4400 - Bromoform	EPA 8260B	10184802	NELAP	PA
4450 - Carbon disulfide	EPA 8260B	10184802	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
4455 - Carbon tetrachloride	EPA 8260B	10184802	NELAP	PA
4475 - Chlorobenzene	EPA 8260B	10184802	NELAP	PA
4575 - Chlorodibromomethane	EPA 8260B	10184802	NELAP	PA
4485 - Chloroethane (Ethyl chloride)	EPA 8260B	10184802	NELAP	PA
4505 - Chloroform	EPA 8260B	10184802	NELAP	PA
4525 - Chloroprene (2-Chloro-1,3-butadiene)	EPA 8260B	10184802	NELAP	PA
4555 - Cyclohexane	EPA 8260B	10184802	NELAP	PA
4560 - Cyclohexanone	EPA 8260B	10184802	NELAP	PA
9375 - Di-isopropylether (DIPE) (Isopropyl ether)	EPA 8260B	10184802	NELAP	PA
4580 - Dibromochloropropane	EPA 8260B	10184802	NELAP	PA
4595 - Dibromomethane (Methylene bromide)	EPA 8260B	10184802	NELAP	PA
4625 - Dichlorodifluoromethane (Freon-12)	EPA 8260B	10184802	NELAP	PA
4745 - Epichlorohydrin (1-Chloro-2,3-epoxypropane)	EPA 8260B	10184802	NELAP	PA
4750 - Ethanol	EPA 8260B	10184802	NELAP	PA
4755 - Ethyl acetate	EPA 8260B	10184802	NELAP	PA
4810 - Ethyl methacrylate	EPA 8260B	10184802	NELAP	PA
4770 - Ethyl-t-butyl ether (ETBE) (2-Ethoxy-2-methylpropane)	EPA 8260B	10184802	NELAP	PA
4765 - Ethylbenzene	EPA 8260B	10184802	NELAP	PA
9408 - Gasoline range organics (GRO)	EPA 8260B	10184802	NELAP	PA
4835 - Hexachlorobutadiene	EPA 8260B	10184802	NELAP	PA
4870 - Iodomethane (Methyl iodide)	EPA 8260B	10184802	NELAP	PA
4875 - Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260B	10184802	NELAP	PA
4895 - Isopropyl alcohol (2-Propanol, Isopropanol)	EPA 8260B	10184802	NELAP	PA
4900 - Isopropylbenzene	EPA 8260B	10184802	NELAP	PA
4925 - Methacrylonitrile	EPA 8260B	10184802	NELAP	PA
4940 - Methyl acetate	EPA 8260B	10184802	NELAP	PA
4950 - Methyl bromide (Bromomethane)	EPA 8260B	10184802	NELAP	PA
4960 - Methyl chloride (Chloromethane)	EPA 8260B	10184802	NELAP	PA
5000 - Methyl tert-butyl ether (MTBE)	EPA 8260B	10184802	NELAP	PA
4965 - Methylcyclohexane	EPA 8260B	10184802	NELAP	PA
4975 - Methylene chloride (Dichloromethane)	EPA 8260B	10184802	NELAP	PA
5005 - Naphthalene	EPA 8260B	10184802	NELAP	PA
5035 - Pentachloroethane	EPA 8260B	10184802	NELAP	PA
5080 - Propionitrile (Ethyl cyanide)	EPA 8260B	10184802	NELAP	PA
5100 - Styrene	EPA 8260B	10184802	NELAP	PA
4370 - T-amylmethylether (TAME)	EPA 8260B	10184802	NELAP	PA
5115 - Tetrachloroethylene (Perchloroethylene)	EPA 8260B	10184802	NELAP	PA
5140 - Toluene	EPA 8260B	10184802	NELAP	PA
5170 - Trichloroethene (Trichloroethylene)	EPA 8260B	10184802	NELAP	PA
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA 8260B	10184802	NELAP	PA
5225 - Vinyl acetate	EPA 8260B	10184802	NELAP	PA
5235 - Vinyl chloride	EPA 8260B	10184802	NELAP	PA
5260 - Xylene (total)	EPA 8260B	10184802	NELAP	PA
4705 - cis & trans-1,2-Dichloroethene	EPA 8260B	10184802	NELAP	PA
4645 - cis-1,2-Dichloroethylene	EPA 8260B	10184802	NELAP	PA
4680 - cis-1,3-Dichloropropene	EPA 8260B	10184802	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
5240 - m+p-xylene	EPA 8260B	10184802	NELAP	PA
4425 - n-Butyl alcohol (1-Butanol, n-Butanol)	EPA 8260B	10184802	NELAP	PA
4435 - n-Butylbenzene	EPA 8260B	10184802	NELAP	PA
5090 - n-Propylbenzene	EPA 8260B	10184802	NELAP	PA
5250 - o-Xylene	EPA 8260B	10184802	NELAP	PA
4440 - sec-Butylbenzene	EPA 8260B	10184802	NELAP	PA
4420 - tert-Butyl alcohol	EPA 8260B	10184802	NELAP	PA
4445 - tert-Butylbenzene	EPA 8260B	10184802	NELAP	PA
4700 - trans-1,2-Dichloroethylene	EPA 8260B	10184802	NELAP	PA
4685 - trans-1,3-Dichloropropylene	EPA 8260B	10184802	NELAP	PA
4605 - trans-1,4-Dichloro-2-butene	EPA 8260B	10184802	NELAP	PA
5510 - Acetophenone	EPA 8270	10185203	NELAP	PA
5560 - Aramite	EPA 8270	10185203	NELAP	PA
5900 - Dibenz(a, j) acridine	EPA 8270	10185203	NELAP	PA
5765 - bis(2-Chloroethyl) ether	EPA 8270	10185203	NELAP	PA
6550 - n-Nitrosomethylethylamine	EPA 8270	10185203	NELAP	PA
6703 - 1,1'-Biphenyl (BZ-0)	EPA 8270C	10185805	NELAP	PA
6705 - 1,2,3,4-Tetrachlorobenzene	EPA 8270C	10185805	NELAP	PA
6710 - 1,2,3,5-Tetrachlorobenzene	EPA 8270C	10185805	NELAP	PA
6715 - 1,2,4,5-Tetrachlorobenzene	EPA 8270C	10185805	NELAP	PA
5155 - 1,2,4-Trichlorobenzene	EPA 8270C	10185805	NELAP	PA
4610 - 1,2-Dichlorobenzene	EPA 8270C	10185805	NELAP	PA
6155 - 1,2-Dinitrobenzene	EPA 8270C	10185805	NELAP	PA
6220 - 1,2-Diphenylhydrazine	EPA 8270C	10185805	NELAP	PA
6885 - 1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270C	10185805	NELAP	PA
4615 - 1,3-Dichlorobenzene	EPA 8270C	10185805	NELAP	PA
6160 - 1,3-Dinitrobenzene (1,3-DNB)	EPA 8270C	10185805	NELAP	PA
4620 - 1,4-Dichlorobenzene	EPA 8270C	10185805	NELAP	PA
6165 - 1,4-Dinitrobenzene	EPA 8270C	10185805	NELAP	PA
4735 - 1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8270C	10185805	NELAP	PA
6420 - 1,4-Naphthoquinone	EPA 8270C	10185805	NELAP	PA
6630 - 1,4-Phenylenediamine	EPA 8270C	10185805	NELAP	PA
5790 - 1-Chloronaphthalene	EPA 8270C	10185805	NELAP	PA
6380 - 1-Methylnaphthalene	EPA 8270C	10185805	NELAP	PA
6425 - 1-Naphthylamine	EPA 8270C	10185805	NELAP	PA
6735 - 2,3,4,6-Tetrachlorophenol	EPA 8270C	10185805	NELAP	PA
6835 - 2,4,5-Trichlorophenol	EPA 8270C	10185805	NELAP	PA
6840 - 2,4,6-Trichlorophenol	EPA 8270C	10185805	NELAP	PA
6000 - 2,4-Dichlorophenol	EPA 8270C	10185805	NELAP	PA
6130 - 2,4-Dimethylphenol	EPA 8270C	10185805	NELAP	PA
6175 - 2,4-Dinitrophenol	EPA 8270C	10185805	NELAP	PA
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8270C	10185805	NELAP	PA
6005 - 2,6-Dichlorophenol	EPA 8270C	10185805	NELAP	PA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8270C	10185805	NELAP	PA
5515 - 2-Acetylaminofluorene	EPA 8270C	10185805	NELAP	PA
5795 - 2-Chloronaphthalene	EPA 8270C	10185805	NELAP	PA
5800 - 2-Chlorophenol	EPA 8270C	10185805	NELAP	PA
6360 - 2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	EPA 8270C	10185805	NELAP	PA
5145 - 2-Methylaniline (o-Toluidine)	EPA 8270C	10185805	NELAP	PA
6385 - 2-Methylnaphthalene	EPA 8270C	10185805	NELAP	PA
6400 - 2-Methylphenol (o-Cresol)	EPA 8270C	10185805	NELAP	PA
6430 - 2-Naphthylamine	EPA 8270C	10185805	NELAP	PA
6460 - 2-Nitroaniline	EPA 8270C	10185805	NELAP	PA
6490 - 2-Nitrophenol	EPA 8270C	10185805	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
5050 - 2-Picoline (2-Methylpyridine)	EPA 8270C	10185805	NELAP	PA
6412 - 3+4 Methylphenol	EPA 8270C	10185805	NELAP	PA
5945 - 3,3'-Dichlorobenzidine	EPA 8270C	10185805	NELAP	PA
6100 - 3,3'-Dimethoxybenzidine	EPA 8270C	10185805	NELAP	PA
6120 - 3,3'-Dimethylbenzidine	EPA 8270C	10185805	NELAP	PA
6355 - 3-Methylcholanthrene	EPA 8270C	10185805	NELAP	PA
6405 - 3-Methylphenol (m-Cresol)	EPA 8270C	10185805	NELAP	PA
6465 - 3-Nitroaniline	EPA 8270C	10185805	NELAP	PA
6365 - 4,4'-Methylenebis(2-chloroaniline)	EPA 8270C	10185805	NELAP	PA
5540 - 4-Aminobiphenyl	EPA 8270C	10185805	NELAP	PA
5660 - 4-Bromophenyl phenyl ether	EPA 8270C	10185805	NELAP	PA
5700 - 4-Chloro-3-methylphenol	EPA 8270C	10185805	NELAP	PA
5745 - 4-Chloroaniline	EPA 8270C	10185805	NELAP	PA
5825 - 4-Chlorophenyl phenylether	EPA 8270C	10185805	NELAP	PA
6410 - 4-Methylphenol (p-Cresol)	EPA 8270C	10185805	NELAP	PA
6470 - 4-Nitroaniline	EPA 8270C	10185805	NELAP	PA
6500 - 4-Nitrophenol	EPA 8270C	10185805	NELAP	PA
6510 - 4-Nitroquinoline 1-oxide	EPA 8270C	10185805	NELAP	PA
6570 - 5-Nitro-o-toluidine	EPA 8270C	10185805	NELAP	PA
6115 - 7,12-Dimethylbenz(a) anthracene	EPA 8270C	10185805	NELAP	PA
5500 - Acenaphthene	EPA 8270C	10185805	NELAP	PA
5505 - Acenaphthylene	EPA 8270C	10185805	NELAP	PA
5510 - Acetophenone	EPA 8270C	10185805	NELAP	PA
4330 - Acrylamide	EPA 8270C	10185805	NELAP	PA
5545 - Aniline	EPA 8270C	10185805	NELAP	PA
5555 - Anthracene	EPA 8270C	10185805	NELAP	PA
5560 - Aramite	EPA 8270C	10185805	NELAP	PA
7065 - Atrazine	EPA 8270C	10185805	NELAP	PA
5570 - Benzaldehyde	EPA 8270C	10185805	NELAP	PA
5567 - Benzenethiol	EPA 8270C	10185805	NELAP	PA
5595 - Benzidine	EPA 8270C	10185805	NELAP	PA
5575 - Benzo(a)anthracene	EPA 8270C	10185805	NELAP	PA
5580 - Benzo(a)pyrene	EPA 8270C	10185805	NELAP	PA
5585 - Benzo(b)fluoranthene	EPA 8270C	10185805	NELAP	PA
5590 - Benzo(g,h,i)perylene	EPA 8270C	10185805	NELAP	PA
5600 - Benzo(k)fluoranthene	EPA 8270C	10185805	NELAP	PA
5610 - Benzoic acid	EPA 8270C	10185805	NELAP	PA
5630 - Benzyl alcohol	EPA 8270C	10185805	NELAP	PA
5670 - Butyl benzyl phthalate	EPA 8270C	10185805	NELAP	PA
7180 - Caprolactam	EPA 8270C	10185805	NELAP	PA
5680 - Carbazole	EPA 8270C	10185805	NELAP	PA
7260 - Chlorobenzilate	EPA 8270C	10185805	NELAP	PA
5855 - Chrysene	EPA 8270C	10185805	NELAP	PA
6065 - Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	EPA 8270C	10185805	NELAP	PA
5925 - Di-n-butyl phthalate	EPA 8270C	10185805	NELAP	PA
6200 - Di-n-octyl phthalate	EPA 8270C	10185805	NELAP	PA
7405 - Diallate	EPA 8270C	10185805	NELAP	PA
9354 - Dibenz(a, h) acridine	EPA 8270C	10185805	NELAP	PA
5900 - Dibenz(a, j) acridine	EPA 8270C	10185805	NELAP	PA
5895 - Dibenz(a,h) anthracene	EPA 8270C	10185805	NELAP	PA
5905 - Dibenzofuran	EPA 8270C	10185805	NELAP	PA
6070 - Diethyl phthalate	EPA 8270C	10185805	NELAP	PA
7475 - Dimethoate	EPA 8270C	10185805	NELAP	PA
6135 - Dimethyl phthalate	EPA 8270C	10185805	NELAP	PA
8620 - Dinoseb (2-sec-butyl-4,6-	EPA 8270C	10185805	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
dinitrophenol, DNBP)				
6205 - Diphenylamine	EPA 8270C	10185805	NELAP	PA
8625 - Disulfoton	EPA 8270C	10185805	NELAP	PA
6260 - Ethyl methanesulfonate	EPA 8270C	10185805	NELAP	PA
7580 - Famphur	EPA 8270C	10185805	NELAP	PA
6265 - Fluoranthene	EPA 8270C	10185805	NELAP	PA
6270 - Fluorene	EPA 8270C	10185805	NELAP	PA
6275 - Hexachlorobenzene	EPA 8270C	10185805	NELAP	PA
4835 - Hexachlorobutadiene	EPA 8270C	10185805	NELAP	PA
6285 - Hexachlorocyclopentadiene	EPA 8270C	10185805	NELAP	PA
4840 - Hexachloroethane	EPA 8270C	10185805	NELAP	PA
6295 - Hexachloropropene	EPA 8270C	10185805	NELAP	PA
6312 - Indene	EPA 8270C	10185805	NELAP	PA
6315 - Indeno(1,2,3-cd) pyrene	EPA 8270C	10185805	NELAP	PA
7725 - Isodrin	EPA 8270C	10185805	NELAP	PA
6320 - Isophorone	EPA 8270C	10185805	NELAP	PA
6325 - Isosafrole	EPA 8270C	10185805	NELAP	PA
7740 - Kepone	EPA 8270C	10185805	NELAP	PA
6345 - Methapyrilene	EPA 8270C	10185805	NELAP	PA
6375 - Methyl methanesulfonate	EPA 8270C	10185805	NELAP	PA
7825 - Methyl parathion (Parathion, methyl)	EPA 8270C	10185805	NELAP	PA
5005 - Naphthalene	EPA 8270C	10185805	NELAP	PA
5015 - Nitrobenzene	EPA 8270C	10185805	NELAP	PA
7955 - Parathion, ethyl	EPA 8270C	10185805	NELAP	PA
6590 - Pentachlorobenzene	EPA 8270C	10185805	NELAP	PA
6600 - Pentachloronitrobenzene	EPA 8270C	10185805	NELAP	PA
6605 - Pentachlorophenol	EPA 8270C	10185805	NELAP	PA
6610 - Phenacetin	EPA 8270C	10185805	NELAP	PA
6615 - Phenanthrene	EPA 8270C	10185805	NELAP	PA
6625 - Phenol	EPA 8270C	10185805	NELAP	PA
7985 - Phorate	EPA 8270C	10185805	NELAP	PA
6640 - Phthalic anhydride	EPA 8270C	10185805	NELAP	PA
6650 - Pronamide (Kerb)	EPA 8270C	10185805	NELAP	PA
6665 - Pyrene	EPA 8270C	10185805	NELAP	PA
5095 - Pyridine	EPA 8270C	10185805	NELAP	PA
6670 - Quinoline	EPA 8270C	10185805	NELAP	PA
6685 - Safrole	EPA 8270C	10185805	NELAP	PA
8235 - Thionazin (Zinophos)	EPA 8270C	10185805	NELAP	PA
6125 - a-a-Dimethylphenethylamine	EPA 8270C	10185805	NELAP	PA
5760 - bis(2-Chloroethoxy)methane	EPA 8270C	10185805	NELAP	PA
5765 - bis(2-Chloroethyl) ether	EPA 8270C	10185805	NELAP	PA
5780 - bis(2-Chloroisopropyl) ether	EPA 8270C	10185805	NELAP	PA
6245 - bis(2-Ethoxyethyl) phthalate	EPA 8270C	10185805	NELAP	PA
6062 - bis(2-Ethylhexyl)adipate	EPA 8270C	10185805	NELAP	PA
5025 - n-Nitroso-di-n-butylamine	EPA 8270C	10185805	NELAP	PA
6545 - n-Nitrosodi-n-propylamine	EPA 8270C	10185805	NELAP	PA
6525 - n-Nitrosodiethylamine	EPA 8270C	10185805	NELAP	PA
6530 - n-Nitrosodimethylamine	EPA 8270C	10185805	NELAP	PA
6535 - n-Nitrosodiphenylamine	EPA 8270C	10185805	NELAP	PA
6550 - n-Nitrosomethylethylamine	EPA 8270C	10185805	NELAP	PA
6555 - n-Nitrosomorpholine	EPA 8270C	10185805	NELAP	PA
6560 - n-Nitrosopiperidine	EPA 8270C	10185805	NELAP	PA
6565 - n-Nitrosopyrrolidine	EPA 8270C	10185805	NELAP	PA
8290 - o,o,o-Triethyl phosphorothioate	EPA 8270C	10185805	NELAP	PA
8310 - tris-(2,3-Dibromopropyl) phosphate (tris-BP)	EPA 8270C	10185805	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
6703 - 1,1'-Biphenyl (BZ-0)	EPA 8270D	10186002	NELAP	PA
6705 - 1,2,3,4-Tetrachlorobenzene	EPA 8270D	10186002	NELAP	PA
6710 - 1,2,3,5-Tetrachlorobenzene	EPA 8270D	10186002	NELAP	PA
6715 - 1,2,4,5-Tetrachlorobenzene	EPA 8270D	10186002	NELAP	PA
5155 - 1,2,4-Trichlorobenzene	EPA 8270D	10186002	NELAP	PA
4610 - 1,2-Dichlorobenzene	EPA 8270D	10186002	NELAP	PA
6155 - 1,2-Dinitrobenzene	EPA 8270D	10186002	NELAP	PA
6220 - 1,2-Diphenylhydrazine	EPA 8270D	10186002	NELAP	PA
6885 - 1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270D	10186002	NELAP	PA
4615 - 1,3-Dichlorobenzene	EPA 8270D	10186002	NELAP	PA
6160 - 1,3-Dinitrobenzene (1,3-DNB)	EPA 8270D	10186002	NELAP	PA
4620 - 1,4-Dichlorobenzene	EPA 8270D	10186002	NELAP	PA
6165 - 1,4-Dinitrobenzene	EPA 8270D	10186002	NELAP	PA
4735 - 1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8270D	10186002	NELAP	PA
6420 - 1,4-Naphthoquinone	EPA 8270D	10186002	NELAP	PA
6630 - 1,4-Phenylenediamine	EPA 8270D	10186002	NELAP	PA
5790 - 1-Chloronaphthalene	EPA 8270D	10186002	NELAP	PA
6380 - 1-Methylnaphthalene	EPA 8270D	10186002	NELAP	PA
6425 - 1-Naphthylamine	EPA 8270D	10186002	NELAP	PA
6735 - 2,3,4,6-Tetrachlorophenol	EPA 8270D	10186002	NELAP	PA
6835 - 2,4,5-Trichlorophenol	EPA 8270D	10186002	NELAP	PA
6840 - 2,4,6-Trichlorophenol	EPA 8270D	10186002	NELAP	PA
6000 - 2,4-Dichlorophenol	EPA 8270D	10186002	NELAP	PA
6130 - 2,4-Dimethylphenol	EPA 8270D	10186002	NELAP	PA
6175 - 2,4-Dinitrophenol	EPA 8270D	10186002	NELAP	PA
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8270D	10186002	NELAP	PA
6005 - 2,6-Dichlorophenol	EPA 8270D	10186002	NELAP	PA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8270D	10186002	NELAP	PA
5515 - 2-Acetylaminofluorene	EPA 8270D	10186002	NELAP	PA
5795 - 2-Chloronaphthalene	EPA 8270D	10186002	NELAP	PA
5800 - 2-Chlorophenol	EPA 8270D	10186002	NELAP	PA
6360 - 2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	EPA 8270D	10186002	NELAP	PA
5145 - 2-Methylaniline (o-Toluidine)	EPA 8270D	10186002	NELAP	PA
6385 - 2-Methylnaphthalene	EPA 8270D	10186002	NELAP	PA
6400 - 2-Methylphenol (o-Cresol)	EPA 8270D	10186002	NELAP	PA
6430 - 2-Naphthylamine	EPA 8270D	10186002	NELAP	PA
6460 - 2-Nitroaniline	EPA 8270D	10186002	NELAP	PA
6490 - 2-Nitrophenol	EPA 8270D	10186002	NELAP	PA
5050 - 2-Picoline (2-Methylpyridine)	EPA 8270D	10186002	NELAP	PA
6412 - 3+4 Methylphenol	EPA 8270D	10186002	NELAP	PA
5945 - 3,3'-Dichlorobenzidine	EPA 8270D	10186002	NELAP	PA
6100 - 3,3'-Dimethoxybenzidine	EPA 8270D	10186002	NELAP	PA
6120 - 3,3'-Dimethylbenzidine	EPA 8270D	10186002	NELAP	PA
6355 - 3-Methylcholanthrene	EPA 8270D	10186002	NELAP	PA
6405 - 3-Methylphenol (m-Cresol)	EPA 8270D	10186002	NELAP	PA
6465 - 3-Nitroaniline	EPA 8270D	10186002	NELAP	PA
6365 - 4,4'-Methylenebis(2-chloroaniline)	EPA 8270D	10186002	NELAP	PA
5540 - 4-Aminobiphenyl	EPA 8270D	10186002	NELAP	PA
5660 - 4-Bromophenyl phenyl ether	EPA 8270D	10186002	NELAP	PA
5700 - 4-Chloro-3-methylphenol	EPA 8270D	10186002	NELAP	PA
5745 - 4-Chloroaniline	EPA 8270D	10186002	NELAP	PA
5825 - 4-Chlorophenyl phenylether	EPA 8270D	10186002	NELAP	PA
6410 - 4-Methylphenol (p-Cresol)	EPA 8270D	10186002	NELAP	PA
6470 - 4-Nitroaniline	EPA 8270D	10186002	NELAP	PA
6500 - 4-Nitrophenol	EPA 8270D	10186002	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
6510 - 4-Nitroquinoline 1-oxide	EPA 8270D	10186002	NELAP	PA
6570 - 5-Nitro-o-toluidine	EPA 8270D	10186002	NELAP	PA
6115 - 7,12-Dimethylbenz(a) anthracene	EPA 8270D	10186002	NELAP	PA
5500 - Acenaphthene	EPA 8270D	10186002	NELAP	PA
5505 - Acenaphthylene	EPA 8270D	10186002	NELAP	PA
5510 - Acetophenone	EPA 8270D	10186002	NELAP	PA
4330 - Acrylamide	EPA 8270D	10186002	NELAP	PA
5545 - Aniline	EPA 8270D	10186002	NELAP	PA
5555 - Anthracene	EPA 8270D	10186002	NELAP	PA
5560 - Aramite	EPA 8270D	10186002	NELAP	PA
7065 - Atrazine	EPA 8270D	10186002	NELAP	PA
5570 - Benzaldehyde	EPA 8270D	10186002	NELAP	PA
5567 - Benzenethiol	EPA 8270D	10186002	NELAP	PA
5595 - Benzidine	EPA 8270D	10186002	NELAP	PA
5575 - Benzo(a)anthracene	EPA 8270D	10186002	NELAP	PA
5580 - Benzo(a)pyrene	EPA 8270D	10186002	NELAP	PA
5585 - Benzo(b)fluoranthene	EPA 8270D	10186002	NELAP	PA
5590 - Benzo(g,h,i)perylene	EPA 8270D	10186002	NELAP	PA
5600 - Benzo(k)fluoranthene	EPA 8270D	10186002	NELAP	PA
5610 - Benzoic acid	EPA 8270D	10186002	NELAP	PA
5630 - Benzyl alcohol	EPA 8270D	10186002	NELAP	PA
5670 - Butyl benzyl phthalate	EPA 8270D	10186002	NELAP	PA
7180 - Caprolactam	EPA 8270D	10186002	NELAP	PA
5680 - Carbazole	EPA 8270D	10186002	NELAP	PA
7260 - Chlorobenzilate	EPA 8270D	10186002	NELAP	PA
5855 - Chrysene	EPA 8270D	10186002	NELAP	PA
6065 - Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	EPA 8270D	10186002	NELAP	PA
5925 - Di-n-butyl phthalate	EPA 8270D	10186002	NELAP	PA
6200 - Di-n-octyl phthalate	EPA 8270D	10186002	NELAP	PA
7405 - Diallate	EPA 8270D	10186002	NELAP	PA
9354 - Dibenz(a, h) acridine	EPA 8270D	10186002	NELAP	PA
5900 - Dibenz(a, j) acridine	EPA 8270D	10186002	NELAP	PA
5895 - Dibenz(a,h) anthracene	EPA 8270D	10186002	NELAP	PA
5905 - Dibenzofuran	EPA 8270D	10186002	NELAP	PA
6070 - Diethyl phthalate	EPA 8270D	10186002	NELAP	PA
7475 - Dimethoate	EPA 8270D	10186002	NELAP	PA
6135 - Dimethyl phthalate	EPA 8270D	10186002	NELAP	PA
8620 - Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8270D	10186002	NELAP	PA
6205 - Diphenylamine	EPA 8270D	10186002	NELAP	PA
8625 - Disulfoton	EPA 8270D	10186002	NELAP	PA
6260 - Ethyl methanesulfonate	EPA 8270D	10186002	NELAP	PA
7580 - Famphur	EPA 8270D	10186002	NELAP	PA
6265 - Fluoranthene	EPA 8270D	10186002	NELAP	PA
6270 - Fluorene	EPA 8270D	10186002	NELAP	PA
6275 - Hexachlorobenzene	EPA 8270D	10186002	NELAP	PA
4835 - Hexachlorobutadiene	EPA 8270D	10186002	NELAP	PA
6285 - Hexachlorocyclopentadiene	EPA 8270D	10186002	NELAP	PA
4840 - Hexachloroethane	EPA 8270D	10186002	NELAP	PA
6295 - Hexachloropropene	EPA 8270D	10186002	NELAP	PA
6312 - Indene	EPA 8270D	10186002	NELAP	PA
6315 - Indeno(1,2,3-cd) pyrene	EPA 8270D	10186002	NELAP	PA
6320 - Isophorone	EPA 8270D	10186002	NELAP	PA
6325 - Isosafrole	EPA 8270D	10186002	NELAP	PA
6345 - Methapyrilene	EPA 8270D	10186002	NELAP	PA

Eurofins Lancaster Laboratories Inc
Issue Date: July 1, 2015

Certificate Number: 02055

AI Number: 30729
Expiration Date: June 30, 2016

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
6375 - Methyl methanesulfonate	EPA 8270D	10186002	NELAP	PA
7825 - Methyl parathion (Parathion, methyl)	EPA 8270D	10186002	NELAP	PA
5005 - Naphthalene	EPA 8270D	10186002	NELAP	PA
5015 - Nitrobenzene	EPA 8270D	10186002	NELAP	PA
7955 - Parathion, ethyl	EPA 8270D	10186002	NELAP	PA
6590 - Pentachlorobenzene	EPA 8270D	10186002	NELAP	PA
6600 - Pentachloronitrobenzene	EPA 8270D	10186002	NELAP	PA
6605 - Pentachlorophenol	EPA 8270D	10186002	NELAP	PA
6610 - Phenacetin	EPA 8270D	10186002	NELAP	PA
6615 - Phenanthrene	EPA 8270D	10186002	NELAP	PA
6625 - Phenol	EPA 8270D	10186002	NELAP	PA
7985 - Phorate	EPA 8270D	10186002	NELAP	PA
6640 - Phthalic anhydride	EPA 8270D	10186002	NELAP	PA
6650 - Pronamide (Kerb)	EPA 8270D	10186002	NELAP	PA
6665 - Pyrene	EPA 8270D	10186002	NELAP	PA
5095 - Pyridine	EPA 8270D	10186002	NELAP	PA
6670 - Quinoline	EPA 8270D	10186002	NELAP	PA
6685 - Safrole	EPA 8270D	10186002	NELAP	PA
8235 - Thionazin (Zinophos)	EPA 8270D	10186002	NELAP	PA
6750 - Thiophenol (Benzenethiol)	EPA 8270D	10186002	NELAP	PA
6125 - a-a-Dimethylphenethylamine	EPA 8270D	10186002	NELAP	PA
5760 - bis(2-Chloroethoxy)methane	EPA 8270D	10186002	NELAP	PA
5765 - bis(2-Chloroethyl) ether	EPA 8270D	10186002	NELAP	PA
5780 - bis(2-Chloroisopropyl) ether	EPA 8270D	10186002	NELAP	PA
6062 - bis(2-Ethylhexyl)adipate	EPA 8270D	10186002	NELAP	PA
5025 - n-Nitroso-di-n-butylamine	EPA 8270D	10186002	NELAP	PA
6545 - n-Nitrosodi-n-propylamine	EPA 8270D	10186002	NELAP	PA
6525 - n-Nitrosodiethylamine	EPA 8270D	10186002	NELAP	PA
6530 - n-Nitrosodimethylamine	EPA 8270D	10186002	NELAP	PA
6535 - n-Nitrosodiphenylamine	EPA 8270D	10186002	NELAP	PA
6550 - n-Nitrosomethylethylamine	EPA 8270D	10186002	NELAP	PA
6555 - n-Nitrosomorpholine	EPA 8270D	10186002	NELAP	PA
6560 - n-Nitrosopiperidine	EPA 8270D	10186002	NELAP	PA
6565 - n-Nitrosopyrrolidine	EPA 8270D	10186002	NELAP	PA
8290 - o,o,o-Triethyl phosphorothioate	EPA 8270D	10186002	NELAP	PA
8310 - tris-(2,3-Dibromopropyl) phosphate (tris-BP)	EPA 8270D	10186002	NELAP	PA
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290	10187209	NELAP	PA
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290	10187209	NELAP	PA
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 8290	10187209	NELAP	PA
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 8290	10187209	NELAP	PA
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 8290	10187209	NELAP	PA
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 8290	10187209	NELAP	PA
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 8290	10187209	NELAP	PA
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 8290	10187209	NELAP	PA
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran	EPA 8290	10187209	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
(1,2,3,6,7,8-Hxcdf)				
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA 8290	10187209	NELAP	PA
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 8290	10187209	NELAP	PA
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 8290	10187209	NELAP	PA
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 8290	10187209	NELAP	PA
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 8290	10187209	NELAP	PA
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 8290	10187209	NELAP	PA
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA 8290	10187209	NELAP	PA
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 8290	10187209	NELAP	PA
9438 - Total Hpcdd	EPA 8290	10187209	NELAP	PA
9444 - Total Hpcdf	EPA 8290	10187209	NELAP	PA
9468 - Total Hxcdd	EPA 8290	10187209	NELAP	PA
9483 - Total Hxcdf	EPA 8290	10187209	NELAP	PA
9555 - Total Pecdd	EPA 8290	10187209	NELAP	PA
9552 - Total Pecdf	EPA 8290	10187209	NELAP	PA
9609 - Total TCDD	EPA 8290	10187209	NELAP	PA
9615 - Total TCDF	EPA 8290	10187209	NELAP	PA
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A	10187403	NELAP	PA
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A	10187403	NELAP	PA
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 8290A	10187403	NELAP	PA
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 8290A	10187403	NELAP	PA
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 8290A	10187403	NELAP	PA
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 8290A	10187403	NELAP	PA
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 8290A	10187403	NELAP	PA
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 8290A	10187403	NELAP	PA
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA 8290A	10187403	NELAP	PA
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA 8290A	10187403	NELAP	PA
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 8290A	10187403	NELAP	PA
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 8290A	10187403	NELAP	PA
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 8290A	10187403	NELAP	PA
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 8290A	10187403	NELAP	PA
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 8290A	10187403	NELAP	PA
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA 8290A	10187403	NELAP	PA
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 8290A	10187403	NELAP	PA
9438 - Total Hpcdd	EPA 8290A	10187403	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
9444 - Total Hpcdf	EPA 8290A	10187403	NELAP	PA
9468 - Total Hxcdd	EPA 8290A	10187403	NELAP	PA
9483 - Total Hxcdf	EPA 8290A	10187403	NELAP	PA
9555 - Total Pecdd	EPA 8290A	10187403	NELAP	PA
9552 - Total Pecdf	EPA 8290A	10187403	NELAP	PA
9609 - Total TCDD	EPA 8290A	10187403	NELAP	PA
9615 - Total TCDF	EPA 8290A	10187403	NELAP	PA
6110 - 2,5-Dimethylbenzaldehyde	EPA 8315	10187801	NELAP	PA
4300 - Acetaldehyde	EPA 8315	10187801	NELAP	PA
4325 - Acrolein (Propenal)	EPA 8315	10187801	NELAP	PA
5570 - Benzaldehyde	EPA 8315	10187801	NELAP	PA
4430 - Butylaldehyde (Butanal)	EPA 8315	10187801	NELAP	PA
4545 - Crotonaldehyde	EPA 8315	10187801	NELAP	PA
4815 - Formaldehyde	EPA 8315	10187801	NELAP	PA
3825 - Hexanaldehyde (Hexanal)	EPA 8315	10187801	NELAP	PA
6330 - Isovaleraldehyde	EPA 8315	10187801	NELAP	PA
3965 - Propionaldehyde (Propanal)	EPA 8315	10187801	NELAP	PA
6755 - Tolualdehyde (1,2-Tolualdehyde)	EPA 8315	10187801	NELAP	PA
5125 - m-Tolualdehyde (1,3-Tolualdehyde)	EPA 8315	10187801	NELAP	PA
6760 - p-Tolualdehyde (1,4-Tolualdehyde)	EPA 8315	10187801	NELAP	PA
7710 - 3-Hydroxycarbofuran	EPA 8318	10188406	NELAP	PA
7010 - Aldicarb (Temik)	EPA 8318	10188406	NELAP	PA
7015 - Aldicarb sulfone	EPA 8318	10188406	NELAP	PA
7195 - Carbaryl (Sevin)	EPA 8318	10188406	NELAP	PA
7205 - Carbofuran (Furaden)	EPA 8318	10188406	NELAP	PA
7800 - Methiocarb (Mesurol)	EPA 8318	10188406	NELAP	PA
7805 - Methomyl (Lannate)	EPA 8318	10188406	NELAP	PA
8080 - Propoxur (Baygon)	EPA 8318	10188406	NELAP	PA
7710 - 3-Hydroxycarbofuran	EPA 8318A	10188600	NELAP	PA
7010 - Aldicarb (Temik)	EPA 8318A	10188600	NELAP	PA
7015 - Aldicarb sulfone	EPA 8318A	10188600	NELAP	PA
7195 - Carbaryl (Sevin)	EPA 8318A	10188600	NELAP	PA
7205 - Carbofuran (Furaden)	EPA 8318A	10188600	NELAP	PA
7800 - Methiocarb (Mesurol)	EPA 8318A	10188600	NELAP	PA
7805 - Methomyl (Lannate)	EPA 8318A	10188600	NELAP	PA
8080 - Propoxur (Baygon)	EPA 8318A	10188600	NELAP	PA
6885 - 1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	10189807	NELAP	PA
6160 - 1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	10189807	NELAP	PA
9651 - 2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	10189807	NELAP	PA
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	10189807	NELAP	PA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	10189807	NELAP	PA
9303 - 2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	10189807	NELAP	PA
9507 - 2-Nitrotoluene	EPA 8330	10189807	NELAP	PA
9510 - 3-Nitrotoluene	EPA 8330	10189807	NELAP	PA
9306 - 4-Amino-2,6-dnitrotoluene (4-am-dnt)	EPA 8330	10189807	NELAP	PA
9513 - 4-Nitrotoluene	EPA 8330	10189807	NELAP	PA
6415 - Methyl-2,4,6-trinitrophenylnitramine (tetryl)	EPA 8330	10189807	NELAP	PA
5015 - Nitrobenzene	EPA 8330	10189807	NELAP	PA
9522 - Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	10189807	NELAP	PA
9558 - Pentaerythritoltetranitrate	EPA 8330	10189807	NELAP	PA
9432 - RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	10189807	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
6885 - 1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330A	10190008	NELAP	PA
6160 - 1,3-Dinitrobenzene (1,3-DNB)	EPA 8330A	10190008	NELAP	PA
9651 - 2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330A	10190008	NELAP	PA
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8330A	10190008	NELAP	PA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8330A	10190008	NELAP	PA
9303 - 2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330A	10190008	NELAP	PA
9507 - 2-Nitrotoluene	EPA 8330A	10190008	NELAP	PA
9510 - 3-Nitrotoluene	EPA 8330A	10190008	NELAP	PA
9306 - 4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330A	10190008	NELAP	PA
9513 - 4-Nitrotoluene	EPA 8330A	10190008	NELAP	PA
6415 - Methyl-2,4,6-trinitrophenylnitramine (tetryl)	EPA 8330A	10190008	NELAP	PA
5015 - Nitrobenzene	EPA 8330A	10190008	NELAP	PA
9522 - Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330A	10190008	NELAP	PA
9558 - Pentaerythritoltetranitrate	EPA 8330A	10190008	NELAP	PA
9432 - RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330A	10190008	NELAP	PA
1645 - Total Cyanide	EPA 9012A	10193405	NELAP	PA
1615 - Corrosivity	EPA 9045C	10198400	NELAP	PA
1900 - pH	EPA 9045C	10198400	NELAP	PA
1610 - Conductivity	EPA 9050	10198604	NELAP	PA
1610 - Conductivity	EPA 9050A	10198808	NELAP	PA
1905 - Total Phenolics	EPA 9066	10200609	NELAP	PA
1860 - Oil & Grease	EPA 9071B	10201602	NELAP	PA
1560 - Cation exchange capacity	EPA 9081	10203404	NELAP	PA
1780 - Ignitability	EPA 1010A	10234807	NELAP	PA
6380 - 1-Methylnaphthalene	EPA 8270C SIM	10242407	NELAP	PA
5500 - Acenaphthene	EPA 8270C SIM	10242407	NELAP	PA
5505 - Acenaphthylene	EPA 8270C SIM	10242407	NELAP	PA
5555 - Anthracene	EPA 8270C SIM	10242407	NELAP	PA
5575 - Benzo(a)anthracene	EPA 8270C SIM	10242407	NELAP	PA
5580 - Benzo(a)pyrene	EPA 8270C SIM	10242407	NELAP	PA
5585 - Benzo(b)fluoranthene	EPA 8270C SIM	10242407	NELAP	PA
5590 - Benzo(g,h,i)perylene	EPA 8270C SIM	10242407	NELAP	PA
5600 - Benzo(k)fluoranthene	EPA 8270C SIM	10242407	NELAP	PA
5855 - Chrysene	EPA 8270C SIM	10242407	NELAP	PA
5895 - Dibenz(a,h) anthracene	EPA 8270C SIM	10242407	NELAP	PA
6265 - Fluoranthene	EPA 8270C SIM	10242407	NELAP	PA
6270 - Fluorene	EPA 8270C SIM	10242407	NELAP	PA
6315 - Indeno(1,2,3-cd) pyrene	EPA 8270C SIM	10242407	NELAP	PA
5005 - Naphthalene	EPA 8270C SIM	10242407	NELAP	PA
6615 - Phenanthrene	EPA 8270C SIM	10242407	NELAP	PA
6665 - Pyrene	EPA 8270C SIM	10242407	NELAP	PA
6380 - 1-Methylnaphthalene	EPA 8270D SIM	10242509	NELAP	PA
5500 - Acenaphthene	EPA 8270D SIM	10242509	NELAP	PA
5505 - Acenaphthylene	EPA 8270D SIM	10242509	NELAP	PA
5555 - Anthracene	EPA 8270D SIM	10242509	NELAP	PA
5575 - Benzo(a)anthracene	EPA 8270D SIM	10242509	NELAP	PA
5580 - Benzo(a)pyrene	EPA 8270D SIM	10242509	NELAP	PA
5585 - Benzo(b)fluoranthene	EPA 8270D SIM	10242509	NELAP	PA
5590 - Benzo(g,h,i)perylene	EPA 8270D SIM	10242509	NELAP	PA
5600 - Benzo(k)fluoranthene	EPA 8270D SIM	10242509	NELAP	PA
5855 - Chrysene	EPA 8270D SIM	10242509	NELAP	PA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
5895 - Dibenz(a,h) anthracene	EPA 8270D SIM	10242509	NELAP	PA
6265 - Fluoranthene	EPA 8270D SIM	10242509	NELAP	PA
6270 - Fluorene	EPA 8270D SIM	10242509	NELAP	PA
6315 - Indeno(1,2,3-cd) pyrene	EPA 8270D SIM	10242509	NELAP	PA
5005 - Naphthalene	EPA 8270D SIM	10242509	NELAP	PA
6615 - Phenanthrene	EPA 8270D SIM	10242509	NELAP	PA
6665 - Pyrene	EPA 8270D SIM	10242509	NELAP	PA
1900 - pH	EPA 9040C	10244403	NELAP	PA
4870 - Iodomethane (Methyl iodide)	EPA 8260C	10307003	NELAP	PA
1950 - Residue-total	SM 2540 G, 21st Ed	20006206	NELAP	PA
6218 - EPH Aliphatic C19-C36	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6222 - EPH Aliphatic C9-C18	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6232 - EPH Aromatic C11-C22	MADEP EPH, Rev.1.1	90017202	NELAP	PA
6234 - EPH Aromatic C11-C22 Unadjusted	MADEP EPH, Rev.1.1	90017202	NELAP	PA
5304 - VPH Aliphatic C5-C8	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5305 - VPH Aliphatic C5-C8 Unadjusted	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5306 - VPH Aliphatic C9-C12	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5307 - VPH Aliphatic C9-C12 Unadjusted	MADEP VPH, Rev.1.1	90017406	NELAP	PA
5311 - VPH Aromatic C9-C10	MADEP VPH, Rev.1.1	90017406	NELAP	PA
9369 - Diesel range organics (DRO)	TNRCC 1005, Rev.3	90019208	NELAP	PA
2050 - Total Petroleum Hydrocarbons (TPH)	TNRCC 1005, Rev.3	90019208	NELAP	PA

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
1000 - Aluminum	EPA 6010	10155201	NELAP	LA
1005 - Antimony	EPA 6010	10155201	NELAP	LA
1010 - Arsenic	EPA 6010	10155201	NELAP	LA
1015 - Barium	EPA 6010	10155201	NELAP	LA
1020 - Beryllium	EPA 6010	10155201	NELAP	LA
1025 - Boron	EPA 6010	10155201	NELAP	LA
1030 - Cadmium	EPA 6010	10155201	NELAP	LA
1035 - Calcium	EPA 6010	10155201	NELAP	LA
1040 - Chromium	EPA 6010	10155201	NELAP	LA
1050 - Cobalt	EPA 6010	10155201	NELAP	LA
1055 - Copper	EPA 6010	10155201	NELAP	LA
1070 - Iron	EPA 6010	10155201	NELAP	LA
1075 - Lead	EPA 6010	10155201	NELAP	LA
1085 - Magnesium	EPA 6010	10155201	NELAP	LA
1090 - Manganese	EPA 6010	10155201	NELAP	LA
1100 - Molybdenum	EPA 6010	10155201	NELAP	LA
1105 - Nickel	EPA 6010	10155201	NELAP	LA
1125 - Potassium	EPA 6010	10155201	NELAP	LA
1140 - Selenium	EPA 6010	10155201	NELAP	LA
1150 - Silver	EPA 6010	10155201	NELAP	LA
1155 - Sodium	EPA 6010	10155201	NELAP	LA
1160 - Strontium	EPA 6010	10155201	NELAP	LA
1165 - Thallium	EPA 6010	10155201	NELAP	LA
1175 - Tin	EPA 6010	10155201	NELAP	LA
1180 - Titanium	EPA 6010	10155201	NELAP	LA
1185 - Vanadium	EPA 6010	10155201	NELAP	LA
1190 - Zinc	EPA 6010	10155201	NELAP	LA
1005 - Antimony	EPA 6020	10156000	NELAP	LA
1010 - Arsenic	EPA 6020	10156000	NELAP	LA

Eurofins Lancaster Laboratories Inc
Issue Date: July 1, 2015

Certificate Number: 02055

AI Number: 30729
Expiration Date: June 30, 2016

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
1020 - Beryllium	EPA 6020	10156000	NELAP	LA
1030 - Cadmium	EPA 6020	10156000	NELAP	LA
1040 - Chromium	EPA 6020	10156000	NELAP	LA
1055 - Copper	EPA 6020	10156000	NELAP	LA
1075 - Lead	EPA 6020	10156000	NELAP	LA
1105 - Nickel	EPA 6020	10156000	NELAP	LA
1140 - Selenium	EPA 6020	10156000	NELAP	LA
1165 - Thallium	EPA 6020	10156000	NELAP	LA
1095 - Mercury	EPA 7471	10166004	NELAP	LA
7355 - 4,4'-DDD	EPA 8081	10178402	NELAP	LA
7360 - 4,4'-DDE	EPA 8081	10178402	NELAP	LA
7365 - 4,4'-DDT	EPA 8081	10178402	NELAP	LA
7025 - Aldrin	EPA 8081	10178402	NELAP	LA
7250 - Chlordane (tech.)	EPA 8081	10178402	NELAP	LA
7470 - Dieldrin	EPA 8081	10178402	NELAP	LA
7685 - Heptachlor	EPA 8081	10178402	NELAP	LA
7690 - Heptachlor epoxide	EPA 8081	10178402	NELAP	LA
8250 - Toxaphene (Chlorinated camphene)	EPA 8081	10178402	NELAP	LA
7110 - alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	10178402	NELAP	LA
7115 - beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	10178402	NELAP	LA
7105 - delta-BHC	EPA 8081	10178402	NELAP	LA
7120 - gamma-BHC (Lindane, gamma-HexachlorocyclohexanE)	EPA 8081	10178402	NELAP	LA
8880 - Aroclor-1016 (PCB-1016)	EPA 8082	10179007	NELAP	LA
8885 - Aroclor-1221 (PCB-1221)	EPA 8082	10179007	NELAP	LA
8890 - Aroclor-1232 (PCB-1232)	EPA 8082	10179007	NELAP	LA
8895 - Aroclor-1242 (PCB-1242)	EPA 8082	10179007	NELAP	LA
8900 - Aroclor-1248 (PCB-1248)	EPA 8082	10179007	NELAP	LA
8905 - Aroclor-1254 (PCB-1254)	EPA 8082	10179007	NELAP	LA
8910 - Aroclor-1260 (PCB-1260)	EPA 8082	10179007	NELAP	LA
6715 - 1,2,4,5-Tetrachlorobenzene	EPA 8270	10185203	NELAP	LA
6400 - 2-Methylphenol (o-Cresol)	EPA 8270	10185203	NELAP	LA
6405 - 3-Methylphenol (m-Cresol)	EPA 8270	10185203	NELAP	LA
6410 - 4-Methylphenol (p-Cresol)	EPA 8270	10185203	NELAP	LA
5855 - Chrysene	EPA 8270	10185203	NELAP	LA
6275 - Hexachlorobenzene	EPA 8270	10185203	NELAP	LA
4835 - Hexachlorobutadiene	EPA 8270	10185203	NELAP	LA
6285 - Hexachlorocyclopentadiene	EPA 8270	10185203	NELAP	LA
4840 - Hexachloroethane	EPA 8270	10185203	NELAP	LA
6290 - Hexachlorophene	EPA 8270	10185203	NELAP	LA
6590 - Pentachlorobenzene	EPA 8270	10185203	NELAP	LA
6605 - Pentachlorophenol	EPA 8270	10185203	NELAP	LA
5095 - Pyridine	EPA 8270	10185203	NELAP	LA
5025 - n-Nitroso-di-n-butylamine	EPA 8270	10185203	NELAP	LA
6525 - n-Nitrosodiethylamine	EPA 8270	10185203	NELAP	LA

Eurofins Document Reference	1-P-QM-GDL-9015387	**Revision**	4
Effective Date	Jan 18, 2016	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix J		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Kathryn Brungard
Reviewed and Approved by	Duane Luckenbill;Review;Monday, January 18, 2016 2:31:09 PM EST Dorothy Love;Approval;Monday, January 18, 2016 2:54:52 PM EST

Details on method quality control (QC) processes are provided in the individual Analytical Procedures. QC limits are maintained in the LIMS. This appendix provides an overview for representative methodology.
NOTE: This appendix is not applicable to OH VAP work. See the OH VAP approved SOPs for QC information.

SW - 846
Quality Control
GC/MS Volatiles Method 8260

Type	Frequency	Corrective Action
Surrogates: Toluene-d_8 Bromofluorobenzene 1,2-Dichloroethane-d_4 Dibromofluoromethane	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	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	Each group (≤20) of samples per matrix/level	Reanalyze LCS and associated samples for compounds outside acceptance limits that are also outside MS/MSD acceptance limits. Compounds that fail high in the LCS and are ND in the samples, can be reported.
Matrix Spike Duplicates (RPD): Spike all compounds of interest	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	Once for each 12-hour time period or ≤20 samples	Reanalyze blank and associated samples if blank outside limits
Internal Standards (ISTD): Fluorobenzene Chlorobenzene-d_5 1,4-Dichlorobenzene-d_4 tert-Butyl alcohol-d10	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.

SW - 846 Quality Control GC/MS Semivolatiles Method 8270		
Type	**Frequency**	**Corrective Action**
Surrogate: Nitrobenzene-d_5 2-Fluorobiphenyl Terphenyl-d_{14} Phenol-d_6 2-Fluorophenol 2,4,6-Tribromophenol	Each sample, MS, MSD, LCS, and blank	Repeat extraction and analysis; if reanalysis confirms original, document on report and/or case narrative
Matrix Spikes: Spike all compounds of interest	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	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 samples, can be reported.
Matrix Spike Duplicates (RPD): Same as for matrix spikes	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	Once per extraction group (≤20) of samples, each matrix, level	Re-extract and reanalyze blank and associated samples
Internal Standards (ISTD): 1,4-Dichlorobenzene-d_4 Naphthalene-d_8 Acenaphthene-d_{10} Phenanthrene-d_{10} Chrysene-d_{12} Perylene-d_{12}	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.

SW - 846 Quality Control GC/MS Semivolatiles Method 8270 SIM		
Type	**Frequency**	**Corrective Action**
Surrogate: **1-Methylnaphthalene-d10** **Fluoranthene-d10** **Benzo(a)pyrene-d12**	Each sample, MS, MSD, LCS, and blank	Repeat extraction and analysis; if reanalysis confirms original, document on report and/or case narrative
Matrix Spikes: Spike all compounds of interest	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	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 samples, can be reported.
Matrix Spike Duplicates (RPD): Same as for matrix spikes	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	Once per extraction group (≤20) of samples, each matrix, level	Re-extract and reanalyze blank and associated samples
Internal Standards (ISTD): 1,4-Dichlorobenzene-d_4 Naphthalene-d_8 Acenaphthene-d_{10} Phenanthrene-d_{10} Chrysene-d_{12} Perylene-d_{12}	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.

SW - 846 Quality Control Dioxins/Furans Method 8290		
Type	**Frequency**	**Corrective Action**
Labeled Compounds: 13C Labeled Isotope of each of 17 Toxic PCDD/PCDF	Each sample, OPR, and blank	Repeat extraction and analysis; if reanalysis confirms original, document on report and/or case narrative
Ongoing Precision and Recovery Standard (OPR): Spike all compounds of interest	Each group (≤20) of samples per matrix/level	Reanalyze OPR and associated samples for compounds outside acceptance limits that are also outside MS/MSD acceptance limits. Compounds that fail high in the OPR and are ND in the samples, can be reported.
Blanks:	Once for each 12-hour time period or ≤20 samples	Reanalyze blank and associated samples if blank outside limits
Internal Standards (ISTD): 13C12-1234-TCDD 13C12-123468-HxCDD	Each sample, OPR, and blank	RT ± 15 secs of retention time in initial calibration.

Quality Control Dioxins/Furans Method 1613B		
Type	**Frequency**	**Corrective Action**
Labeled Compounds: 13C Labeled Isotope of each of 17 Toxic PCDD/PCDF	Each sample, OPR, and blank	Repeat extraction and analysis; if reanalysis confirms original, document on report and/or case narrative
Ongoing Precision and Recovery Standard (OPR): Spike all compounds of interest	Each group (≤20) of samples per matrix/level	Reanalyze OPR and associated samples for compounds outside acceptance limits that are also outside MS/MSD acceptance limits. Compounds that fail high in the OPR and are ND in the samples, can be reported.
Blanks:	Once for each 12-hour time period or ≤20 samples	Reanalyze blank and associated samples if blank outside limits
Internal Standards (ISTD): 13C12-1234-TCDD 13C12-123468-HxCDD	Each sample, OPR, and blank	RT ± 15 secs of retention time in initial calibration.

Quality Control Congeners Method 1668		
Type	**Frequency**	**Corrective Action**
Labeled Compounds: 13C Labeled Isotope of each of 18 Toxic PCBs	Each sample, OPR, and blank	Repeat extraction and analysis; if reanalysis confirms original, document on report and/or case narrative
Ongoing Precision and Recovery Standard (OPR): Spike all compounds of interest	Each group (≤20) of samples per matrix/level	Reanalyze OPR and associated samples for compounds outside acceptance limits that are also outside MS/MSD acceptance limits. Compounds that fail high in the OPR and are ND in the samples, can be reported.
Blanks:	Once for each 12-hour time period or ≤20 samples	Reanalyze blank and associated samples if blank outside limits
Internal Standards (ISTD): 13C12-PCB70 13C12-PCB111 13C12-PCB141 13C12-PCB170	Each sample, OPR, and blank	RT ± 15 secs of retention time in initial calibration.

SW-846 Quality Control Pesticides/PCBs Methods 8081; 8082; 8141; 8151		
Type	**Frequency**	**Corrective Action**
Surrogate: Organochlorine Pesticides & PCBs Decachlorobiphenyl (DCB) Tetrachloro-*m*-xylene (TCMX) Herbicides: Dichloroacetic acid (DCAA) Organophosphorous Pesticides: 2-nitro-*m*-xylene (2NMX)	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
Matrix Spikes: Organochlorine Pesticides: Spike all compounds of interest, except PCBs, chlordane, and toxaphene Herbicides & Organophosphorous Pesticides: all compounds of interest PCBs: Aroclor 1016 & Aroclor 1260	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.
Laboratory Control Sample: Organochlorine Pesticides: Spike all compounds of interest, except PCBs, chlordane, and toxaphene Herbicides & Organophosphorous Pesticides: all compounds of interest PCBs: Aroclor 1016 & Aroclor 1260	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 samples can be reported.

SW-846 Quality Control Pesticides/PCBs Methods 8081; 8082; 8141; 8151 (continued)		
Type	**Frequency**	**Corrective Action**
Matrix Spike Duplicates (RPD): Organochlorine Pesticides: Spike all compounds of interest, except PCBs, chlordane, and toxaphene Herbicides & Organophosphorous Pesticides: all compounds of interest PCBs: Aroclor 1016 & Aroclor 1260	Each extraction group (≤20) of samples per matrix/level	Evaluated in conjunction with acceptable LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Blanks:	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, too, contain the analyte which was contaminating the blank. If the reinjected blank is unacceptable, any affected samples must be reextracted.
Internal Standards (ISTD): Herbicides: 4,4'-dibromo octafluorobiphenyl (DBOB)	Each sample, MS, MSD, LCS, and blank	Internal standard criteria is advisory only.

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

SW-846
Quality Control
Volatiles by GC
8021

Type	Frequency	Corrective Action
Surrogates: Aromatics; α,α,α-Trifluorotoluene (TFT)	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	Each group of samples (≤20) of similar matrix/level each method	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	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 samples can be reported.
Internal Standard (ISTD): Aromatics; 1-chloro-3-fluorobenzene	Each sample, LCS , MS, MSD, blank, and standard	Reanalyze samples; if reanalysis confirms original, document on report and/or case narrative. In cases where the sample matrix is elevating the ISTD recovery, a dilution and reanalysis may be performed.
Matrix Spike Duplicate (RPD): Same compounds as matrix spikes	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	At least once per batch (≤20 samples) and once 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.

SW-846 Quality Control TPH-DRO 8015B		
Type	**Frequency**	**Corrective Action**
Surrogate: *o*-Terphenyl	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.
Matrix Spike: # 2 Fuel	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 Sample: # 2 Fuel	Each group (≤20) of samples per matrix/level	Reinject if surrogates appear low. If still out of spec, reextract batch. LCS that fails high and DRO is ND in the samples can be reported.
Laboratory Control Duplicates (RPD): # 2 Fuel	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	Once per extraction group (≤20) of samples, each matrix, level	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 which 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.

SW-846 Quality Control TPH-GRO 8015B		
Type	**Frequency**	**Corrective Action**
Surrogate: Trifluorotoluene (FID)	Each sample, MS/MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix-related problems are evident
Matrix Spike: Gasoline standard	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 Sample Gasoline standard	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 samples can be reported.
Matrix Spike Duplicate (RPD): Same compounds as matrix spikes	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	At least one per 20 samples and at least once 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

SW-846 Quality Control* Inorganics (Metals)		
Type	**Frequency**	**Corrective Action**
Internal Standard (ICP & ICP/MS only):	Each sample, standard and QC (Unspiked, Dup., MS, MSD, LCS, dilution, post digestion spike and blank)	If the internal standard response falls outside the specified range, then the samples would be reanalyzed.
Matrix Spikes:	Each group of samples of similar matrix/level (≤20) each method	Analyze post-digestion spike sample
Matrix Spike Duplicate (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):	Each group of samples of similar matrix/level (≤20) each method	Flag the data

SW-846 Quality Control* Inorganics (Metals)		
Type	**Frequency**	**Corrective Action**
Blanks: Initial Calibration (ICB) Continuing Calibration (CCB)	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	Each SDG or batch (≤20 samples)	Redigest and reanalyze blank and associated samples if sample result is greater than the LOQ and <20× blank result
Serial Dilutions (ICP, ICP/MS only):	Each group of (≤20) of similar matrix/level	Flag the data
Interference Check Sample (ICP, ICP/MS only):	Each element after Initial Calibration Verification at beginning and end of the run or min. of 2× per 8 hour	Correct for interference, recalibrate the instrument
Laboratory Control Sample:	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.
Post Digestion Spike:	When matrix spikes are outside 75 % - 125% range, or the statistical window (whichever is tighter).	Flag the data

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

QC Table for SW-846 Miscellaneous Water Tests			
Test	**QC Type**	**Frequency**	**Corrective Action**
Sulfide	Blank	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze.
	Laboratory Control Sample	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze. LCSs that fail high (and associated samples are ND) can be reported.
	Duplicate	Each group of samples of similar matrix (≤20)	Ensure that LCS meets acceptance criteria.
	Matrix Spike/ Matrix Spike Duplicate	Each group of samples of similar matrix (≤20)	Ensure that LCS meets acceptance criteria.
	Blank	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze.

Bromide (IC) **Chloride (IC)** **Cyanide (total)** **Fluoride (IC)** **Nitrate/Nitrite (IC)** **Sulfate (IC)**	Laboratory Control Sample	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze. LCSs that fail high (and associated samples are ND) can be reported.
	Duplicate	Each group of samples of similar matrix (≤10)	Ensure that LCS meets acceptance criteria.
	Matrix Spike	Each group of samples of similar matrix (≤10)	Ensure that LCS meets acceptance criteria.
Phenols **TOC Quad**	Blank	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze.
	Laboratory Control Sample	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze. LCSs that fail high (and associated samples are ND) can be reported.
	Matrix Spike/ Matrix Spike Duplicate	Each group of samples of similar matrix (≤10)	Ensure that LCS meets acceptance criteria.
pH **Moisture**	Laboratory Control Sample	Each group of samples of similar matrix (≤20)	Re-analyze samples.
	Duplicate	Each group of samples of similar matrix (≤10)	Ensure that LCS meets acceptance criteria.
Microbiology	Organism control	Each lot of media (minimum of one per month)	Investigate cause
	Negative control	Each lot of media (minimum of one per month)	Investigate cause

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

Drinking Water Quality Control Inorganics (Metals)		
Type	**Frequency**	**Corrective Action**
Internal Standard (ICP & ICP/MS only):	Each sample, standard and QC (Unspiked, Dup., MS, LFB, Post Digestion Spike, dilution and blank)	If the internal standard response falls outside the specified range, then the samples would be reanalyzed.
Matrix Spikes:	Each group of samples of similar matrix/level (≤10) each method	Analyze post-digestion spike sample
Duplicates (RPD):	Each group of samples of similar matrix/level (≤10) each method	Flag the data
Blanks: Initial Calibration (ICB) Continuing Calibration (CCB)	Each wavelength immediately after calibration verification at 10% frequency	Correct problem, recalibrate, and rerun
Preparation Blank	Each batch (≤10 samples)	Redigest and reanalyze blank and associated samples if sample result <10 times blank result or >LOQ
Laboratory Fortified Blank (LFB):	Each batch (≤10 samples)	Redigest and reanalyze LFB and associated samples. Elements that fail high in the LFB and are ND in the samples can be reported.
Post Digestion Spike:	When matrix spikes are outside range	Flag the data

Drinking Water EPA Method 525.2 Quality Control		
Type	**Frequency**	**Corrective Action**
Lab Reagent Blank (LRB):	One per extraction batch of (≤20) samples	Re-extract and reanalyze blank and associated samples
Lab Fortified Blank (LFB): Spike all compounds of interest	One per extraction batch of (≤20) samples	Re-extract and reanalyze LFB and associated samples for compounds outside acceptance limits. Compounds that fail high in the LFB and are ND in the samples can be reported.
Matrix Spike/Matrix Spike Duplicate (MS/MSD): Spike all compounds of interest	One per extraction batch of (≤20) samples	Recoveries for LFB must be within criteria. If there is insufficient sample for MSD, then a duplicate (extraction and analysis) of another sample in the batch must be performed.
Surrogates: 1,3-Dimethyl-2-nitrobenzene Perylene-d_{12} Triphenylphosphate	Each sample, LFB, MS, MSD, and blank	Re-extract and reanalyze the sample
Internal Standards (ISTD): Acenaphthene-d_{10} Phenanthrene-d_{10} Chrysene-d_{12}	Each sample, LFB, MS, MSD, and blank	Reanalyze samples

QC Table for Miscellaneous Water Tests			
Test	**QC Type**	**Frequency**	**Corrective Action**
Alkalinity **Ammonia (ISE)** **Ammonia (Distill)** **Dissolved Solids** **Fluoride (ISE)** **Hardness** **Sulfate (TURB)** **Sulfide** **Total Solids** **Turbidity**	Blank	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze.
	Laboratory Fortified Blank	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze.*
	Duplicate	Each group of samples of similar matrix (≤20) Alkalinity, Dissolved Solids, Total Solids, Turbidity each group of similar matrix (≤10)	Ensure that LFB meets acceptance criteria.
	Matrix Spike/ Matrix Spike Duplicate	Each group of samples of similar matrix (≤20) (not for Turbidity)	Ensure that LFB meets acceptance criteria.
Bromide (IC) **Chloride (IC)** **Cyanide (total & free)** **Fluoride (IC)** **Nitrogen (TKN)** **Nitrate/Nitrite** **Sulfate (IC)** **Total Phosphorus** **TOC**	Blank	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze.
	Laboratory Fortified Blank	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze.*
	Duplicate	Each group of samples of similar matrix (≤10)	Ensure that LFB meets acceptance criteria.
	Matrix Spike	Each group of samples of similar matrix (≤10)	Ensure that LFB meets acceptance criteria.
Phenols	Blank	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze.
	Laboratory Fortified Blank/Laboratory Control Sample	Each group of samples of similar matrix (≤20)	Prepare the entire batch again and re-analyze.*
	Matrix Spike/ Matrix Spike Duplicate	Each group of samples of similar matrix (≤10)	Ensure that LFB meets acceptance criteria.
pH **Moisture**	Laboratory Fortified Blank	Each group of samples of similar matrix (≤20)	Re-analyze samples.
	Duplicate	Each group of samples of similar matrix (≤10)	Ensure that LFB meets acceptance criteria.
Microbiology	Organism control (+)	Each lot of media (minimum of one per month)	Investigate cause
	Negative control (-)	Each lot of media (minimum of one per month)	Investigate cause

*LFBs that fail high and associated samples are ND can be reported.

QC Table for Drinking Water Methods: 507, 515.1, 531.1		
Type of QC	**Frequency**	**Corrective Action**
Blank	Each batch of (≤20) samples	Inject a solvent blank to check for analytical system contamination. Re-inject the blank. If the re-injected blank is acceptable then any samples with positive results must be re-injected. If the re-injected blank is unacceptable, all associated samples must be re-extracted.
Surrogate 507 – 2-NMX 515 – DCAA 531 – BDMC	Added to each field and QC sample during the extraction.	Recovery must be within specifications unless matrix-related problems are evident, in which case report results and comment.
Matrix Spike/Matrix Spike Duplicate Spike all compounds of interest, except multipeak compounds	Each batch (≤20) of samples if sample volume is available.	Evaluate in conjunction with the LFB.
Laboratory Fortified Blank (LFB) Spike all compounds of interest, rotate multipeak compounds	Each batch of (≤20) samples. LCSD may be used if insufficient sample for MS/MSD is submitted.	If LFB compounds are outside of acceptance limits, re-extract and re-analyze the batch. Compounds that fail high in the LFB and are ND in the samples can be reported.

QC Table for Drinking Water Method: 524.2		
Type of QC	**Frequency**	**Corrective Action**
Blank	One blank for each 12-hour period or batch of ≤20 samples	Reanalyze blank and associated samples if blank is unacceptable.
Surrogate 4-Bromofluorobenzene 1,2-Dichlorobenzene-d_4	Added to each field and QC sample prior to analysis	Reanalyze sample if outside limits. If reanalysis confirms original, document on report.
Matrix Spike/Matrix Spike Duplicate Spike all compounds of interest	At client request.	Evaluate in conjunction with the LFB.
Laboratory Fortified Blank (LFB) Spike all compounds of interest	One LFB for each 12 hour period.	If target compounds are outside of acceptance limits, re-analyze the LFB. If second LFB fails, recalibrate instrument, re-analyze LFB and any associated samples. Compounds that fail high in the LFB and are ND in the samples can be reported.
Internal standard (ISTD) Fluorobenzene	Added to each field and QC sample prior to analysis	Reanalyze sample if outside limits. If reanalysis confirms original, document on report.

EPA 624
Quality Control
GC/MS Volatiles

Type	Frequency	Corrective Action
Surrogates: 4-Bromofluorobenzene 1,2-Dichloroethane-d_4 Fluorobenzene	Each sample, MS, MSD, LCS, and blank	Reanalyze sample if outside limits; if reanalysis is within limits, the reanalysis data is reported. If surrogates confirm original, document on report and/or case narrative
Matrix Spikes: Spike all compounds of interest	Each batch (≤20) of samples	Evaluated by analyst in conjunction with the LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Samples: Spike all compounds of interest	Each batch (≤20) of samples	Reanalyze LCS and associated samples for compounds outside acceptance limits that are also outside MS/MSD acceptance limits. Compounds that fail high in the LCS and are ND in the samples can be reported.
Matrix Spike Duplicates (RPD): Spike all compounds of interest	Each batch (≤20) of samples	Evaluated by analyst in relationship to other QC results
Blanks:	Once every 24-hour tune period and/or 20 samples, whichever comes first	Reanalyze blank and associated samples if blank outside QC limits
Internal Standards (ISTD): Bromochloromethane 2-Bromo-1-chloropropane 1,4-Difluorobenzene	Each sample, MS, MSD, LCS, and blank	Reanalyze sample if outside limits; if reanalysis is within limits, the reanalysis data is reported. If internals confirm original, document on report and/or case narrative

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

EPA 625 Quality Control GC/MS Semivolatiles		
Type	**Frequency**	**Corrective Action**
Surrogate: Nitrobenzene-d_5 2-Fluorobiphenyl Terphenyl-d_{14} Phenol-d_6 2-Fluorophenol 2,4,6-Tribromophenol	Each sample, MS, MSD, LCS, and blank	Re-extract and reanalyze if more than one surrogate out per fraction (acid/base) or any recovery <10%; if re-extraction and reanalysis confirms originals, document on report and/or case narrative
Matrix Spikes: Spike all compounds of interest	Each group (≤20) of samples per matrix/level	Evaluate in conjunction with the LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Sample: Spike all compounds of interest	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 samples can be reported.
Matrix Spike Duplicates (RPD): Same as for matrix spikes	Each group (≤20) of samples per matrix/level	Evaluated by analyst in relationship to other QC results
Blanks:	Once per extraction group (≤20) of samples, each matrix, level, instrument	Re-extract and reanalyze blank and associated samples
Internal Standards (ISTD): 1,4-Dichlorobenzene-d_4 2-Fluoronaphthalene Acenaphthene-d_{10} Phenanthrene-d_{10} Chrysene-d_{12} Perylene-d_{12}	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.

EPA 608 Quality Control Pesticides/PCBs		
Type	**Frequency**	**Corrective Action**
Surrogate: Organochlorine Pesticides & PCBs DCB TCMX	Each sample, MS, MSD, LCS, and blank	Repeat extraction and analysis if reanalysis confirms original report results and comment in case narrative
Matrix Spikes: Organochlorine Pesticides: Spike all compounds of interest, except PCBs, chlordane, and toxaphene PCBs: Aroclor 1016 and Aroclor 1260	Each batch (≤20) of samples	Evaluate in conjunction with LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Matrix Spike Duplicates (RPD): Organochlorine Pesticides: Spike all compounds of interest, except PCBs, chlordane, and toxaphene PCBs: Aroclor 1016 and Aroclor 1260	Each batch (≤20) of samples	Evaluated by analyst in relationship to other QC results
Laboratory Control Sample: Organochlorine Pesticides: Spike all compounds of interest, except PCBs, chlordane, and toxaphene PCBs: Aroclor 1016 and Aroclor 1260	Each batch (≤20) of samples	Re-extract and reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds in the LCS that fail high and are ND in the samples can be reported.
Blanks:	Each batch (≤20) of samples	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 which was contaminating the blank. If the reinjected blank is unacceptable, any affected samples must be reextracted.

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

EPA Method 602
Petroleum Analysis
Acceptance Criteria

Type	Frequency	Corrective Action
Surrogate: α,α,α-Trifluorotoluene (PID)	Each sample, MS, MSD, LCS, and blank	Reanalyze if the surrogate recovery is outside the limits unless matrix-related problems are evident.
Matrix Spike: Spike all compounds of interest	Each group (≤20) of samples	Evaluate in conjunction with LCS. Acceptable LCS would be indicative of matrix effects on the MS/MSD.
Laboratory Control Sample: Spike all compounds of interest	Each group (≤20) of samples. LCSD analyzed if sufficient volume is not available for MS/MSD	Reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds in the LCS that fail high and are ND in the samples can be reported.
Matrix Spike Duplicates (RPD): Same compounds as the matrix spike	Each group (≤20) of samples	Evaluated by an analyst in relationship to other QC results
Blanks:	At least once per 24 hours	Reanalyze blank and associated samples if blank is outside limits
Internal Standards (ISTD): 1-Chloro-3-fluorobenzene (PID)	Each sample, MS, MSD, LCS, and blank	Reanalyze samples; if reanalysis confirms original result, document on report or case narrative. In cases where the sample matrix is elevating the ISTD recovery, a dilution and reanalysis may be performed.

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

EPA Method 600 Series (Method 200.8 for ICP/MS) Quality Control Inorganics (Metals)		
Type	**Frequency**	**Corrective Action**
Internal Standard:	Each sample, standard and QC (Unspiked, Dup., MS, LCS, dilution, Post Digestion Spike and blank)	If the internal standard response falls outside the specified range, then the samples would be reanalyzed.
Matrix Spikes:	Each group of samples of similar matrix/level (≤10) each method	Analyze post-digestion spike sample
Matrix Spike Duplicate (RPD):	Not required	N/A
Duplicates (RPD):	Each group of samples of similar matrix/level (≤10) each method	Flag the data
Blanks: Initial Calibration (ICB) Continuing Calibration (CCB) Preparation Blank	Each wavelength immediately after calibration verification at 10% frequency or every 2 hours (beginning and end of run min.) Each SDG or batch (≤10 samples)	Correct problem, recalibrate, and rerun Redigest and reanalyze blank and associated samples if sample result is greater than the LOQ and <10× blank result
Serial Dilutions:	Each group of (≤10) of similar matrix/level	Flag the data
Interference Check Sample:	Each wavelength after Initial Calibration Verification at beginning and end of the run or min. of 2 times per 8 hour	Correct for interference, recalibrate the instrument
Laboratory Control Sample:	Each SDG or batch (≤10 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.
Post Digestion Spike:	When matrix spikes are outside 70% to 130% range or within the statistical window (whichever is tighter)	Flag the data
Analytical Spike:	One per 10 field samples	ICP-MS – flag the data

Quality Control for Miscellaneous 600 Series Water Tests			
Test	**QC Type**	**Frequency**	**Corrective Action**
Alkalinity **Ammonia (ISE)** **Ammonia (Distill.)** **Dissolved Solids** **Fluoride (ISE)** **Hardness** **Sulfate (turb)** **Sulfide** **Total Solids** **Turbidity**	Blank	Each batch (≤20) of samples	Prepare the entire batch again and re-analyze.
	Laboratory Control Sample	Each batch (≤20) of samples	Prepare the entire batch again and re-analyze.*
	Duplicate	Each batch (≤20) of samples	Ensure that LCS meets acceptance criteria.
	Matrix Spike/ Matrix Spike Duplicate	Each batch (≤20) of samples (not for turbidity)	Ensure that LCS meets acceptance criteria.
Bromide (IC) **Chloride (IC)** **Sulfate (IC)** **Cyanide (total & free)** **Fluoride (IC)** **Nitrogen (TKN)** **Nitrate/Nitrite** **Total Phosphorus** **TOC**	Blank	Each batch (≤20) of samples	Prepare the entire batch again and re-analyze.
	Laboratory Control Sample	Each batch (≤20) of samples	Prepare the entire batch again and re-analyze.*
	Duplicate	Each batch (≤10) of samples	Ensure that LCS meets acceptance criteria.
	Matrix Spike	Each batch (≤10) of samples	Ensure that LCS meets acceptance criteria.
Phenols	Blank	Each batch (≤20) of samples	Prepare the entire batch again and re-analyze.
	Laboratory Control Sample	Each batch (≤20) of samples	Prepare the entire batch again and re-analyze.*
	Matrix Spike/ Matrix Spike Duplicate	Each batch (≤10) of samples	Ensure that LCS meets acceptance criteria.

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

*LCSs that fail high and associated samples are ND can be reported.

TO-15 Volatile Organics in Air		
Type	**Frequency**	**Corrective Action**
Laboratory Control Sample: Spike all compounds of interest	Each group (≤20) of samples	Reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS and are ND in the samples, can be reported.
Blanks:	Once for each 24-hour time period or ≤20 samples	Reanalyze blank and associated samples if blank outside limits
Internal Standards (ISTD): Bromochloromethane 1,4-Difluorobenzene Chlorobenzene-d_5	Each sample, 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.

TO-14A Volatile Organics in Air		
Type	**Frequency**	**Corrective Action**
Laboratory Control Sample: Spike all compounds of interest	Each group (≤20) of samples	Reanalyze LCS and associated samples for compounds outside acceptance limits. Compounds that fail high in the LCS and are ND in the samples, can be reported.
Blanks:	Once for each 24-hour time period or ≤20 samples	Reanalyze blank and associated samples if blank outside limits
Internal Standards (ISTD): Bromochloromethane 1,4-Difluorobenzene Chlorobenzene-d_5	Each sample, 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.

Eurofins Document Reference	1-P-QM-GDL-9015388	**Revision**	3
Effective Date	Jan 13, 2015	**Status**	Effective
Historical/Local Document Number	DOD - Environmental Quality Policy Manual Appendix K		
Local Document Level	Level 1		
Local Document Type	POL - Policy		
Local Document Category	ES - Environmental Sciences		

Prepared by	Barbara F. Reedy
Reviewed and Approved by	Robert Strocko;Review;Tuesday, December 30, 2014 10:09:14 AM EST Duane Luckenbill;Review;Tuesday, December 30, 2014 12:59:11 PM EST Dorothy Love;Approval;Tuesday, December 30, 2014 1:18:10 PM EST

MICROBIOLOGICAL TESTING

1. MICROBIOLOGICAL SAMPLE HANDLING

1.1. Microbiological Sample Collection

The containers for environmental microbiology are typically sterile, screw-cap plastic bottles. A minimum of 100 mL of sample is required. The sampling containers are purchased with a sterility certification. The sterility, absence of autofluoresence, and volume of each purchased lot of containers is verified by randomly selecting a container from each purchased lot and inoculating it with approximately 100 mL of sterile tryptic soy broth and placing it in incubation for 24 hours at 35° ± 0.5°C. Each lot of bottles is also checked for absence of autofluoresence with a 366-nm UV light with a 6-Watt bulb. The 100-mL calibration line on the container is verified using a 100-mL Class A graduated cylinder to 2.5% tolerance.

Samples collected for microbiological analyses must follow a specific protocol:

- The sampling taps are to be free of aerators, strainers, hose attachments, and purification devices; they should not be mixing type faucets, and avoid leaky faucets.
- Maintain a steady water flow for 3 to 5 minutes before collecting the sample.
- Using aseptic techniques, fill the container to just above the 100-mL mark on the container. This will allow for mixing and chlorine residual analysis.
- Do not overfill the container.
- If another environmental microbial analysis is required, or if the water is discolored (to act as a color standard), a separate container will be required.

1.2. Microbiological Sample Storage

Because sample integrity can be compromised by improper storage, the environmental microbiology samples are refrigerated with the temperature monitored until requested by the microbiologist for analysis.

Holding times for samples are monitored and analysis is scheduled accordingly. For Safe Drinking Water Act (SDWA) compliance purposes, no sample (for total coliform analysis) with over 30 hours elapsed time from collection will be analyzed. HPC samples from SDWA surface water systems must be tested within 8 hours of collection. Fecal coliform tests on effluents for National Pollutant Discharge Elimination System (NPDES) compliance purposes must be transported to the laboratory within 6 hours of collection. Samples that arrive past 6 hours of when they were collected cannot be tested. Whenever possible, the sample should be tested within 2 hours of receipt.

1.3. Microbiological Sample Return/Disposal

All solid wastes generated from the microbiological analyses are disposed of in bags designated as “BioHazard”, sterilized via autoclave and disposed of by incineration. The laboratory uses a sophisticated, laboratory information management system (LIMS), which includes programming to assist in the identification of hazardous wastes at time of discard. In most cases, a sample for coliform testing is collected in a container that will also be the test vessel. When this occurs, samples are discarded in the laboratory immediately after analysis is completed. When samples are not tested in the sample container, the sample containers are returned to sample storage for disposal.

2. MICROBIOLOGICAL TECHNICAL REQUIREMENTS AND TRACEABILITY OF MEASUREMENTS

2.1. Media

- Within the microbiology laboratory, procedures are in place to address preparation, labeling, storage, expiration, documentation, and quality/sterility evaluation requirements for these materials. Only commercially prepared or manufactured dehydrated media is used for SDWA water work. Media may not be formulated from basic ingredients. Each new lot of dehydrated or commercially prepared medium is checked against positive and negative culture controls. Each purchased lot of MMO-MUG media is tested for performance using *E. coli*, *K. pneumoniae*, and *Ps. aeruginosa*, or equivalent organisms following a standard operating procedure. The positive/negative organism check is performed on each new lot of purchased or prepared media for QC purposes.

- Each analytical method includes a list of media needed for the test. These are fully described, including name, purity, and description of preparation. Where applicable, shelf life and storage conditions are also listed.

- The Microbiology Department is responsible for maintaining an inventory of the media needed. New supplies of media are checked by the Purchasing Department to ensure that they match the purchase order. The laboratory is responsible for checking that new supplies meet the method requirements.

- In addition to the name and concentration, the media containers are labeled with the storage conditions, the date opened, and an expiration or re-evaluation date. Subsequent media preparations at the laboratory are fully documented in a logbook and are traceable to, or labeled to include:

    1. Name of media
    2. Concentration, as appropriate
    3. Date prepared
    4. Name of analyst preparing or reference to logbook
    5. Storage conditions
    6. Expiration/re-evaluation date
    7. Manufacturer name and lot #
    8. Sterilization time and temperature
    9. Final pH, where required
    10. Sterility check result

2.2. Microbiological Standard Sources, Calibration, and Preparation

Microbial Control Species - Where required, laboratory cultures are obtained from the American Type Culture Collection (ATCC). Cultures used in testing are no more than five transfers from ATCC freeze-dried cultures.

2.3. Microbiological Equipment Maintenance

Equipment maintenance and calibration is addressed in instrument-specific Operation, Maintenance, and Calibration Procedures (OMC) or instrument-specific instruction manuals located within the department.

The general process for sterilization procedures are outlined below:

2.3.1. All autoclaving is done at 121° ± 1°C, with times as specified below (in minutes):

Carbohydrate media	25
Rinse water	60
Contaminated materials	minimum of 70

2.3.2. Sterile disposable single use membrane filter units or sterile glass filter funnels are used for methods that require filtration.

2.4. Microbiological Labware Cleaning

Sterile disposable plastic ware is primarily used for microbiological analysis. However, procedures are in place to outline the washing process for each type of labware used in the laboratory. Most glassware is machine-washed. Labware that is washed by hand is either air dried or dried in specifically designed ovens and sterilized appropriately. Each new lot, or at least annually, of detergents used to wash glassware for Environmental Microbiology labware, is tested using the Inhibitory Residue Test, as outlined in SM20 9020.B.4.a.2).

MICROBIOLOGICAL INTERNAL QUALITY CONTROL CHECKS

2.5. Microbiological Laboratory Quality Control Samples and Acceptance Criteria

Quality control (QC) samples are analyzed with each batch of samples or new lot of reagents, as required by the referenced methods, to demonstrate that all aspects of the analysis are in control within established limits of precision and accuracy. Chromofluorogenic media QC tests are lot-specific and performed on each newly received lot.

Each laboratory analytical method specifies (or includes cross-references to) the type of QC sample, frequency of analysis, acceptance criteria for QC sample results, and corrective action to be taken if QC sample results fall outside of the acceptance range. The handling of QC data is described in section 9.2 of the Environmental Quality Policy Manual. The types of QC samples and the information each provides are discussed in the following paragraphs.

2.5.1. Negative System Control - The QC on this is method specific and can be found in 1-P-QM-PRO-9018209, Quality Control/Quality Assurance Procedure for Environmental Microbiology.

2.5.2. Positive and Negative Organism Controls - Each lot/batch of media is tested using positive and negative organism controls.

2.5.3. Duplicate Counting (Test Variability/Reproducibility) - duplicate counting is performed monthly on HPC and fecal MF plates. Each analyst who counted samples for a month, counts the plates and their results are evaluated. Counts must be within 10% difference of the total average for all analysts to be acceptable.

2.5.4. Duplicates - For heterotrophic plate count samples, a duplicate is a second aliquot of a sample that is treated identically to the original to determine precision of the test. The plate counts are averaged.

2.5.5. Serial Dilutions - Fecal coliform, biosolids analyses, and heterotrophic plate counts may require serial dilution of the sample.

2.6. Microbiological Quality Control Sample Frequency and Corrective Action

Each analytical method defines the frequency for the required QC samples, where appropriate. The corrective action required when a QC result fails to meet the acceptance criteria is also given, where appropriate.

The QC acceptance criteria are available to analysts in the laboratory. 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 invalidating results. It should be noted that resampling may be required in the case of invalidated results for SDWA, Environmental Protection Agency (EPA), Pennsylvania Department of Environmental Protection (PADEP), or Pennsylvania Department of Health (DOH) compliance samples due to the short hold-times in microbiological analysis.

2.7. Microbiological Water Systems

Laboratory Reagent Water Suitability Testing - On an annual basis, a sample is sent to a PADEP certified laboratory for suitability analyses. These serve as confirmation of our analyses, as well as to supply additional data on the water suitability.

2.8. Microbiological Reporting Limits

For microbiological analysis, the limits are method-specified and/or project-specific. This information is programmed into the LIMS for reporting purposes.

Arcadis of New York, Inc.

50 Fountain Plaza

Suite 600

Buffalo, New York 14202

Tel 716 667 0900

Fax 716 667 0279

www.arcadis.com

APPENDIX C

Health and Safety Plan

Site Specific Health and Safety Plan

Revision 12h, 9/21/2015

Project Name: Lower Ley Creek Remediation

Project Number: B0035101.0001
Client Name: Respondents to Administrative Order on Consent for Remedial Design
Date: 8/8/2016
HASP Expires 8/8/2017
Revision: NA

Approvals:

HASP Developer: Nicholas Beyrle

Project Manager: Todd Cridge

HASP Reviewer: Daniel Zuck

HASP Reviewer Signature: 

Signed by: Daniel Zuck

Emergency Information

Site Address: Lower Ley Creek
City of Syracuse/Town of Salina
Onondaga County, New York

Emergency Phone Numbers:

Emergency (fire, police, ambulance)			911
Emergency (facility specific, if applicable):			
NA			
Emergency Other (specify)	Poison Control		800-222-1222
Client Contact	Todd Cridge	Work:	315-671-9271
		Cell:	315-317-4777
WorkCare (non-lifethreatening injury/illness)			1-800-455-6155
Project H&S	Daniel Zuck		516-369-2741
Task Manager	Lauren Putnam		315-671-9385
Project Manager	Todd Cridge		315-671-9271
Corporate H&S Specialist	Julie Santaniello		978-551-0033
Corporate H&S Director	Denis Balcer		614-778-9171

Hospital Name and Address: St. Joseph's Health
711 N. Townsend Street, Syracuse, NY 13203

Hospital Phone Number: 315-448-5101

Incident Notification Process

1 Dial 911/Facility Emergency Number/WorkCare as applicable
2 Contact PM/Supervisor — Todd Cridge
3 Contact Corporate H&S — Denis Balcer
4 Contact Client — Todd Cridge

Complete below, as applicable, or clear cell contents:

Location of Assembly Area(s): To be determined each day durring H&S Meeting.

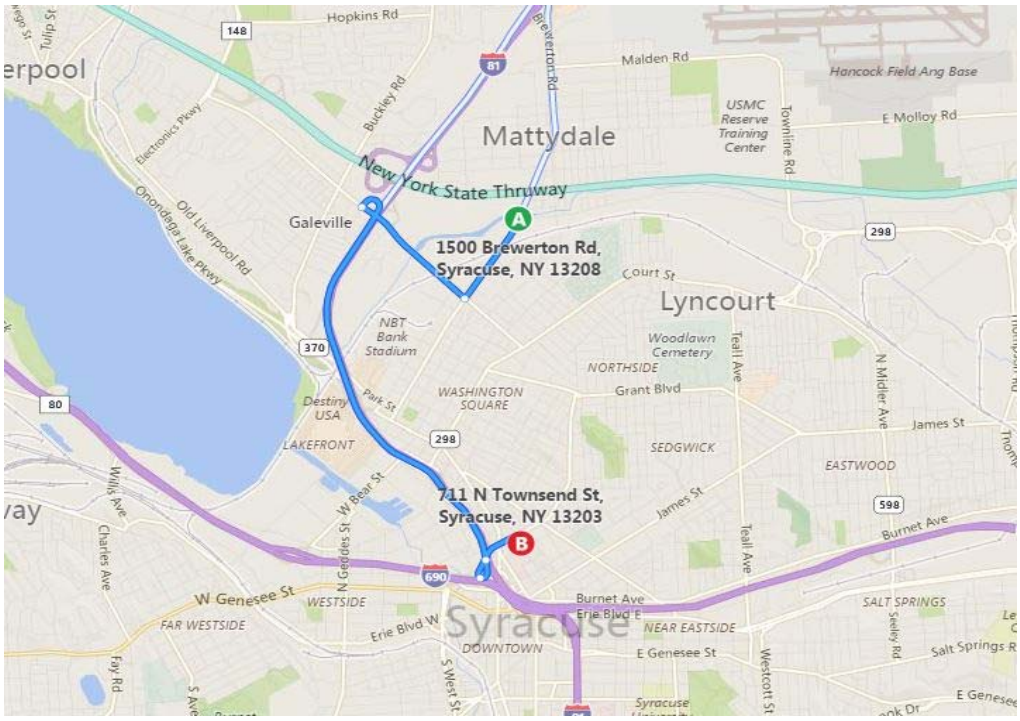
Nearest AED location: NA
Nearest Storm Shelter: Personal Vehicles, Closest Occupied Building

Route to the Hospital

A 1500 Brewerton Rd, Syracuse, NY 13208

↑	1.	Depart **US-11 / Brewerton Rd** toward Factory Ave / CR-93	0.6 mi
↱	2.	Turn **right** onto **7th North St / CR-45**	0.9 mi
81	3.	Take ramp **right** for **I-81 South** toward **Syracuse**	3.0 mi
↱	4.	At exit **19**, take ramp **right** for **Butternut St** toward **Clinton St**	0.1 mi
↱	5.	Bear **right** onto **Websters Landing**	30 ft
↱	6.	Take ramp **right**	213 ft
↱	7.	Bear **right** onto **Butternut St**	0.4 mi
↱	8.	Turn **right** onto **N Townsend St**	335 ft
	9.	Arrive at **N Townsend St** The last intersection is Butternut St If you reach E Laurel St, you've gone too far	

B 711 N Townsend St, Syracuse, NY 13203



General Information

Site Type (select all applicable where work will be conducted):

- [x] Active
- [ ] Bridge
- [ ] Buildings
- [ ] Commercial
- [ ] Construction
- [ ] Military Installation
- [ ] Inactive Industrial
- [ ] Active Industrial
- [ ] Landfill
- [ ] Marine
- [ ] Mining
- [ ] Parking Lot/Private Roadway
- [ ] Railroad
- [x] Remote Area
- [x] Residential
- [ ] Retail
- [ ] Roadway (public, including right-of-way)
- [ ] Water Treatment Plant
- [ ] Unknown
- [ ] Security Risk Site/Location
- [ ] Utility
- [x] Other (specify): Water Way

If lone worker used on project, additional communication and emergency action planning for lone worker required.

Surrounding Area and Topography (select one):

- [x] Surrounding area and topography are presented in the project work plan
- [ ] Surrounding area and topography (*briefly describe*):

Simultaneous Operations (SimOps)

- [x] Not applicable
- [ ] SimOps will exist on this project

Site Background (select one):

- [x] Detailed site background is presented in the project work plan
- [ ] Site background (*briefly describe)* :

Project Tasks
The following tasks are identified for this project:

1 Site Walk/Reconnaissance/Survey
2 Sediment Probing/Survey from Boat
3 Soil Sampling with Tractor-mounted Rig
4 Sediment Sampling with Barge-mounted Rig
5 Sample Processing

☐ Subcontractor H&S information is attached
☑ Utility clearance required for intrusive work.
☐ Journey Management Plan attached
☑ State specific H&S required: Arcadis H&S Field Handbook Section II, Section III subsections A, C, F, M, N, R, W, and Y.
Comments:

☑ The following H&S Standards are attached:
Motor Vehicle HS Standard

Roles and Responsibilities

	Name	*Role*	*Additional Responsibilities (Describe)*
1	Todd Cridge	PM	• Obtain client-specific health and safety information and communicate with the client on health and safety issues. • Report all injuries, illnesses and near-misses to the client representative, lead incident investigations, and ensure that any recommendations made are implemented.
2	Lauren Putnam	TM	• Review all applicable H&S Standards, and ensure that project activities conform to all requirements. • Communicate with the field lead on health and safety issues.
3	Daniel Zuck	Field Lead/ SSO	• Ensure that work is performed in a safe manner and that necessary safety equipment is maintained and used at the Site. • Communicate with the task manager on health and safety issues. • Ensure that necessary site-specific training is performed (both initial and "tailgate" safety briefings).
4	Variable	Field Staff	• Conduct work in a safe manner and that equipment is maintained and used safely. • Communicate with the SSO on health and safety issues. • Ensure that necessary site-specific training is up to date.
5			
6			

Training

All Arcadis employees are required to have the following training to be on site:	*Selected Arcadis employees are required to have the following additional training:*	Names or Numbers from above
Hazwoper 40 Hour	First Aid/CPR	3 & 4
PPE	DOT HazMat #1	3 & 4
Defensive Driving - Smith On-Line	Hazwoper 8-Hour Supervisor	3
H&S Program Orientation	Boating Safety	4, applicable staff
Hazwoper 8-Hour Annual Refresher		
BBP (Bloodborne Pathogens)		

Hazard Analysis

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
Consequences Ratings*		A	B	C	D
People	Property	0 Almost impossible	1 Possible but unlikely	2 Likely to happen	3 Almost certain to happen
1 - Slight or no health	Slight or no damage	0 - Low	1 - Low	2 - Low	3 - Low
2 - Minor health effect	Minor damage	0 - Low	2 - Low	4 - Medium	6 - Medium
3 - Major health effect	Local damage	0 - Low	3 - Low	6 - Medium	9 - High
4 - Fatalities	Major damage	0 - Low.	4 - Medium.	8 - High	12 - High

Business Line
Environment

Business Unit
REM Activities

Task 1: Site Walk/Reconnaissance/Survey

Hazardous Activity #1

Field-Ambient environment - exposure heat, cold, sun, weather, etc

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): **Suggested FHSHB Ref. Section/Part: III I, III M**

Biological	-	Chemical	-	Driving	M	Electrical	L
Environmental	L	Gravity	H	Mechanical	-	Motion	L
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Field H&S Handbook (see ref. above) Secondary: H&S Standards Engineering Controls (specify below) Admin. Controls (specify below) Specialized Equipment (specify below) PPE (see HASP "PPE" section)

Enter Required Controls:
Engineering Controls - Use a tent or vehicle to protect workers from the elements during breaks
Admin Control - Shorter work hours if necessary based on hot or cold conditions

Hazardous Activity #2

Field-Mobilization/Demobilization - from a site

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): **Suggested FHSHB Ref. Section/Part: III V**

Biological	-	Chemical	L	Driving	M	Electrical	-
Environmental	-	Gravity	M	Mechanical	-	Motion	L
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK Field H&S Handbook (see ref. above) Engineering Controls (specify below) Secondary: JSAs Job Briefing/Site Awareness PPE (see HASP "PPE" section) Admin. Controls (specify below)

Enter Required Controls:
Engineering Control - Long grass and vegetation should be controlled by clearing activities when necessary prior to mobilization.
Administrative Controls- Use TRACK, discuss task list identified in JSA prior to initiating work.

Hazardous Activity #3

Field-Biological - insects, spiders, snakes, etc

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): **Suggested FHSHB Ref. Section/Part: III N**

Biological	M	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Engineering Controls (specify below) Secondary: JSAs HASP Job Briefing/Site Awareness PPE (see HASP "PPE" section) Housekeeping

Enter Required Controls:
Engineering Control - Long grass and vegetation should be controlled by clearing activities when necessary prior to mobilization.
Administrative Controls- Use TRACK, discuss task list identified in JSA prior to initiating work.

Hazardous Activity #4

Field-Walking - uneven or slippery terrain

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): **Suggested FHSHB Ref. Section/Part: III E, III F**

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	M	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Secondary: Housekeeping PPE (see HASP "PPE" section)

Enter Required Controls:
Admin Control - Familiarize workers with the site layout and tripping hazards or locations of slippery terrain during daily safety meetings
Engineering Controls: Use an established trail or walkway to avoid trip hazards when possible.

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
Consequences Ratings*		A	B	C	D
People	Property	0 Almost impossible	1 Possible but unlikely	2 Likely to happen	3 Almost certain to happen
1 - Slight or no health	Slight or no damage	0 - Low	1 - Low	2 - Low	3 - Low
2 - Minor health effect	Minor damage	0 - Low	2 - Low	4 - Medium	6 - Medium
3 - Major health effect	Local damage	0 - Low	3 - Low	6 - Medium	9 - High
4 - Fatalities	Major damage	0 - Low.	4 - Medium.	8 - High	12 - High

Task 2: Sediment Probing/Survey from Boat

Hazardous Activity #1

Field-Surface water -working on water from boat

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):						**Suggested FHSHB Ref. Section/Part:**		**III G**
Biological	-	Chemical	-	Driving	-	Electrical	-	
Environmental	-	Gravity	L	Mechanical	-	Motion	L	
Personal Safety	L	Pressure	-	Radiation	-	Sound	-	

Overall Unmitigated Risk: Low Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK Boating Safety Training Cont./Emerg. Planning Inspections JSAs Secondary: Engineering Controls (specify below) Specialized Equipment (specify below) Job Briefing/Site Awareness PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering Controls- Use proper tools that limit potential for falling from boat.
Administrative Controls- Have staff review SOPs and JSAs prior to conducting activity.

Hazardous Activity #2

General-Lifting and movement of equipment of varying weights at varying frequencies by manual methods

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):						**Suggested FHSHB Ref. Section/Part:**		**III AF**
Biological	-	Chemical	-	Driving	-	Electrical	-	
Environmental	-	Gravity	-	Mechanical	-	Motion	-	
Personal Safety	M	Pressure	-	Radiation	-	Sound	-	

Overall Unmitigated Risk: Low Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Engineering Controls (specify below) Job Rotation Secondary: JSAs Job Briefing/Site Awareness Specialized Equipment (specify below) Admin. Controls (specify below) Engineering Controls (specify below)

Enter Required Controls:

Engineering Control - Use field vehicle to facilitate moving equipment when possible. Set up site to reduce the risk of bending and reaching for equipment
Admin Control - Ensure workers are trained in proper lifting techniques (lifting with the legs and not the back, use 2 people to carry heavy equipment)

Hazardous Activity #3

Field-Contaminated media (contact with impacted soil, water, air, sediment, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):						**Suggested FHSHB Ref. Section/Part:**		**III E, III F, III AH**
Biological	-	Chemical	H	Driving	-	Electrical	-	
Environmental	M	Gravity	-	Mechanical	-	Motion	-	
Personal Safety	-	Pressure	-	Radiation	M	Sound	-	

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) Secondary: H&S Standards HASP Admin. Controls (specify below) HAZWOPER Training PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering Control - Use best practices to avoid contact with field contaminated media
Admin Control - Ensure proper decontamination practices are known in the event contaminated media gets in contact with skin.

Hazardous Activity #4

Field-Surface water - wading in shallow water

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):						**Suggested FHSHB Ref. Section/Part:**		**III E, III G**
Biological	-	Chemical	-	Driving	-	Electrical	-	
Environmental	-	Gravity	M	Mechanical	-	Motion	-	
Personal Safety	M	Pressure	-	Radiation	-	Sound	-	

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Job Briefing/Site Awareness Engineering Controls (specify below) Secondary: HASP PPE (see HASP "PPE" section) Inspections

Enter Required Controls:

Admin Control - Familiarize workers with the site layout and tripping hazards or locations of slippery terrain during daily safety meetings
Engineering Controls: Use an established trail or walkway to avoid trip hazards when possible.

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
Consequences Ratings*		A	B	C	D
People	Property	0 Almost impossible	1 Possible but unlikely	2 Likely to happen	3 Almost certain to happen
1 - Slight or no health	Slight or no damage	0 - Low	1 - Low	2 - Low	3 - Low
2 - Minor health effect	Minor damage	0 - Low	2 - Low	4 - Medium	6 - Medium
3 - Major health effect	Local damage	0 - Low	3 - Low	6 - Medium	9 - High
4 - Fatalities	Major damage	0 - Low.	4 - Medium.	8 - High	12 - High

Task 3: Soil Sampling with Tractor-mounted Rig

Hazardous Activity #1

Field-Drilling - Mechanical method (drill rig, DPT, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): **Suggested FHSHB Ref. Section/Part: III E, III F, III AC**

Biological	-	Chemical	L	Driving	-	Electrical	-
Environmental	-	Gravity	M	Mechanical	-	Motion	H
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) Specialized Equipment (specify below) Work Plan Secondary: Housekeeping Inspections

Enter Required Controls:

Engineering Controls- Ensure a safe distance from equipment when not required, put field truck in between you and rig.

Administrative Controls- Ensure the rig has gone through safety checks before use, confirm equipment is in good working order.

Hazardous Activity #2

Field-Utilities - drilling, digging or excavating in the vicinity of subsurface utilities

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): Suggested FHSHB Ref: **III AN**

Biological	-	Chemical	H	Driving	-	Electrical	H
Environmental	-	Gravity	-	Mechanical	-	Motion	L
Personal Safety	-	Pressure	M	Radiation	-	Sound	-

Overall Unmitigated Risk: High Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK H&S Standards Engineering Controls (specify below) Admin. Controls (specify below) Inspections Specialized Equipment (specify below) Secondary: JSAs Field H&S Handbook (see ref. above) Job Briefing/Site Awareness Cont./Emerg. Planning Engineering Controls (specify below) Admin. Controls (specify below)

Enter Required Controls:

Engineering Control - Hand dig if necessary

Admin Control - Utility Clearance Checklist

Hazardous Activity #3

Field-Contaminated media (contact with impacted soil, water, air, sediment, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): Suggested FHSHB Ref: **III E, III F, III AH**

Biological	-	Chemical	H	Driving	-	Electrical	-
Environmental	M	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	M	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) Secondary: H&S Standards HASP Admin. Controls (specify below) HAZWOPER Training PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering Control - Use best practices to avoid contact with field contaminated media

Admin Control - Ensure proper decontamination practices are known in the event contaminated media comes into contact with skin.

Hazardous Activity #4

Field - Sampling - split spoon, continuous sampling tool, sonic

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): **Suggested FHSHB Ref. Section/Part: III F, III L, III S**

Biological	-	Chemical	L	Driving	-	Electrical	-
Environmental	-	Gravity	L	Mechanical	M	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	M

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Job Briefing/Site Awareness Job Rotation Secondary: PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering Control - Use absorbent pad to wipe down bottles before handling.

Admin Controls - Ensure the sample bottles and coolers are all in good condition prior to packing and shipping.

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
Consequences Ratings*		A	B	C	D
People	Property	0 Almost impossible	1 Possible but unlikely	2 Likely to happen	3 Almost certain to happen
1 - Slight or no health	Slight or no damage	0 - Low	1 - Low	2 - Low	3 - Low
2 - Minor health effect	Minor damage	0 - Low	2 - Low	4 - Medium	6 - Medium
3 - Major health effect	Local damage	0 - Low	3 - Low	6 - Medium	9 - High
4 - Fatalities	Major damage	0 - Low.	4 - Medium.	8 - High	12 - High

Task 4: **Sediment Sampling with Barge-mounted Rig**

Hazardous Activity #1

Field-Surface water -working on water from boat

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): **Suggested FHSHB Ref. Section/Part:** **III G**

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	L	Mechanical	-	Motion	L
Personal Safety	L	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Low Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK Boating Safety Training Cont./Emerg. Planning Inspections JSAs Secondary: Engineering Controls (specify below) Specialized Equipment (specify below) Job Briefing/Site Awareness PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering Controls- Use proper tools that limit potential for falling from boat.
Administrative Controls- Have staff review SOPs and JSAs prior to conducting activity.

Hazardous Activity #2

Field-Sampling - sediment sampling using a vibratory sampler

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): **Suggested FHSHB Ref. Section/Part:** **III AD, V G**

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	-	Mechanical	L	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Low Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) Secondary: Job Briefing/Site Awareness Admin. Controls (specify below) Inspections Specialized Equipment (specify below) PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering Controls- Use proper tools that limit potential exposure.
Administrative Controls- Have staff review SOPs and JSAs prior to conducting activity.

Hazardous Activity #3

Field-Contaminated media (contact with impacted soil, water, air, sediment, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): **Suggested FHSHB Ref. Section/Part:** **III E, III F, III AH**

Biological	-	Chemical	H	Driving	-	Electrical	-
Environmental	M	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	M	Sound	-

Overall Unmitigated Risk: High Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) Secondary: H&S Standards HASP Admin. Controls (specify below) HAZWOPER Training PPE (see HASP "PPE" section)

Enter Required Controls:

Admin Controls - Ensure workers are up to date on proper HazMat training and a current Shipping Determination has been reviewed.
Engineering Control- Ensure workers are training in decon techniques.

Hazardous Activity #4

Field - Sampling - split spoon, continuous sampling tool, sonic

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): **Suggested FHSHB Ref. Section/Part:** **III F, III L, III S**

Biological	-	Chemical	L	Driving	-	Electrical	-
Environmental	-	Gravity	L	Mechanical	M	Motion	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	M

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Job Briefing/Site Awareness Job Rotation Secondary: PPE (see HASP "PPE" section)

Enter Required Controls:

Engineering Control - Use absorbent pad to wipe down bottles before handling.
Admin Controls - Ensure the sample bottles and coolers are all in good condition prior to packing and shipping.

Risk Assessment Matrix		Likelihood Ratings** (likelihood that incident would occur)			
Consequences Ratings*		A	B	C	D
People	Property	0 Almost impossible	1 Possible but unlikely	2 Likely to happen	3 Almost certain to happen
1 - Slight or no health	Slight or no damage	0 - Low	1 - Low	2 - Low	3 - Low
2 - Minor health effect	Minor damage	0 - Low	2 - Low	4 - Medium	6 - Medium
3 - Major health effect	Local damage	0 - Low	3 - Low	6 - Medium	9 - High
4 - Fatalities	Major damage	0 - Low.	4 - Medium.	8 - High	12 - High

Task 5: Sample Processing

Hazardous Activity #1

Field-HazMat and wastes - handling and storage at site locations (investigation derived wastes, process wastes, etc)

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): Suggested FHSHB Ref: **III AG, III AH**

Biological	-	Chemical	M	Driving	-	Electrical	-
Environmental	M	Gravity	-	Mechanical	-	Motion	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Work Plan Engineering Controls (specify below) Secondary: Hazcom Training HAZWOPER Training Cont./Emerg. Planning Admin. Controls (specify below) Specialized Equipment (specify below) Housekeeping Inspections PPE (see HASP "PPE" section)

Enter Required Controls:

Admin Controls - Ensure workers are up to date on proper HazMat training and a current Shipping Determination has been reviewed.
Engineering Control- Ensure workers are training in decon techniques.

Hazardous Activity #2

Field-Sampling - sample cooler preparation

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): Suggested FHSHB Ref: **III AD, III AF**

Biological	-	Chemical	M	Driving	-	Electrical	-
Environmental	-	Gravity	M	Mechanical	L	Motion	L
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK JSAs Engineering Controls (specify below) See HASP "Monitoring" section Secondary: Job Briefing/Site Awareness Admin. Controls (specify below) Work Plan PPE (see HASP "PPE" section)

Enter Required Controls:

Admin Controls - Ensure workers are up to date on proper HazMat training and a current Shipping Determination has been reviewed.
Engineering Control- Ensure workers are training in decon techniques.

Hazardous Activity #3

General-Cutting - using fixed blades such as pocket knives, Leatherman, box cutters or scissors

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): Suggested FHSHB Ref: **III AD**

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	-	Mechanical	M	Motion	-
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Low if utilizing:

Controls that should be Considered: Primary: TRACK Specialized Equipment (specify below) Secondary: Admin. Controls (specify below) JSAs PPE (see HASP "PPE" section)

Enter Required Controls:

Administrative Controls- Ensure staff have reviewed SOP for using the selected tool, review task specific JSA.
Engineering Control- Select the best tool for the task, identify the tool that would reduce strain and [illegible] if possible.

Hazardous Activity #4

General-Lifting of equipment or heavy materials by mechanical methods

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low): Suggested FHSHB Ref: **III AF**

Biological	-	Chemical	-	Driving	-	Electrical	-
Environmental	-	Gravity	-	Mechanical	-	Motion	M
Personal Safety	M	Pressure	-	Radiation	-	Sound	-

Overall Unmitigated Risk: Medium Mitigated Risk: Medium if utilizing:

Controls that should be Considered: Primary: TRACK Specialized Training per Standard Secondary: JSAs Job Briefing/Site Awareness Specialized Equipment (specify below) Admin. Controls (specify below) Engineering Controls (specify below)

Enter Required Controls:

Hazard Communication (HazCom)/Global Harmonization System (GHS)

☐ HAZCOM/GHS for this project is managed by the client or general contractor

List the chemicals anticipated to be used by Arcadis on this project per HazCom/GHS requirements.
(Modify quantities as needed)

	Preservatives	Qty
☐	Not applicable	
☐	Hydrochloric acid	<500 ml
☐	Nitric acid	<500 ml
☐	Sulfuric acid	<500 ml
☐	Sodium hydroxide	<500 ml
☐	Zinc acetate	<500 ml
☐	Ascorbic acid	<500 ml
☐	Acetic acid	<500 ml
☐	Isopropyl alcohol	< 4 gal.
☐	Formalin (<10%)	< 4 gal.
☐	Methanol	<500 ml
☐	Sodium bisulfate	<500 ml

	Decontamination	Qty
☐	Not applicable	
☑	Alconox	≤ 5 lbs
☐	Liquinox	≤ 1 gal
☑	Acetone	≤ 1 gal
☐	Methanol	≤ 1 gal
☑	Hexane	≤ 1 gal
☐	Isopropyl alcohol	≤ 4 gal
☐	Nitric acid	≤ 1 L
☐	Other:	
	_____	
	_____	
	_____	

	Calibration	Qty.
☐	Not applicable	
☑	Isobutylene/air	1 cyl
☐	Methane/air	1 cyl
☐	Pentane/air	1 cyl
☐	Hydrogen/air	1 cyl
☐	Propane/air	1 cyl
☐	Hydrogen sulfide/air	1 cyl
☐	Carbon monoxide/air	1 cyl
☐	pH standards (4,7,10)	≤ 1 gal
☐	Conductivity standards	≤ 1 gal
☐	Other:	
	_____	

	Fuels	Qty.
☐	Not applicable	
☑	Gasoline	≤ 5 gal
☐	Diesel	≤ 5 gal
☐	Kerosene	≤ 5 gal
☐	Propane	1 cyl
☐	Other:	
	_____	

	Kits	Qty.
☐	Not applicable	
☐	Hach (specify):	1 kit
☐	DTECH (specify):	1 kit
☐	Other:	1 kit
	_____	
	_____	
	_____	

	Remediation	Qty.
☐	Not applicable	
☐	_____	
☐	_____	
☐	_____	
☐	_____	
☐	_____	

	Other:	Qty.
☐	Not applicable	
☐	Spray paint	≤ 6 cans
☐	WD-40	≤ 1 can
☐	Pipe cement	≤ 1 can
☐	Pipe primer	≤ 1 can
☐	Mineral spirits	≤ 1 gal

	DOT(1):	Qty.
☐	MOT eligible soils	
☐	MOT eligible water	
☐	MOT eligible solids	
☐	MOT eligible liquids	
☐	_____	
☐	_____	

Material safety data sheets (MSDSs)/Safety Data Sheets (SDSs) must be available to field staff.
Indicate below how MSDS information will be provided:

☐ Not applicable
☐ Printed copy in company vehicle
☐ Printed copy in the project trailer/office
☑ Printed copy attached
☐ Electronic copy on field computer

☐ Contractor MSDSs/SDSs are not applicable
☐ Contractor MSDSs/SDSs are attached
☑ Contractor MSDSs/SDSs will be on site and located:

In their company vehicle

☐ Bulk quantities of the following materials will be stored: _____

Contact the project H&S contact for information in determining code and regulatory requirements associated with bulk storage of materials.

OSHA® QUICK CARD

Comparison of NFPA 704 and HazCom 2012 Labels

	NFPA 704	HazCom 2012
Purpose	Provides basic information for emergency personnel responding to a fire or spill and those planning for emergency response.	Informs workers about the hazards of chemicals in workplace under normal conditions of use and foreseeable emergencies.
Number System: NFPA Rating and OSHA's Classification System	0-4 0-least hazardous 4-most hazardous	1-4 1-most severe hazard 4-least severe hazard • The Hazard category numbers are NOT required to be on labels but are required on SDSs in Section 2. • Numbers are used to CLASSIFY hazards to determine what label information is required.
Information Provided on Label	• Health-Blue • Flammability-Red • Instability-Yellow • Special Hazards*-White *OX Oxidizers W Water Reactives SA Simple Asphyxiants	• Product Identifier • Signal Word • Hazard Statement(s) • Pictogram(s) • Precautionary statement(s); and • Name address and phone number of responsible party.
Health Hazards on Label	Acute (short term) health hazards ONLY. Acute hazards are more typical for emergency response applications. Chronic health effects are not covered by NFPA 704.	Acute (short term) and chronic (long term) health hazards. Both acute and chronic health effects are relevant for employees working with chemicals day after day. Health hazards include acute hazards such as eye irritants, simple asphyxiants and skin corrosives as well as chronic hazards such as carcinogens.
Flammability/ Physical Hazards on Label	NFPA divides flammability and instability hazards into two separate numbers on the label. Flammability in red section Instability in yellow section	A broad range of physical hazard classes are listed on the label including explosives, flammables, oxidizers, reactives, pyrophorics, combustible dusts and corrosives.
Where to get information to place on label	Rating system found in NFPA Fire Protection Guide to Hazardous Materials OR NFPA 704 Standard System for Identification of the Hazards of Materials for Emergency Response 2012 Edition. Tables 5.2, 6.2, 7.2 and Chapter 8 of NFPA 704	OSHA Hazard Communication Standard 29 CFR 1910.1200 (2012). 1) Classify using Appendix A (Health Hazards) and Appendix B (Physical Hazards) 2) Label using Appendix C
Other	The hazard category numbers found in section 2 of the HC2012 compliant SDSs are NOT to be used to fill in the NFPA 704 diamond.	Supplemental information may also appear on the label such as any hazards not otherwise classified, and directions for use.
website	www.nfpa.org/704	www.osha.gov OR www.osha.gov/dsg/hazcom/index.html

For more information:

National Fire Protection Association
www.nfpa.org | 800.344.3555

OSHA® Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov | 800.321.OSHA (6742)

NFPA OSHA® QUICK CARD

The substance: "NOMIXUP 7042012"

To create an OSHA label per HazCom 2012:

Step 1: Perform the classification in accordance with Appendix A: Health Hazards & Appendix B Physical Hazards of 29 CFR 1910.1200 - this is where you find the criteria for each hazard class and hazard category.

Class: Flammable Gas, Category 1

Class: Carcinogen, Category 1B

Class: Specific Target Organ Toxicity (Single Exposure), Category 3

Class: Substances and Mixtures Which, in Contact with Water, Emit Flammable Gases, Category 3

Step 2: Gather labeling information (Pictograms, Signal Word, Hazard Statements) from Appendix C of 29 CFR 1910.1200 based on the chemical's hazard class and category.

Identifier: NOMIXUP 7042012

DANGER!

Hazard Statements:	Extremely Flammable Gas May Cause Cancer May Cause Respiratory Irritation In Contact with Water Releases Flammable Gas
Precautionary Statements:	Keep away from heat/sparks/open flames/hot surfaces.-No Smoking Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid breathing vapors and mists. Wear protective gloves and eye protection. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call poison center/doctor if you feel unwell. Leaking Gas Fire: Do not extinguish unless leak can be stopped safely. Eliminate all ignition sources if safe to do so. Store in tightly closed container in a well-ventilated place, locked up. Use outdoors or use in a well-ventilated place. Dispose of contents in accordance with local/regional/national regulations.

XYZ Chemical Company 123 Main St. Anywhere , NY, USA 1-800-000-1111

To Create NFPA 704 label:

Step 1: Collect information on hazards from applicable sections of SDS. Some SDSs may provide the NFPA diamond symbol with hazard rating numbers filled in already. Note: Do NOT use the hazard category numbers given in section 2 of HazCom 2012 compliant SDS on 704 label!

If the diamond is not provided on the SDS you can obtain the information under the following sections of the SDS. Note that additional information may be provided in other sections of the SDS.

- Health hazard information under Section 11
- Flammability information under Section 9
- Instability information under Section 10
- Special information under Section 9, 10, 11

Step 2: Obtain current edition copy of NFPA 704 or view on line at *www.nfpa.org/704*. Compare the criteria on the SDS sections as shown above with the criteria shown in Tables 5.2 (Health), 6.2 (Flammability), 7.2(Instability) and 8.2(Special Hazards)

Step 3: Place numbers for the degree of hazard associated with the criteria obtained in Step 2 in the correct quadrant of NFPA 704 placard.

NFPA Label for NOMIXUP 7042012

For more information:

National Fire Protection Association
www.nfpa.org | 800.344.3555

OSHA®

Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov | 800.321.OSHA (6742)

Monitoring

☐ Chemical air monitoring is not required for this project or is the responsibility of contractor.

For projects requiring air monitoring, list the relevant constituents representing a hazard to site workers.

Constituent	Max. Conc.	Units	TWA	Units	STEL	Units	IDLH	Units	LEL/UEL (%)		VD Air=1	VP (mm Hg)	IP (eV)
PCBs	590	ppm	0.5	m,s	NA	-	5	m,N	NA/NA	0	NA	0.001	NA
Arsenic	37	ppm	0.01	m	NA	-	5	m	NA/NA	0	NA	NA	NA
Cadmium	594	ppm	0.005	m,O	NA	-	9	m,N	NA/NA	0	NA	NA	NA
Lead	1,163	ppm	0.05	m	NA	-	100	m	NA/NA	0	NA	0	NA
Mercury (elemental and	4	ppm	0.025	m,s	0.1	m,N	10	m,N	NA/NA	0	NA	0.0012	NA
Nickel elemental	1,400	ppm	1.5	m,i	NA	-	10	m,N	NA/NA	0	NA	NA	NA

Notes: TWAs are ACGIH 8 hr-TLVs unless noted.

p-ppm m-mg/m3
s- skin c-ceiling
r- resipirable i-inhalable

c2- ceiling (2 hr) se-sensitizer
"9999" - NA O-OSHA PEL
N-NIOSH 10 hr REL

"#N/A" -Constituent is not in database, manually enter information

Monitoring Equipment and General Protocols

Air monitoring is required for any task or activity where employees have potential exposure to vapors or particulates above the TWA. Action levels below are appropriate for most situations. Contact the project H&S contact for all stop work situations. Select monitoring frequency and instruments to be used.

Monitoring Frequency:	Continuously during intrusive tasks (PCBs) and when handeling unsaturated material (PCBs/particulates).
Indicator Tube/Chip Frequency:	Indicator tube/chip monitoring not required

	Instrument	Action Levels			Actions
☑	Photoionization Detector		<	0.013	Continue work
		0.013	-	0.026	Sustained >5 min. continuous monitor, review eng. controls and PPE, proceed with caution
	Lamp (eV): 10.6		>	0.026	Sustained >5 min. stop work, contact SSO
☐	Flame Ionization Detector (FID)		<	0.0	Continue work
		0.0	-	0.0	Sustained >5 min. continuous monitor, review eng. controls and PPE, use caution
			>	0.0	Sustained >5 min. stop work, contact SSO
☐	LEL/O2 Meter	0-5% LEL			Continue work
		>5-10% LEL			Continuous monitor, review eng. controls, proceed with caution
		>10% LEL			Stop work, evacuate, contact SSO
		19.5%-23.5% O2			Normal, continue work
		<19.5% O2			O2 deficient, stop work, evacuate, cont. SSO
		>23.5% O2			O2 enriched, stop work, evacuate, contact SSO
☐	Indicator: ☐tube ☐chip	≤PEL/TLV			Continue work
		>PEL/TLV			Stop work, review eng. controls and PPE, contact SSO
	Compound(s):				
☑	Particulate Monitor (mists, aerosols, dusts in mg/m^3)		<	1.5	Continue work
		1.5	-	3.000	Use engineering controls, monitor when handeling uns
			>	3.000	Stop work, review controls, contact SSO
☐	Other:	Specify:			Specify:

Constituents notated with a "<=SI" are OSHA regulated substances. If exposure is expected to be above the TLV, contact an industrial hygienist or CSP for assistance.

Personal Protective Equipment (PPE)

See JSA or Permit for the task being performed for required PPE*. If work is not conducted under a JSA or Permit, refer to the governing document for PPE requirements. At a minimum, the following checked PPE is required for* *all tasks during field work* *(outside of field office trailers and vehicles) not covered by a JSA or Permit on this project:*

Minimum PPE required to be worn by all staff on project:

☑	Hard hat	☐	Snake chaps/guards	☐	Coveralls:
☑	Safety glasses	☐	Briar chaps	☐	Apron:
☐	Safety goggles	☐	Chainsaw chaps	☑	Chem. resistant gloves:
☐	Face shield	☐	Sturdy boot	☐	Gloves other:
☐	Hearing protection	☑	Steel or comp. toe boot	☐	Chemical boot:
☐	Rain suit	☐	Metatarsal boot	☐	Boot other:
☐	Other:			☑	Traffic vest, shirt or coat:
				☐	Life vest:

Specify Type:

Nitrile Gloves	
Class II	
Type III	

Task specific PPE: When site activites may include potential for skin contact, PPE will be upgraded to include the items identified in the task specific JSAs.

Comments:

See JSAs for job specific PPE Requirments.

Medical Surveillance (*check all that apply*)

- ☐ Medical Surveillance is not required for this project.
- ☑ HAZWOPER medical surveillance applies to all Arcadis site workers on the project.
- ☑ HAZWOPER medical surveillance applies to all subcontractors on the project.
- ☐ HAZWOPER medical surveillance applies to all site workers on the project except:

- ☐ Other medical surveillance required (describe type and who is required to participate):

- ☐ Client drug and/or alcohol testing required.

Hazardous Materials Shipping and Transportation (*check all that apply*)

- ☐ Not applicable, no materials requiring a Shipping Determination (SD) will be transported or shipped
- ☐ A SD has been reviewed and provided to field staff
- ☑ A SD is attached
- ☐ All HazMat will be transported under Materials of Trade by Arcadis (see generic MOT SD Form)
- ☐ Other (specify):

Roadway Work Zone Safety (*check all that apply*)

- ☑ Not applicable for this project
- ☐ All or portions of the work conducted under a TCP
- ☐ All or portions of the work conducted under a STAR Plan
- ☐ TCP or STAR Plan provided to field staff
- ☐ TCP or STAR Plan attached
- ☐ Other (specify):

Arcadis Commercial Motor Vehicles (CMVs)

This section is applicable to Arcadis operated vehicles only

- ☐ This project will **not** utilize CMV drivers
- ☑ This project will utilize CMV drivers

AUS Personal Protective Equipment List by Business Line

This matrix outlines **basic** PPE requirements for each Business Line. **Specific client, task, or regulatory requirements may dictate the type of PPE beyond what is listed in this matrix.** Additionally, task specific PPE requirements may also be included in the HASP or JSA. Hazard/task specific PPE or emergency supply recommendations are outlined by hazard/task in the Field H&S Handbook. PPE and equipment should be charged to the project. For any supplies that the PM determines cannot be billed, the equipment should be charged to the employee's overhead charge number. PPE associated with specialized training such as NFPA 70E Arc Flash is not included in this matrix. Refer to the specific training program for a description of the necessary PPE for tasks involving such requirements.

Listed "General PPE" is required for field staff, the last column specifies PPE for Arcadis staff visiting project sites.	Environment [1]	Infrastructure [1]	Buildings [1]	Water [1]	Staff Visiting Project Sites
Minimum PPE Required to Be Worn					
Hard Hat	R	R	R	R	R
Reflective Traffic Vest (Minimum Class 2)	R	R	R	R	R
Safety Glasses - Clear and Tinted	R	R	R	R	R
ANSI Compliant Safety -Toe Boots	R	R	R	R	R
Minimum PPE Required to Have On Hand					
Hearing Protection - Ear plugs (Need for ear muffs TBD)	R	R	R	R	R
Leather gloves and glove clip	R	R	R	R	R
First Aid Supplies [2]					
Small first aid kit	R	R	R	R	O
16 oz. Bottle of Eye Wash	R	R	R	R	O
Tick Remover (fine tip tweezers) (See THA for high risk locations)	O	O	O	O	O
PPE Supplies Required As Appropriate					
PPE duffel bag with logo, or equivalent	O	O	O	O	O
Half Face or Full-Face Respirator [3] (See THA)	O [3]	O [3]	O [3]	O [3]	O [3]
Insect Repellent (See THA.) (Recommended 20-30% DEET)	O	O	O	O	O
Sunscreen	O	O	O	O	O
Hand sanitizer	O	O	O	O	O
Cut Resistant or Chemical Resistant Gloves [4]	O	O	O	O	O
Poison Ivy pre-exposure wipes or post exposure cleanser (i.e.Tecnu or Zanfel) (See THA for high risk locations)	O	O	O	O	O
Other specialized protective equipment (See THA for Work Tasks)	O	O	O	O	O
Outdoor wilderness survival kit [5]	O	O	O	O	O

Notes:
R - Required
O - Optional. Based on HASP Task Hazard Analysis (THA) or geographic location of work.
THA - Task Hazard Analysis. Review the HASP Task Hazard Analysis (THA) in making this determination. Certain specific factors can influence the determination for requiring this PPE for the site or task. For example, certain geographic regions may have a higher incidence of the hazard or associated risk, the proximity of the site relative to emergency services may require such, previous observations of the hazard at the site, or where unknown hazard conditions apply. Modifications to the minimum required PPE are required to be communicated via the HASP and/or JSA.
1 The Business Line Director, Operations Manager, Project Manager or Employee Supervisor is responsible for making the decision to provide Arcadis branded shirts to employees. Billing of such shirts is related to the authority level of the decision maker.
2 For project sites with an office/trailer, First Aid/emergency response supplies can be kept in a central location, and may not be required to be carried by each Arcadis employee.
3 Staff must comply with the Arcadis Respiratory Protection H&S Standard before a respirator can be worn. The H&S Standard is available on the H&S Team webpage via the H&S Standards Library link. Link to ANA H&S Standard Library
[4] Determination for use of cut resistant, chemical resistant gloves or other specialized hand protection are to be based on THA in the project HASP.
[5] Outdoor survival kits are generally required when working in remote wilderness locations. See the HASP THA and the Field H&S Handbook for requirements and supply list.

Site Control (*check all that apply*)

- ☐ Not applicable for this project.
- ☑ Site control protocols are addressed in JSA or other supporting document (attach)
- ☐ Maintain an exclusion zone of _____ ft. around the active work area
- ☐ Site control is integrated into the STAR Plan or TCP for the project
- ☐ Level C site control - refer to Level C Supplement attached
- ☐ Other (specify):

Decontamination (*check all that apply*)

- ☐ Not applicable for this project.
- ☑ Decontamination protocols are addressed in JSA or other governing document (attach)
- ☑ Wash hands and face prior to consuming food, drink or tobacco.
- ☑ Remove gloves and coveralls and contain, wash hands and face prior to consuming food, drink or tobacco. Ensure footwear is clean of site contaminants
- ☐ Respiratory protection- refer to the Level C supplement attached.
- ☐ Other (specify):

Sanitation *(check all that apply)*

- ☑ Mobile operation with access to off-site restrooms and potable water
- ☐ Restroom facilities on site provided by client or other contractor
- ☐ Project to provide portable toilets (1 per 20 workers)
- ☐ Potable water available on site
- ☐ Project to provide potable water (assume 1 gal./person/day)
- ☐ Project requires running water (hot and cold, or tepid) with soap and paper towels

Safety Briefings (*check all that apply*)

- ☑ Safety briefing required daily
- ☐ Safety briefing required twice a day
- ☐ Safety briefings required at the following frequency: _____
- ☑ Subcontractors to participate in Arcadis safety briefings
- ☑ Arcadis to participate in client/contractor safety briefings
- ☐ Other (specify):

Safety Equipment and Supplies

Safety equipment/supply requirements are addressed in the JSA or Permit for the task being performed. *If work is not performed under a JSA or Permit, the following safety equipment is required to be present on site in good condition (Check all that apply):*

- ☑ First aid kit
- ☐ Bloodborne pathogens kit
- ☑ Fire extinguisher (in vehicle)
- ☐ Eyewash (ANSI compliant)
- ☐ Eyewash (bottle)
- ☑ Drinking water
- ☐ Other: _____

- ☐ Insect repellent
- ☐ Sunscreen
- ☐ Air horn
- ☑ Traffic cones
- ☐ 2-way radios
- ☐ Heat stress monitor

_____

International Travel

☑ This project does not involve international travel
☐ This project involves international travel to: *Type in a city name or select country from menu*

Contact WorkCare for travel to this country (M=Mandatory, R=Recommended):	NA
iJet Security Rating (1=minimum threat, 5=very high threat):	NA
U.S. State Department Travel Alert (A) or Warning (W) Issued:	NA
Arcadis Grey (G) or Black (B) listed:	NA

Behavior Based Safety Program (*check all that apply*)

☑ TIP required at the following frequency on this project:
Select One: _____ mhrs 1 time(s) per person Define: per field week
☐ H&S Field Assessment required at the following frequency on this project:
Select One: _____ mhrs _____ time(s) _____ Define: _____
☐ Other (specify):

Signatures

I have read, understand and agree to abide by the requirements presented in this health and safety plan. I understand that I have the absolute right to stop work if I recognize an unsafe condition affecting my work until corrected.

Printed Name	Signature	Date

Add additional sheets if necessary

You have an absolute right to STOP WORK if unsafe conditions exist!

Attachment A
JSAs

Job Safety Analysis

General

JSA ID	HASP 1	**Status**	Complete
Job Name	General Industry-Driving - passenger vehicles	**Created Date**	8/8/2016
Task Description	Driving a car, van, or truck on public roadways.	**Completed Date**	08/08/2016

Client / Project

Client	Lower Ley Creek PRP Group
Project Number	B0035101.0001
Project Name	Lower Ley Creek Remediation
Project Manager	Todd Cridge

User Roles

Role	Employee	Due Date	Completed Date
Developer	Nicholas Beyrle	8/8/2016	8/8/2016
HASP Reviewer	Zuck, Daniel	8/8/2016	8/8/2016
Quality Reviewer			

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Pre-Trip Inspection	1	Failing to perform pre-trip inspections may cause mechanical failure, accident or injury	Perform walk around of vehicle with particular attention to tire inflation and condition. Check lights, wipers, seatbelts for proper operating condition. Properly adjust seat and mirrors prior to vehicle operation. Use or review vehicle inspection checklist as required under the MVSP.	ARC HSGE024 Motor Vehicle Safety Standard (MVSP)
		2	Scrapes, cuts, burns to hand if inspecting engine fluids and/or tires. Eye splash hazard if inspecting engine fluids. Pinch or crush hazards when opening or closing hood, trunk or tailgate.	Wear protective gloves and safety glasses as described below when checking under hood or tires. Use TRACK and keep hands clear when opening/closing hood, trunk, or tailgate to avoid crush or pinch hazard.	
		3	Struck by other vehicles while walking around vehicle performing inspections	Wear high visibility vest, shirt, or coat while performing inspections in parking lots or other areas with a traffic hazard. Remain vigilant of moving vehicles or equipment in area, face oncoming vehicles to extent practical.	
		4	Improperly secured cargo may dislodge creating injury, property damage or road hazard.	Ensure all cargo is properly secured to prevent movement while the vehicle is in opertation. This includes cargo in the cab of the vehicle.	

2	Driving a motor vehicle on public streets	1	Failing to observe traffic flow ahead increases risk of hard braking resulting in potential impact of vehicle ahead, being struck by another vehicle from behind and decreases decision making time.	Use Smith System Key #1, "Aim High in Steering". **Look ahead (15 seconds if possible) to observe traffic flow and traffic signals.** Adjust speed accordingly to keep vehicle moving and avoid frequent braking. Select lane of least traffic and adjust speed based on observed signal timing when possible. Avoid following directly behind large vehicles that obscure view ahead.	Smith System "5-Keys" is a registered trademark of Smith System Driver Improvement Institute, Inc.
		2	Failing to observe vehicles, pedestrians, bicyclists and other relevant objects in vicinity of your vehicle increases risk of side swipes, rear ending, and third party injury.	Use Smith System Key #2, "Get the Big Picture". **Maintain 360 degrees of awareness around vehicle.** Check a mirror every 6-8 seconds, maintain space around the vehicle, choose a lane that avoids being boxed in. Look for pedestrian activity ahead in crosswalks or sidewalks. Watch for construction zone approach signs and act early by executing lane changes and reducing speed.	
		3	Failing to keep your eyes moving increases risk of not seeing relevant vehicles, pedestrians and objects in your vicinity that may impair your ability to make timely and appropriate driving decisions and also increases risk of accident.	Use Smith System Key #3, "Keep Your Eyes Moving". **Move your eyes every 2 seconds and avoid staring while evaluating relevant objects.** Scan major and minor intersections prior to entering them. Check mirrors.	
		4	Failing to maintain space around and in front of your vehicle increases risk of striking another vehicle or being struck by another vehicle. Insufficient space shortens time for effective driving decision making resulting in increased accident risk.	Use Smith System #4, "Leave Yourself an Out". **Use 4 second rule when following a vehicle.** Avoid driving in vehicle clusters by adjusting speed and using lanes that permit maximum space and visibility. When stopped, keep one car length space in front of vehicle ahead or white line.	
		5	Failing to communicate with other drivers and pedestrians increases risk of striking vehicles, pedestrians, or being struck by other vehicles, especially from the rear.	Use Smith System Key #5, "Make Sure They See You". **Brake early and gradually when stopping to reduce potential of being rear ended.** Keep foot on brake while stopped. Use turn signals and horn effectively. Establish eye contact with other drivers and pedestrians to extent practical. Use vehicle positioning that promotes being seen.	
		6	Distractions within the vehicle takes focus off driving, increases risk of accident decreases time for making effective driving decisions.	**Cell phone use (any type or configuration) is prohibited while the vehicle is in motion.** Familiarize yourself with vehicle layout and controls (radio, temperature controls, etc.) prior to operating unfamiliar vehicles. Set controls prior to operating vehicle. Use GPS in unfamiliar areas to avoid use of paper maps/directions while driving. Set GPS prior to vehicle operation. Pull over and stop to modify GPS functions. Avoid consuming food or drink while driving.	

3	Parking	1	Parking vehicle in areas of clustered parked vehicles or near facility entrance may impair visibility to oncoming traffic in lot and increase exposure to pedestrian traffic.	**Use pull through parking or back into parking space when permitted or practical.** When practical and safe to do so, park away from other vehicles and avoid parking near the facility entrance or loading docks. If available, use a spotter to aid in backing activity. Back no further than necessary and back slowly. Get out and look (GOAL) if uncertain of immediate surroundings. Tap horn prior to backing.	

PPE Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses	While checking engine or tires	Required
Hand Protection	work gloves (specify type)	Leather or equivalent checking engine or	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	other	Vehicle kit (applies to company trucks)	Required
Miscellaneous	fire extinguisher	Applies to company trucks	Required
	first aid kit	Applies to company trucks	Required

Job Safety Analysis

General

JSA ID	--	**Status**	
Job Name	General Industry-Site inspection/walkover/boating	**Created Date**	8/8/2016
Task Description	Site Inspection	**Completed Date**	
Template	True	**Auto Closed**	False

Client / Project

Client	Lower Ley Creek PRP Group
Project Number	B0035101.0001.00004
Project Name	Lower Ley Creek Remediation
PIC	Lukasiewicz, Kathy
Project Manager	Cridge, Todd

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Clare, Ryan		12/10/2010		☐
HASP Reviewer					☑
Quality Reviewer					☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Undeveloped Site Walk(Winter Conditions)	1	Slippery/icy conditions	Use caution and proper footwear with traction	FHSHB III(S)
		2	Eye/face injury	Use caution when walking through trees and brush. Wear proper eye protection to avoid eye injury	FHSHB III(S)
		3	Hypothermia/frostbite	Assess weather conditions and wear proper clothing to avoid hypothermia/frostbite and freezing	FHSHB III(M)
		4	Falling ice/snow	Assess the site for falling ice/snow from trees/powerlines. Use caution when walking around trees and powerlines. Wear hard hat	FHSHB III(S)
		5	Stray animals	Make lots of noise while walking through the site. Carry repellent in the event of encountering stray animals. If a dangerous or aggravated animal is spotted, leave the area, return to your vehicle and contact animal control.	FHSHB III(N)
		6	Vehicular traffic	Asses the site and the surrounding area for vehicle traffic. Use caution when walking near busy roadways. Wear type II or III traffic vest.	FHSHB III(S)
2	Undeveloped Site Walk (Summer Conditions)	1	Slips/trips/falls	Use caution when walking on un-even surfaces. Use proper footwear with traction	FHSHB III(S)
		2	Eye injury	Use caution when walking through areas of trees and brush. Wear proper eye protection to avoid eye injury from tree limbs	FHSHB III(S)
		3	Dehydration	Drink plenty of water and avoid long periods of direct sun exposure	FHSHB III(M)
		4	Sunburn	Wear sunscreen. Avoid long periods of direct sun exposure. Work in the shade if possible.	FHSHB III(M),(S)

		5	Vehicular traffic	Assess the site and the surrounding area for vehicular traffic. Use caution when walking near busy roadways. Wear type II or III traffic vest.	FHSHB III(S)
		6	Stray animals, ticks, bugs	Make lots of noise when traveling through the site and carry repellent spray. If a dangerous or aggravated animal is spotted, leave the area and return to your vehicle and contact animal control. Wear long pants/long sleeve shirt and use insect repellent as necessary	FHSHB III(N)
3	Site inspection (boating)	1	See Barge Drilling JSA	See Barge Drilling JSA	

PPE **Personal Protective Equipment**

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Foot Protection	steel-toe boots		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	first aid kit		Required
Personal	eye wash (specify type)		Required
	insect repellant		Recommended
	sunscreen		Recommended

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		
Employee: **Role** **Review Type** **Completed Date**		
Employee: **Role** **Review Type** **Completed Date**		

Job Safety Analysis

General

JSA ID	--	**Status**	
Job Name	General Industry-Surveying - land/water	**Created Date**	8/8/2016
Task Description	Land surveying/Bathymetry	**Completed Date**	
Template	TRUE	**Auto Closed**	FALSE

Client / Project

Client	Lower Ley Creek PRP Group
Project Number	B0035101.0001.00004
Project Name	Lower Ley Creek Remediation
PIC	Lukasiewicz, Kathy
Project Manager	Cridge, Todd

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Clare, Ryan		8/8/2016	Girard, Ben	☐
HASP Reviewer					☐

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Site reconnaissance and walk-around	1	Slips/trips/falls can occur from walking on uneven ground surface.	Survey the site upon arrival. Note any site conditions that may pose a potential hazard.	FHSHB III(H)(S)
2	Removal of manhole covers	1	Pinch points and scrape hazards when removing MH cover.	Do not place fingers under lid during removal. Use shovels, pry bars, etc. to place under lid edge to lift. Wear sturdy work glove. Wear steel toe boot. Do not purposely drop lids.	FHSHB III(S)(AF)
		2	Back/neck/arm/shoulder strains and hand blisters could occur from over lifting, or not lifting properly.	Use proper lifting techniques, keep back straight, lift with legs, use “J” Hook or pry bar, Buddy System required	FHSHB III(AF)
3	Equipment set-up, calibration and survey of target area	1	Slips/trips/falls can occur from walking on uneven ground surface.	Watch for uneven ground, debris, and trip hazards. If possible clear area of trip hazards. Wear gloves and heavy denim work pants to avoid cuts when working in heavy brush/briers. Use buddy system to spot for uneven ground while surveying.	FHSHB III(S)
4	Placement of stakes	1	Hands/fingers/arms can get struck by hammer/mallet. Splinters and lacerations can occur if stake splinters during hammering.	Wear leather work gloves and safety glasses when placing stakes.	FHSHB III(S)
5	Placement of monuments	1	Back strain from digging holes or mixing concrete	Use proper shoveling techniques and keep back straight. Use the right tool for the job.	FHSHB III(AF)
		2	Exposure to concrete can cause skin irritation or illness	Wear impermeable glove during mixing and concrete placement, promptly wash exposed skin. Do not use bare hands to mix, place, or finish concrete.	FHSHB III(S)
		3	Inhalation of concrete dust during mixing	Keep face away from concrete when poured out of bag, Promptly wet concrete to be mixed.	FHSHB III(S)
6	Channel Bathymetric Survey	1	See Sediment Probing JSA	See Sediment Pobing JSA	

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Recommended
Eye Protection	safety glasses		Required
Foot Protection	boots	reinforced toe boots	Required
	rubber boots	for wetland/waterway	Recommended
Hand Protection	work gloves (specify type)	leather	Required
Head Protection	hard hat		Recommended
Miscellaneous PPE	other	snake chaps	Recommended
	traffic vest--Class II or III	orange during hunting season	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Miscellaneous	fire extinguisher	inspected	Required
	first aid kit	not expired	Required
	Other	snake chaps depending on work location	Recommended
Personal	insect repellant		Required
	sunscreen	not expired	Required
	water/fluid replacement		Required

Review Comments

Reviewer	Comments
Employee: **Role** **Review Type** **Completed Date**	

Job Safety Analysis

General

JSA ID	--	**Status**	
Job Name	Environment-Sediment sampling	**Created Date**	8/8/2016
Task Description	Sediment Probing from a Boat	**Completed Date**	
Template	TRUE	**Auto Closed**	FALSE

Client / Project

Client	ARCADIS-AGMI
Project Number	000000100000
Project Name	GENERAL OVERHEAD
PIC	
Project Manager	

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Clare, Ryan		8/8/2016	Girard, Ben	☑
HASP Reviewer					☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Placement of boat for sediment probing	1	Slip/trip/falls can occur when accessing or egressing boat	Wear anti-slip footwear with ankle support. Plan route onto and off of boat, do not hurry through task.	Field H&S Handbook V(G); III(F)
		2	Clutter and equipment on boat can cause tripping hazard including location and placement of equipment cables, ropes, or chains.	Maintain good housekeeping and aisle space. Secure objects to prevent shifting or movement that could impair walkway. Keep materials clear of designated walkways, cover if practical.	FHSHB III(F)
		3	Boat can be damaged from encountering objects and other protuberances in water during boat operation.	Use qualified boat operator, and use spotters if navigating in areas with shallow depths, felled trees in water or rock hazards, use depth finders as appropriate.	Field H&S Handbook V(G)
		4	Muscle strains from moving Vibracore components or other equipment onto or off of boat.	Use proper techniques by keeping back straight, use buddy system for large or bulky items, avoid awkward twisting or stooping.	Field H&S Handbook V(G)
2	Setup/breakdown of probing device	1	Pinch/crush hazards while erecting tripod, installing Vibracore barrel, placing spuds (if equipped).	Wear protective gloves that maintain dexterity. Identify and keep hands clear, do not hurry through task or take shortcuts,	Field H&S Handbook V(G); III(S)
		2	Wet surfaces on boat can cause slipping	Wear anti-slip footwear with ankle support. Do not hurry through task. Ensure adequate illumination if working in non-daylight hours	Field H&S Handbook V(G)
		3	Muscle strain from lifting barrel, tripod or moving other equipment.	Use buddy system to lift bulky objects or objects weighing more than what you are capable of lifting alone. Team lift items greater than 50 lbs.	Field H&S Handbook V(G); III(AF)
		4	Hand injuries can be caused from rough edges on equipment, metal sheeting or during the cutting of rope	Wear protective gloves that maintain dexterity. Identify and keep hands clear, do not hurry through task or take shortcuts, take the time to correct/protect protruding or sharp edges	Field H&S Handbook V(G)

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	boots	safety toe (muck boots reccomended)	Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	leather	Required
Miscellaneous PPE	personal flotation device		Required

Supplies

Type	Supply	Description	Required
Communication Devices	walkie talkie		Required
Decontamination	Decon supplies (specify type)		Required
Miscellaneous	fire extinguisher	inspected	Required
	first aid kit	not expired	Required
Personal	eye wash (specify type)		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		

Job Safety Analysis

General

JSA ID	--	**Status**	
Job Name	Environment-Drilling, soil sampling, well	**Created Date**	8/8/2016
Task Description	Drilling, soil sampling, and well installation	**Completed Date**	
Template	TRUE	**Auto Closed**	FALSE

Client / Project

Client	Lower Ley Creek PRP Group
Project Number	B0035101.0001.00004
Project Name	Lower Ley Creek Remediation
PIC	Lukasiewicz, Kathy
Project Manager	Cridge, Todd

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Clare, Ryan		8/8/2016	Girard, Ben	☐
HASP Reviewer					☐

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Set up necessary traffic and public access controls	1	Struck by vehicle due to improper traffic controls	Use a buddy system for placing site control cones and/or signage. Position vehicle so that you are protected from moving traffic. Wear Class II traffic vest	FHSHB III(E)(S)
2	Utility Clearance	1	Potential to encounter underground or above ground utilities while drilling.	Complete utility clearance in accordance with the ARCADIS Utility Clearance H&S Standard.	ARCADIS H&S Standard ARCHSFS019
3	General drill rig operation	1	Excessive noise is generated by rig operation.	When the engine is used at high RPMs or soil samples are being collected, use hearing protection.	FHSHB III(L)
		2	During drill rig operation, surfaces will become hot and cause burns if touched, and COCs in the soils more readily vaporize generating airborne contaminates.	Due to friction and lack of a drilling fluid, heat will be produced during this method. Mainly drill augers. Be careful handling split spoons. Wear proper work gloves. When soils and parts become heated, the COC could volatilize. Air monitoring should always be performed in accordance with the HASP.	FHSHB III(E)
		3	Moving parts of the drilling rig can pull you in causing injury. Pinch points on the rig and auger connections can cause pinching or crushing of body parts.	Stay at least 5 feet away from moving parts of the drill rig. Know where the kill switch is, and have the drillers test it to verify that it is working. Do not wear loose clothing, and tie long hair back. Avoid wearing jewelry while drilling. Cone off the work area to keep general public away from the drilling rig.	FHSHB III(E)
		4	Dust and debris can cause eye injury and soil cuttings and/or water could contain COCs.	Wear safety glasses and stay as far away from actual drilling operation as practicable. Wear appropriate gloves to protect from COCs.	FHSHB III(K)(S)
		5	Drilling equipment laying on the ground (i.e. augers, split spoons, decon equipment, coolers, etc), create a tripping hazard. Water from decon buckets generate mud and cause a slipping hazard.	Keep equipment and trash picked up, and store away from the primary work area.	FHSHB III(F)
		6	The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Clearance H&S Standard for guidance.	Utility Standard

4	Hollow stem auger drilling	1	All hazards in step 3 apply. Additionally,The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	Utility Standard
		2	Hands or fingers can get caught and crushed if trying to clean by hand or with tools while the auger is still turning.	Auger should always be stopped and clutch disengaged prior to cleaning.	FHSHB III(E)
5	Direct push drilling	1	The drill rods will be handled by workers most of the time rather than the rig doing it, therefore pinch points can cause lacerations and crushing of fingers/body parts.	Keep a minimum of 5 feet away from drill rig operation and moving parts.	FHSHB III(E)
		2	The direct push rigs are usually meant to fit in spaces where larger rig can't. Tight spaces can pin workers.	Do not put yourself between the rig and a fixed object. Use Spotters or a tape measure to ensure clearances in tight areas. Pre-plan equipment movement from one location to the next.	FHSHB III(E)
		3	Some direct push equipment is controlled by wireless devices. These controls can fail and equipment can strike workers or cause damage to property.	The drill rig should be used in a large open area to test wireless controls prior to moving to boring locations. The operator of the rig will test the kill switch with wireless remote prior to use. Operator will stay in range of rig while moving so that wireless signal will not be too weak and cause errors to the controls.	FHSHB III(E)
		4	Sampling sleeves must be cut to obtain access to soil. Cutting can cause lacerations.	It's preferable to let the driller cut the sleeves open. Many drillers have holders for the sleeve to allow for stability when cutting. If you cut the sleeves, use a hook blade, change blade regularly, and cut away from the body.	FHSHB III(E)
		5	Soil cores may contain contaminated media.	Wear nitrile gloves and saftey glasses for protection from contaminated media when logging soil borings.	FHSHB III(K)(S)
6	Sample collection and processing	1	Injuries can result from pinch points on sampling equipment, and from breakage of sample containers.	Care should be taken when opening sampling equipment. Look at empty containers before picking them up, and do not over-tighten container caps. Use dividers to store containers in the cooler so they do not break.	Sample Cooler Handling JSA
		2	Lifting heavy coolers can cause back injuries.	Use two people to move heavy coolers. Use proper lifting techniques.	
6	Monitoring well installation	1	Same hazards as in Step 3	See step 3	
		2	Monitoring well construction materials can clutter the work area causing tripping hazards.	Well construction materials should be picked up during the well installation process.	FHSHB III(F)
		3	Heavy lifting can cause muscle strains, and cutting open bags can cause lacerations.	Well construction materials are usually 50 lbs or greater. Team lift or use drill rig to hoist bags. Always use work gloves while cutting open bags.	
		4	Well pack material (i.e. sand, grout, bentonite) can become airborne and get in your eyes.	Wear safety glasses for protection from airborne sand and dust.	FHSHB III(S)
		5	Cutting the top of the well to size can cause jagged/sharp edges on the top of the well casing.	Wear gloves when working with the top of the well casing, and file any sharp jagged edges that resulted from cutting to size.	FHSHB III(S)

7	Soil cutting and purge water management	1	Moving full drums can cause back injury, or pinching/crushing injury.	Preferably have the drilling contractor move full drums with their equipment. If this is not practicable, use lift assist devices such as drum dollies, lift gates, etc. Employ proper lifting techniques, and perfrom TRACK to identify pinch/crush points. Wear leather work gloves, and clear all walking and work areas of debris prior to moving a drum.	Drum Handling JSA

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Driller to provide and manage	Recommended
Miscellaneous	fire extinguisher	inspected	Required
	first aid kit	not expired	Required
Personal	eye wash (specify type)	bottle	Required
	water/fluid replacement		Recommended
Traffic Control	traffic cones		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		

Job Safety Analysis

General

JSA ID	--	**Status**	
Job Name	Infrastructure-Barge Drilling	**Created Date**	8/8/2016
Task Description	Sediment Sampling	**Completed Date**	
Template	TRUE	**Auto Closed**	FALSE

Client / Project

Client	Lower Ley Creek PRP Group
Project Number	B0035101.0001.00004
Project Name	Lower Ley Creek Remediation
PIC	Lukasiewicz, Kathy
Project Manager	Cridge, Todd

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Clare, Ryan			Girard, Ben	☐
HASP Reviewer					☐

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Access and Egress from barge	1	Slips and falls on wet surfaces	Keep surfaces dry to the extent practical, do not allow ice to form on walking surfaces of deck in cold weather. Wear PFD specific by project HASP during all barge work, ensure PFD is secure incase falling into water. Wear footwear with anti-slip sole, good tread and ankle support.	FHSHB III(F)
		2	Falls while going from dock to boat or boat to barge	Do not hurry through tasks, grasp any hand holds or railing, do not carry equipment or supplies that obstruct view, ensure adequate illumination especially during night work.	
		3	Trips over equipment and supplies	Maintain good housekeeping at all times. Keep designated aisles clear, ensure guard rails are present on edge of barge.	FHSHB III(F)
		4	Injury from improperly secured ladders, stairs or ramps	Barge operator to ensure all ladders and ramps used are in good sound condition and properly secure, ARCADIS worker to use TRACK to assure themselves the ramp, ladder or stair is in good sound condition.	FHSHB V(G)
2	Barge placement or movement	1	Falls from shifting barge	Stay seated, hold onto to rails or brace when barge is being repositioned in case of hard shift.	
		2	Impact from improperly secured rolling or stacked equipment and supplies	Stay clear of stored equipment when practical when barge being moved, keep all rolling equipment secured and wheels chocked, do not have unsecured stacked supplies or equipment.	FHSHB V(G)
		3	Impact with other river, lake traffic	Ensure navigational lighting is functional for night work. If working near locks/dams, be vigilant of other water traffic. Ensure barge spuds are placed properly and are suitable for currents. Barge operator responsible to ensure barge held steady. Do not work during small craft warning/advisory. Depart barge if warning/advisory is issued	FHSHB V(G)
3	Drilling activities	1	See Drilling JSA	See Drilling JSA	

		2	Entanglement of PFD straps in drill stem	PFDs are to be secured at all times when on barge. Ensure all PFD straps are adequately secured to avoid entanglement in drill stem or other drilling component. Watch for loose straps on co workers in close proximity to the drill rig.	FHSHB V(G)
4	Barge Evacuation/Emergency	1	Falls from cluttered or poorly planned evacuation routes or emergency skiffs	Emergency skiffs, if present, shall be clean, well maintained, and free of obstructions that would affect safe utilization. Evacuation drill to be performed on the first day of barge work on the project and at other intervals specified by barge operator or SSO.	FHSHB V(G); III(F)
		2	Property damage or injury from poorly planned demobilization plan in hurricane or other adverse weather event.	Demobilization plan including locations of safe harbor and lead times for areas prone to hurricane or other weather condition that might cause sudden changes in water level due to utility water management issues. Communication plan with dam operators to be established when working at location influenced by sudden releases of water from dam spillways.	FHSHB V(G); III(I)
		3	Delay in emergency response from absence of required equipment	All emergency devices including life rings, first aid kits, emergency skiffs and fire extinguishers to be present, in good condition, and unobstructed.	FHSHB V(G)

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots	with anti-slip soles	Required
Head Protection	hard hat		Required
Miscellaneous PPE	personal flotation device	Type V, non-inflatable	Required

Supplies

Type	Supply	Description	Required
Communication Devices	walkie talkie	between barge/tug or barge/lock	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
	Other	portable toilet	Required
	Other	emergency boat/skiff	Required
Personal	water/fluid replacement		Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		

Job Safety Analysis

General

JSA ID		**Status**	Completed
Job Name	Environmental-Soil/Sediment Sampling	**Created Date**	8/82016
Task Description	Soil/Sediment Core Sample Processing	**Completed Date**	
Template	False	**Auto Closed**	False

Client / Project

Client	Lower Ley Creek PRP Group
Project Number	B0035101.0001.00004
Project Name	Lower Ley Creek Remediation
PIC	Lukasiewicz, Kathy
Project Manager	Cridge, Todd

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Putnam, Lauren			Hill, Sarah	☑
HASP Reviewer					☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Set-up sample processing area	1	Staff can be hit by vehicular traffic, and pedestrians can enter work area.	To the extent possible, set up processing area away from roadways, access roads, and active site operations. Wear Class II traffic vest when working proximal to vehicular traffic. Use traffic cones to keep pedestrians away.	
		2	Slips/trips/falls could occur from uneven walking and working surfaces.	Visually inspect surfaces/areas for slip/trip/fall hazards and remove if possible. If hazard cannot be removed, identify/flag hazard using high visibility tape/flagging or cones. Avoid unstable ground (e.g., mud, water, ice, loose gravel, etc.) when carrying equipment. Use good housekeeping practices.	
		3	Pinch Points.	Wear mechanic style/leather work gloves when handling equipment. Keep hands/fingers clear of mobile parts/hinged areas.	
2	Prepare samples for processing	1	Muscle strains from lifting samples.	Use 2-person lift for items >40 lbs or large and bulky items; bend and lift legs/arms, not back. Position body with feet spread to maintain balance and front-facing target area when moving equipment to minimize twisting/turning of torso. Use hand cart or other appropriate method to transport equipment if available.	
		2	Dropping samples/equipment on self or others.	Wipe off wet equipment, carry small loads. Use caution while transporting cores through from vehicles to the designated processing area. Ensure workers are away from transport pathways.	
		3	Pinch points/lacerations.	Wear leather or cut resistant gloves to protect hands/fingers during loading/unloading of equipment/cores. Identify and mark pinch points and communicate with others. Keep hands/fingers away from pinch points.	

3	Soil/sediment sample processing	1	Section core tube.	Keep hands holding the core tube 1 foot away from drill bit when draining water off cores (for sediment cores). When opening cores, cut away from the body and ensure personnel are not within 3 feet of core tube while cutting.	FHSHB III (S)
		2	Back strain.	Utilize rubber mats when standing all day to help prevent any foot or back aches. Utilize a second person to move heavier drums > 40 lbs.	
		3	Field personnel can come into contact with impacted media.	Inspect the area and do not directly handle impacted media. Wear nitrile gloves and safety glasses to protect your skin and eyes from impacted media.	
		4	Cuts/punctures/abrasions from cutting core tubes.	Keep hands away from electric shears when cutting core tubes, have a second person hold the tube behind the cutter. Wear leather or cut resistant gloves when handling aluminum core tubes. Identify and avoid potential caught-between/pinch points and sharp edges.	
4	Package soil/sediment samples	1	Field personnel can come into contact with impacted material.	Inspect the area and do not directly handle impacted media. Wear nitrile gloves and safety glasses to protect your skin and eyes from impacted media.	FHSHB III (S)
		2	Back strain from lifting heavy coolers.	Use 2-person lift for items >40 lbs; bend and lift with legs/arms, not back. Position body with feet spread to maintain balance and front-facing target area when moving equipment to minimize twisting/turning of torso. Use hand cart or other appropriate method to transport equipment if available.	

Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	leather, cut resistant	Required
Head Protection	hard hat		Required
Miscellaneous PPE	traffic vest--Class II or III		Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	decon supplies (specify type)	Alconox, Hexane	Required
Miscellaneous	first aid kit		Required
	rubber floor mat		Recommended
Personal	eye wash (specify type)	bottle	Recommended
	insect repellant		Recommended
	sunscreen		Recommended
Traffic Control	traffic cones		Recommended

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		

Job Safety Analysis

General

JSA ID	--	**Status**	
Job Name	Environment-Sample cooler handling	**Created Date**	8/8/2016
Task Description	Sample cooler handling	**Completed Date**	
Template	TRUE	**Auto Closed**	FALSE

Client / Project

Client	Lower Ley Creek PRP Group
Project Number	B0035101.0001.00004
Project Name	Lower Ley Creek Remediation
PIC	Lukasiewicz, Kathy
Project Manager	Cridge, Todd

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Clare, Ryan		8/8/2016	Girard, Ben	☐
HASP Reviewer					☑

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Transfer field samples to sample packing area	1	Lifting heavy coolers may result in muscle strain especially to lower back.	Use proper lifting techniques and keep back straight. Use buddy system for large coolers, Use mechanical aids like hand trucks if readily available to move coolers. Do not over fill coolers with full sample containers for temporary movement to the sample prep area. Ensure an adequate supply of sample coolers are in field.	
		2	Hazards to hands from broken glass caused by over tightening lids or improper placement in cooler	Inspect all bottles and bottle caps for cracks/leaks before and after filling container. Do not over tighten sample lids. Clean up any broken bottles immediately, avoid contact with sample preservatives. Wear leather gloves when handling broken glass.	FHSHB III(S)
		3	Exposure to chemicals (acid preservatives or site contaminants) on the exterior of sample bottles after filling.	Wear protective gloves for acid preservatives and safety glasses with side shields during all sample container handling activities (before and after filling), Once filled follow project specific HASP PPE requirements for skin and eye protection.	FHSHB III(K,S)
		4	Samples containing hazardous materials may violate DOT/IATA HazMat shipping regulations	All persons filling a sample bottle or preparing a cooler for shipment must have complete ARCADIS DOT HazMat shipping training. Compare the samples collected to the materials described in the Shipping Determination for the Project and ensure consistent. Re-perform all Shipping determinations if free product is collected and not anticipated during planning.	FHSHB III(B,K)
2	Sample cooler selection	1	Sample coolers with defective handles, lid hinges, lid hasps cracked or otherwise damaged may result in injury (cuts to hands, crushing of feet if handle breaks etc)	Only use coolers that are new or in like new condition, No rope handled coolers unless part of the manufacturer's handle design.	ARCADIS Shipping Guide US-001
		2	Selection of excessively large coolers introduces lifting hazards once the cooler is filled.	Select coolers and instruct lab to only provide coolers of a size appropriate for the material being shipped. For ordinary sample shipping sample coolers should be 48 quart capacity or smaller to reduce lifting hazards.	

3	Pack Samples	1	Pinch points and abrasions to hands from cooler lid closing unexpectedly	Beware that lid could slam shut; block/brace if needed; be wary of packing in strong winds. New coolers may be more prone to self closing, tilt cooler back slightly to facilitate keeping lid open.	
		2	Awkward body positions and contact stress to legs and knees when preparing coolers on irregular or hard ground surfaces.	Plan cooler prep activities. Situate cooler where neutral body positions can be maintained if practical, like truck tailgate. Avoid cooler prep on rough gravel surfaces unless knees and legs protected during kneeling.	
4	Sealing, labeling and Marking Cooler	1	Cuts to hands and forearms from strapping tape placement or removing old tape and labels	Do not use a fixed, open-blade knife to remove old tags/labels, USE SCISSORS or other safety style cutting device. Only use devices designed for cutting. Do not hurry through task.	FHSHB III(S)
		2	Lifting and awkward body position hazards from taping heavy coolers, dropping coolers on feet during taping.	Do not hurry through the taping tasks, ensure samples in cooler are evenly distributed in cooler to reduce potential for overhanging cooler falling off edge of tailgate/table when taping.	
		3	Improper labeling and marking may result in violation of DOT/IATA HazMat shipping regulations delaying shipment or resulting in regulatory penalty	Do not deviate from ARCADIS Shipping Guide or Shipping Determination marking or labeling requirements.	FHSHB III(B,K)
5	Offering sample cooler to a carrier or lab courier for shipment.	1	Lifting heavy coolers may result in muscle strain especially to lower back.	See lifting hazard controls above.	
		2	Carrier refusal to accept cooler may cause shipping delay and/or result in violation of DOT HazMat shipping regulations.	Promptly report all rejected and refused shipments to the ARCADIS DOT Program Manager. Do Not re-offer shipment if carrier requires additional labels markings or paperwork inconsistent with your training or Shipping Determination without contacting the ARCADIS DOT Compliance Manager.	FHSHB III(B)

PPE — Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Hand Protection	chemical resistant gloves	nitrile	Required
	work gloves (specify type)	leather	Recommended

Supplies

Type	Supply	Description	Required
Miscellaneous	Other	Scissors	Required

Review Comments

Reviewer		Comments
Employee: **Role** **Review Type** **Completed Date**		
Employee: **Role** **Review Type** **Completed Date**		

Attachment B
MSDS/SDS

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Acetone **CAS Number:** 67-64-1
Chemical Formula: C_3H_6O
Structural Chemical Formula: CH_3COCH_3
EINECS Number: 200-662-2
ACX Number: X1001253-6
Synonyms: ACETON; ACETONE; CHEVRON ACETONE; DIMETHYL KETONE; DIMETHYLFORMALDEHYDE; DIMETHYLKETAL; EPA PESTICIDE CHEMICAL CODE 004101; KETONE PROPANE; KETONE,DIMETHYL; BETA-KETOPROPANE; METHYL KETONE; 2-PROPANONE; PROPANONE; PYROACETIC ACID; PYROACETIC ETHER
General Use: Solvent for fats, oils, waxes, resins, rubber, plastics, lacquers.
Used in manufacture of methyl isobutyl ketone, mesityl oxide, acetic acid, diacetone alcohol, isoprene. Used in solvent extraction processes.
Solvent in the manufacture of explosives and rayon. Component of adhesives, glues, cleaning solvents, lacquer thinners, nail polish, paint removers.
Storing acetylene gas (takes up about 24 times its volume of the gas).
Purifying paraffin and biomedical hardening and dehydrating tissues.
Minor food additive, permitted in USA.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
acetone	67-64-1	95-99.5

OSHA PEL
TWA: 1000 ppm; 2400 mg/m^3.

NIOSH REL
TWA: 250 ppm (590 mg/m^3).

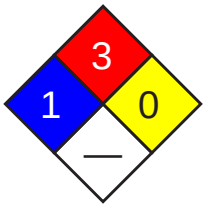
DFG (Germany) MAK
TWA: 500 ppm; PEAK: 1000 ppm.

ACGIH TLV
TWA: 500 ppm; STEL: 750 ppm.

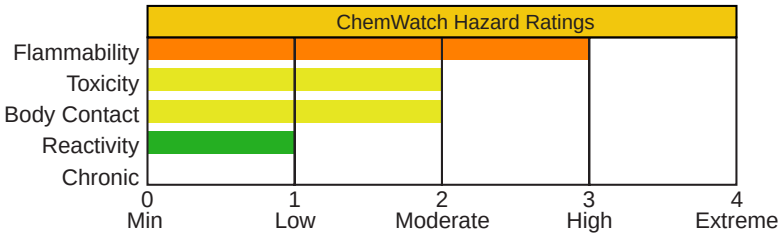
IDLH Level
2500 ppm (10% LEL).

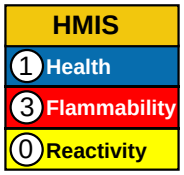
EU OEL
TWA: 500 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, highly volatile liquid; sweet odor. Irritating. Other Acute Effects: muscle weakness, mental confusion, coma (high concentrations). Ingestion: GI irritation, kidney/liver damage, metabolic changes, coma. Chronic Effects: dermatitis. Highly flammable.

Potential Health Effects

Target Organs: respiratory system, central nervous system (CNS), skin
Primary Entry Routes: inhalation, skin contact, eye contact, ingestion
Acute Effects
Inhalation: The vapor is discomforting to the upper respiratory tract.

Inhalation hazard is increased at higher temperatures.
Exposure to ketone vapors may produce nose, throat and mucous membrane irritation. High concentrations of vapor may produce central nervous system depression characterized by headache, vertigo, loss of coordination, narcosis and cardiorespiratory failure. Some ketones produce neurological disorders (polyneuropathy) characterized by bilateral symmetrical paresthesia and muscle weakness primarily in the legs and arms.
Symptoms of exposure may include restlessness, headache, vomiting, stupor, low blood pressure and rapid and irregular pulse, eye and throat irritation, weakness of the legs, dizziness and lightheadedness.
Inhalation of high concentrations produces dryness of the mouth and throat, dizziness, nausea, incoordinated movements, loss of coordinated speech, drowsiness, and in extreme cases, coma.
Inhalation of acetone vapors over long periods causes irritation of the respiratory tract, coughing, headache. Acetone concentrations of 52200 ppm for 1 hour produced narcosis in rats and fatalities at 126600 ppm.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration.
The vapor is discomforting to the eyes.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is discomforting to the skin if exposure is prolonged and may cause drying of the skin, which may lead to dermatitis.
Toxic effects may result from skin absorption.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is highly discomforting and mildly toxic if swallowed but may be harmful if swallowed in quantity.
Small amounts or low dose rates are regarded as practically non-harmful.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.
Workers exposed to 700 ppm acetone for 3 hours/day for 7-15 years showed inflammation of the respiratory tract, stomach and duodenum, attacks of giddiness and loss of strength. Exposure to acetone may enhance liver toxicity of chlorinated solvents.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If available, administer medical oxygen by trained personnel.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush with fresh running water.
Ensure irrigation under the eyelids by occasionally lifting upper and lower lids. If pain persists or recurs seek medical attention.
Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water.
Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

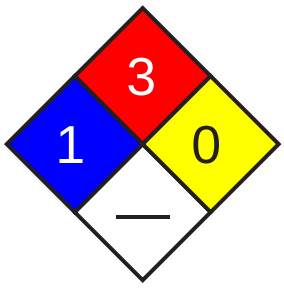
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to acetone:
1.Symptoms of acetone exposure approximate ethanol intoxication.
2.About 20% is expired by the lungs and the rest is metabolized.
Alveolar air half-life is about 4 hours following two hour inhalation at levels near the Exposure Standard; in overdose, saturable metabolism and limited clearance, prolong the elimination half-life to 25-30 hours.
3.There are no know antidotes and treatment should involve the usual methods of decontamination followed by supportive care.

Section 5 - Fire-Fighting Measures

Flash Point: -20 °C
Autoignition Temperature: 465 °C
LEL: 2.15% v/v
UEL: 13% v/v
Extinguishing Media: Water spray or fog; alcohol stable foam.
Dry chemical powder.
Bromochlorodifluoromethane (BCF) (where regulations permit).
Carbon dioxide.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
PLEASE NOTE: 10% of acetone in water has a flash point below 20 deg. C.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protective location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

See DOT ERG

Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Avoid breathing vapors and contact with skin and eyes.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Shut off all possible sources of ignition and increase ventilation.
Water spray or fog may be used to disperse vapor.
Stop leak if safe to do so. Contain spill with sand, earth or vermiculite.
Collect residues and place in flammable waste container.
Any electric cleaning equipment must be explosion proof.
Wash spill area with large quantities of water.
If contamination of drains or waterways occurs, advise emergency services.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.

DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
None required when handling small quantities. OTHERWISE: If inhalation risk of overexposure exists, wear NIOSH-approved organic-vapor respirator.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream with polyethylene gloves or Butyl rubber gloves or Neoprene rubber gloves.
Safety footwear.

Respiratory Protection:

Exposure Range >1000 to <2500 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range 2500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: use ov (black) cartridge for nuisance(<1000)

Other: Overalls. Ensure that there is ready access to eye wash unit and Ensure there is ready access to an emergency shower.

Glove Selection Index:

BUTYL/NEOPRENE ..... Best selection
PE/EVAL/PE ..... Best selection
PVDC/PE/PVDC ..... Best selection
BUTYL ..... Best selection
SARANEX-23 2-PLY..... Satisfactory; may degrade after 4 hours continuous immersion
TEFLON ..... Satisfactory; may degrade after 4 hours continuous immersion
SARANEX-23 ..... Poor to dangerous choice for other than short-term immersion
CPE ..... Poor to dangerous choice for other than short-term immersion
HYPALON ..... Poor to dangerous choice for other than short-term immersion
NITRILE+PVC ..... Poor to dangerous choice for other than short-term immersion
PVA ..... Poor to dangerous choice for other than short-term immersion
VITON/NEOPRENE ..... Poor to dangerous choice for other than short-term immersion
NEOPRENE..... Poor to dangerous choice for other than short-term immersion
PVC..... Poor to dangerous choice for other than short-term immersion
NATURAL+NEOPRENE..... Poor to dangerous choice for other than short-term immersion
NATURAL RUBBER..... Poor to dangerous choice for other than short-term immersion
NITRILE ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless, highly volatile, highly flammable liquid with characteristic sweet odor. Mixes in alcohol, ether, most hydrocarbons and oils.

Physical State: Liquid
Odor Threshold: 47.5 to 1613.9 mg/m^3
Vapor Pressure (kPa): 24 at 20 °C
Vapor Density (Air=1): 2.0
Formula Weight: 58.08
Specific Gravity (H_2O=1, at 4 °C): 0.79 at 20 °C
Evaporation Rate: 11 (BuAc=1) VFast
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 56.2 °C (133 °F) at 760 mm Hg
Freezing/Melting Point: -95.35 °C (-139.63 °F)
Volatile Component (% Vol): 100
Water Solubility: Miscible

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers, strong acids and strong alkalis.
Reacts violently with bromoform and chloroform in the presence of alkalies or in contact with alkaline surfaces.

Section 11 - Toxicological Information

Toxicity

Oral (man) TD_{Lo}: 2857 mg/kg
Oral (rat) LD_{50}: 5800 mg/kg
Inhalation (human) TC_{Lo}: 500 ppm
Inhalation (man) TC_{Lo}: 12000 ppm/4 hr
Inhalation (man) TC_{Lo}: 10 mg/m^3/6 hr
Inhalation (rat) LC_{50}: 50100 mg/m^3/8 hr
Dermal (rabbit) LD_{50}: 20000 mg/kg

Irritation

Eye (human): 500 ppm - irritant
Eye (rabbit): 3.95 mg - SEVERE
Eye (rabbit): 20 mg/24 hr -moderate
Skin (rabbit): 395 mg (open) - mild
Skin (rabbit): 500 mg/24 hr - mild

See *RTECS* AL 3150000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released on soil, it will both volatilize and leach into the ground and probably biodegrade. If released into water, it will probably biodegrade. It will also be lost due to volatilization (estimated half-life 20 hr from a model river). Bioconcentration in aquatic organisms and adsorption to sediment should not be significant. In the atmosphere, it will be lost by photolysis and reaction with photochemically produced hydroxyl radicals. Half-life estimates from these combined processes average 22 days and are shorter in summer and longer in winter. It will also be washed out by rain.

Ecotoxicity: LD_{100} Asellus aquaticus 3 ml/l (within 3 days of exposure) /Conditions of bioassay not specified; LC_{50} Mexican axolotl 20.0 mg/l/48 hr (3-4 weeks after hatching) /Conditions of bioassay not specified; TL_m Mosquito fish 13,000 mg/l/24, 48, 96 hr /Conditions of bioassay not specified; LD_{100} Gammarus fossarum 10 ml/l (within 48 hr) /Conditions of bioassay not specified; LC_{50} Poecilia reticulata (guppy) 7,032 ppm/14 days /Conditions of bioassay not specified; LC_{50} Ring-necked pheasant oral greater than 40,000 ppm, in diet, age 10 days, (no mortality to 40,000 ppm); LC_{50} Salmo gairdneri (Rainbow trout) 5,540 mg/l/96 hr at 12 °C (95% confidence limit 4,740-6,330 mg/l), wt 1.0 g /static bioassay; LC_{50} Clawed toad 24.0 mg/l/48 hr (3-4 weeks after hatching) /Conditions of bioassay not specified; TL_m Daphnia magna 10 mg/l/24, 48 hr /Conditions of bioassay not specified

Henry's Law Constant: 3.97×10^{-5}
BCF: negligible
Biochemical Oxygen Demand (BOD): theoretical 122%, 5 days
Octanol/Water Partition Coefficient: log K_{ow} = -0.24

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Acetone
ID: UN1090
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** B **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U002 Ignitable Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001 5000 lb (2268 kg)
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Unleaded Petrol
AUT5000

Section 1 - Chemical Product and Company Identification 61

Material Name: Unleaded Petrol **CAS Number:** 8006-61-9
Chemical Formula: Mixture of hydrocarbons
EINECS Number: 232-349-1
ACX Number: X1003056-5
Synonyms: AUTOMOTIVE GASOLINE, LEAD-FREE; GASOLINE; MOTOR FUEL; MOTOR SPIRITS; NATURAL GASOLINE; PETROL; UNLEADED PETROL
General Use: Lead free motor fuel for internal combustion engines, 2-stroke and 4-stroke.

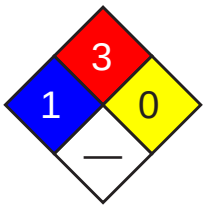
Section 2 - Composition / Information on Ingredients

Name	CAS	%
gasoline	8006-61-9	>90
benzene	71-43-2	5 max.

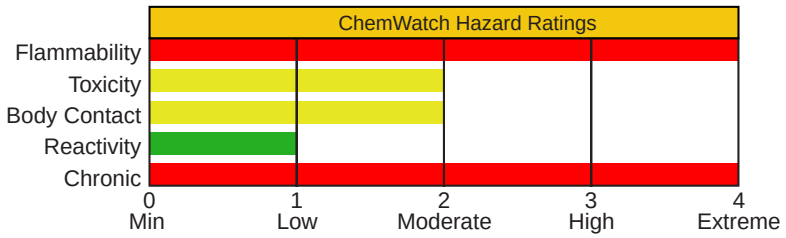
OSHA PEL **NIOSH REL**

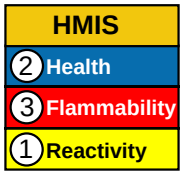
ACGIH TLV
TWA: 300 ppm, 890 mg/m^3;
STEL: 500 ppm, 1480 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear liquid; distinctive odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, drunkenness, unconsciousness. Chronic Effects: dermatitis. Possible cancer hazard. Flammable.

Potential Health Effects

Target Organs: skin, eye, respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, ingestion, skin contact

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract and may be harmful if exposure is prolonged. Inhalation hazard is increased at higher temperatures. Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death. WARNING: Intentional misuse by concentrating/inhaling contents may be lethal. High inhaled concentrations of mixed hydrocarbons may produce narcosis characterized by nausea, vomiting and lightheadedness. Inhalation of aerosols may produce severe pulmonary edema, pneumonitis and pulmonary hemorrhage. Inhalation of petroleum hydrocarbons consisting substantially of low molecular weight species may produce irritation of mucous membranes, incoordination, giddiness, nausea, vertigo, confusion, headache, appetite loss, drowziness, tremors and anesthetic stupor. Massive exposures may produce central nervous system depression with sudden collapse and deep coma; fatalities have been recorded. Irritation of the brain and/or apneic anoxia may produce convulsions. Although recovery following overexposure is generally complete, cerebral micro- hemorrhage of focal post-inflammatory scarring may produce eleptiform seizures some months after the exposure. Pulmonary episodes may include chemical pneumonitis with edema and hemorrhage. The lighter hydrocarbons may produce kidney and neurotoxic effects. Liquid paraffins may produce anesthesia and depressant actions leading to weakness, dizziness, slow and shallow respiration, unconsciousness, convulsions and death. C_{5-7} paraffins may also produce polyneuropathy. Aromatic hydrocarbons accumulate in lipid-rich tissues (typically the brain, spinal cord and peripheral nerves) and may produce functional impairment manifested by nonspecific symptoms such as nausea, weakness, fatigue, vertigo; severe exposures may produce inebriation or unconsciousness. Many of the petroleum hydrocarbons are cardiac sensitizers and may cause ventricular fibrillations.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration. The vapor is discomforting to the eyes. Petroleum hydrocarbons may produce pain after direct contact with the eyes. Slight, but transient, disturbances of the corneal epithelium may also result. The aromatic fraction may produce irritation and lachrymation. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin if exposure is prolonged. The material contains a component that may be absorbed through the skin and may cause drying of the skin, which may lead to dermatitis from repeated exposures over long periods. Toxic effects may result from skin absorption. Open cuts, abraded or irritated skin should not be exposed to this material. The material may accentuate any pre-existing dermatitis condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments. The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Ingestion of petroleum hydrocarbons may produce irritation of the pharynx, esophagus, stomach and small intestine with edema and mucosal ulceration. Resulting symptoms include a burning sensation in the mouth and throat. Large amounts may produce narcosis with nausea and vomiting, weakness or dizziness, slow and shallow respiration, swelling of the abdomen, unconsciousness and convulsions. Myocardial injury may produce arrhythmias, ventricular fibrillation and electrocardiographic changes. Central nervous system depression may also occur. Light aromatic hydrocarbons produce a warm, sharp, tingling sensation on contact with taste buds and may anesthetize the tongue. Aspiration into the lungs may produce coughing, gagging, and a chemical pneumonitis with pulmonary edema and hemorrhage.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes. Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following. Chronic poisoning may occur from vapor inhalation or skin absorption. The most significant toxic effect is insidious and irreversible injury to the blood-forming tissue by benzene. Leukemia may develop. Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes. Gasoline "sniffing" has caused severe nerve damage. Repeated or prolonged exposure to mixed hydrocarbons may produce narcosis with dizziness, weakness, irritability, concentration and/or memory loss, tremor in the fingers and tongue, vertigo, olfactory disorders, constriction of visual field, paresthesias of the extremities, weight loss and anemia and degenerative changes in the liver and kidney. Chronic exposure by petroleum workers to the lighter hydrocarbons has been associated with visual disturbances, damage to the central nervous system, peripheral neuropathies (including numbness and paresthesias), psychological and neurophysiological deficits, bone marrow toxicities (including hypoplasia, possibly due to benzene) and hepatic and renal involvement. Chronic dermal exposure to petroleum hydrocarbons may result in defatting which produces localized dermatoses. Surface cracking and erosion may also increase susceptibility to infection by microorganisms.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital, or doctor.

See DOT ERG

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available). Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short term repeated exposures to petroleum distillates or related hydrocarbons:

1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

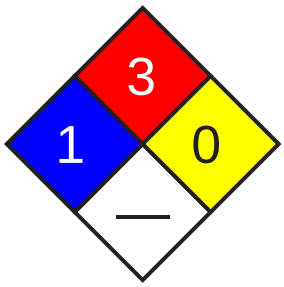
Section 5 - Fire-Fighting Measures

Flash Point: -43 °C
Autoignition Temperature: 280 °C
LEL: 1.4% v/v
UEL: 7.6% v/v

See DOT ERG

Extinguishing Media: Foam. Dry chemical powder.
Bromochlorodifluoromethane (BCF) (where regulations permit). Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidizers. Vapor forms an explosive mixture with air. Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition. Heating may cause expansion/decomposition with violent rupture of containers. On combustion, may emit toxic fumes of carbon monoxide (CO).



Fire Diamond

Fire Incompatibility: Avoid contamination with oxidizing agents, i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc., as ignition may result.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. If safe, switch off electrical equipment until vapour fire hazard removed. Use water delivered as a fine spray to control fire and cool adjacent area. Avoid spraying water onto liquid pools. Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately. Avoid breathing vapors and contact with skin and eyes. Control personal contact by using protective equipment. Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

See DOT ERG

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. No smoking, naked lights or ignition sources. Increase ventilation. Stop leak if safe to do so.
Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite. Use only

spark-free shovels and explosion proof equipment. Collect recoverable product into labeled containers for recycling. Absorb remaining product with sand, earth or vermiculite. Collect solid residues and seal in labelled drums for disposal. Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked. Avoid smoking, bare lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke. Vapor may ignite on pumping or pouring due to static electricity. DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling. Avoid contact with incompatible materials. Keep containers securely sealed. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can, metal drum. Packing as recommended by manufacturer. Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. If inhalation risk of overexposure exists, wear a NIOSH approved organic-vapor respirator. Correct respirator fit is essential to obtain adequate protection. In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream with polyethylene gloves or PVC gloves. Safety footwear. Do NOT use this product to clean the skin.

Respiratory Protection:

Exposure Range >300 to 1000 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >1000 to 15,000 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >15,000 to 300,000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >300,000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black

Other: Overalls. Ensure that there is ready access to eye wash unit. Ensure there is ready access to an emergency shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple, highly flammable, volatile liquid with characteristic sharp odor. Floats on water. Consists of a complex mixture of hydrocarbons with small amounts of residual benzene from the refining operations.

Physical State: Liquid
Odor Threshold: 0.005 ppm
Vapor Pressure (kPa): 53.33 at 20 °C
Vapor Density (Air=1): > 2
Formula Weight: Not applicable.
Specific Gravity (H_2O=1, at 4 °C): 0.72-0.735 at 15 °C
Evaporation Rate: Fast
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 38.89 °C (102 °F)
Freezing/Melting Point: Not available
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not available.
Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of incompatible materials. Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 18800 mg/kg

Irritation
Skin (rabbit): 500 mg/24h mild

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
Biochemical Oxygen Demand (BOD): 8%, 5 days

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible. Follow all applicable federal, state, and local laws. Incinerate residue at an approved site. Recycle containers where possible, or dispose of in an authorized landfil.
BEWARE: Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned, the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Gasoline
ID: UN1203
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: 139, B33, B101, T8
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: n-Hexane **CAS Number:** 110-54-3
Chemical Formula: C_6H_{14}
Structural Chemical Formula: $H_3C(CH_2)_4CH_3$
EINECS Number: 203-777-6
ACX Number: X1001498-5
Synonyms: DIPROPYL; ESANI; GETTYSOLVE-B; HEKSAN; HEXANE; N-HEXANE; N-HEXANE; HEXANEN; HEXYL HYDRIDE; NORMAL HEXANE; NORMAL-HEXANE; SKELLYSOLVE-B; SKELLYSOLVE B
General Use: An incidental component of many aliphatic solvent mixes used as lacquer, paint and enamel thinners, also in ink reducers and cleaning solvents.
Also used for solvent extraction of oil seeds and in pesticide residue analysis and gas chromatography.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
n-hexane	110-54-3	> 95

OSHA PEL
TWA: 500 ppm; 1800 mg/m^3.

NIOSH REL
TWA: 50 ppm (180 mg/m^3).

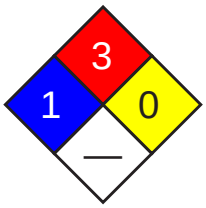
DFG (Germany) MAK
TWA: 50 ppm; PEAK: 400 ppm.

ACGIH TLV
TWA: 50 ppm; skin.

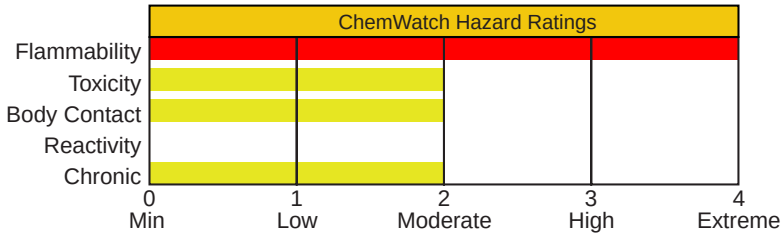
IDLH Level
1100 ppm (10% LEL).

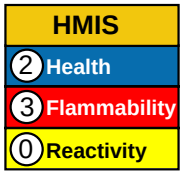
EU OEL
TWA: 72 mg/m^3 (20 ppm).

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, volatile liquid; sweet/gasoline odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, fatigue, muscle weakness, hallucinations. Chronic Effects: muscle weakness, motor loss, sensory disturbances. Flammable.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, central nervous system (CNS), peripheral nervous system
Primary Entry Routes: inhalation, skin contact/absorption, eyes, ingestion
Acute Effects

Inhalation: The vapor is discomforting and harmful to the upper respiratory tract.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is irritating to the eyes and may cause smarting, painand redness.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis.
Toxic effects may result from skin absorption.

Ingestion: The liquid is highly discomforting and harmful if swallowed.
Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.
Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic inhalation or skin exposure to n-hexane may cause peripheral neuropathy, which is damage to nerve ends in extremities, e.g. fingers, with loss of sensation and characteristic thickening. Nerve damage has been documented with chronic exposures of greater than 500 ppm.
Improvement in condition does not immediately follow removal from exposure and symptoms may progress for two or three months. Recovery may take a year or more depending on severity of exposure, and may not always be complete.
Exposure to n-hexane with methyl ethyl ketone (MEK) will accelerate the appearance of damage, but MEK alone will not cause the nerve damage.
Other isomers of hexane do not cause nerve damage.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

See DOT ERG

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Following acute or short-term repeated exposures to n-hexane:
1.Large quantities of n-hexane are expired by the lungs after vapor exposure (50-60%). Humans exposed to 100 ppm demonstrate an n-hexane biological half life of 2 hours.
2. Initial attention should be directed towards evaluation and support of respiration. Cardiac dysrhythmias are a potential complication.
INGESTION:
1.Ipecac syrup should be considered for ingestion of pure hexane exceeding 2-3 mL/kg. Extreme caution must be taken to avoid aspiration since small amounts of n-hexane intratracheally, produce a severe chemical pneumonitis
BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

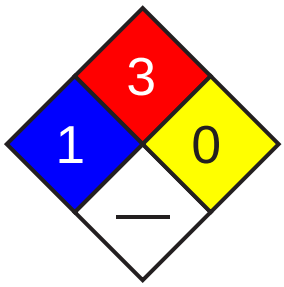
Determinant	Index	Sampling Time	Comments
2,5-hexanedione in urine	5 mg/gm creatinine	End of shift	NS
n-Hexane in end-exhaled air			SQ

NS: Non-specific determinant; Metabolite observed following exposure to other materials.
SQ: Semi-quantitative determinant; Interpretation may be ambiguous - should be used as a screening test or confirmatory test.

Section 5 - Fire-Fighting Measures

Flash Point: -22 °C
Autoignition Temperature: 225 °C
LEL: 1.1% v/v
UEL: 7.5% v/v
Extinguishing Media: Dry chemical powder. Foam.
Carbon dioxide.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO). May emit clouds of acrid smoke.
Fire Incompatibility: Avoid reaction with oxidizing agents.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protective location.
If safe to do so, remove containers from path of fire.

See DOT ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Pollutant - clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so.
Water spray or fog may be used to disperse/absorb vapor.
Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable products into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

See DOT ERG

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.

Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Avoid concurrent exposure to materials containing Methyl Ethyl Ketone MEK

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in specific circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Polyethylene gloves. Wear chemical protective gloves, eg. PVC.
Wear safety footwear.
Do NOT use this product to clean the skin.

Respiratory Protection:
Exposure Range >500 to <1100 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask
Exposure Range 1100 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Note: poor warning properties

Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.

Glove Selection Index:

PE/EVAL/PE	Best selection
PVA	Best selection
SARANEX-23 2-PLY	Best selection
VITON	Best selection
VITON/CHLOROBUTYL	Best selection
TEFLON	Satisfactory; may degrade after 4 hours continuous immersion
NITRILE	Satisfactory; may degrade after 4 hours continuous immersion
NEOPRENE	Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL	Poor to dangerous choice for other than short-term immersion
NITRILE+PVC	Poor to dangerous choice for other than short-term immersion
PVC	Poor to dangerous choice for other than short-term immersion
BUTYL	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid with typical paraffinic odor; floats on water. Mixes with most other organic solvents, chloroform, ether, alcohol. A very volatile liquid, it readily forms explosive vapor /air mixes.

Physical State: Liquid
Odor Threshold: 0.076 ppm
Vapor Pressure (kPa): 13.33
Vapor Density (Air=1): 2.97
Formula Weight: 86.17
Specific Gravity (H_2O=1, at 4 °C): 0.6603 at 20 °C
pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point: 68.89 °C (156 °F)
Freezing/Melting Point: -100 °C (-148 °F) to -95 °C (-139 °F)
Volatile Component (% Vol): 100
Water Solubility: 0.002% by weight

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and ignition source. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 28710 mg/kg
Inhalation (human) TC_{Lo}: 190 ppm/8W
Inhalation (rat) LD_{50}: 48000 ppm/4h

Irritation
Eye (rabbit): 10 mg - mild

See *RTECS* MN9275000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Photolysis, hydrolysis or bioconcentration are not expected to be an important environmental fate processes. Biodegradation may occur in soil and water; however, volatilization and adsorption are expected to be far more important fate processes. A K_{oc} range of 1250 to 4100 indicates a low to slight mobility class in soil. In aquatic systems it may partition from the water column to organic matter contained in sediments and suspended materials. A Henry's Law constant of 1.81 atm-cu m/mole at 25 °C suggests rapid volatilization from environmental waters. The volatilization half-lives from a model river and a model pond, the latter considers the effect of adsorption, have been estimated to be 2.7 hr and 6.8 days, respectively. It is expected to exist entirely in the vapor-phase in ambient air. Reactions with photochemically produced hydroxyl radicals in the atmosphere have been shown to be important (average estimated half-life of 2.9 days). Data also suggests that nighttime reactions with nitrate radicals may contribute to atmospheric transformation, especially in urban environments.
Ecotoxicity: No data found.
Henry's Law Constant: calculated at 1.81
BCF: estimated at 2.24 to 2.89
Biochemical Oxygen Demand (BOD): theoretical 0%, 7 days
Octanol/Water Partition Coefficient: log K_{ow} = 4.11
Soil Sorption Partition Coefficient: K_{oc} = estimated at 1250 to 4100

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Hexanes
ID: UN1208
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: IB2, T4, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Isobutene
CAS Number: 115-11-7
Chemical Formula: C_4H_8
Structural Chemical Formula: $(CH_3)_2C=CH_2$
EINECS Number: 204-066-3
ACX Number: X1003822-9
Synonyms: Isobutene; ISOBUTYLENE; ASYM-DIMETHYLETHYLENE; GAMMA-BUTYLENE; 1,1-DIMETHYLETHYLENE; ISO-BUTENE; ISOBUTENE; ISOPROPYLIDENEMETHYLENE; LIQUEFIED PETROLEUM GAS; 2-METHYL-1-PROPENE; 2-METHYLPROPENE; 2-METHYLPROPYLENE; 1-PROPENE,2-METHYL-; PROPENE,2-METHYL-; UNSYM. DIMETHYLETHYLENE
General Use: Production of butene polymers used as adhesives, tackifiers, oil additives.
Butyl rubbers, copolymer resins with butadiene, acrylates and methacrylates.
Also to produce anti-oxidants for foods, food supplements, plastics and in production of isooctane and high-octane aviation gasoline.
Used in closed pressurized systems, fitted with safety relief valve.
Vented gas is flammable, denser than air and will spread. Vent path must not contain ignition sources, pilot lights, bare flames.

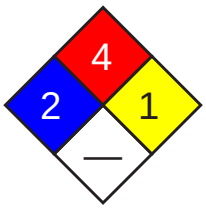
Section 2 - Composition / Information on Ingredients

Name	CAS	%
isobutene	115-11-7	>99

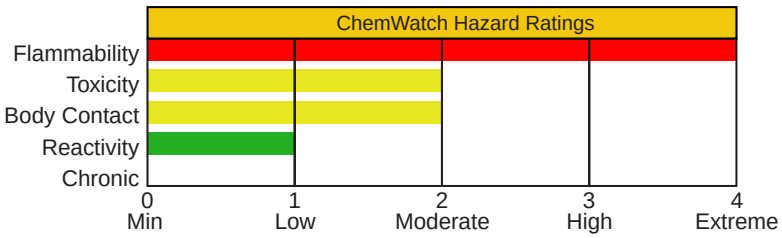
OSHA PEL **NIOSH REL**

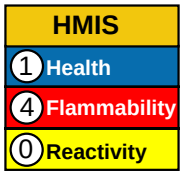
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word

Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas. Acute Effects: Simple asphyxiant which can displace available oxygen; initial symptoms: rapid respiration, air hunger, diminished mental alertness, impaired muscular coordination. Can form explosive mixtures in air. Flammable.

Potential Health Effects

Target Organs: None reported
Primary Entry Routes: inhalation
Acute Effects
Inhalation: The gas is a simple asphyxiant (precludes access to oxygen) and is harmful if exposure is prolonged and inhalation may cause loss of consciousness.

Acute effects from inhalation of high concentrations of gas / vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated atmosphere of gas is prolonged this may lead to narcosis, unconsciousness, even coma, and unless resuscitated, death.
Iso-butene is a simple asphyxiant and may have a narcotic action.
Material is highly volatile and may quickly form concentrated atmosphere in confined or unventilated area. Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.
Hydrocarbons may sensitize the heart to adrenalin and other circulatory catecholamines; as a result cardiac arrhythmias and ventricular fibrillation may occur. Abrupt collapse may produce traumatic injury.
Central nervous system (CNS) depression may be evident early. Symptoms of moderate poisoning may include giddiness, headache, dizziness and nausea.
Serious poisonings may result in respiratory depression and may be fatal.
The paraffin gases C1-4 are practically non-toxic below their lower flammability limits (18000-50000 ppm). Above this level, incidental effects include CNS depression and irritation but these are reversible upon cessation of the exposure. The C3 and iso-C5 hydrocarbons show increasing narcotic properties; branching of the chain also enhances the effect.
The C4 hydrocarbons appear to be more highly neurotoxic than the C3 and C5 members. Several fatalities due to voluntary inhalation of butane have been reported, possibly due to central, respiratory and circulatory effects resulting from anesthesia, laryngeal edema, chemical pneumonia or the combined effects of cardiac toxicity and increased sympathomimetic effects.
Inhalation of petroleum gases may produce narcosis, due in part to olefinic impurities. Displacement of oxygen in the air may cyanosis.
If present in sufficient quantity these gases may reduce the oxygen level to below 18% producing asphyxiation.
Symptoms include rapid respiration, mental dullness, lack of coordination, poor judgement, nausea and vomiting.
The onset of cyanosis may lead to unconsciousness and death.

Eye: The liquid is highly discomforting and may cause severe cold burns and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The gas is regarded as non-irritating to the eyes.

Skin: Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.The liquid is discomforting to the skin and may rapidly cause severe cold burns.
Bare unprotected skin should not be exposed to this material.
There is no evidence of skin absorption but contact may cause frostbite,

Ingestion: Overexposure is unlikely in this form.
Considered an unlikely route of entry in commercial/industrial environments.
The liquid is highly discomforting if swallowed and may cause severe cold burns.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic overexposure may produce dermatitis.

Section 4 - First Aid Measures

Inhalation: Avoid becoming a casualty and remove to fresh air.
Lay patient down. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation.
If available, medical oxygen should be administered by trained personnel.
Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.
Do not apply hot water or radiant heat. Apply a clean, dry dressing.
Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. DO NOT induce vomiting. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink. Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

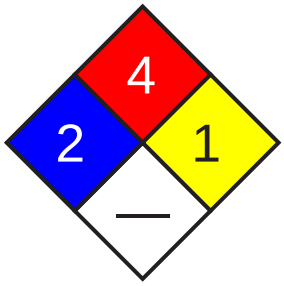
Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:
1.Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.

2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: -76.111 °C
Autoignition Temperature: 465 °C
LEL: 1.8% v/v
UEL: 9.6% v/v
Extinguishing Media: Water spray or fog; dry chemical powder.
Carbon dioxide.
Foam.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Flammable gas. Liquid and vapor are highly flammable.
Dangerous hazard when exposed to heat, flame and oxidizers.
Gas may form explosive mixtures with air over a wide area.
Decomposes on heating and produces toxic fumes of carbon monoxide (CO) and carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Do not extinguish burning gas. If safe to do so, stop flow of gas.
If flow of gas cannot be stopped, leave gas to burn.
Cool fire-exposed containers with water spray from a protected location.
Do not approach cylinders suspected to be hot.
If safe to do so, remove containers from path of fire.
Fight fire from a safe distance, with adequate cover.

Section 6 - Accidental Release Measures

Small Spills: Avoid breathing vapor and any contact with liquid or gas. Protective equipment including respirator should be used. Do NOT enter confined spaces where gas may have accumulated. Shut of all sources of possible ignition and increase ventilation. Clear area of personnel. Stop leak only if safe to so do. Remove leaking cylinders to safe place. Release pressure under safe controlled conditions by opening valve. Keep area clear of personnel until gas has dispersed.

See DOT ERG

Large Spills: DO NOT touch the spill material. Shut off all possible sources of ignition and increase ventilation.
Restrict access to area. Clear area of personnel and move upwind.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Avoid spraying water onto liquid pools.
Use extreme caution to avoid a violent reaction.
Stop leak if safe to do so.
DO NOT enter confined places where gas may have collected. Remove leaking cylinders to a safe place. Fit vent pipes. Release pressure under safe, controlled conditions by opening valve. Burn issuing gas at vent pipes.
Do not exert excessive pressure on valve; do not attempt to operate damaged valve.
Keep area clear of personnel until gas has dispersed
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices. Use in a well-ventilated area.

Obtain a work permit before attempting any repairs.
Do not attempt repair work on lines, vessels under pressure.
Atmospheres must be tested and O.K. before work resumes after leakage.
Wear protective clothing and gloves when handling containers.
No smoking, bare lights, heat or ignition sources.
Use spark-free tools when handling. Ground all lines and equipment.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
Gas may travel a considerable distance to source of ignition.
Vapor may ignite on pumping or pouring due to static electricity.
Avoid physical damage to containers.
DO NOT transfer gas from one cylinder to another.
Natural gases contain a contaminant, radon-222, a naturally occurring radioactive gas. During subsequent processing, radon tends to concentrate in liquified petroleum streams and in product streams having similar boiling points.
Industry experience indicates that the commercial product may contain small amounts of radon-222 and its radioactive decay products (radon daughters). The actual concentration of radon-222 and radioactive daughters in process equipment (IE lines, filters, pumps and reactor units) may reach significant levels and produce potentially damaging levels of gamma radiation. A potential external radiation hazard exists at or near any pipe, valve or vessel containing a radon enriched stream or containing internal deposits of radioactive material. Field studies, however, have not shown that conditions exist that expose the worker to cumulative exposures in excess of general population limits. Equipment containing gamma-emitting decay products should be presumed to be internally contaminated with alpha- emitting decay products which may be hazardous if inhaled or ingested.
During maintenance operations that require the opening of contaminated process equipment, the flow of gas should be stopped and a four hour delay enforced to allow gamma-radiation to drop to background levels. Protective equipment (including high efficiency particulate respirators (P3) suitable for radionucleotides or supplied air) should be worn by personnel entering a vessel or working on contaminated process equipment to prevent skin contamination or inhalation of any residue containing alpha-radiation.
Airborne contamination may be minimized by handling scale and/or contaminated materials in a wet state.

Recommended Storage Methods: Packaging as recommended by manufacturer.
Check that containers are clearly labeled.
Cylinder fitted with valve protector cap.
Ensure the use of equipment rated for cylinder pressure.
Ensure the use of compatible materials of construction.
Cylinder valve must be closed when not in use or when empty.
Cylinder must be properly secured either in use or in storage.
WARNING: Suckback into cylinder may result in rupture.
Use back-flow preventive device in piping.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated areaIf gas concentrations are high: or If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Used in closed pressurized systems; fitted with temperature and pressure safety relief valves which are vented to allow safe dispersal.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Protective gloves eg. leather gloves or gloves with leather facing. Neoprene rubber gloves.
Safety footwear.

Other: Operators should be trained in correct use & maintenance of respirators Ensure that there is ready access to breathing apparatus.
Protective overalls, closely fitted at neck and wrist. Eye-wash unit.
IN CONFINED SPACES:
1. Non-sparking protective boots.
2. Static-free clothing.
3. Ensure availability of lifeline.
Staff should be trained in all aspects of rescue work.
Ensure there is ready access to an emergency shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Easily liquified flammable gas or colorless highly volatile liquid. Packed as liquid under pressure and remains liquid only under pressure. Sudden release of pressure or leakage may result in rapid vaporization with generation of large volume of highly flammable / explosive gas. Strong gasoline odor. Floats and boils on water giving a flammable / explosive, visible cloud. Soluble in alcohol, ether, benzene and sulphuric acid.

Physical State: Liquefied gas
Odor Threshold: 1.3 to 3.0 mg/m^3
Vapor Pressure (kPa): 182 kPa at 10 °C
Vapor Density (Air=1): 2.01
Formula Weight: 56.11
Specific Gravity (H_2O=1, at 4 °C): 0.59
Evaporation Rate: Very rapid
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: -6.9 °C (20 °F)
Freezing/Melting Point: -140.35 °C (-220.63 °F)
Volatile Component (% Vol): 100
Water Solubility: Practically insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid contact with oxidizing agents.

The interaction of alkenes and alkynes with nitrogen oxides and oxygen may produce explosive addition products; these may form at very low temperatures and explode on heating to higher temperatures (the addition products from 1,3-butadiene and cyclopentadiene form rapidly at -150 °C and ignite or explode on warming to -35 to -15 C). These derivatives ("pseudo- nitrosites") were formerly used to characterize terpene hydrocarbons.

Exposure to air must be kept to a minimum so as to limit the build-up of peroxides which will concentrate in bottoms if the product is distilled.

The product must not be distilled to dryness if the peroxide concentration is substantially above 10 ppm (as active oxygen) since explosive decomposition may occur. Distillate must be immediately inhibited to prevent peroxide formation. The effectiveness of the antioxidant is limited once the peroxide levels exceed 10 ppm as active oxygen. Addition of more inhibitor at this point is generally ineffective.

Prior to distillation it is recommended that the product should be washed with aqueous ferrous ammonium sulfate to destroy peroxides; the washed product should be immediately re-inhibited.

A range of exothermic decomposition energies for double bonds is given as 40-90 kJ/mol. The relationship between energy of decomposition and processing hazards has been the subject of discussion; it is suggested that values of energy released per unit of mass, rather than on a molar basis (J/g) be used in the assessment. For example, in "open vessel processes" (with man-hole size openings, in an industrial setting), substances with exothermic decomposition energies below 500 J/g are unlikely to present a danger, whilst those in "closed vessel processes" (opening is a safety valve or bursting disk) present some danger where the decomposition energy exceeds 150 J/g.

Avoid reactions with oxidizing agents, organic acids, inorganic acids halogenated compounds, polymerizable esters, oxygen, cyanohydrins and molten sulphur.

Section 11 - Toxicological Information

Toxicity
Inhalation (rat) LC_{50}: 620000 mg/m^3/4h

Irritation
Nil reported

See *RTECS* UD 0890000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
BCF: no food chain concentration potential
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options.
Discharge to burning flare. Return empty cylinders to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Isobutylene *see also* Petroleum gases, liquefied
ID: UN1055
Hazard Class: 2.1 - Flammable gas
Packing Group:
Symbols:
Label Codes: 2.1 - Flammable Gas
Special Provisions: 19, T50
Packaging: **Exceptions:** 306 **Non-bulk:** 304 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** E **Other:** 40

Shipping Name and Description: Petroleum gases, liquefied *or* Liquefied petroleum gas
ID: UN1075
Hazard Class: 2.1 - Flammable gas
Packing Group:
Symbols:
Label Codes: 2.1 - Flammable Gas
Special Provisions: T50
Packaging: **Exceptions:** 306 **Non-bulk:** 304 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Attachment C
Shipping Determinations

SHIPPING DETERMINATION FORM Revision 8c

Date:	8/8/2016
Project Name:	Lower Ley Creek Remediation
Project Number:	B0035101.0001
Supplemental Information:	None

1) Description of the Material to be Transported or Shipped

1a	Select a description category ===>	Samples
1b	*Polychlorinated biphenyls impacted soils or solids*	
1c		

☑ This material is mixed with water, soil or other inert material
☑ This material will be shipped on wet or blue ice
☐ This material will be shipped on dry ice

2) Classification and Identification

This material is: Not Restricted/Not Regulated
Do not complete section 2a or 2b below

Complete for Hazardous Materials ONLY:

2a UN/NA/ID# : | 2b PG: | Hazard Class: NA

Add UN or NA prior to the number | Subsidiary Hazard Class: NA NA

PSN: NA

Add the word "mixture" or "solution" in cell above if not already included in the PSN.

☐ See Sect. 7

2c This material is a: No additional criteria applies to this material

3) Packaging, Exceptions and Shipping Information

This material will be shipped (mode of transport and type of shipment):

3a Air as a non-restricted consignment

If using an exception/exemption, list the exception/exemption below

3b None

Carrier/Transporter information:

3c FedEx Express (Air)

Consider entering your desired bottle set in section 3f prior to completing 3a-3c to see if exceptions can be used.

Auth. Air Limits for EQ, LQ and Fully Reg. Shipments and Selected Ground LQ and SQE:

Inner Container Limit (NA- Not Applicable; F- Forbidden; mg, g, or kg for solids; ml or L for liquids):

Glass	NA	NA	Plastic Bag	NA	NA
Metal	NA	NA	Paper Bag	NA	NA
Plastic	NA	NA	Fibre	NA	NA

Outer package Limit:	NA	NA

Air Shipping Specification Package Requirements (NA-Not Available or Not Applicable):

Combination Packages					
Drums:	Steel	Aluminum	Plywood	Fibre	Plastic
	NA	NA	NA	NA	NA
Jerricans:	Steel	Aluminum	Plastic		
	NA	NA	NA		
Boxes:	Steel	Aluminum	Plywood	Fibreboard	Plastic
	NA	NA	NA	NA	NA
Single Packages					
Drums:	Steel	Aluminum	Fibre	Wood	Plastic
	NA	NA	NA	NA	NA
Jerricans:	Steel	Aluminum	Plastic		
	NA	NA	NA		
Boxes:	Steel	Aluminum	Plywood	Fibreboard	Plastic
	NA	NA	NA	NA	NA
Bags:	Textile	Plastic	Paper		
	NA	NA	NA		

Specification packages are not required.

Complete 3d-3f for all Shipments HazMat and Not Regulated/Not Restricted:

3d	Packaging Type:	Combination Package - Non-Bulk				
3e	Inner Container Category:	Glass receptacles				
3f	Inner Container Specific/Pkg:	Container type		Net Qty. Each Container		
	≤# of Single /Inners: 24	4 oz	Glass	4	oz	
	≤# of Single /Inners: 0	None	None		None	
	≤# of Single /Inners: 0	None	None		None	
	≤# of Single /Inners: 0	None	None		None	
	≤# of Single /Inners: 0	None	None		None	
	≤# of Single /Inners: 0	None	None		None	
3g	Intermediate Packaging:	Plastic bag/liner				
3h	Outer Packaging:	Non-specification box- plastic (sample cooler)				
3i	Other:	None				

- ☑ Arcadis Shipping Guide US-001 attached
- ☐ Specific package closure instructions are attached
- ☐ Arcadis Shipping Guide or HSSP is available for this shipment: NA

4) Marks and Labels

- ☐ PSN, ID # (ID # -12 mm text height required)
- ☐ To/From Address (10 pt. font, Arial)
- ☐ Hazard Class Label(s) :
- ☐ Cargo Aircraft Only Label
- ☐ Orientation Arrows (2 req.)
- ☐ LTD QTY (Ground - no "Y")
- ☐ LTD QTY (Air -"Y")
- ☐ Excepted Quantity
- ☐ Small Quantity Exception by Hwy/Rail
- ☐ OVERPACK (12mm text height required)
- ☐ Dry Ice Class 9 Label
- ☐ Scientific Research Specimen
- ☐ Inside packages meet prescribed spec.
- ☐ RQ (place before PSN on package)
- ☐ Radioactive Matateriał, Exc Package
- ☐ Other: _____

Checked marks and labels are usually required - consult applicable regulation for actual marks/labels required.

5) Documentation

- ☑ No special documentation required
- ☐ Requires a Shipper's Declaration (air) prepared using : None
- ☐ Requires HazMat ground shipping papers prepared using: None
- ☐ Requires a Bill of Lading or Manifest (>MOT, Freight,Trucking Co., Waste Hauler, etc.)
- ☐ Requires Special Permit DOT-SP # _____
- ☐ Other: _____

6) Emergency Response

☐ Use ChemTel 24/7 Emergency Phone and Contract Number
or approved equivalent (authorized client or vendor) for this shipment:
1-800-255-3924 (ChemTel #MIS0007883 Register this shipment with ChemTel:
Have carrier tracking number available. http://Arcadis.chemtel.net/

☐ Ensure current edition of North American Emergency Response Guidebook in vehicle (Arcadis Transport requiring a shipping paper)

7) Special Instructions (Specify any "See Section 7" details in cell B124)

7a	

8) References and Rationale for the Determination (add additonal sheets, if requried):

NA

ICAO/IATA Special Provisions:

Sample media is PCB impacted sediment and soil. Historic samples have exhibited concentrations above 50 parts per million (ppm) (maximum concentrations were seen above 80ppm). It is anticipated that most concentrations will be below 50ppm.

☐ See attached for rationale (IF CHECKED, DETERMINATION IS VOID IF RATIONALE NOT ATTACHED)

9) Signatures

Determination performed by: Nicholas Beyrle
Phone (XXX-XXX-XXXX): 585.662.4044

Determination QA/QC performed by: _____

QUICK VIEW SHIPPING DETERMINATION FORM Revision 8

For Use by Field Staff

Date:	8/8/2016
Project Name:	Lower Ley Creek Remediation
Project Number:	B0035101.0001

The material you will be shipping includes the following:
Polychlorinated biphenyls impacted soils or solids

If this is not what you are shipping or if you need help, contact Nicholas Beyrle at 585.662.4044 for assistance and guidance.

The material in your shipment has been classified as a: Not Restricted/Not Regulated

This material has been identified as:

PROPER SHIPPING NAME (including applicable modifiers and technical names):

An ID Number, Proper Shipping Name, Hazard Class, and Packing Group are not required for this shipment.

ID NUMBER: **0** Hazard Class NA (NA) Packing Group 0

[ ] The above information in RED is required on the outer package of your shipment as illustrated in the picture

[X] Follow Shipping Guide US-001 to prepare this shipment [ ] Follow Shipping Guide US-015 for dry ice

[ ] Refer to the referenced HSSP to right for more information: NA

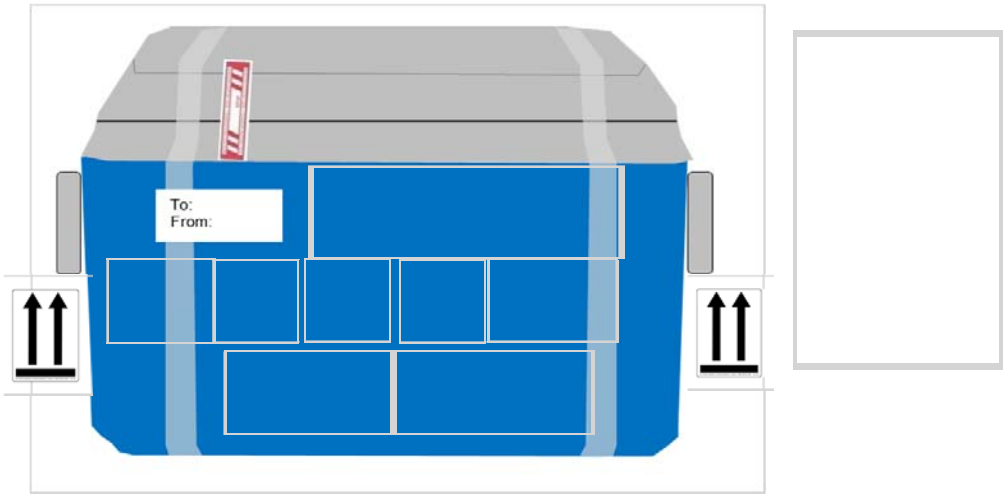
Package preparation configuration per package shipped (not to exceed):

Inner container sizes and quantity:

# of containers	Size	Type	Net Qty Each
24	4 oz	Glass	4 oz
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None

Intermediate packaging:	Plastic bag/liner
Outer packaging:	Non-specification box- plastic (sample cooler)

Place marks and labels on same side of package, except orientation arrows should be placed on each end of package.



If you do not have all of the marks or labels shown above. DO NOT GIVE THE PACKAGE TO FEDEX or UPS. Orientation arrows may be red colored. If required, contact the individual listed above for assistance.

[ ] Your supervisor (PM, TM, or Field supervisor) must register this shipment with ChemTel (the Arcadis 24 hour emergency phone number provider).

You must offer this shipment to: FedEx Express (Air)

ARCADIS SHIPPING GUIDE NO. US-001

Environmental Sample Cooler Preparation
for Hazardous Materials Shipping
Do Not Use After 12/31/2016

1.0 Overview

This shipping guide provides guidance on the required shipping/transporting configuration for this material per U.S. Department of Transportation (DOT) and the International Air Transport Association (IATA) requirements. This guide **does not exempt** the user from the obligation of performing a proper Shipping Determination for the actual material to be shipped. This guide is subject to the limitations of Section 5.0 below.

2.0 Important Arcadis Prohibitions

Unless otherwise permitted by another Shipping Guide, HazMat Shipping Support Package (HSSP) or as permitted in the project Shipping Determination, ice chests used for hazardous material shipments **must not contain drain plugs** (solid plastic ice chests must be used).

ARCADIS prohibits the use of Igloo® Playmate® type ice chests for hazardous material shipments.

3.0 Preparation of Solid Materials for Shipment

Once collected, soil/solid samples should be promptly placed in a sample cooler on ice for preservation. The following general procedure is applicable to cooler preparation:

1. Select a sample cooler of suitable size for the number of samples to be shipped. In general, sample coolers should not exceed 52 quart capacity to reduce lifting hazards. Sample coolers will be new or clean and should be in good condition (manufacturer supplied handles/lid hinges intact, and no cracks or other impairments that might affect cooler integrity). Samples with large containers (16 oz. soil jars, etc) should be placed in coolers with a nominal capacity of 48 quarts.
2. Line the cooler with a large heavy duty plastic bag.
3. Place absorbent material in the bottom of the plastic bag (usually arrives in the cooler from the analytical laboratory). If not provided or the cooler is new, use vermiculite (approximately 2 inches) or other suitable absorbent. *Absorbent used must be compatible with the sample material, in sufficient quantity to absorb the entire contents of the inner packaging and of a type consistent with project data quality objectives.*
4. Place the soil containers (**with lids taped or secured by other secondary method**) into bubble wrap bags and secure.
5. Group and place soil sample sets **into self-sealing plastic bags**.
6. Place bagged soil sample containers in cooler and **make sure all bottles are in an upright position**.
7. Use blue ice or bag wet ice in self-sealing plastic bags.
8. Place ice on top of sample containers (fill remaining annulus of cooler with as much as possible).
9. Seal bag encompassing the sample containers and ice.
10. Place layer of bubble wrap over bag, if necessary.
11. Place Chain- of- Custody in self sealing plastic bag and secure to lid of cooler with tape.

12. Close and seal cooler with Chain-of-Custody Seals.
13. Tape lid of cooler shut by wrapping strapping tape completely around the cooler and over the Chain-of-Custody Seals.
14. Tape the drain plug, if permitted to be present, of the cooler with duct tape or strapping tape. DO NOT TAPE THE DRAIN PLUG SHUT IF THE COOLER CONTAINS DRY ICE.
15. Affix laboratory name and address label and other labels and marking as required by the applicable shipping guide to the outside of the cooler.
16. Complete air waybill and other shipping papers as required by the Shipping Determination.
17. Offer cooler for shipment.

4.0 Preparation of Liquid Materials for Shipment

Once collected, water samples should be promptly placed in a sample cooler on ice for preservation. The following general procedure is applicable to cooler preparation:

1. Select a sample cooler of suitable size for the number of samples to be shipped. In general, sample coolers should not exceed 52 quart capacity to reduce lifting hazards while maintaining sufficient space for adequate ice placement. Sample coolers will be new or clean and should be in good condition (manufacturer supplied handles/lid hinges intact, and no cracks or other impairments that might affect cooler integrity). Samples with large containers (1L glass, etc.) should be placed in coolers with a nominal capacity of 48 quarts.

2. Line the cooler with a large heavy duty plastic bag.
3. Place absorbent material in the bottom of the plastic bag (usually arrives in the cooler from the analytical laboratory). If not provided or the cooler is new, use vermiculite (approximately 2 inches) or other suitable absorbent. *Absorbent used must be compatible with the sample material, in sufficient quantity to absorb the entire contents of the inner packaging and of a type consistent with project data quality objectives.*
4. Place water containers (**with lids taped or secured by other secondary method)** into bubble wrap bags or wrap in bubble wrap and secure. If VOCs are collected, up to three 40 ml vials may be placed into a single bubble wrap bag. Large glass containers like 1L glass bottles to be double bubble wrapped/bagged for added protection. Sturdy plastic or metal containers do not need to be bubble wrapped.
5. Group and place water sample sets **into self-sealing plastic bags**. Since water sample sets may be large, a sample set may be grouped into several bags. Avoid mixing sample containers from different sample locations into the same bag to reduce potential for cross contamination.
6. Place water sample containers in cooler. **Keep all bottles in upright position**.
7. Use blue ice or bag wet ice in self-sealing plastic bags.
8. Place ice on top of sample containers (fill remaining annulus of cooler with as much as possible).
9. Seal large bag encompassing the sample containers and ice.
10. Place layer of bubble wrap over bag, if necessary.
11. Place Chain- of- Custody in self sealing plastic bag and secure to lid of
12. Close and seal cooler with Chain-of-Custody Seals.
13. Tape lid of cooler shut by wrapping strapping tape completely around the cooler and over the Chain-of-Custody Seals.
14. Tape the drain plug, if permitted to be present, of the cooler with duct tape or strapping tape. DO NOT TAPE THE DRAIN PLUG SHUT IF THE COOLER

CONTAINS DRY ICE.
15. Affix laboratory name and address label along with other required labels and markings as required by applicable shipping guide to the cooler.
16. Affix orientation (“UP”) arrows **on each end of the cooler**.
17. Complete air waybill and other shipping papers as required by the Shipping Determination.
18. Offer cooler for shipment.

5.0 Limitations

This shipping guide is limited to the following conditions:
1) Packaging described must be used, alternate packaging to be approved by ARCADIS Director of Transportation Safety or Transportation Safety Specialist.
2) Sample coolers should be less than or equal to 52 quart in size.
3) Sample cooler used must have good integrity, without any cracks or deformities, with manufacturer supplied handles and lid hinges in good
4) Specific packaging instructions may be presented in selected shipping guides and take precedence over requirements of this guide.
5) Employees preparing coolers for shipment are required to be trained in HazMat #1 or HazMat #12 training.

SHIPPING DETERMINATION FORM Revision 8c

Date:	8/8/2016
Project Name:	Lower Ley Creek Remediation
Project Number:	B0035101.0001
Supplemental Information:	None

1) Description of the Material to be Transported or Shipped

1a	Select a description category ===>	Samples
1b	*Polychlorinated biphenyls impacted soils or solids*	
1c		

☑ This material is mixed with water, soil or other inert material
☑ This material will be shipped on wet or blue ice
☐ This material will be shipped on dry ice

2) Classification and Identification

This material is: Hazardous Material
Complete section 2a and 2b below

Complete for Hazardous Materials ONLY:

2a	UN/NA/ID# :	UN3432	2b PG:	II	Hazard Class:	9
					Subsidiary Hazard Class:	NA / NA

PSN: Polychlorinated biphenyls, solid

Add the word "mixture" or "solution" in cell above if not already included in the PSN.

☐ See Sect. 7

2c This material is a: Hazardous Waste and a Hazardous Substance

3) Packaging, Exceptions and Shipping Information

This material will be shipped (mode of transport and type of shipment):

3a Air using an IATA/ICAO exception/limitation

If using an exception/exemption, list the exception/exemption below

3b IATA/ICAO - Excepted Quantity

Carrier/Transporter information:

3c FedEx Express (Air)

Consider entering your desired bottle set in section 3f prior to completing 3a-3c to see if exceptions can be used.

Auth. Air Limits for EQ, LQ and Fully Reg. Shipments and Selected Ground LQ and SQE:

Inner Container Limit (NA- Not Applicable; F- Forbidden; mg, g, or kg for solids; ml or L for liquids):

Glass	0.03	kg	Plastic Bag	NA	NA
Metal	0.03	kg	Paper Bag	NA	NA
Plastic	0.03	kg	Fibre	NA	NA

Outer package Limit: 0.5 kg

Air Shipping Specification Package Requirements (NA-Not Available or Not Applicable):

Combination Packages					
Drums:	Steel	Aluminum	Plywood	Fibre	Plastic
	NA	NA	NA	NA	NA
Jerricans:	Steel	Aluminum	Plastic		
	NA	NA	NA		
Boxes:	Steel	Aluminum	Plywood	Fibreboard	Plastic
	NA	NA	NA	NA	NA
Single Packages					
Drums:	Steel	Aluminum	Fibre	Wood	Plastic
	NA	NA	NA	NA	NA
Jerricans:	Steel	Aluminum	Plastic		
	NA	NA	NA		
Boxes:	Steel	Aluminum	Plywood	Fibreboard	Plastic
	NA	NA	NA	NA	NA
Bags:	Textile	Plastic	Paper		
	NA	NA	NA		

Specification packages are not required when using the selected exception or exemption.

Complete 3d-3f for all Shipments HazMat and Not Regulated/Not Restricted:

3d	Packaging Type:	Combination Package - Non-Bulk				
3e	Inner Container Category:	Glass receptacles				
3f	Inner Container Specific/Pkg:	Container type		Net Qty. Each Container		
	≤# of Single /Inners: 24	4 oz	Glass	4	oz	
	≤# of Single /Inners: 0	None	None		None	
	≤# of Single /Inners: 0	None	None		None	
	≤# of Single /Inners: 0	None	None		None	
	≤# of Single /Inners: 0	None	None		None	
	≤# of Single /Inners: 0	None	None		None	
3g	Intermediate Packaging:	Plastic bag/liner				
3h	Outer Packaging:	Non-specification box- plastic (sample cooler)				
3i	Other:	None				

- [x] Arcadis Shipping Guide US-001 attached
- [ ] Specific package closure instructions are attached
- [ ] Arcadis Shipping Guide or HSSP is available for this shipment: NA

4) Marks and Labels

- [ ] PSN, ID # (ID # -12 mm text height required)
- [x] To/From Address (10 pt. font, Arial)
- [ ] Hazard Class Label(s) :
- [ ] Cargo Aircraft Only Label
- [x] Orientation Arrows (2 req.)
- [ ] LTD QTY (Ground - no "Y")
- [ ] LTD QTY (Air -"Y")
- [x] Excepted Quantity
- [ ] Small Quantity Exception by Hwy/Rail
- [ ] OVERPACK (12mm text height required)
- [ ] Dry Ice Class 9 Label
- [ ] Scientific Research Specimen
- [ ] Inside packages meet prescribed spec.
- [x] RQ (place before PSN on package)
- [ ] Radioactive Matateriał, Exc Package
- [ ] Other: _____

Place all marks and labels checked in this section on same side of package (excludes orientation arrows).

5) Documentation

- [x] No special documentation required
- [ ] Requires a Shipper's Declaration (air) prepared using : None
- [ ] Requires HazMat ground shipping papers prepared using: None
- [ ] Requires a Bill of Lading or Manifest (>MOT, Freight,Trucking Co., Waste Hauler, etc.)
- [ ] Requires Special Permit DOT-SP # _____
- [ ] Other: _____

6) Emergency Response

☑ Use ChemTel 24/7 Emergency Phone and Contract Number
or approved equivalent (authorized client or vendor) for this shipment:
1-800-255-3924 (ChemTel #MIS0007883 Register this shipment with ChemTel:
Have carrier tracking number available. http://Arcadis.chemtel.net/

☐ Ensure current edition of North American Emergency Response Guidebook in vehicle (Arcadis Transport requiring a shipping paper)

7) Special Instructions (Specify any "See Section 7" details in cell B124)

	Gross package weight must not exceed 64 pounds. Add "RQ" to shipping paper and "waste" to PSN. FX-06 Polychlorinated Biphenyls (PCBs) offered under UN3432 requires liquids to be IP3 or IP3A metal inner packages with absorbent filling all open space. Solids can be in any inner package approved by packing instruction. Outer package must be a 1A2 steel drum, DOT-SP 8249, 9168 or 11248
7a	

8) References and Rationale for the Determination (add additonal sheets, if requried):

DOT 49 CFR 172.101, appendices A and B IATA section 2.6	NA
ICAO/IATA Special Provisions: A11	
Sample media is PCB impacted sediment and soil. Historic samples have exhibited concentrations above 50 parts per million (ppm) (concentrations were at least 80ppm). It is anticipated that most concentrations will be below 50ppm.	
☐ See attached for rationale (IF CHECKED, DETERMINATION IS VOID IF RATIONALE NOT ATTACHED)	

9) Signatures

Determination performed by: Nicholas Beyrle
Phone (XXX-XXX-XXXX): 585.662.4044

Determination QA/QC performed by: _____

QUICK VIEW SHIPPING DETERMINATION FORM Revision 8

For Use by Field Staff

Date:	8/8/2016
Project Name:	Lower Ley Creek Remediation
Project Number:	B0035101.0001

The material you will be shipping includes the following:
Polychlorinated biphenyls impacted soils or solids

If this is not what you are shipping or if you need help, contact Nicholas Beyrle at 585.662.4044 for assistance and guidance.

The material in your shipment has been classified as a: Hazardous Material

This material has been identified as:
PROPER SHIPPING NAME (including applicable modifiers and technical names):
Polychlorinated biphenyls, solid

ID NUMBER: **UN3432** Hazard Class 9 (NA) Packing Group II

[ ] The above information in RED is required on the outer package of your shipment as illustrated in the picture
[X] Follow Shipping Guide US-001 to prepare this shipment [ ] Follow Shipping Guide US-015 for dry ice
[ ] Refer to the referenced HSSP to right for more information: NA

Package preparation configuration per package shipped (not to exceed):

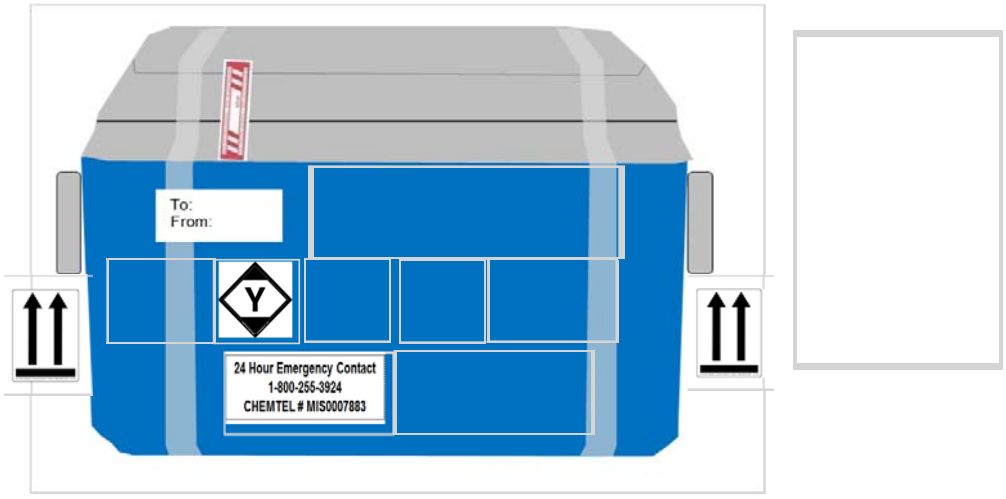
Inner container sizes and quantity:

# of containers	Size	Type	Net Qty Each
24	4 oz	Glass	4 oz
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None

Intermediate packaging:	Plastic bag/liner
Outer packaging:	Non-specification box- plastic (sample cooler)

Gross package weight must not exceed 64 pounds.

Place marks and labels on same side of package, except orientation arrows should be placed on each end of package.



If you do not have all of the marks or labels shown above. DO NOT GIVE THE PACKAGE TO FEDEX or UPS. Orientation arrows may be red colored. If required, contact the individual listed above for assistance.

[X] Your supervisor (PM, TM, or Field supervisor) must register this shipment with ChemTel (the Arcadis 24 hour emergency phone number provider).

You must offer this shipment to: FedEx Express (Air)

ARCADIS SHIPPING GUIDE NO. US-001

Environmental Sample Cooler Preparation
for Hazardous Materials Shipping
Do Not Use After 12/31/2016

1.0 Overview

This shipping guide provides guidance on the required shipping/transporting configuration for this material per U.S. Department of Transportation (DOT) and the International Air Transport Association (IATA) requirements. This guide **does not exempt** the user from the obligation of performing a proper Shipping Determination for the actual material to be shipped. This guide is subject to the limitations of Section 5.0 below.

2.0 Important Arcadis Prohibitions

Unless otherwise permitted by another Shipping Guide, HazMat Shipping Support Package (HSSP) or as permitted in the project Shipping Determination, ice chests used for hazardous material shipments **must not contain drain plugs** (solid plastic ice chests must be used).

ARCADIS prohibits the use of Igloo® Playmate® type ice chests for hazardous material shipments.

3.0 Preparation of Solid Materials for Shipment

Once collected, soil/solid samples should be promptly placed in a sample cooler on ice for preservation. The following general procedure is applicable to cooler preparation:

1. Select a sample cooler of suitable size for the number of samples to be shipped. In general, sample coolers should not exceed 52 quart capacity to reduce lifting hazards. Sample coolers will be new or clean and should be in good condition (manufacturer supplied handles/lid hinges intact, and no cracks or other impairments that might affect cooler integrity). Samples with large containers (16 oz. soil jars, etc) should be placed in coolers with a nominal capacity of 48 quarts.
2. Line the cooler with a large heavy duty plastic bag.
3. Place absorbent material in the bottom of the plastic bag (usually arrives in the cooler from the analytical laboratory). If not provided or the cooler is new, use vermiculite (approximately 2 inches) or other suitable absorbent. *Absorbent used must be compatible with the sample material, in sufficient quantity to absorb the entire contents of the inner packaging and of a type consistent with project data quality objectives.*
4. Place the soil containers (**with lids taped or secured by other secondary method**) into bubble wrap bags and secure.
5. Group and place soil sample sets **into self-sealing plastic bags**.
6. Place bagged soil sample containers in cooler and **make sure all bottles are in an upright position**.
7. Use blue ice or bag wet ice in self-sealing plastic bags.
8. Place ice on top of sample containers (fill remaining annulus of cooler with as much as possible).
9. Seal bag encompassing the sample containers and ice.
10. Place layer of bubble wrap over bag, if necessary.
11. Place Chain- of- Custody in self sealing plastic bag and secure to lid of cooler with tape.

12. Close and seal cooler with Chain-of-Custody Seals.
13. Tape lid of cooler shut by wrapping strapping tape completely around the cooler and over the Chain-of-Custody Seals.
14. Tape the drain plug, if permitted to be present, of the cooler with duct tape or strapping tape. DO NOT TAPE THE DRAIN PLUG SHUT IF THE COOLER CONTAINS DRY ICE.
15. Affix laboratory name and address label and other labels and marking as required by the applicable shipping guide to the outside of the cooler.
16. Complete air waybill and other shipping papers as required by the Shipping Determination.
17. Offer cooler for shipment.

4.0 Preparation of Liquid Materials for Shipment

Once collected, water samples should be promptly placed in a sample cooler on ice for preservation. The following general procedure is applicable to cooler preparation:

1. Select a sample cooler of suitable size for the number of samples to be shipped. In general, sample coolers should not exceed 52 quart capacity to reduce lifting hazards while maintaining sufficient space for adequate ice placement. Sample coolers will be new or clean and should be in good condition (manufacturer supplied handles/lid hinges intact, and no cracks or other impairments that might affect cooler integrity). Samples with large containers (1L glass, etc.) should be placed in coolers with a nominal capacity of 48 quarts.

2. Line the cooler with a large heavy duty plastic bag.
3. Place absorbent material in the bottom of the plastic bag (usually arrives in the cooler from the analytical laboratory). If not provided or the cooler is new, use vermiculite (approximately 2 inches) or other suitable absorbent. *Absorbent used must be compatible with the sample material, in sufficient quantity to absorb the entire contents of the inner packaging and of a type consistent with project data quality objectives.*
4. Place water containers (**with lids taped or secured by other secondary method)** into bubble wrap bags or wrap in bubble wrap and secure. If VOCs are collected, up to three 40 ml vials may be placed into a single bubble wrap bag. Large glass containers like 1L glass bottles to be double bubble wrapped/bagged for added protection. Sturdy plastic or metal containers do not need to be bubble wrapped.
5. Group and place water sample sets **into self-sealing plastic bags**. Since water sample sets may be large, a sample set may be grouped into several bags. Avoid mixing sample containers from different sample locations into the same bag to reduce potential for cross contamination.
6. Place water sample containers in cooler. **Keep all bottles in upright position**.
7. Use blue ice or bag wet ice in self-sealing plastic bags.
8. Place ice on top of sample containers (fill remaining annulus of cooler with as much as possible).
9. Seal large bag encompassing the sample containers and ice.
10. Place layer of bubble wrap over bag, if necessary.
11. Place Chain- of- Custody in self sealing plastic bag and secure to lid of
12. Close and seal cooler with Chain-of-Custody Seals.
13. Tape lid of cooler shut by wrapping strapping tape completely around the cooler and over the Chain-of-Custody Seals.

14. Tape the drain plug, if permitted to be present, of the cooler with duct tape or strapping tape. DO NOT TAPE THE DRAIN PLUG SHUT IF THE COOLER CONTAINS DRY ICE.
15. Affix laboratory name and address label along with other required labels and markings as required by applicable shipping guide to the cooler.
16. Affix orientation (“UP”) arrows **on each end of the cooler**.
17. Complete air waybill and other shipping papers as required by the Shipping Determination.
18. Offer cooler for shipment.

5.0 Limitations

This shipping guide is limited to the following conditions:

1) Packaging described must be used, alternate packaging to be approved by ARCADIS Director of Transportation Safety or Transportation Safety Specialist.
2) Sample coolers should be less than or equal to 52 quart in size.
3) Sample cooler used must have good integrity, without any cracks or deformities, with manufacturer supplied handles and lid hinges in good
4) Specific packaging instructions may be presented in selected shipping guides and take precedence over requirements of this guide.
5) Employees preparing coolers for shipment are required to be trained in HazMat #1 or HazMat #12 training.

Attachment D
Field Forms

Control Number: TSM- B0035101.0001

TSM + project number plus date as follows: xxxxxxxx.xxxx.xxxxx - dd/mm/year

TAILGATE HEALTH & SAFETY MEETING FORM

Project Name: Lower Ley Creek Remediation			**Project Location:**
Date:	**Time:**	**Conducted by:**	**Signature/Title:**

Issues or concerns from previous day's activities:

Task anticipated to be performed today:

The following was used to to communicate H&S information in this briefing (check all that apply):

- ☐ HASP (*including THA*)
- ☐ JSAs (*specify JSA #s*):
- ☐ Permits (*specify type or #*):
- ☐ TCP or STAR Plan
- ☐ FHSHB (*specify sections*):
- ☐ H&S Standard (*specify number*):
- ☐ H&S checklist (*specify type*):
- ☐ Activity specific hazard analysis:

Activity:

Hazard Types (unmitigated ranking H-High, M-Medium, L-Low):

Biological		Chemical		Driving		Electrical	
Environmental		Gravity		Mechanical		Motion	
Personal Safety		Pressure		Radiation		Sound	

Controls required to be used:

PPE Required (If not using JSA or Permit with PPE requirements):

- ☐ Hard hat
- ☐ Safety glasses
- ☐ Face shield
- ☐ Safety goggles
- ☐ Steel/composite toe boots
- ☐ Traffic vest *(specify II or III*):
- ☐ Life Vest (*specify type*):
- ☐ Protective Suit (*specify type*):
- ☐ Protective gloves (*specify type*):
- ☐ Other (*specify*):

Signature and Certification: I have read and understand the project specific HASP for this project.

Printed Name/Signature/Company	Sign In Time	Sign Out Time

I will STOP the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to **STOP THE JOB,** I will perform **TRACK**; and then amend the hazard assessments or the HASP as needed.

I will not assist a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done TRACK and I have thoroughly controlled the hazard.

All site staff should arrive fit for work. If not, they should report to the supervisor any restrictions or concerns.

In the event of an injury, employees will call **WorkCare at 1.800.455.6155** and then notify the field supervisor.

Utility strike, motor vehicle accident or 3rd party protperty damage - field supervisor will immediately notify the Project or Task Manager

What You Need to Know

Emergency Phone: 911 *WorkCare Phone:* 1-800-455-6155
Your nearest hospital: St. Joseph's Health 711 N. Townsend Street, Syracuse, NY 13203 0 0 0 315-448-510

H&S Specialist for this project: Julie Santaniello *Cell Phone:* 978-551-0033
Project Site Safety Officer: Variable
Nearest assembly area(s): To be determined each day durring H&S Meeting.
Nearest storm shelter(s): Personal Vehicles, Closest Occupied Building
Simultaneous operations (SimOps): You must review address SimOps activities in your tailgate safety briefing. Review of THA may be required.
Site Security: A Site Security Plan does not apply to this project.
Utility Clearance: Review of utility clearance checklist and daily site walkover for utility identification is required.
State Specific Requirements: You must follow Heat Injury and Illness Prevention Plan developed for this project.
You are required to have current training in the following:
Hazwoper 40 Hour, PPE, Defensive Driving - Smith On-Line, H&S Program Orientation , Hazwoper 8-Hour Annual Refresher , BBP (Bloodborne Pathogens),

SDSs for this project are located: Printed copy attached
Primary chemical constituents of concern for this project:
PCBs,

PID action levels for this project:

<	0.3			Continue work
	0.3	-	0.5	Sustained >5 min. continuous monitor, review eng. controls and PPE, proceed with caution
>	0.5			Sustained >5 min. stop work, contact SSO

For work not conducted under a JSA or permit, you must wear the following PPE:
Hard hat, Safety glasses, Steel or comp. toe boot, Traffic vest, shirt or coat: Class II, Gloves other:0,

See JSAs for job specific PPE Requirments.

You are required to be current on your medical surveillance.

You are not authorized to work until you have reviewed and agree with shipping determinations that are applicable to your project.
TCP/STAR Plans are not required for your work.

The following safety equipment and supplies are required to be on site for this project:
First aid kit, Fire extinguisher, Drinking water, Traffic cones,

Site Control: Site control is integrated into the STAR Plan or TCP for the project
Decontamination: Decontamination protocols are addressed in JSA or other governing document (attach)
Sanitation: Mobile operation with access to off-site restrooms and potable water

Safety Briefings: Safety briefing required daily
This project has the following TIP goals: 1 time(s)

PID Calibration Log

ARCADIS Design & Consultancy for natural and built assets

Zero Gas Source: ____________________ Instrument Type: ____________________ PAGE ____ of ____

Lot Number/Expiration Date: ____________________ Serial Number: ____________________

Calibration Gas Source: ____________________ Instrument Type: ____________________

Lot Number/Expiration Date: ____________________ Serial Number: ____________________

Concentration: ____________________ ____________________

Instrument Number	Date	Time	Zero Cal. OK (Y/N)	Calibration Gas Reading	Comments	Calibration w/in 2% (Y/N)?	Alarms Set (Yes/No)?	User Initials

Air Monitoring Documentation Form

PID Model: _____ Monitor Frequency: _____

LEL/O_2 Model: _____

CIT Model: _____

Dust Mon. Model: _____

Air Monitoring Results

Date	Time	PID (units)	O_2 (%)	LEL (% LEL)	CIT (ppm)	Dusts (mg/m^3)	Location

PID	Photoionization Detector	ppm	Part per million
LEL	Lower Explosive Limit	%	Percent
O2	Oxygen	mg/m3	Miligram per cubic meter
CIT	Colorimetric Indicator Tube		

Arcadis Visitor Acknowledgement and Acceptance of HASP Signature Form

By signing below, I waive, release and discharge the owner of the site and Arcadis and their employees from any future claims for bodily and personal injuries which may result from my presence at, entering, or leaving the site and in any way arising from or related to any and all known and unknown conditions on the site.

Printed Name	Signature	Company	Date/Time On Site	Date/Time Off Site

THIS FORM MUST BE COMPLETED IN ENTIRETY PRIOR TO BEGINNING ANY INTRUSIVE WORK

Project: Lower Ley Creek Remediation
Project Number: B0035101.0001
Form Completion Date: _____ Form Expiration Date: _____
(15 business days post form completion date)

Pre-Field Work

Required: One Call or "811" notified 48-72 hours in advance of work? #: _____
Ticket Expiration Date _____ (Review State Requirements)
Utility companies notified during the One Call process ☐ See attached ticket

_____ _____ _____ _____
_____ _____ _____ _____

List any other utilities requiring notification: ☐ None

_____ _____ _____ _____

Private Locator Contacted ☐ Yes ☐ No

Plan private utility clearance subcontractor assignments, areas, required clearance equipment, depth of clearance needed, types of utilities. When possible re-clear 811 markings to confirm utility locations.

Client provided utility maps or "as built" drawings showing utilities? ☐ Yes ☐ No

Field Work - This must be completed on site, by staff who have a minimum of one year of field experience in identifying utilities. Review Check list with PM or designee prior to beginning intrusive work.

List Soil Boring / Well IDs or Excavation Locations applicable to this clearance checklist:

3 Reliable Lines of Evidence Required Prior to Starting any Subsurface Intrusive Work

☐ One Call/"811" (Reliable as a line of evidence when working in public right of way or easement)
Utility Markings Present: ☐ Paint ☐ Pin flags/stakes ☐ Other ☐ None

☐ Client Provided Maps/Drawings **OR** ☐ Maps/Drawings requested but not provided
☐ Client Clearance Name(s)/Affiliation(s) _____
☐ Interview(s): Name(s)/Affiliation(s) _____
_____

Did person(s) interviewed indicate depths of any utilities in the subsurface?
☐ Yes, depths provided: ☐ Did not know or refused to answer
Additional Comments:

☐ Site Inspection (**Complete Page 2 & Photo Document Marked Utilities & Utility Structures**)
☐ Public Records / Maps / Asbuilits
☐ Private Locator: (Name and Company) _____
☐ Ground Penetrating Radar (GPR)
☐ Radiofrequency (RFLoc)
☐ Electromagnetic (EM)
☐ Metal Detector

Soft Dig Methods
☐ Termination Depth _____ft. bgs
☐ Potholing / Vacuum Extraction
☐ Air-Knife ☐ Hydro-Knife
☐ Probing
☐ Hand Auguring

Tips for Successful Utility Location:
1. Don't forget to look up
2. Be on site with Private Utility Locators
3. Ask Private Locators to "confirm" other's markings
4. Select alternate/backup locations during clearance process
5. Mark out all known utilities. Leave nothing to question
6. No hammering - no pickaxes - no digging bars - no shortcutting
7. No excessive turning or downward force of hand augers/shovels
8. Utilities may run in or directly under asphalt/concrete

☐ Other: _____
☐ Marine Locator: (Name and Company) _____

During the site inspection look for the following: **("YES" requires additional investigation and the utility must be marked properly prior to beginning subsurface intrusive work)**:

Site Inspection	Utility Color Codes	Present	
a) Natural gas line present (evidence of a gas meter)?	Yellow	☐ Yes	☐ No
i) Feeder Lines to buildings or homes?		☐ Yes	☐ No
b) Evidence of electric lines:	Red		
i) Conduits to ground from electric meter or along wall?		☐ Yes	☐ No
iii) Conduits from power poles running into ground?		☐ Yes	☐ No
ii) Light poles, electric devices with no overhead lines?		☐ Yes	☐ No
iii) Overhead electric lines present? (See Section l)		☐ Yes	☐ No
c) Evidence of sewer drains:	Green		
i) Restrooms or kitchen on site?		☐ Yes	☐ No
ii) Sewer cleanouts present?		☐ Yes	☐ No
iii) Combined sewer /storm lines or multiple sewer lines?		☐ Yes	☐ No
d) Evidence of water lines:	Blue		
i) Water meter on site or multiple water lines?		☐ Yes	☐ No
ii) Fire hydrants in vicinity of work?		☐ Yes	☐ No
iii) Irrigation systems? (Sprinkler heads, valve boxes, controls in building)		☐ Yes	☐ No
e) Evidence of storm drains:	Green		
i) Open curbside or slotted grate storm drains		☐ Yes	☐ No
ii) Gutter down spouts going into ground		☐ Yes	☐ No
f) Evidence of telecommunication lines:	Orange		
i) Fiber optic warning signs in areas?		☐ Yes	☐ No
iv) Aboveground cable boxes or housings or wires in work area?		☐ Yes	☐ No
g) Underground storage tanks:			
i) Tank pit present, tank vent present?		☐ Yes	☐ No
ii) Product lines running to dispensers/buildings?		☐ Yes	☐ No
h) Do utilities enter or exit existing structures/buildings?			
If Yes, confirm the utility markings outside of structure/building match up.		☐ Yes	☐ No
i) Proposed excavation marked in white?	White	☐ Yes	☐ No
j) Unclassed utilities / anomalies marked in pink?	Pink	☐ Yes	☐ No
k) **Overhead** Utilities/Communication Lines - **Look Up**:			
i) Overhead electrical conduit, pipe chases, cable trays, product lines?		☐ Yes	☐ No
ii) Overhead fire sprinkler system?		☐ Yes	☐ No
l) **Overhead** Power lines in or near the work area:			
i) < 50 kV within 10 ft. of work area?		☐ Yes	☐ No
ii) >50 - 200 kV within 15 ft. of work area?		☐ Yes	☐ No
iii) >200-350 kV within 20 ft. of work area?		☐ Yes	☐ No
iv) >350-500 kV within 25 ft. of work area?		☐ Yes	☐ No
v) >500-750 kV within 35 ft. or work area?		☐ Yes	☐ No
vi) >750-1000 kV within 45 ft. of work area?		☐ Yes	☐ No
m) Other:			
i) Evidence of linear asphalt or concrete repair?		☐ Yes	☐ No
ii) Evidence of linear ground subsidence or change in vegetation?		☐ Yes	☐ No
iii) Unmarked manholes or valve covers in work area?		☐ Yes	☐ No
iv) Warning signs ("Call Before you Dig", etc.) on or adjacent to site?		☐ Yes	☐ No
v) Utility color markings not illustrated in this checklist?	i.e. Purple	☐ Yes	☐ No
n) Has the Utilities & Structures Checklist been reviewed by the PM or Designee		☐ Yes	☐ No
PM or Designee Name: _____			

Name and Signature of person completing the checklist: _____

Date: _____

Do not perform **mechanized** intrusive work within 30 inches of a utility marking without receiving pre-approval by Corporate H&S .

ARCADIS Design & Consultancy for natural and built assets

Weekly Vehicle Inspection Form

Vehicle # / License Plate # | **Wheels # / Last 6 of Vin #**

Inspection Date												
Odometer reading												
Driver / Inspector Name												
Check the appropriate box and enter repair date for identified repairs:	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date
Interior[1] Horn operational												
Door Locks operational												
Seat Belts in good repair & operational												
Seats and Seating Controls operational												
Steering Wheel - No Excessive Play												
Interior Lights and Light Controls												
Instrument Panel/Gauges												
Wiper Controls operational												
Heat/Defrost/Air Conditioning operational												
Rear View Mirror present												
Backup Camera/Sensors working												
Jack and Lug Wrench present												
Exterior[1] Lights and Signals operational												
Tires and Spare Tire properly inflated												
Tires have proper tread depth (Page 2)												
Doors operational												
Windows Cracked/Damaged												
Side View Mirrors operational												
Damaged Body Panels and Bumpers												
Engine & Brakes Engine Start & Running Smoothly												
Fluid Levels-OK?, No Noticeable Leaks												
Belts tight, no cracks												
Parking Brake & Brakes operational												
Emergency Equipment[2] First Aid Kit, inspected monthly												
Fire Extinguisher properly secured												
Fire Extinguisher inspected monthly												
Amber emergency warning light present												
Roadside Assistance Information												
Recommend spotter cones available												
Cargo Cargo Secure and Properly Distributed												
Securing Devices in Good Condition												
Registration Valid License Plate /Tags												
Valid Registration and Insurance												
Valid City/State Inspection Decal												
Lease Plan information/Fuel Card												

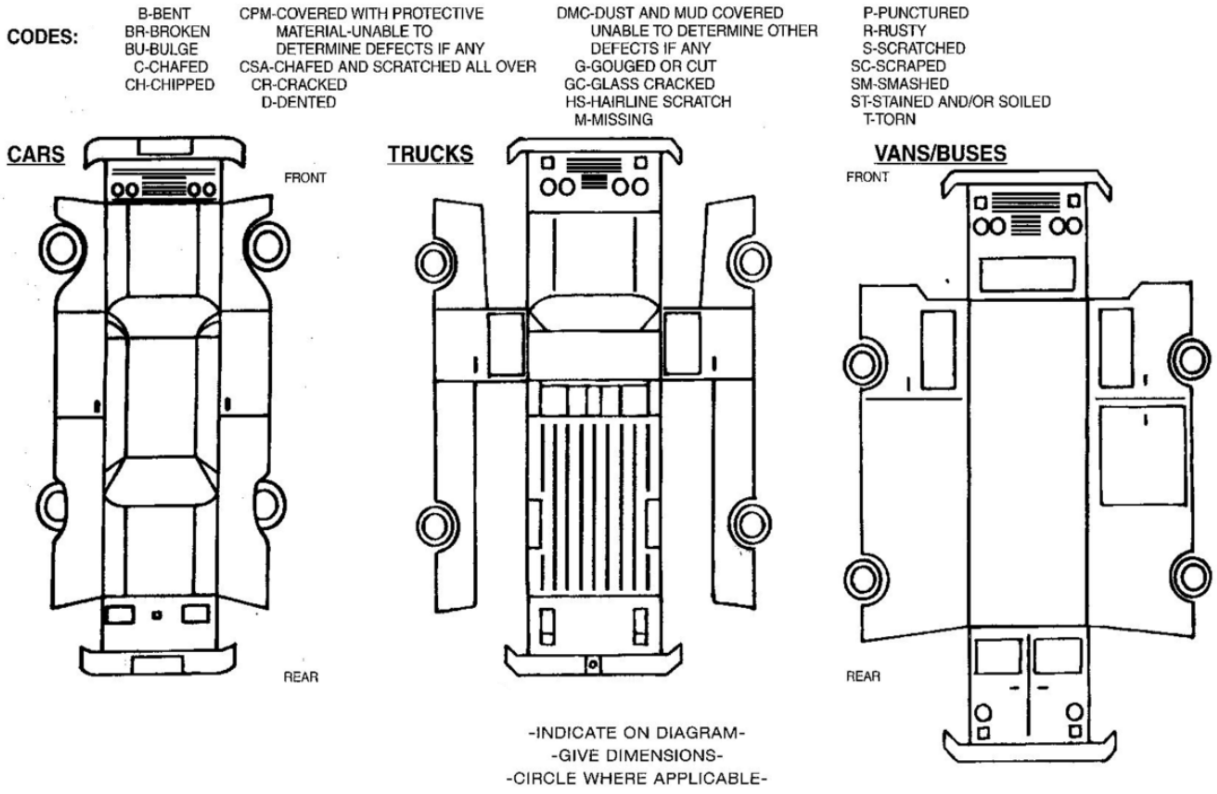
[1] **Note all damages to the vehicle on the back of this page**

[2] **Emergency Equipment required per Motor Vehicle Standard ARC HSGE024**

GOAL Get Out And Look

Note All Vehicle Damage Below

All Vehicle Damage must be reported to Anthony Cline (Corporate Fleet Manager) and Susan Berndt (Corporate Legal)



Tread Depth Guide: If a tread gauge is not available coins may be used to determine remaining tread. 2/32” is the minimum by law in most states (top of Lincoln’s head on penny), 4/32” is minimum recommended for wet surfaces (top of Washington’s head on quarter), 6/32” is minimum recommended for snowy surfaces (top of Lincoln Memorial on penny).Vehicle tires should be replaced if the tread depth is less than 6/32”.

2/32” remaining 4/32” remaining 6/32” remaining

Reference JSA 10907 For Weekly Vehicle Inspection

Arcadis Heat Illness Prevention Plan
HASP Supplement

Date Completed 8/8/2016 Revision 3, 4/14/2015

Project Name Lower Ley Creek Remediation

Project Manager Todd Cridge

Authority and Implementation

The following designated individuals have authority and responsibility for implementing the provisions of this program at the work site indicated above.

Site Health &Safety Officer Daniel Zuck **Designated Alternate**

Procedures for Provision of Water

The Site Health & Safety Officer (SHSO) or designee will be responsible for implementing the following when conditions at the site are anticipated to exceed **80 degrees** Fahrenheit:

1. Maintaining an adequate supply of suitably cool, fresh and pure potable water (fresh and pure is defined as "odor free" and "suitably cool" is defined as water being cooler than the ambient temperature but not so cold as to cause discomfort or prevent drinking.) on site at all times to allow each employee to consume one quart of water per hour, ideally at a rate of four 8-oz cups per hour. Entering the requested information into the formula provided below calculates the number of quarts of water required per employee, per hours worked per day.
Electrolyte replacement drinks or "Sports Drinks" can be used to replace essential minerals lost during sweating. Generally, such drinks should supplement water intake such as one "sports drink" to every two bottles of water. Also, a teaspoon of salt added to every gallon of water could also be used.
2. Designate and communicate a water source such as an onsite potable plumbed system, chilled coolers containing bottled water, or drinking water coolers (of a sufficient capacity to support all field staff present) and disposable cups for potable water consumption. The water source must provide suitably cool, fresh and pure water in sufficient quantity for all employees at the site. Water shall be provided free of charge or expenses will be reimbursed for employees.
3. Document and communicate the decision to either provide all water for the day at the start of the shift (e.g., 2 gallons per employee for an 8-hour shift), or a replenishment plan. Note: a sufficient quantity of water must always be present and readily accessible to allow every employee to consume at least one quart of water per hour. It is suggested to have a minimum of three hours supply of water per employee on hand.
4. Water supplies must be positioned as close as possible to the work site. If site conditions prohibit such positioning then an alternative plan must be prepared to address making water readily available to site workers.
5. Inspect the coolers / water dispensers for cleanliness and replenishment of water and cooling ice on a documented routine interval based on temperatures and staff size. Cooling ice will be stored in clean coolers if added directly to water dispensers. If the site temperature exceeds 90 degrees F the frequency of the cooler inspection will increase to maintain cool water and water supply levels.

6. Oversee the daily inspection and maintenance of coolers to ensure they are kept clean and in good condition.

No. of Employees 2 **No. of Work Hours Per Day** 10 **Quarts of Water Required** 20

One cooler will be provided for every four workers and will contain 24 16-ounce bottles every 2 hours.

No. of Employees 2 **Number of Coolers** 1 **Bottles Required** 24

Check which situation applies. Must check at least one box, or provide additional detail.

x	Ice will be purchased at the start of each daym, if needed, by the site Health & Safety Officer or designee.
	Ice will be distributed from on-site machine or service meeting applicable potable water standards.

Checklist of materials to order and keep on hand.

	Anti-microbial hand cleaner.		Food Safe cleaning product for water cooler.
	Paper towels.		Sufficient amount of drinking cups for each employee and water dispenser.
	Potable water to clean coolers.		Other Items -

Access to Shade

1. The Site Health & Safety Officer or designee is responsible for directing how shade will be coordinated and placed when temperatures exceed **80 degrees** Fahrenheit.

2. Before the start of work, the location of the shade areas, the importance of taking shade breaks, recognizing the signs and symptoms of heat illness, and the schedule of shade breaks (> 10 minutes every two hours), and the location will be addressed during each Tailgate Safety Meeting. Access to shade must be allowed at all times (As temperature increases cool down breaks should increase in frequency.)

3. The amount of shaded areas must be able to accommodate all employees taking a recovery or rest break including those employees who are on meal breaks. This doesn't mean that the shaded area(s) must provide shade to accommodate all employees on a site or working a shift at the same time. An example includes rotating routine breaks among employees. Also, additional portable shade structures can be erected on an "as-needed" basis. Employees must have enough shaded space so they can sit in a normal posture fully in the shade with enough space to allow for sitting without being in physical contact with each other. **Employees who desire access to shade must not be deprived of it due to lack of space.**

4. Employees who take a preventative cool-down rest; (1) shall be monitored and asked if they are experiencing symptoms of heat stress; (2) shall be encouraged to remain in the shade; (3) shall not be ordered back to work until any signs or symptoms of heat illness have abated, but in no event less than 5 minutes in addition to the time needed to access the shade.
If an employee exhibits signs or symptoms of heat illness while taking a preventative cool-down rest the SHSO will provide appropriate first aid or emergency response support.

5. Shade structures will be relocated to follow along with the crew for moving tasks. Shade structures will be placed within 50 feet of the work area, if practical. Shade structures must be no further than a short walk away (e.g. 2-3 minutes) from the work area. This consideration becomes critical as the temperature rises above 80 degrees F.

6. In situations where it is not safe or feasible to provide shade, the SHSO will document in the HASP Supplement the unsafe or unfeasible conditions, and include the steps taken to provide alternative cooling measures equivalent to shade.

Check Available Option

x	Provide vehicle(s) with working air conditioner to all employees on recovery or rest breaks as well as employees taking onsite meal breaks on the shift at any time.)
	Provide temporary or mobile shade structure(s) that are either ventilated or open to air movement (Secure against wind.)
	Building or permanent structure(s) in close proximity to the work area that provide a cooling environment either through mechanical ventilation or are open to air movement will be used for shade. (Job trailer, pavilion, manufacturing building, etc.)

Monitoring of Weather

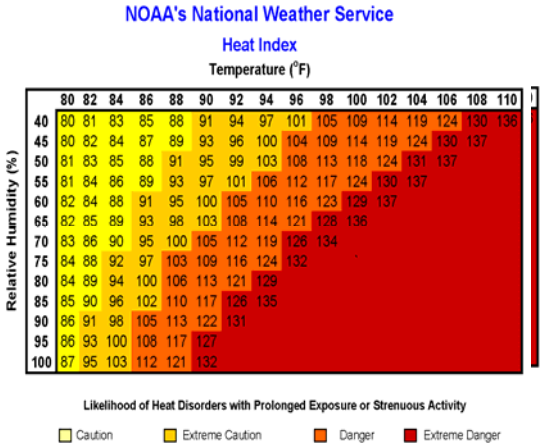
1. The SHSO or designee must check the extended weather forecast in advance of the upcoming work on a weekly basis. Work schedules will be adjusted in advance, taking into consideration whether high temperatures or a heat wave is expected.
Accepted weather forecasting resources include webpages such as: http://www.noaa.gov/ or http://www.weather.com/

2. Before work starts for the day or for the shift, the SHSO will review the forecasted temperature and humidity for the work site and compare conditions against the National Weather Service Heat Index (below) to evaluate the risk level for heat illness. Determination will be made of whether or not workers will be exposed to a combination of temperature and humidity characterized as “Extreme Caution”, "Danger" or “Extreme Danger” for heat illnesses. It is important to note that the temperature at which these warnings occur must be lowered as much as 15 degrees if the workers under consideration are in direct sunlight.

3. A thermometer will be used at the job site to monitor for sudden increases in temperature. The SHSO will be responsible for obtaining a thermometer prior to the start of the project and making it readily accessible or mounting it in an area where it can easily be monitored throughout the course of the day.

3a. If the temperature exceeds **80 degrees** Fahrenheit, shade structures will be opened and made available to workers.

3b. If the temperature equals or exceeds **95 degrees** Fahrenheit, additional preventive measures (such as those outlined in the High Heat Procedures) will be implemented.



Procedures for High Heat and Heat Waves

High Heat

These procedures are additional preventative measures to be implemented when the temperature equals or exceeds **95 degrees Fahrenheit**.
The SHSO or designee is responsible for ensuring effective observation and monitoring of employees during periods of high heat by implementing one or more of the following procedures:
1. SHSO or designee will supervise 20 or fewer employees,
2. The “Buddy System” is mandatory;
3. Regular communication with SHSO or designee via mobile phone or radio of identifying another effective means of observation;
4. Designating one or more employees as authorized to contact emergency medical services and communicating that if no designate is identified and the SHSO is unavailable that any employee can call for emergency medical assistance.
5. During high heat conditions, employees will be provided with a minimum 10-minute cool-down period every two hours.

Tailgate Safety Meetings will include a review the high heat procedures, encourage employees to drink plenty of water, and remind employees of the importance to take a preventative or recovery cool-down rest when necessary.

The “Buddy System” must be implemented, especially for new employees and employees who have yet to acclimate to high heat conditions. Additionally, frequent communication will be maintained with employees working by themselves (via cell phone or two-way radio), to be on the lookout for possible symptoms of heat illness.

Employees will be observed for alertness and signs and symptoms of heat illness at regular intervals to be documented in the field book or field log.

When the SHSO is not available, an alternate responsible person must be assigned to look for signs and symptoms of heat illness. Such a designated observer will be trained and know what steps to take if heat illness occurs.

Heat Waves

A “heat wave” as defined by the National Oceanic and Atmospheric Administration (NOAA), is a period of abnormally and uncomfortably hot and unusually humid weather.” Typically, a heat wave lasts 2 or more days. A "Heat Wave" as defined for the purposes of this Standard is when temperatures are sustained above 80 degrees F.
During a heat wave or if site conditions indicate the potential for “Extreme Caution”, "Danger" or “Extreme Danger” per the NOAA Heat Index Table the following steps will be taken:

Work schedules will be modified to protect workers from heat illnesses. The SHSO or designee in coordination with the project team, will use their Stop Work Authority and evaluate the following actions and document the action in the daily field log

1 Modify work hours.
2 Reschedule or suspend work or specific tasks that are strenuous.
3 Cease work for the day.

If schedule modifications are not possible, the Heat Illness Prevention Plan will be reviewed before work resumes. At a minimum, procedures for heat illness prevention, the provisions of the high heat procedures, the weather forecast and emergency response protocols will be reviewed.

Employees will be provided with additional water and rest breaks and will be observed more frequently. During work activities and rest breaks, employees will be observed for signs and symptoms of heat illness.

All employees will maintain frequent communication with the SHSO or designee, who will be monitoring workers for possible symptoms of heat illness. In the event of large project sites where the SHSO may be unable to be near the workers (to directly observe or communicate with them), then communication via a cell phone or radio may be used for this purpose provided reception in the area is reliable.

Procedure for Emergency Response

Emergency procedures include recognizing the symptoms of heat related illness. A critical step also involves ensuring that effective communication is established either through voice, direct observation or electronic means such as via mobile phones or 2-way radios. In an emergency situation it is critical that employees understand the process and contact information for requesting emergency medical support. The reception coverage for the site must be evaluated and understood to ensure adequate communication is in place across the project site.

1. The Site Health & Safety Officer or designee is responsible for implementing the following procedures for emergency response. These procedures include, but are not limited to, the following:

2. Prior to assigning staff to a particular work site, during the Tailgate H&S Tailgate Safety Meeting all site workers will review a map of the Site along with clear and precise directions (such as streets or road names, distinguishing features, and distances to major roads), to avoid a delay of emergency medical services.

3. Prior to assigning staff to a particular work site, efforts will be made to ensure that a qualified and appropriately trained and equipped person is available at the site to render first aid, if necessary.

4. Prior to the start of the morning Tailgate Safety Meeting, a determination will be made of whether or not a language barrier is present at the site, and steps will be taken (such as assigning the responsibility to call emergency medical services to the Health & safety Officer or an English speaking worker) to ensure that emergency medical services can be immediately called in the event of an emergency in accordance with the HASP.

5. All Health & Safety Officers and supervisors will carry cell phones or other means of communication to ensure that emergency medical services can be called. Checks will be made to ensure that these electronic devices are allowed on site, have adequate reception across the site, and are functional prior to each shift.

6. When an employee reports symptoms, or is observed displaying symptoms of possible heat illness, steps will be taken immediately to keep the affected employee cool and comfortable until emergency service responders have been called and treatment guidance is provided, or until they arrive at the Site (to reduce the progression to more serious illness).

7. During a heat wave or hot temperatures, workers will be reminded and encouraged to immediately report to the Site Health & Safety Officer any signs or symptoms they are experiencing.

Procedure for Handling a Sick Employee

1. The Site Health & Safety Officer or designee is responsible for implementing the following procedures for handling a sick employee. These procedures include the following:

2. When an employee displays possible signs or symptoms of heat illness, the Site Health & Safety Officer or designee will check the sick employee and determine whether resting in the shade and drinking cool water will suffice or if emergency service providers will need to be called. In the event of a non-emergency incident the SHSO will contact the employees supervisor or the project manager as well as calling WorkCare **1-800-455-6155 (US) and 1-888-449-7787 (Canada)** for non-emergency medical assistance.
A sick worker will not be left alone, and will be monitored closely for the remainder of the day or until emergency support arrives.

3. Signs of the onset of Heat Illness are: excessive fatigue, heavy sweating, headaches, cramps, dizziness, elevated pulse.
Signs of Heat Exhaustion are: Cool, moist, pale or flushed skin, nausea or vomiting, disorientation or confusion.
Signs of Heat Stroke are: hot, red skin which can feel dry to the touch, or moist from overexertion, changes in consciousness, rapid or weak pulse, shallow rapid breathing.

4. When an employee displays possible signs or symptoms of heat illness and no trained first aid worker or supervisor is available at the site, emergency service providers will be called.

5. Emergency service providers will be called immediately if an employee displays signs or symptoms of heat illness (loss of consciousness, incoherent speech, convulsions, red and hot face) or does not get better after drinking cool water in intervals of 8 ounces every 15 minutes and resting in the shade. While the ambulance is in route, first aid will be administered (**cool the worker: place the worker in the shade, remove excess layers of clothing, place ice pack in the armpits and groin area and fan the victim**).
A worker determined to be suffering heat illness will not be allowed to leave the site except under medical care.

6. If an employee displays signs or symptoms of severe heat illness (loss of consciousness, incoherent speech, convulsions, red and hot face), and the work site is located more than 20 minutes away from a hospital, call emergency service providers, communicate the signs and symptoms of the victim, and request an Air Ambulance if necessary.

Revisions, notes, amendments, and clarifications specific to this plan will be detailed in the space below:

ARCADIS Design & Consultancy for natural and built assets

Water Risk Assessment Form

Project Name:	Project Location:
Project Number:	Date / Time:
Project Manager:	Evaluation Completed By:
Expiration Date: (At a minimum the WRAF must be reviewed and update every 3 months)	

1. Description of Water Operations

Scope of work:	
Type or Water Body (Stream, Pond, River, Ocean, etc.):	
Depth range of Water Body: _____ to _____	Typical Working Hours: _____ to _____
Water Body Flow Rate or Current (List unit of measurement):	
Water Body Temperature Range (List unit of measurement):	
Geographic Limits of Work Area inlcuding Sart/End Location:	
Surrounding Topography or Site Conditions:	

2. Identification & Control of Water Hazards [1,2]

(Circle Answer that Applies)

1) Will work be conducted at a height of 6ft or greater with unprotected edges? If **YES,** completion of the Elevated Work Permit is required. See Section 5.3 of Water Operations Standard	**YES**	**NO**
2) Will work be conducted when water temperature is at or below 60 ˚F? If **Yes**, below select type of cold water work PPE to be used : (See Section 5.2 of Water Operations Standard)	**YES**	**NO**
Water temperatures are between 60 °F and 50°F and the air temperature is above 60°F and when rescue can be achieved within 15 minutes	**Type I PFD**	
Water temperature is at or below 60°F and when rescue can be achieved within 1 hour	**Work Suit**	
Water temperature is at or below 50°F and/or when rescue is anticipated to exceed greater than 1 hour	**Immersion Suit**	
2) Does the Water Operations listed in Section 1. present a risk of drowning? If **YES,** select type of Inherently Buoyant PFD to be used: (See Section 5.1.1 of Water Operations Standard)	**YES**	**NO**
Worn when employees are working in or near an open ocean, rough seas, or remote water where rescue may be slow coming. See Section 2.	**Type I**	
Worn by employees when working around or on calm, inland waters, or where there is a good chance for fast rescue	**Type II**	
Worn by employees when working around or on calm, inland waters, or where there is a good chance for fast rescue	**Type III**	
4) Does the work require the use of a boat / vessel ? If **YES**, an electronic Float Plan must be completed and submitted prior to starting work. (See Section 5.5.1 of Water Operations Standard)	**YES**	**NO**
5) Will work on boat/vessel be conducted within 3,000ft of a Dam, Spillway, Similar Fearture? If **YES**, completion of a communication plan is required. (See Section 5.5 of Water Operations Standard)	**YES**	**NO**

2. Identification & Control of Water Hazards [1,2]

(Circle Answer that Applies)

6) Will staff be working alone (Lone Worker)? If **YES**, the use of the buddy system is required and completion of a communication plan is required. (See Section 5.1 of Water Operations Standard)	**YES**	**NO**
7) Will work be conducted at night with out the use of a boat / vessel? If **YES**, completion of a communication plan is required. (See Section 5.1 of Water Operations Standard)	**YES**	**NO**

2) If **YES** is selected **for any questions 3, 4, 5, and 6 must be reviwed and completed**.

3.Communcition Plan

(List Minimum Requirements as required in Section 5.1 of the Water Operations Safety Standard)

1) If working in water within 3,000ft of a dam, dam overflow, water intake, or similar structure, Arcadis will notify the structure owner and discuss the appropriate safety requirements and work restrictions and document the requirements here.

4. Emergency Action / Rescue Plan

(List the Rescue Requirements as requireed in Section 5.5.1 & 5.7 of the Water Operations Safety Standard)

5.Restrictions

Minimum restrictions are listed below

1) The use of Type V and non-inherently buoyant PFDs is not approved unless approved by Corporate H&S.
2) The use of PFDs classified for recreational use are prohibited for use on Arcadis projects.
3) Snorkeling or diving work is prohibited unless reviewed and approval by the Arcadis Diving Control Board (DCB)

6.Site Safety Officer (SSO) Review and Signature

The signatory has reviewed this WRAF and has reviewed the Water Operations Safety Standard. The WRAF must be shared with all personnel performing the work, and must also be available for review in the appropriate work area. After activation of the Emergency Response Plan contact **Arcadis LIFELine (443-569-8585)**

Name (Print):	Date:
Signature:	Time:

FLOAT PLAN

INSTRUCTIONS: Complete this plan before you go boating and leave it with a reliable person who can be depended upon to notify the Coast Guard, or other rescue organization, should you not return or check-in as planned. If you have a change of plans after leaving, be sure to notify the person holding your Float Plan. For additional copies of this plan, visit: **www.floatplancentral.org**

www.cgaux.org

Do NOT file this plan with the U.S. Coast Guard

www.uscgboating.org

VESSEL

IDENTIFICATION:

Name & Hailing Port _____

Document / Registration No. _____ HIN _____

Year & Make _____

Length _____ Type _____ Draft _____ Hull Mat. _____

Color _____

Prominent Features _____

PROPULSION:

Primary-- Type _____ No. Eng. ___ Fuel Capacity _____

Auxiliary--Type _____ No. Eng. ___ Fuel Capacity _____

COMMUNICATION:

Radio Call Sign _____

DSC MMSI No. _____

Radio-1: Type _____ Ch./ Freq. Monitored _____

Radio-2: Type _____ Ch./ Freq. Monitored _____

Cell / Satellite No. _____

E-mail _____

NAVIGATION: (Check all on board)

☐ Maps ☐ Charts ☐ Compass ☐ GPS / DGPS

☐ Radar ☐ Sounder ☐ _____

SAFETY & SURVIVAL

VISUAL DISTRESS SIGNALS:

☐ Electric S-O-S Light

☐ Orange Flag

☐ Orange Smoke

☐ Red Flares

AUDIBLE DISTRESS SIGNALS:

☐ Bell

☐ Horn / Siren

☐ Whistle

PFDs: (Do not count Type IV devices)

_____ Quantity On Board

GROUND TACKLE:

☐ Anchor: Line Length _____

OTHER GEAR:

☐ Drogue / Sea Anchor

☐ EPIRB _____

☐ Fire Extinguisher

☐ Flashlight / Searchlight

☐ Food & Water for _____ days

☐ Foul Weather Gear

☐ Life raft / Dinghy

☐ Personal Locator Beacon

☐ Signal Mirror

☐ _____

☐ _____

☐ _____

PERSONS ONBOARD

OPERATOR:

Name _____ Age ___ Gender ___ Notes (Special medical condition, can't swim, etc.) _____

Address _____ Has experience: ☐ with this Vessel ☐ with Area

City _____ State _____ Zip Code _____ Home phone _____

Vehicle (Year, Make & Model) _____ Vehicle License No. _____

Trailer will be parked at: _____ Trailer License No. _____

PASSENGERS / CREW: Name & Address | Age | Gender | Notes (Special medical condition, can't swim, etc.)

1. _____
2. _____
3. _____
4. _____
5. _____

Attach "Supplemental Passenger List" if additional passengers or crew on board.

ITINERARY

	DATE	TIME	LOCATION / WAYPOINT	MODE OF TRAVEL	REASON FOR STOP	CHECK-IN TIME
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						

Attach "Supplemental Itinerary" if there are additional locations or waypoints.

Contact 1: _____ Phone Number _____

Contact 2: _____ Phone Number _____

If you have a genuine concern for the safety or welfare of any persons on board the Vessel described above, who have not returned or checked-in in a reasonable amount of time, then follow the step-by-step instructions on the *Boating Emergency Guide™* included with this float plan, or on the Internet at:

www.floatplancentral.org/help/BoatingEmergencyGuide.htm

BOATING EMERGENCY GUIDE™

You will need the following items before you begin: 1) the **Float Plan** if one was given to you, 2) **Pen** or **Pencil**, 3) Clean sheet of **Paper** or **Writing Tablet**, and 4) your local **Telephone Directory**. Begin with Step 1 below.

Step 1: Do you have a genuine concern for the safety or welfare of any persons who have not returned or checked-in in a reasonable amount of time?

If YES, then continue with **Step 2**, otherwise **STOP**, no further action is required.

Step 2: Were you given a prepared Float Plan by anyone on board the vessel?

If YES, then continue with **Step 3**, otherwise got to **Step 5**.

Step 3: On the Float Plan, locate the two Contact lines at the bottom of the page. Call Contact number 1...

<table>
<tr><th>IF CONTACT #1</th><th>THEN</th></tr>
<tr><td>Answers phone</td><td>Take notes during your conversation.
1. Let the person know you are responding to a late return or check-in by the individuals designated on the Float Plan.
2. Determine if the person you are talking to, or anyone else at that location, has recently had contact with anyone on the vessel, and when and where that contact occurred.
3. Are you still concerned about the safety or welfare of any persons on board the vessel?
<table>
<tr><th>IF</th><th>THEN</th></tr>
<tr><td>Yes</td><td>Continue with Step 4.</td></tr>
<tr><td>No</td><td>STOP. No further action is required.</td></tr>
</table></td></tr>
<tr><td>Does not answer phone</td><td>Continue with Step 4.</td></tr>
</table>

Step 4: Call Contact number 2...

<table>
<tr><th>IF CONTACT #2</th><th>THEN</th></tr>
<tr><td>Answers phone</td><td>Take notes during your conversation.
1. Let the person know you are responding to a late return or check-in by the individuals designated on the Float Plan.
2. Determine if the person you are talking to, or anyone else at that location, has recently had contact with anyone on the vessel, and when and where that contact occurred.
3. Are you still concerned about the safety or welfare of any persons on board the vessel?
<table>
<tr><th>IF</th><th>THEN</th></tr>
<tr><td>Yes</td><td>Continue with Step 6.</td></tr>
<tr><td>No</td><td>STOP. No further action is required.</td></tr>
</table></td></tr>
<tr><td>Does not answer phone</td><td>Continue with Step 6.</td></tr>
</table>

Step 5: Take a moment to jot down the facts you know about each item in the checklist below.

> DO NOT SPECULATE. Speculation about a detail may mislead Search And Rescue personnel, add to the overall search and rescue time, and adversely affect the outcome.

- ☐ Period of time the vessel has been overdue.
- ☐ Purpose of the trip or voyage.
- ☐ Description of the Vessel (type. size. color, features, etc.)
- ☐ Vessels departure point and destination.
- ☐ Places the Vessel planned to stop during transit.
- ☐ Navigation equipment on board (such as GPS, Loran C, Radar, Compass, Sounder, etc.)
- ☐ Number of people aboard the Vessel, as well as personal habits e.g. dependability, reliability, etc.
- ☐ Was the Vessel already moored, or did a vehicle tow it to the launch point?
- ☐ License plate number and description of the tow vehicle, and/or passenger transport vehicle.
- ☐ Communications equipment aboard, including type of radio and frequencies monitored, cellular or satellite telephone numbers of individuals, etc.
- ☐ Additional points of contact along the vessels planned route.
- ☐ Where there any pending commitments e.g. work, appointments, etc.

Continue with **Step 6**.

Step 6:

1. Contact your local Law Enforcement agency (Police or Sheriff).
2. Let the dispatcher know that you are responding to a late return or check-in by the persons on board the vessel.
3. The dispatcher will instruct you from here.

> **Note:** The dispatcher will provide you with the necessary contact or agency connection to get a search and rescue mission started. This is usually handled this way because it puts you closest to the agency conducting the actual search and rescue, eliminating an unnecessary middleman.
>
> If the dispatcher would like a follow-up call from you on the outcome of the rescue, they will let you know.

4. Continue with **Step 7**.

Step 7: Be patient... you've done everything you can possibly do for now. It is important to keep the telephone available, so emergency personnel can contact you with additional information and/or questions concerning the search and rescue effort.

STOP -- End of Guide

Float Plan Central™ is a service of the U.S. Coast Guard Auxiliary
www.floatplancentral.org

Attachment E
TIP

Task Improvement Process

General

Observed Company:

Observation Type:

TIP Form: H&S Field Multi-Task (General)

Task Observed:

Observee Name:

Observer Name:

Observation Date:

Project Number: B0035101.0001

Project Name: Lower Ley Creek Remediation

Supervisor:

Equipment On Site:

Pertinent Information:

Observation

Task	Correct	Questionable	Comments
General			
PPE worn according to HASP/JLA specifications and inspected before use?			
STOP work authority used where appropriate?			
Body Use/Positioning			
Proper lifting/pushing / pulling techniques used (no awkward positions/posture; no twisting or excessive reaching; no straining; no excessive weight; load under control/stable; etc.)?			
Body parts away from pinch points (clear or protected from being caught between objects/equipment or from contacting sharp objects/edges, etc.)?			
Body parts not in the Line of Fire (protected from being struck by traffic, equipment, falling/flying objects, etc.)?			

Work Procedures/Environment			
Correct type and number of barricades/warning devices/cones?			
Communication with others when necessary (hand signals, flags, etc.)?			
Right tools and equipment selected for the job and inspected before use?			
Tools and equipment used properly?			
Housekeeping performed (work areas and pathways clear of hazards, uneven surfaces addressed, etc.)?			
Slip/trip/fall hazards addressed (path selected and cleared, eyes on path, speed footing, etc.)?			
Proper energy control (electrical systems grounded, lock out/tag out performed, isolated, cords/fixtures in good condition, GFCI inspected and utilized when appropriate and used properly, etc.)?			
Protected from overhead/underground utilities (proper clearance, properly marked, spotters as necessary, etc.)?			
Safe work on/near water (appropriate flotation device, appropriate boat for body of water and operation of boat, etc.)?			
Chemical/Radiation protection (decontamination zones set up properly, air monitoring, completed, and logged, etc.)?			
Fall from elevated height prevention (maintains 3-points of contact, appropriate ladder, mounting/dismounting vehicle/equipment, fall arrest system, etc.)?			
Any additional safety issues identified:			

Tip Summary Enter details of the TIP and follow up discussion provide details on how any questionable items were resolved.

Discussion following the TIP led by: _____

Date of follow-up discussion: _____

Positive Comments:

Discussion Summary Completed:

- ☐ Supervisor Led
- ☐ Peer to Peer
- ☐ Arcadis Employee to Subcontractor

Summary of Questionable Items

Action Items (Optional) Assign appropriate action items based on the observations made. You can add more than one action item if needed.

Item #	Action Item	Responsible Person	Due Date	Comp. Date
1				
2				
3				

Standard Review

Reviews to be performed after entry of this TIP into 4-Sight.

Quality Review

Quality Reviews to be performed after entry of this TIP into 4-Sight.

Field Validation and Verification

Use the 4-Sight generated copy of this TIP to perform field V&V activities.

Attachment F
Standards

EXECUTIVE SUMMARY

The following is a requirements summary applicable to the Motor Vehicle Safety Program (MVSP):

- The MVSP applies to all Arcadis drivers operating Arcadis owned, leased, rented, or personal motor vehicles used for business purposes and all Arcadis owned, leased or rented motor vehicles used for non-business (personal) purposes.
- Arcadis expects 100 percent compliance with all applicable driving laws and regulations.
- Employees operating Arcadis owned, leased or rented vehicles for personal use must have written supervisor's approval.
- All Arcadis drivers with an assigned driving function for Arcadis may have their Motor Vehicle Record (MVR) reviewed by approved representatives of Corporate Human Resources, Health and Safety and/or Legal Departments.
- Newly hired drivers with an assigned driving function for Arcadis and a clean MVR must complete, at a minimum, on-line defensive driving training within 30 days of hire.
- Existing Arcadis drivers with an assigned driving function for Arcadis must participate, at a minimum, in on-line defensive driving training at intervals prescribed by Health and Safety.
- Weekly vehicle inspections are required for all Arcadis owned, leased, or rented vehicles used during the previous 7 days. Inspections will be documented.
- All Arcadis owned, leased, or rented motor vehicles will be properly maintained in accordance with manufacturer's recommendations. All defects affecting safe operation of the motor vehicle will be promptly repaired.
- Arcadis employees are prohibited from modifying Arcadis owned or leased vehicles unless the modification is approved in writing by Corporate Health and Safety and/or Corporate Procurement.
- Arcadis prohibits use of cellular phones, including hands free mode, while driving any vehicle for Arcadis.

1. POLICY

It is the policy of Arcadis to implement sound defensive driving training and education to employees. It is also Arcadis policy to provide administrative management that ensures vehicles are well maintained and driven by qualified employees.

2. PURPOSE AND SCOPE

2.1 Purpose

Arcadis is committed to providing a healthy and safe work environment for our employees, subcontractors, clients and visitors. To this end, Arcadis embraces this Health and Safety MVSP Standard.

This standard and accompanying requirements provides consistent practices with regards to defensive driving and vehicle administration for Arcadis vehicles.

2.2 Scope

Generally, this Standard applies to all employees operating motor vehicles for Arcadis

2.2.1 Business Driving – This MVSP applies to the operation of any motor vehicle during the conduct of Arcadis business. It applies to every Arcadis Driver operating an Arcadis, rental, leased or personal vehicle used for company business.

2.2.2 Area Involved **–** This MVSP applies to the operation of motor vehicles for company business in any country in which Arcadis employees or temporary agency employees are working.

2.2.3 Exceptions

2.2.3.1 Operation of Commercial Motor Vehicles

Additional requirements apply to operation of commercial motor vehicles (CMVs). Refer to the Arcadis Transportation Safety Program for Commercial Motor Vehicles (CMV Program) for additional information. When client requirements are more restrictive than this MVSP, the more restrictive requirement will apply for all work activities involving driving for that client.

2.2.3.2 Drivers without an Assigned Driving Function for Arcadis

Drivers without an assigned driving function for Arcadis are still subject to the requirements of the Arcadis Vehicle Use Policy maintained by Human Resources.

3. DEFINITIONS

Definitions relating this MVSP can be found in Exhibit 1.

4. RESPONSIBILITIES

The following have responsibilities under this standard:

4.1 **Corporate Health and Safety Department (Health and Safety)** – Has the responsibility for: revising and updating this standard, communicating MVSP requirements to employees. They also ensure this MVSP is being implemented effectively. Health and Safety has a primary focus of identifying defensive driving education and training resources. Health and Safety is also responsible for stewarding programs involving vehicle inspections and maintenance requirements. Health and Safety has the authority to request and evaluate motor vehicle reports on Arcadis drivers at any time.

4.2 **Health and Safety MVSP Specialist (MVSP Specialist) –** Is the primary contact for all issues related to implementation of this MVSP, including reporting of all accidents and incidents involving a motor vehicle. The MVSP Specialist will coordinate with other Corporate departments, as required, related to MVSP implementation requirements.

Contact the MVSP Specialist for all MVSP related reporting, questions or concerns.

4.3 **Corporate Human Resources Department (Human Resources)** – Has the responsibility to review applicable portions of this standard for the purposes of ensuring consistency with Human Resource's policies and procedures regarding motor vehicle operation. Human Resources have a primary focus of ensuring administrative procedures concerning vehicle use are followed by employees. Human Resources has the authority to request and evaluate motor vehicle reports on Arcadis drivers at any time.

4.4 **Corporate Legal Department (Legal) –** Has the responsibility to provide oversight of the requirements stipulated in this standard to ensure Arcadis risks are properly managed. Legal has the authority to request and evaluate MVRs on Arcadis drivers at any time.

4.5 **Corporate Purchasing (Purchasing)** – Has the responsibility to oversee leasing and maintenance management vendors and facilitate maintenance issues associated with Arcadis owned or leased vehicles. Purchasing will also work with Health and Safety on safety equipment needs for owned or leased vehicles.

4.6 **Health and Safety Managers and Specialists** – Are responsible for facilitating and educating staff on MVSP requirements. These individuals may also perform audits or conformance assessment to ensure compliance with the requirements of this standard.

4.7 **Arcadis Managers and Supervisors (including project and task managers)** – These managers and supervisors provide stewardship concerning the requirements of this standards to lower tier managers and employees. In addition, they assure that appropriate time is provided to ensure implementation of MVSP requirements and facilitate maintenance request approvals.

4.8 **Arcadis Employees** – Each employee has the responsibility to adhere to this MVSP and to communicate Health and Safety concerns, issues and questions to their supervisor or to Health and Safety staff. In addition, all employees have the responsibly to use TRACK prior to any driving activity and will follow all applicable Arcadis, federal, state, provincial, and local jurisdiction regulatory; and client requirements when driving an Arcadis owned, leased, rented vehicle.

5. PROCEDURE

5.1 General Procedure and Requirements

Employees must report all moving violations that may affect their driving status for Arcadis

Only Arcadis Drivers as defined in Section 3.0 are permitted to drive Arcadis vehicles. Exceptions to this policy are limited only to individuals authorized by the Arcadis Driver or fleet administrator to perform short term driving and parking activities involving Arcadis vehicles such as maintenance employees and valets. Use of joint venture and temporary agency employees working with or for Arcadis to operate Arcadis vehicles requires pre- approval of the Business Line President and Legal.

Arcadis Drivers who drive Arcadis vehicles or personal vehicles used for Arcadis business will maintain a valid driver's license, appropriate for the vehicle they are operating, that is free from any driving restrictions or suspension. An Arcadis Driver who is asked to drive for business purposes in any type of vehicle, shall notify their supervisor or designated Arcadis contact by the next business day if:

- Their license is suspended, revoked, or restricted;
- They receive a moving violation while driving for Arcadis-related business; or

- Receive a moving violation during non-business related driving in any type of motor vehicle that might affect their driving status with Arcadis.

If one of these issues occurs, the employee's supervisor will contact the MVSP Specialist. The MVSP Specialist (or his/her designate), in cooperation with Human Resources and Legal, as deemed necessary, will evaluate the employee's driving status (especially in instances of license suspension, revocation or restriction) and, as appropriate, corrective action recommendations will be made.

Employees who fail to report a driving violation to their supervisor that might affect their driving status for Arcadis purposes (a restricted driver) will face disciplinary action which may include termination if the conviction is discovered through routine MVR pulls, criminal background checks or other official documentation transmitted or made available to Arcadis. Arcadis will work to the extent practical with employees who report driving violations that might affect their driving status for Arcadis purposes if Arcadis operations management can accommodate a driving restriction for the driver or other suitable arrangement is made consistent with Human Resources (HR) and Legal policies.

All Arcadis Drivers driving an Arcadis motor vehicle or personal vehicle for Arcadis business will:

Arcadis prohibits use of cellular phones, including hands free mode, when driving vehicles for Arcadis

- Wear seat belts at all times in any vehicle with seat belts (this includes taxis and shuttle buses equipped with seat belts);
- Have a valid unrestricted operators license appropriate for the vehicle being driven;
- Operate and license the vehicle in accordance with applicable laws;
- Operate the vehicle consistent with client driving rules, speed limits, and requirements when operating the vehicle on project sites;
- Drive defensively as learned through training, education, and experience;
- Exercise caution when taking any prescription or over-the-counter medication that may cause drowsiness or an altered mental state;
- Not use controlled substances, illegal drugs, or be under the influence of alcohol while driving on Arcadis business;

- Not drive in a manner that could be deemed reckless or aggressive by other drivers;
- Not use radar/laser-type detectors;
- Not pick up hitchhikers;
- Not smoke in company vehicles; and
- For drivers with an assigned driving function for Arcadis, if permanently assigned an Arcadis motor vehicle will ensure the vehicle is maintained as directed by the Arcadis maintenance vendor.

Use of headlights at all times, even during daylight hours is recommended. Additionally, Arcadis expects all drivers to use pull through parking or back into parking places consistent with their defensive driving training specified in this standard and as permitted by local laws.

5.2 MVR Review

5.2.1 New Hire MVR Review

MVSP Guide-005 provides details of the MVR review process

Human Resources will perform a MVR review on potential new hires of positions that have an assigned driving function for Arcadis. The MVR review process for potential new hires follows an established review process that will result in a Pass, Conditional, or Restricted status. A MVR review resulting in restricted status will prevent hiring of the candidate unless excepted as specified in section 5.2.5. Human Resources will communicate the MVR review results to the hiring manager prior to finalizing the new hire process.

5.2.2 Existing Employee MVR Review

Human Resources may perform a MVR review on existing employees with an assigned driving function for Arcadis at a frequency stipulated by Corporate. The MVR review process for existing employees follows an established review process that will either result in a Pass, Conditional, or Restricted status. Human Resources will communicate the MVR review results to the supervisor of any employee having a Conditional or Restricted status resulting from the MVR review.

5.2.3 Post-Accident MVR Review

Any vehicle related accident classed as a preventable Motor Vehicle Accident (MVA) will require a MVR review for the employee involved in the MVA. Preventable VLEs are not generally subject to the MVR review process; however, Corporate reserves the right to perform a MVR review on any employee involved in a vehicle related accident regardless of accident classification. The MVSP Specialist will report the need to run a MVR to HR upon determination of a preventable MVA and HR will communicate the MVR results to the employee and their supervisor.

5.2.4 Commercial Motor Vehicle MVR Reviews

Detailed requirements concerning MVR review and evaluation for drivers participating in the Arcadis CMV Program is not addressed in this standard. MVR reviews related to CMV drivers are performed by Arcadis Director of Transportation Safety or his/her approved designate.

5.2.5 Appeals

MVR reviews that result in restricted driving status for a potential new hire or existing employee may be appealed to the applicable Business Line President through the applicable business line H&S Director. The Business Line President may elect to maintain the restriction or overturn the restriction. An overturned restriction may be referred by the Business Line President to the Accident Review Committee for additional corrective action based on the circumstances of the restriction.

5.3 Defensive Driving Training, Evaluation, and Education Requirements

The Arcadis Training Center provides instructions on how to enroll into defensive driving training courses or tutorials

5.3.1 New Hire Defensive Driving Training

All new hires (regardless of driving assignment) with an active driver's license will complete on-line defensive driving training prescribed by Health and Safety within 30 days of employment.

New hires with conditional driving status may be required to complete on-line defensive driving training prior to operating a vehicle for Arcadis.

5.3.2 Existing Employee Defensive Driving Training

On a frequency defined by Corporate Health and Safety, in cooperation with operations senior management, employees who have an assigned driving function for Arcadis shall complete an on-line defensive driving training course designated by Health and Safety or an equivalent course approved by Health and Safety.

Note: For existing employees hired before the implementation date of this policy, the supervisor will determine if the employee drives on average 5 or more days per month to warrant participation in this training.

In furtherance of Arcadis' goal of promoting safe driving, employees who do not have an assigned driving function for Arcadis are also eligible to voluntarily participate in the same on-line defensive driving training concurrent with prescribed timeframes for any assigned Arcadis driver training.

If a client requires classroom or hands-on defensive driver's training, the Arcadis Training Center will arrange for the required classroom training. The Arcadis required on-line training will not be required for those driving employees who attend classroom training (hands-on or subject matter training) consistent with a Health and Safety recognized defensive driving system during the same calendar year.

All Arcadis drivers are expected to review and be familiar with the contents of the Operator's Manual(s) for the vehicles they will be operating. Additional training may be provided or required at the request of an employee's supervisor, Health and Safety, or as required by a client.

Supervisors should discuss with their direct reports about their abilities to operate large vehicles and address direct report concerns

5.3.3 Inexperienced Drivers

New hires or existing employees having an assigned driving function for Arcadis and known to have only possessed a valid drivers license for less one year or experienced drivers that are unfamiliar with driving large vehicles may warrant additional evaluation and training in the operation of the vehicle(s) they are expected to drive while working for Arcadis. Supervisors are encouraged to review with their direct reports their license and driving history to ensure the driver is comfortable and

knowledgeable of expected vehicle operation. If determined by the supervisor that additional evaluation is warranted, a Commentary Drive (see Section 5.4) should be considered. The supervisor may schedule an additional TIP at a later date to ensure safe driving of larger vehicles is being performed.

Supervisors may opt to enroll drivers in additional defensive driving on-line training or hands-on defensive driver training if the driver expresses concerns about their ability to safely drive a vehicle.

5.3.4 Drivers Requiring Training or Evaluation due to Corrective Action from MVR Review

Any driver subject to Corrective Action arising from an MVR review will be trained or evaluated as prescribed in the MVR evaluation process (MVSP Guide-005).

5.3.5 Additional Defensive Driving Training and Education Requirements for Employees Involved in a Vehicle Loss Event

Corrective actions associated with an employee involved in a preventable or non-preventable VLE will be determined by the supervisor based on the severity and circumstances of the incident as determined by the Incident Reporting and Investigation H&S Standard (ARC HSMS010).

5.3.6 Additional Criteria for Temporary Agency Employees

Temporary agency employees are only permitted to drive Arcadis Vehicles or Rental Vehicles under the following requirements:

- The temporary agency employee's MVR is clear of any violation for the prior three (3) years and lists no prior critical violations. Critical violations include such issues as:
    - Alcohol-related offenses
    - Driving while impaired or under the influence of alcohol or drugs
    - Homicide, negligent homicide, or manslaughter by vehicle
    - Fleeing or attempting to elude police officer
    - Hit and run
- If a temporary agency employee receives a convicted violation or has an accident while driving, regardless of fault or preventability, on Arcadis business, they are

immediately prohibited from driving Arcadis vehicles, rental vehicles or a personal vehicle for Arcadis business unless otherwise permitted by the applicable Business Line President or the ANA Director of Health and Safety.

5.4 Sources for On-Line and Video Based Defensive Driving Training

The on-line defensive driving training or equivalent training will be provided by, or based on, a nationally recognized defensive driving training company such as Smith System or other recognized provider as approved by Health and Safety and arranged through the Arcadis Training Center. Video based defensive driving training modules will be arranged through the Arcadis Training Center.

5.5 Commentary Drive Program

The Commentary Drive evaluates driver understanding of safe driving behaviors by having the driver verbalize their observations to the Commentary Drive observer when operating the vehicle. The observer will use a standard Commentary Drive Evaluation Form to document driver understanding of safe driving principles such as the Smith System "5 Keys". The observer will also provide real time feedback on questionable driving behaviors. Commentary Drives are expected to last a minimum of 1 hour behind the wheel driving time.

MVSP Guide-001 provides criteria for observers used in Commentary Drives

Employees performing observer functions for Commentary Drives must be current on Health and Safety defensive driving on-line training obligations as described in Section 5.3 above and meet additional criteria approved by Health and Safety.

5.6 Driving TIPs

The driving TIP may be used to evaluate driver performance and provide solutions related to questionable driving behaviors for routine driving evaluations under the Arcadis Behavior Based Safety (BBS) Program. Solutions generated using the TIP process will be consistent with the expectations of the Arcadis BBS Program.

5.7 Sources of Hands-On Defensive Driving Training

When used, hands-on defensive driving training will be provided by, or based on, a nationally recognized defensive driving training course such as Smith System or other provider approved by Health and Safety. The trainer must be certified in the program upon which they are instructing and can be either internal or external to Arcadis. Arrangements for hands-on defensive driving courses are handled by the Arcadis Training Center.

5.8 Additional Training and Education for Other Driving Conditions

Working together, supervisors, managers, and Health and Safety have the responsibility of determining additional training for employees driving under special conditions such as CMVs, towing trailers, riding and operating all-terrain vehicles or other non-routine driving conditions. Training approved by Health and Safety will be arranged through the Arcadis Training Center.

5.9 Driving Distractions and Cell Phone Use While Operating a Motor Vehicle

Arcadis strictly prohibits employee use of personal or company-provided cellular phones (including but not limited to voice communication, texting, video, internet browsing and gaming) either in hands-on or hands free mode, speaker, or use of similar devices while the employee is operating any motor vehicle for Arcadis purposes.

5.10 Additional Defensive Driving Procedures

Arcadis promotes additional defensive driving techniques to assist in the elimination or minimization of MVAs and VLEs. These techniques include:

- When a second Arcadis employee is available, and where it is safe to do so, all vehicle backing operations should use a spotter to assist with the backing operation.
- As a best practice, use of the cone program to promote awareness of hazards around parked vehicles.
- To assist drivers in their potential lack of familiarity with the location in which they are driving, one of the following should be utilized by drivers traveling to unfamiliar locations:
  - The use of GPS systems in rental cars, and/or
  - Pre-Trip Route Planning through the use of Google® Maps or MapQuest®, and/or

MVSP Guide-007 provides best practices for spotting and cone placement

- o Preparation of a Journey Management Plan (JMP) using the template provided in the Excel Standard HASP Template

5.11 Vehicle Inspections and Maintenance

All company owned or leased vehicles will be maintained in safe operating condition. To ensure vehicles are properly maintained, a daily pre-trip visual inspection must be informed prior to operating the vehicle. The pre-trip inspection should include, but is not limited to:

- Seat belts;
- Doors and door locks;
- Lights;
- Mirrors;
- Horn;
- Back up alarms, if equipped;
- Parking brake;
- Instrument panel;
- Steering;
- Windows;
- Windshield wipers;
- Tires; and
- Emergency equipment.

A more comprehensive weekly documented inspection (daily if required by the client, manager or supervisor or if vehicle is operated in harsh environments) is also required. Rental vehicles operated by Arcadis for more than one week also must also use the documented weekly inspection process. Inspections are required to be documented on the Weekly Vehicle Inspection Checklist or equivalent.

Documented vehicle inspections are required weekly and use of approved fuel cards is also required

Deficiencies identified in inspections or at any other time will be managed through the Arcadis vehicle leasing company vendor or maintenance provider specified by Corporate Purchasing. Routine maintenance (gasoline, oil, etc.) will also be managed through these vendor(s) using

approved fuel cards. Use of assigned fuel cards is critical to help ensure maintenance schedules are maintained for the vehicle. Records of vehicle inspections should be maintained at the office or project location where the vehicle is assigned.

Employees operating company owned or leased vehicles (including qualifying rental vehicles) required to be maintained under the CMV program will follow inspection and maintenance requirements specified in the CMV program. **Use of Weekly Vehicle Inspection checklist for CMV operation is not permitted.**

5.12 Safety Equipment for Arcadis Vehicles

All Arcadis owned or leased vehicles are expected to have, at a minimum, a 2.5 lb. A,B,C fire extinguisher (permanently mounted), first aid kit and an orange strobe or oscillating light. The orange oscillating light/strobe may be permanently affixed or removable; however, owned or leased vehicles obtained after April 4, 2016 must have permanently installed amber warning lights installed in or on the vehicle. Rental vehicles and Arcadis owned, leased, or rented vehicles will be subject to equivalent requirements, if used for field work unless otherwise excepted from a specific safety equipment requirement by the project specific HASP or Job Safety Analysis. Rental vehicles are not required to have fire extinguishers permanently mounted.

Arcadis Trucks:
- ✓ Fire Extinguisher
- ✓ First Aid Kit
- ✓ Orange Strobe

All Arcadis owned or leased vehicles obtained on or after June 1, 2012 will be required to be equipped with back up alarms. Arcadis owned or leased vehicles obtained prior to June 1, 2012 will be required to have a functioning back up alarm if used for project work with client mandated back up alarm requirement.

All Arcadis owned or leased pickup trucks with an open bed obtained on or after April 4, 2016 will be required to be equipped with a rear window protector.

Refer to MVSP Guide-010 for additional recommendations for safety and emergency equipment that may be required for specific project needs.

All Arcadis vehicles managed under the Arcadis approved vendor maintenance program have Emergency Roadside Assistance. Documentation, including the phone number, for the vendor providing assistance must be maintained in the glove box of the vehicle.

5.13 Securing Loads in Vehicles

All luggage, equipment and supplies loaded into a vehicle operated by Arcadis will be stowed in a manner that will prevent appreciable movement. Luggage, equipment and supplies placed in the passenger compartment of vehicles will be placed in a manner that will prevent rapid forward movement in the event of a hard stop or frontal collision. Objects will not be placed on the dashboard of vehicles unless they are secured in place by friction mats, suction cups, or similar securing device.

Securing straps, tiesdowns (all types) and securing nets used to secure loads on trucks must be inspected prior to each use. Damaged, worn or frayed securing straps or tiedowns must not be used.

Chemicals transported in Arcadis vehicles must conform to the requirements of the Arcadis Transportation Safety Program for HazMat Shipping and Transportation including, but not limited to, securement provisions of DOT Facts-108a, “Materials of Trade”.

Arcadis CMVs are subject to additional load securement requirements specified by the Arcadis Transportation Safety Program for CMVs.

5.14 Vehicle Modification

Arcadis employees are prohibited from modifying Arcadis owned or leased vehicles unless the modification is approved in writing by Corporate Health and Safety and/or Corporate Procurement.

5.15 Special Considerations for Rental Vehicles

Rental vehicles will be treated and driven in a manner equivalent to an Arcadis owned or leased vehicle. Additionally, Arcadis employees renting vehicles will plan and select a vehicle appropriate for the conditions anticipated when driving. Careful planning is required to preferentially use Arcadis owned or leased vehicles for off road use instead of using rental vehicles when reasonable, practical and permitted under contract (client or rental company) terms. Due to operating unfamiliarity typically encountered when renting vehicles, use of TRACK to identify and mitigate atypical or unfamiliar vehicle functionality or performance is required.

MVSP Guide-006 provides safety best practices information for rental vehicles. Arcadis drivers must be 21 years of age to rent vehicles.

6. VEHICLE USE AND INSURANCE

6.1 Non-Business Use of Company Vehicles

Non-business use during business hours and/or having non-business related passengers in an Arcadis Vehicle or Rental Vehicle during such business use is prohibited. In the event of an accident in these situations, the employee is personally liable for injuries and damages associated with such an accident and the employee, and not Arcadis, will be responsible for all rental charges. Operating an Arcadis Vehicle or Rental Vehicle for strictly personal use on weekends, evenings and holidays is prohibited, unless prior approval by the employee's supervisor is given, and the vehicle possession is necessary due to remote location and assignments, and the employee has all required personal automobile liability insurance. Supervisors should assess the requirement and may place any other appropriate limitations on such use.

Use of an Arcadis Vehicle or Rental Vehicle to commute to and from work should be limited to those situations where there is a sound business reason to do so and must be authorized by the operations manager.

6.2 Insurance

Arcadis has vehicle insurance coverage for Arcadis Vehicles and Rental Vehicles. If an accident occurs or damage is sustained, there is a $2,000 deductible for damage to the Arcadis Vehicle or Rental Vehicle ("collision") and a $10,000 deductible for damage to another vehicle, property damage or injury to another party ("liability"). These deductibles are paid by the relevant Arcadis office.

If an accident should occur during non-business hours while an employee is driving an Arcadis Vehicle or Rental Vehicle, in accordance with state law, the Arcadis employee could be personally liable for injuries and damages associated with such an accident.

6.2.1 Vehicle Rental in the United States

As stated above, Arcadis has insurance for all Arcadis Vehicles. When renting for business in the United States, the rental should be arranged through World Travel, and there is no need to accept the insurance coverage offered by Arcadis preferred rental car vendors (currently Enterprise and National).

6.2.2 Vehicle Rental Outside of the United States

If an Arcadis employee is renting a vehicle for business **outside of the United States, the employee must accept the insurance offered by the local rental car company in order to be fully covered under the company's Foreign Package policy.** In addition, check with Corporate H&S about any additional coverage that may be needed for the country in which you are renting.

6.2.3 Personal Vehicles

Employees who drive their own vehicle for company business, as a condition for performance of his or her duties, shall comply with all minimum state requirements for auto insurance as required by their state. This requirement includes auto liability insurance with the minimum amounts of coverage meeting or exceeding that state's requirements. If requested, employees shall provide a current insurance card which indicates the amount of coverage as adequate proof of insurance coverage.

If a personal vehicle is damaged or involved in an accident while being driven for company business, the insurance covering that personal vehicle is primary. Arcadis does not reimburse employees for personal auto insurance deductibles.

7. TRAINING

See section 5.3 of this standard for training requirements.

8. REFERENCES

Arcadis Transportation Safety Program for Commercial Motor Vehicles

MVSP Guide-001, Staff Approved for Conducting Commentary Drives

MVSP Guide-002, Guidelines for Conducting Commentary Drives

MVSP Guide-003, Automated Enforcement Conviction Evaluation Criteria

MVSP Guide-004, Criteria for Defining a Motor Vehicle Accident

MVSP Guide-005, Guide for MVR Corrective Actions

MVSP Guide-006, Rental Vehicle Safety Requirements and Best Practices

MVSP Guide-007, Spotter and Cone Program Best Practices

MVSP Guide-008, MVSP Restricted Driving Appeal Process

MVSP Guide-009, Reserved

MVSP Guide-010, Safety Requirements for Arcadis Vehicles

MVSP Guide-011, Reporting Requirements for all Vehicle Damage

Incident Reporting and Investigation H&S Standard (ARC HSMS010)

9. RECORDS

Records will be maintained as follows:

- MVRs pulled as required under this MVSP and associated notifications, approvals, releases, and findings information will be maintained by Human Resources.
- TIP results, incident reports and near miss reports related to MVSP activities will be maintained in the 4-Sight database.
- Commentary Drive documentation will be provided to the employee unless otherwise specified by the MVSP Specialist.
- Any training certificates or documentation arranged through the Arcadis Training Center (hands-on defensive driving, defensive driving on-line, defensive driving videos, etc.) will be maintained by the Arcadis Training Center.

10. APPROVALS AND HISTORY OF CHANGE

Approved By: Julie Santaniello, CSP, Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
26 March 2007	01		Original document
18 August 2007	02		Change in required on-line defensive drivers training
22 October 2007	03		Changing over to new template format and addition of the “Comments on My Driving?” program
21 January 2008	04		Change to new template; change to 2008 organization job titles; change to prohibit texting/emailing while driving
13 June 2008	05		Addition of Sections 5.10 and 5.11 on other defensive driving techniques and cone placement.
6 October 2008	06		Clarified who is required to complete online training in Section 5.3 and modified section on when hands-on defensive driving is required after an accident.
8 April 2009	07		Incorporated references to the CMV program and vehicle inspection requirements. Incorporated Vehicle Use Policy. Added fatigue management requirements. Deleted references to the Commentary Drive which is obsolete.
3 November 2009	08		Incorporated Smith System videos as a corrective action, Commentary Drive Program and revised Exhibit 2 and added new Exhibit 4.
1 November 2010	09		Deleted Comments on my driving section as program was discontinued.

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
25 May 2011	10		Revised content and restructured selected exhibits and standard sections. Most content duplicated in the Vehicle Use policy removed. Vehicle Use policy incorporated by reference
August 16, 2011	11		Replaced section 5.7, added new definitions and guide references, clarified fatigue management recommendations, modified terminology for BBS program, provided MVR report clarifications.
May 2, 2012	12		Comprehensive restructuring, Revisions to training and MVR processes, expanded rental vehicle safety, inclusion of additional MVSP guidance documents, roles and responsibilities clarification. Inclusion of vehicle safety equipment information. Formalization of the ARC process.
14 March 2013	13		Clarified MVR review and training for new hires. Clarified standard conflict with other corporate department policies. Restructuring of section 5.2. Removal of assigned driving function. Revision to headlight use. Section 4.2 MVSP Specialist e-mail link address updated
8 December 2013	14		Added definition for assigned driving function, Restructured MVR review requirements, Newly licensed driver requirements, and add references to new MVSP Guides. Title changes and minor editing throughout.

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
29 January 2014	15	Sam Moyers	Addition of new section 5.13 addressing load securement to harmonize with other H&S standards and guidance. Addition of pre trip visual inspection information to harmonize with other H&S standards and guidance. Clarification of expectations in the cone and spotter program. Revised header and footer to current standard and modified revision history table.
4 February 2014	16	Sam Moyers	Section 5.1 was modified to clarify Arcadis parking expectations
22 September 2015	17	Sam Moyers	Revised appeal process and relinked revised MVSP Guide-005. Rebranding. Revised signature block
6 May 2016	18	Sam Moyers	Revised with new section 6 dealing with insurance issues. New section 5.3.6 dealing with temporary agency employees. Both were included from integrated HR Vehicle Use Policy. Revised sections 5.3.5, 5.9 and 5.12 to clarify current policy. Added a definition for field work in Exhibit 1. Added additional references concerning cell phone prohibition.

EXHIBIT 1 - DEFINITIONS

Arcadis vehicle or Arcadis motor vehicle: Any motor vehicle owned or leased by Arcadis employee.

Arcadis driver or driver: Any Arcadis US employee or temporary agency employee who drives an Arcadis vehicle, leased vehicle, rental vehicle, or personal vehicle for business reasons whether the use of the vehicle includes operation from the local office or for travel while away from the local office.

Arcadis employee: Any full-time, part-time, temporary, as needed employee, and interns employed by Arcadis US.

Assigned Driving Function for Arcadis: Any Arcadis driver who drives on average 5 or more days per month in the interest of Arcadis.

Business use of Arcadis owned, leased, rented, or personal motor vehicle: For the purposes of this standard, business use of an Arcadis, rental, leased or personal vehicle including but not limited to: attending meetings; driving to and from a client location; driving to dinner while out of town on business; and driving to an office supply store to pick up office supplies. Use of the vehicle for business would not include personal use as described below.

Corporate: As used in this standard and materials incorporated by reference, the term “Corporate” means Corporate Health and Safety, Corporate Human Resources, and/or Corporate Legal departments unless otherwise specified.

Field Work: As used in this standard means any Arcadis work activity outside of an office environment.

Manager: The employee’s administrative supervisor or an Operations Manager

Motor vehicle accident (MVA): Any incident on a reasonably anticipated route during the course of work where an Arcadis owned, leased, or rented motor vehicle is:

MVSP Guide-004 provides detailed MVA information and FAQs

- On a public or established private roadway or parking area involving a third party motor vehicle, excluding load securement failures by a third party motor vehicle.
- On a public roadway involving damage to public or private property, excluding road debris damage.
- Involved in any type of pedestrian impact resulting in injury or property damage.
- Involved in an Arcadis load securement failure or mechanical component failure on a public or established private roadway involving a third party motor vehicle or public property damage.
- On a public roadway involving damage or injury associated with another Arcadis operated vehicle, including load securement failures.

Personal use of Arcadis vehicle, leased vehicle or rented motor vehicle: For the purposes of this standard, personal use of an Arcadis vehicle, leased vehicle or rental vehicle include but are not limited to supervisor approved: driving to dinner with a non-business-related person(s) in the vehicle; driving for the purposes of personal entertainment or personal business; using an Arcadis vehicle or rental vehicle for staying over period of time not required for business (e.g., staying over a weekend to visit friends, etc.).

Potential New Hire or Candidate: For the purpose of this standard means an individual who has had an written offer made and accepted for employment with Arcadis.

Preventable MVA: A MVA where the Arcadis driver was as fault or was determined through the Arcadis LNL Investigation process failed to exercise reasonable care while driving an Arcadis vehicle. The classification of Preventable MVA is assigned by Corporate Health and Safety.

Rental vehicle: For the purposes of this policy, any motor vehicle rented from an established rental car company for Arcadis business whether the use of the vehicle is operated from the local office or for travel while away from the local office.

Supervisor: The employee's administrative supervisor (project supervisor if approved by the administrative supervisor).

Temporary agency employee: A temporary agency employee utilized by Arcadis for temporary work. Temporary Employee Agency agreements shall provide for standard automobile insurance and other terms consistent with this policy.

Vehicle loss event (VLE): Any incident involving a motor vehicle that does not meet the definition of a MVA. VLEs may be preventable or non-preventable based on findings of the Arcadis LNL Investigation process and is assigned by Corporate Health and Safety.

Hiring managers should review contracts for driving related issues involving temp agency employees

Implementation Date	Arcadis HS Standard Name	ARCADIS Design & Consultancy for natural and built assets
13 December 2006	Utility Location and Clearance	
Revision Date	Arcadis HS Standard No.	Revision Number
10 May 2016	ARCHSFS019	15

EXECUTIVE SUMMARY

Damaging an underground or aboveground utility can result in serious injury and loss of life, disrupt essential services, and create significant liability to Arcadis, clients, and subcontractors. Therefore, it is Arcadis policy that the following steps be completed prior to beginning any subsurface intrusive work (i.e., any work or activity that breaks the plane of the ground surface):

- The presence of existing or known utilities will be investigated and cleared (to the extent feasible) by locating and marking before the start of any subsurface intrusive work and where appropriate, visually verifying through soft dig methods (referred to as potholing or daylighting) before the start of any subsurface intrusive activity.

- A minimum of **three (3) reliable lines** of evidence are required for an acceptable utility clearance. Each location of subsurface intrusive work must have at least 3 reliable lines of evidence. All lines of evidence used during the utility clearance procedure will be recorded on the Utility and Structures Checklist or equivalent client-provided checklist or permit. If a line of evidence is lost or not apparent, STOP WORK, and re-establish the line of evidence prior to resuming subsurface intrusive work.

- The lines of evidence used will be reasonable and appropriate for the conditions expected to be encountered (soil type, water table, etc.) and the type of utilities expected to be encountered (e.g., gas line versus an irrigation line).

- Contact the State One Call or equivalent service (Nationwide "811") as required by law. The State One Call or equivalent service (Nationwide "811") can only be used as a reliable line of evidence when working within the public right-of-way or easement.

- For point clearance (single intrusive point, used as 1 of the 3 required reliable lines of evidence), the borehole must be cleared to 110% of the diameter of the intrusive device (e.g., auger, drill head, etc.) or an additional 2 inches of overall diameter, whichever is greater.

- Utility clearance information will be documented on the Arcadis Utility and Structures Checklist (USC) or equivalent client-provided checklist or permit. The Utility Structures and Checklist is valid for 15 business days from the date of completion. A copy of the completed Utility and Structures Checklist will remain on-site during all subsurface intrusive work.

- Employees overseeing utility clearance activities will:

    - Be familiar with the contents of this standard and ARC HSFS-019 Supplement 2;
    - Have one year of field experience in the visual identification of utilities; and
    - If operating equipment, have training and six months of experience in the proper operation and results interpretation of any clearance equipment, including without limitation, magnetometers and ground penetrating radar.

- A utility strike is an unplanned contact of a utility during the course of work that results in damage requiring repairs, making a report to the utility owner, or requiring further assessment to evaluate the potential for damage. All utility strikes must be reported within 24 hours using the Utility Line Strike Investigation Form. **Do not enter the incident into 4-Sight until approved to do so by Corporate Legal. Refer to** ARC HSFS-019 Supplement 5**, Utility Strike Emergency Action Plan Guidelines.**

Report Utility Incident Now

1. POLICY

It is the practice of Arcadis and its affiliated companies to implement appropriate, reasonable, and practical standards within acceptable and customary industry practices to promote the health and safety of its employees and avoid and mitigate exposure of risk in the performance of their work. In furtherance of this policy, Arcadis promotes and encourages compliance by all employees with this policy and standards relating to work in the vicinity of subsurface, submerged, or aboveground utilities.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard directs general safety standards and best practices associated with the identification and management of subsurface, submerged, and aboveground utilities on project sites. Utility location standard operating procedures (SOP) for submerged utilities can found in ARC HSFS-019 Supplement 6.

2.2 Scope

This standard assigns responsibilities and expectations for proper utility clearance by both Arcadis employees and Arcadis subcontractors at project sites.

3. DEFINITIONS

Definitions relating to Utility Clearance can be found in Exhibit 1.

4. RESPONSIBILITIES

4.1 Project Manager Responsibilities

For every project site having the potential to come into contact with utilities, Project Managers must ensure that:

- The requirements of this standard are followed.
- Local regulations governing utility clearance are followed. This includes ensuring local and/or state laws defining activities or depth of intrusive work/excavation requiring utility clearance are reviewed as they vary by location. For further information, refer to One Call and State Law Directory.
- Efforts are made to work with the client, project site representatives, public utility companies, and subcontractors to identify the nature of any utilities and to determine control processes that need to be implemented by Arcadis and the subcontractors to prevent damage to these utilities and to properly manage the effects in the event there is utility damage.
- Utility clearance activities are only delegated to a Task Manager or other individual meeting the requirements of Section 4.2 below, as appropriate. However, even if the Project Manager delegates certain responsibilities, the Project Manager maintains primary responsibility for a complete utility clearance.

For additional information on Project Manager responsibilities and best practices, refer to ARC HSFS-019 Supplement 1.

- Project Managers or designee must review the Utility and Structures Checklist with staff and Arcadis subcontractors conducting subsurface intrusive work (including "Sub-of-Subs" when conducting subsurface intrusive work) prior to staff beginning subsurface intrusive work. The Project Manager or designee review must be documented on the Utility and Structures Checklist prior to starting subsurface intrusive work.

4.2 Field Personnel Responsibilities

Arcadis field personnel conducting work on a project site having the potential to come into contact with utilities have the responsibility to:

- Read, understand, and follow this standard and ARC HSFS-019 Supplement 2 and complete the appropriate checklists during the on-site utility and structures locate and clearance process.

- Complete a minimum of one year of utility clearance-related experience before accepting responsibility for any utility clearance tasks. This requires on-site training led by another Arcadis employee with detailed knowledge and experience in identifying utilities and structures.

- Complete training and have 6 months of experience in operating and interpreting the results of remote sensing technologies, including without limitation, magnetometers and ground penetrating radar, before operating such technologies. Field staff should understand the technologies being utilized by a private utility locate contractor and how they are operating in comparison with the site conditions. Refer to ARC HSFS-019 Supplement 3 for more information.

- Prior to beginning subsurface intrusive work, the Utility and Structures Checklist must be completed and signed by the staff member completing or overseeing the clearance. Confirm that the Utility and Structures Checklist was reviewed by the Project Manager or designee as discussed in Section 4.1 above. Review the Utility and Structures Checklist daily prior to starting subsurface intrusive activities to ensure all utilities are identified and markings are present. A copy of the completed Utility and Structures Checklist will remain on-site during all subsurface intrusive work (i.e., any work or activity that breaks the plan of the ground surface).

- Use their STOP WORK Authority to eliminate any reasonable concern if utilities cannot be reasonably located and contact the Project Manager to review the STOP WORK situation and confirm the direction of action before moving forward.

- Ensure that Arcadis subcontractors conduct their own reasonable independent utility clearance efforts as required by Arcadis' standard subcontract and are aware of any Arcadis clearance standards used on-site.

- Be on-site and provide oversight during utility locate activities and any active subsurface intrusive work or activities involving contractor under contract to Arcadis.

- If a utility is damaged and repaired during the course of the field event, field staff must provide oversight and document that the repair appears competent and complete to prevent further damage to the site when the damaged utility is re-activated.

4.3 Arcadis Subcontractor Responsibilities

According to Arcadis' standard subcontract, subcontractors have agreed to take responsibility for any damages resulting from a utility impact caused by their work. Therefore, Arcadis subcontractors are expected to take reasonable time and diligence to conduct their own independent utility clearance using reasonable standards and processes. Subcontractors have the responsibility to stop their work if utility concerns are identified and will report those concerns to the Arcadis employee overseeing their work activities. Arcadis staff should reinforce these responsibilities with subcontractors during job safety briefings.

In jurisdictions where the actual contractor performing the subsurface intrusive work is required to perform utility clearance notifications, the contractor will perform the clearance notification and will provide evidence of the notification to Arcadis (ticket or ticket number, etc.). Refer to ARC HSFS-019 Supplement 4 for Best Practices for State One Call procedures.

- If overhead utilities are present in areas where heavy equipment will be operated, ensure adequate clearance is provided. For heavy equipment that is extendable or telescoping (e.g., excavators, dump trucks, extendable lift trucks), evaluate whether the use of a spotter is necessary prior to operating heavy equipment when in proximity to the overhead utility.

- If a utility is damaged and repaired during the course of the field event, the field subcontractor must verify that the repair is competent and complete to prevent further damage to the site when the damaged utility is re-activated.

5. PROCEDURE

5.1 General

Protocols to be followed during utility and structures location and clearance activities are outlined in:

- Best Practices for Project Managers (or Their Delegates) Concerning Utility Clearance (ARC HSFS-019 Supplement 1).

- Best Practices for Field Personnel Concerning Utility Clearance (ARC HSFS-019 Supplement 2).

- Use and Limitations of Common Underground Locating Technologies and Clearance Methods (ARC HSFS-019 Supplement 3).

- Best Practices for State One Call Procedures (ARC HSFS-019 Supplement 4).
- Emergency Action Plan guidelines for Utility Strikes (HSFS-019 Supplement 5).
- Utility Location Standard Operating Procedure for Aquatic Work Activities (ARC HSFS-019 Supplement 6).

5.2 Lines of Evidence

When locating underground utilities, three (3) reliable "lines of evidence" must be established to help determine where a subsurface utility may be located. A line of evidence may be a site drawing that shows where a utility is located, it could be anecdotal information obtained from owners or employees, it could be established using any number of non-intrusive geophysical methods [e.g., ground penetrating radar (GPR), electromagnetic survey (EM), radio-frequency methods (RF), etc.], or it could involve probing for or exposing the utility by soft dig technologies (i.e., daylighting or potholing). Some lines of evidence will identify utility locations with a high degree of certainty (e.g., direct connect radio-frequency technique, daylighting or potholing, sonde tracing, etc.). Other lines of evidence will identify utilities will less certainty (e.g., anecdotal reports, design drawings, etc.).

Effective utility locate practices must use multiple lines of evidence until there is a high degree of certainty that the underground services have been adequately located. Three (3) reliable lines of evidence are required for an appropriate utility clearance as defined in this standard. All reliable lines of evidence used during the utility clearance procedure will be recorded on the Utility and Structures Checklist or equivalent client-provided checklist or permit. If three (3) reliable lines of evidence have not established certainty in the location of a utility, STOP WORK and do not proceed. Additional reliable lines of evidence must be utilized until the presence or absence of the underground utility can be established. During work activities, if a line of evidence is lost or not apparent (e.g., paint markings have faded), STOP WORK, and re-establish the line of evidence prior to resuming subsurface intrusive work.

Generally, the following lines of evidence may be used to meet this minimum utility clearance requirement:

1. Contacting the State One Call or equivalent service (Nationwide "811") is REQUIRED BY LAW regardless if it will be used as a line of evidence. Contacting the State One Call or equivalent service (Nationwide "811") is an acceptable reliable line of evidence when working within the public right of way or easement. Note that the State One Call can provide valuable information regarding locations and types of utilities entering the private property.

   Note: For work on private property or in areas not served by State One Call or equivalent service, consider using a reputable private utility locating company to locate and mark the utilities. **Use of a reputable private utility locator is encouraged for all projects with subsurface or submerged utilities.** When working with a private locater, it is best practice to pre-plan clearance areas, review required clearance equipment and the re-clearing/confirmation of any public utility mark outs (State One Call or equivalent service Nationwide "811").

2. Use detailed, scaled site utility plans, preferably in the form of an “as-built” or “record” drawing, to identify and/or confirm utility locations. Document request and/or receipt of utility drawings from the property owner/client on the Utilities and Structures Checklist.

3. Interview(s) with knowledgeable site or client personnel. The following questions should be asked during the interview and answers documented on the Utility and Structures Checklist:

   o Employees(s) Name and Affiliation(s) with the site;

   o Types of utilities, including utility composition and location of utilities on-site;

   o Depths of known utilities; and

   o Any other pertinent information regarding utilities on the site.

View the Utilities and Structures Checklist

4. Conduct a detailed visual site inspection of areas around all planned subsurface intrusive work points or areas to identify and/or confirm utility locations. For underground utilities, conduct an inspection for structures that tend to indicate the presence and general location of such utilities, including, but not limited to manholes, vaults, valve covers, valve markers, telephone pedestals, transformer housings, fire hydrants, spigots, sprinkler heads, air relief valves, backflow preventers, meters, downspouts going into the subsurface, power poles with wiring going into the subsurface and line markers. Saw cut lines and concrete/asphalt repairs often yield valuable information regarding utility locations.

   Always discuss the presence of utilities with the site owner, operator, and/or occupant to identify any potential utilities that might not be readily identified by non-intrusive clearing methods or may be:

   o At depths > 5 feet below ground surface; or

   o At very shallow depths (< 2 feet below ground surface), such as communication lines, electrical conduits/wiring, irrigation lines, etc.

If one of the above lines of evidence cannot be utilized or if using the above lines of evidence does not adequately identify utilities with reasonable certainty, one or more additional lines of evidence must be utilized. Commonly used lines of evidence are listed on the Utility and Structures Checklist.

A discussion of use and limitations associated with common utility location and clearance methods is provided in ARC HSFS-019 Supplement 3.

Standard operating procedures for utility location in submerged settings are presented in ARC HSFS-019 Supplement 6.

The lines of evidence will be recorded on the Utility and Structures Checklist or equivalent client-provided checklist or permit.

Note: If a line of evidence is lost, utility markings are removed/worn, or area of previous clearance is not confirmed, STOP WORK and re-establish the

line(s) of evidence prior to resuming subsurface intrusive work. Each location of subsurface intrusive work must have 3 reliable lines of evidence. All lines of evidence used during the utility clearance procedure will be recorded on the Utility and Structures Checklist of equivalent client-provided checklist or permit. If a line of evidence is lost or not apparent, STOP WORK, and re-establish the line of evidence prior to resuming subsurface intrusive work. The Utility Structures and Checklist is valid for 15 business days from the date of completion.

If and when any line of evidence reveals that planned subsurface work will be located inside the 30-inch Tolerance Zone of known/marked/located/observed utilities, the project team must Stop Work and contact Corporate H&S as early as possible for pre-approval.

5.3 Color Codes used for Utility Markings

The following colors are used for marking utilities. Some government agencies or large industrial facilities may use additional colors not provided below. Arcadis policy is to assume any paint marking or pin flag color not provided below is a subsurface utility marking until proven otherwise.

If utilities or subsurface anomalies are identified but the utility type or anomalies are not classified, it is recommend that a pink (Temporary Survey Marking) marking be used. Once the type of utility is established, the pink marks should be repainted/remarked to represent the correct type of utility.

COLOR	Utility Line
WHITE	Proposed Excavation
PINK	Temporary Survey Markings
RED	Electrical Power Lines, Cables, Conduit and Lighting Cables
YELLOW	Gas, Oil, Steam, Petroleum or Gaseous Materials
ORANGE	Communication, Alarm or Signal Lines, Cables or Conduit
BLUE	Potable Water
PURPLE	Reclaimed Water, Irrigation and Slurry Lines
GREEN	Sewer and Drain Lines

APWA and ANSI standard Z-53.1

5.4 Locating Technologies

There are several types of locating technologies that can be used to identify and locate utilities in the subsurface. Project teams need to work closely with private utility locators (PUL) in order to best match locating technology with site conditions. To provide the best results, all possible locating technologies should be available for use and implementation at the project location. Any potential interferences should also be discussed up front and then at the project site during utility location activities. Potential interferences could be soil moisture, soil type, standing water on concrete/asphalt, rebar, fencing, and metal

structures that are in the subsurface. Employees overseeing locating technology activities should have an understanding of device operation and limitations. For further information, refer to ARC HSFS-019 Supplement 3, Use and Limitations of Common Utility Location Technologies and Clearance Methods.

5.5 Clearance Methods

In some cases, proposed subsurface intrusive locations may be pre-cleared using other intrusive methods. Determine the clearance or soft dig method based on-site conditions and utilize the least invasive method possible. The number of subsurface intrusive locations and soil type should be taken into consideration. The following clearance methods are listed from least invasive to most:

1. Vacuum Extraction/Potholing (air or water-based),
2. Air knifing,
3. Hydroknifing,
4. Probing,
5. Hand augering,
6. Hand digging, and
7. Posthole digging.

Single-Point clearance must be 110% of the proposed subsurface intrusive area or the diameter plus 2 inches, whichever is greater. Three-Point clearance must be installed in a triangular pattern around the proposed borehole and in a configuration not to allow for utilities to enter the borehole. Three-Point clearance must be 110% of the proposed intrusive area or the diameter of the intrusive area plus 2 inches, whichever is greater. Each method of clearance should be documented on the Utility and Structure Checklist.

Manual clearing methods, such as shoveling, using pick axes, digging bars and other hand tools, should be avoided completely or only used when absolutely necessary and used with caution. Excessive downward force, prying or use in poor/obstructed visibility conditions is prohibited as these tools can damage utilities.

Surface cover (e.g., asphalt) removal methods within the 30-inch Tolerance Zone that pose excessive downward force, such as jackhammering, should be used with extreme caution. Methods that only cut the surface cover (coring or saw cutting) present less risk due to the absence of the downward force, which could cause collateral damage to shallow subsurface utilities. Note that utilities are often present at the concrete or pavement/soil interface or encased within the concrete or pavement and are easily damaged during concrete coring or pavement removal. Always work slowly, methodically and frequently STOP WORK to evaluate conditions during these work activities.

For borings and excavations, if the utility is known to be at depths where hand clearing is not feasible or creates additional safety concerns, no work will be performed within the 30-inch Tolerance Zone vertically or horizontally of the utility unless manual clearing is performed under the oversight of an Excavation Competent Person as defined in ARC HSCS005 Arcadis Excavation and Trenching.

5.5.1 Temporary Backfilling of Pre-Cleared Boreholes

In some cases, it may be necessary to temporarily backfill a pre-cleared location until the remaining subsurface activities are performed. At these locations where subsurface intrusive work does not immediately follow pre-clearance, it is important to properly backfill and mark the pre-cleared location in order to relocate the pre-cleared location. In general, wooden stakes, survey markers, whiskers, paint marking or other surficial markings alone are inadequate because these markings can be easily removed, damaged or otherwise lost leading to uncertainty regarding the pre-cleared location. Although the specific steps for backfilling a pre-cleared location will depend on site-specific conditions, use the following additional steps to prevent loss of the pre-cleared location:

- Backfill a pre-cleared location with clean sand or other granular material that is significantly different than the surrounding subsurface native material. Native soil should not be used to backfill a pre-cleared location that may require further subsurface work.
- Backfill the top 2 feet of a pre-cleared location with dyed sand or gravel to facilitate re-location.
- Use hammered wooden stakes or delineators to mark locations as an additional measure, if practical.
- In the event that the pre-cleared borehole is located on asphalt or concrete and an asphalt cold patch is required, use white paint to mark the intrusive location with a circle over the asphalt cold patch.
- In some instances, such as projects potentially affected by unexploded ordinance (UXO), the pre-cleared borehole may require that a PVC of matching diameter pipe be inserted into the pre-cleared borehole, filled with clean sand and affixed with a matching cap. Contact the project manager to identify any client-specific requirements.
- Always use a physical subsurface marker such as described above to identify the pre-cleared borehole location. Never rely solely on field measurements or GPS coordinates.
- If a utility or anomaly/obstruction is encountered during the pre-clearing process, backfill the hole with the native soil and mark the location with a pink-painted X and/or NO.

In the event that a previously pre-cleared location cannot be located, the location must be re-cleared prior to performing subsurface intrusive work.

5.6 Clearance for Working in Vicinity of Subsurface Utilities

Prior to the start of subsurface intrusive activities (i.e., excavations, vertical drilling, installing grounding rod, and soil sampling), all utilities must be located and measures must be instituted to avoid subsurface utility hazards. See exemptions for subsurface intrusive work in Exhibit 1 (Definitions). Do not conduct subsurface work within 30 inches of a line marking in all directions. If the centerline of the utility is marked, the diameter of

the utility or utility bank (Exhibit 1) must be incorporated into the 30-inch Tolerance Zone, see Figure 1 located in Exhibit 2 for further instructions.

If and when any line of evidence reveals that planned subsurface work will be located inside the 30-inch Tolerance Zone of known/marked/located/observed utilities, the project team must Stop Work and contact Corporate H&S as early as possible for pre-approval.

If subsurface work must take place within the 30-inch Tolerance Zone of the line marking, the utility must be exposed (potholed) by soft dig/clearance methods prior to starting subsurface intrusive activities (see Section 5.5 for options); **no mechanized equipment is permitted for the exposing of the utility**.

Once the utility has been exposed, if mechanized equipment is planned for use within the 30-inch Tolerance Zone of the utility, such activity must receive pre-approval by Corporate H&S, as necessary, to mitigate or accept the risk associated with the planned work. Additional excavation safety procedures may have to be developed as part of the approval to proceed. It should be noted that any disturbance within the 30 inches or disruption of the bedding materials could affect the integrity of the utility.

For horizontal borings, to avoid striking a utility, damage from vibration, damage by pressure of the advancing boring, do not drill within 30 inches in all directions (3-Dimensional cylinder) of a line marking. Make sure to factor the diameter of the line or utility bank when computing 30-inch Tolerance Zone. When crossing a utility during horizontal drilling, it is recommend that the utility be exposed 30 inches in a 360°-direction. When exposing utilities for horizontal borings, the utility must be exposed (potholed) by soft dig/clearance methods. This recommendation applies even if the operating contractor has technology that places the location to within a few inches. Make sure to factor the diameter of the utility when determining the 30-inch Tolerance Zone. If subsurface work must take place within the 30-inch Tolerance Zone of the line marking, the utility must be exposed (potholed) by soft dig/clearance methods prior to starting subsurface intrusive work (see Section 5.5 for options); **no mechanized equipment is permitted for the exposing of the utility**. Once the utility has been exposed, if mechanized equipment is planned for use within the 30-inch Tolerance Zone of the utility, such activity must receive pre-approval by Corporate H&S, as necessary, to mitigate or accept the risk associated with the planned work. Additional excavation safety procedures may have to be developed as part of the approval to proceed. It should be noted that any disturbance within the 30 inches or disruption of the bedding materials could affect the integrity of the utility.

Additional cautions for horizontal borings include gravity utilities, such as sewers and storm drains, as the depth of these utilities will change (sometimes significantly) as they run across the project site. Always obtain the utility depth at the location where the boring will actually cross the line by collecting sewer depth inverts from identified manholes and interpolating those depths to the area of the subsurface intrusive work.

During well installations and well abandonment via mechanical equipment, the 30-inch Tolerance Zone rule applies outward from the outside edge of the largest diameter auger or tool to be used for installation and abandonment (over drilling). In cases where wells have been previously installed and the 30-inch rule has not been followed, work proposed using mechanized equipment to work within the 30-inch Tolerance Zone will

require approval from Corporate H&S. For more information, see Exhibit 2 for further instructions.

5.6.1 Aboveground Activities causing Subsurface Disturbance in the Vicinity of Underground Utilities

Aboveground activities can cause damage to shallow underground utilities or structures. Plan the intended path/mobilization/operation of Heavy Equipment is cleared to ensure that shallow utilities are not damaged. If Heavy Equipment must cross over shallow utilities, the utilities will be protected. Other subsurface disturbances may lead to damage such as clearing trees/shrubs/vegetation as roots may be entangled with underground piping or structures. For more information, see Best Practices for Field Personnel Concerning Utility Clearance (ARC HSFS-019 Supplement 2).

5.7 Acceptable Clearance for Working in Vicinity of Overhead Power Lines and Other Overhead Lines and Structures

No work will be performed by Arcadis or our subcontractor near overhead power lines where any Unqualified Person or equipment is within the limits specified below unless the power line has been properly covered or de-energized by the owner or operator of the power line. Qualified Person approach distances are defined in Exhibit 5A and 5B of ARC HSFS0006 Electrical Safety Standard.

Power Line Voltage Phase to phase (kV)	Minimum Safe Clearance (feet)
50 or below	10
Above 50 to 200	15
Above 200 to 350	20
Above 350 to 500	25
Above 500 to 750	35
Above 750 to 1,000	45

ANSI standard B30.5-1994, 5-3.4.5

5.7.1 Reducing Vehicle and Mechanical Equipment Clearance Requirements

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 feet (305 centimeters (cm)) is maintained. If the voltage is higher than 50 kilovolts (kV), the clearance shall be increased 4 inches (10 cm) for every 10 kV over that voltage. However, under any of the following conditions, the clearance may be reduced:

- If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 feet (122 cm). If the voltage is higher than 50 kV, the clearance shall be increased 4 inches (10 cm) for every 10 kV over that voltage.

- If insulating barriers are installed to prevent contact with the lines and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

- If the equipment is an aerial lift that is insulated for the voltage involved and if the work is performed by a qualified person, the clearance (between the uninsulated portion of the aerial lift and the power line) may be reduced to the distance given in OSHA 1910.333(c)(3)(ii)(C) Table S-5. Reference information from OSHA 1910.333 Table S-5 and NFPA 70E Table 130.4(C)(a) for alternating-current systems and 130.4(C)(b) for the distances associated with direct-current voltage systems is included as Exhibit 5 of ARC HSFS0006 Electrical Safety Standard.

Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments unless:

- The employee is using protective equipment rated for the voltage; or

- The equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the line than permitted in this section of this standard.

If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding may not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions, such as the use of barricades or insulation, shall be taken to protect employees from hazardous ground potentials, depending on earth resistivity and fault currents, which can develop within the first few feet or more outward from the grounding point.

When a machine is in contact with an overhead power line, do not allow anyone to come near or touch the machine. Stay away from the machine and summon outside assistance.

5.7.2 Acceptable Clearance for Working in Vicinity of Non-Electrical Overhead Utilities and Structures

Arcadis field personnel will identify non-electrical overhead utilities and structures and where possible, work is not be conducted within the 30-inch Tolerance Zone of these overhead utilities and structures. It is recommended that if work will be completed in the vicinity of non-electric overhead utilities, the overhead utilities should be labeled with warning signs, protective barricades, and/or flags. Non-electrical overhead utilities and structures may include, but is not limited to, pipe chases, water lines, ceilings in buildings, etc. Arcadis field personnel will notify its site workers

(employees, subcontractors, vendors, etc.) of known overhead utilities and structures during the tailgate safety meeting. See Exhibit 2 for additional details.

5.8 Reporting Utility Incidents

Arcadis field personnel involved with any subsurface, submerged, and aboveground utility strikes should immediately STOP WORK and contact the Project Manager to discuss the incident unless there are injuries, then call 911 or the available emergency services number for the area and then the Project Manager. The utility strike must be reported to Corporate Health and Safety and Legal Departments immediately and no later than 24 hours. Use the Utility Line Strike Investigation Form as part of the notification process.

Selected utility strike incidents may also utilize a conference call with operations management to review findings and lessons learned. The Business Line Health and Safety Director will make the determination concerning the need to have the incident review call and will arrange the call, if deemed necessary.

5.9 Relationship of this standard to the Project Specific HASP

With the exception of the Utility and Structures Checklist, this standard, including most supplements, are not designed to be printed off and attached to project HASPs. During project health and safety planning, this standard will be reviewed and applicable clearance technologies and methods will be documented on the Utility and Structures Checklist.

Additionally, emergency action standards specific to utility strikes should be addressed. ARC HSFS-019 Supplement 5 provides general guidelines for emergency response to utility strikes. Applicable information may be attached to the Utility and Structures Checklist to facilitate communication of response expectations.

5.10 Required Contract Terms and Conditions

Arcadis' standard client and subcontractor contracts contain required terms and conditions defining responsibility for utility clearance and the allocation of risk associated with an impacted utility. These terms and conditions have prescribed language concerning subsurface work that is presented in Arcadis client contracts and Arcadis' subcontractor contracts, which can be found on the Legal Source site. If such provisions cannot be agreed upon, the reasons are documented and other risk-management actions should be identified, such as limits of liability, add additional physical investigations, additional lines of evidence or utility location, assignment of risk to subcontractors, etc. In addition, any changes to these terms and conditions require approval by Legal Services.

6. TRAINING

Employees responsible for coordinating or conducting utility clearance activities will be familiar with the requirements of this standard. Arcadis in-house 8-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) refresher may provide awareness-level training regarding this utility location and clearance standard.

7. REFERENCES (regulation citation, technical links, publications, etc.)

- Utility and Structures Checklist
- Utility Line Strike Investigation Form
- ARC HSFS-019 Supplement 1, Best Practices for Project Managers (or Their Delegates) Concerning Utility Clearance
- ARC HSFS-019 Supplement 2, Best Practices for Field Personnel Concerning Utility Clearance
- ARC HSFS-019 Supplement 3, Use and Limitations Associated with Location Technologies and Common Utility Clearance Methods
- ARC HSFS-019 Supplement 4, Best Practices for State One Call Procedures and Notifications
- ARC HSFS-019 Supplement 5, Emergency Action Plan guidelines for Utility Strikes
- ARC HSFS-019 Supplement 6, Utility Location SOP for Aquatic Work Activities
- Figure 1 – 30-Inch Tolerance Zone
- ARC HSCS005 Excavation and Trenching
- ARC HSFS0006 Electrical Safety Standard
- One Call and State Law Directory

8. RECORDS - DATA RECORDING AND MANAGEMENT

8.1 Utility Clearance Records

All records (maps, checklists and documentation of communications) used to determine the location of utilities should be retained and kept in the project file.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Julie Santaniello, CSP – Corporate H&S, Manager of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
13 December 2006	01	Mike Thomas/Pat Vollertsen	Original document
26 March 2007	02	Mike Thomas/Pat Vollertsen	Put in new company format
15 May 2007	03	Mike Thomas/Pat Vollertsen	Added nation-wide 811 number
6 September 2007	04	Mike Thomas/Pat Vollertsen	Changing over to new template format
22 February 2008	05	Mija Coppola	Changing over to new template format
13 January 2009	06	Mija Coppola	Define lines of evidence
4 October 2010	07	Sam Moyers/Mija Coppola	Reformatting and addition of utility clearance information
13 February 2012	08	Sam Moyers/Mija Coppola	Modified link information for utility strike reporting, clarified local/state requirements in section 4.1 and 4.3
28 January 2013	09	Tony Tremblay	Utility and Structures Checklist revised; hyperlink updated
12 February 2013	10	Amanda Tine/Tony Tremblay	Clarified clearance boundaries for Unqualified staff in Section 5.7 and added information about vehicles and equipment being used near power lines in Section 5.7.1

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
15 March 2013	11	Kurt Merkle, Rebecca Lindeman / Tony Tremblay	Added additional text to standard for recent lessons learned, added section 5.4 (Locating Technologies) and 5.5 (Clearance Methodologies), added additional details to section 5.6 when working in close proximity to subsurface utilities, and added Supplement 6 - Utility Location SOP for Aquatic Work Activities.
07 July 2013	12	Andrew McDonald/ Tony Tremblay	Removed HSFS-019 Supplement 1, Utility Definitions. Added hyperlink for One Call and State Law Directory. Segregated evidence of sewer or storm drains in USC list. Removed Sam Moyers and added Andrew McDonald as author.
26 September 2014	13	Andrew McDonald/Tony Tremblay	Added Exhibit 1. Definitions and 30 inch tolerance zone. Clarified use of 811 or state one call as a reliable line of evidence. Added best practice to cover backfilling of pre-cleared boreholes. Updated USC list to cover soft dig termination depths and PM review.
23 February 2015	14	Tony Tremblay	Page number correction

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
10 May 2016	15	Denis Balcer/Sharon Lingle/Alec MacAdam/Andrew McDonald/Tony Tremblay/Julie Santaniello	ES and Section 4.2 - define subsurface intrusive work; clarify employees providing oversight of utility contractors, Arcadis requirements of operating and interpreting results of utility clearance equipment, and utility clearance before all subsurface intrusive work. Sections 1 and 5.8- changed submarine to submerged. Section 4.1 – added contacting public utility companies to help clear utilities. Section 4.2 – Clarified requirement to complete one year of utility clearance-related experience. Section 4.2 and 4.3 - Added discussion on aboveground activities causing subsurface disturbances. Added responsibility to clear overhead utilities when heavy equipment will be used and to evaluate use of a spotter. Added that repairs to damaged utilities need to be verified as competent and complete. Section 5.2 – Clarified reliable lines of evidence for each subsurface intrusive work point and degrees of certainty. Added all work within 30-inch Tolerance Zone needs Corp H&S preapproval. Section 5.6 and Exhibit 1- Clarify subsurface intrusive work and activity and exemptions for subsurface intrusive work. Section 5.6.1 – Add requirement to evaluate aboveground activities that may lead to subsurface disturbances that may cause damage to shallow underground utilities or structures.

Implementation Date 13 December 2006	Arcadis HS Standard Name Utility Location and Clearance	ARCADIS Design & Consultancy for natural and built assets
Revision Date 10 May 2016	Arcadis HS Standard No. ARCHSFS019	Revision Number 15

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
10 May 2016	15	Denis Balcer/Sharon Lingle/Alec MacAdam/Andrew McDonald/Tony Tremblay/Julie Santaniello	Section 5.7.2 – added non-electric overhead utilities and structures other than power lines need to be identified and marked if working in that area. Section 9 – Changed reviewer from Tony Tremblay to Julie Santaniello. Exhibit 1 – added definitions of Utility Strike, Daylighting, Potholing, Subsurface Intrusive Work, Subsurface Intrusive Activities, and Utility Bank. Standard and Supplements placed on new Arcadis headers. Updated Supplement revision numbers to be consistent with standard. Supplement 2 revised. Utility Clearance and Structures Checklist and Utility Strike Investigation Form revised.

EXHIBIT 1 – DEFINITIONS

Aboveground Utilities - For the purpose of this procedure, aboveground utilities include, but are not limited to: any aboveground line, pipe, conduit, system, or facility used for producing, storing, conveying, transmitting or distributing communication or telecommunications signals, electricity, gas, liquid, petroleum and petroleum products, coal slurry, hazardous liquids or gases, water under pressure, steam, sanitary sewage, storm water, or other materials, liquids, or gases.

Daylighting – exposing underground utilities or structures through soft dig technology/clearance prior to completing subsurface intrusive activities.

Excavation - Any man-made cut, cavity, trench, or depression, in an earth surface formed by earth removal into which a person can bodily enter.

Overhead Utilities and Structures – Overhead water lines, overhead pipe chases, ceilings in buildings.

Potholing – exposing underground utilities or structures through soft dig technology/clearance prior to completing subsurface intrusive activities.

Subsurface Intrusive Activities – For the purposes of this procedure, subsurface intrusive activities include, but are not limited to: excavations, vertical drilling, installing grounding rod, soil sampling, etc,

Subsurface Intrusive Work – Is any work or activity that breaks the plane of the ground surface. Exemptions include soil sampling using a non-conductive sampling tool to a depth of 6 inches below ground surface (bgs), placement of survey flagging to a depth of 6 inches bgs, and placement of non-conductive survey stake(s) to a depth of 6 inches bgs).

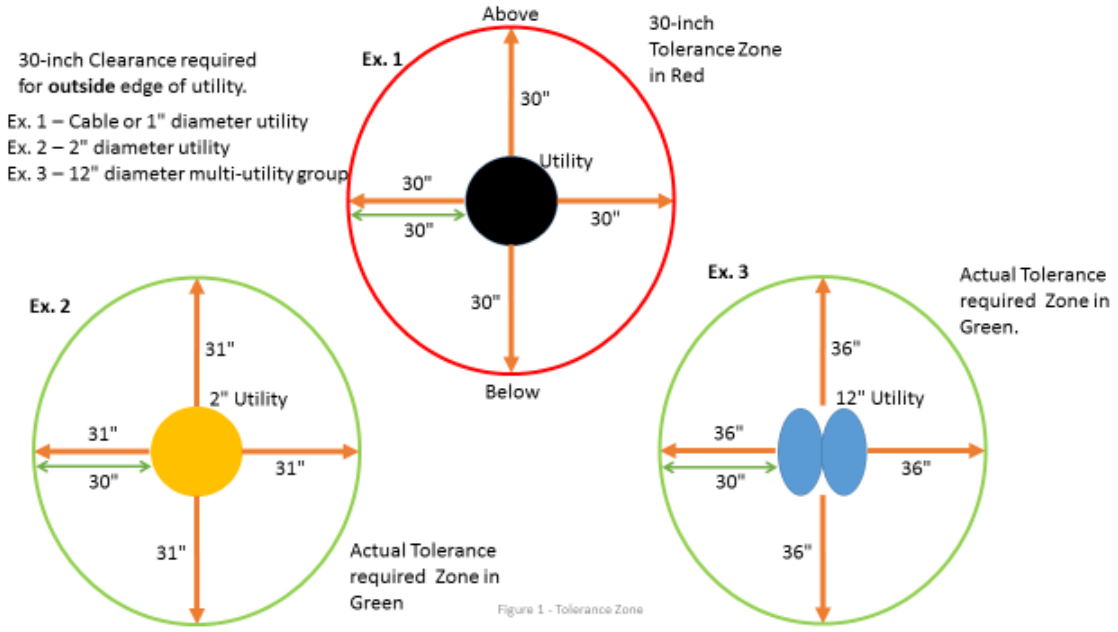
Subsurface Utilities - For the purposes of this procedure, subsurface utilities include, but are not limited to: any underground line, pipe, conduit, system, or facility used for producing, storing, conveying, transmitting or distributing communication or telecommunications signals, electricity, gas, liquid, petroleum and petroleum products, coal slurry, hazardous liquids or gases, water under pressure, steam, storm water, or sanitary sewage; underground storage tanks; tunnels and cisterns; and septic tanks and lines.

Tolerance Zone – The area within 30 inches in all directions from the outside diameter of a located/marked utility in which special care is to be taken. If the centerline of the utility is marked, the diameter of the utility or utility bank/trench must be incorporated into the 30 inches. This area must be hand cleared with non-mechanized equipment. Once the utility has been exposed, if mechanized equipment is planned for use within the 30-inch Tolerance Zone of the utility, such activity must receive pre-approval by Corporate H&S, to mitigate or accept the risk associated with the planned work. See Figure 1 – 30-inch Tolerance Zone.

Utility Bank – a structure containing two or more conduits. A conduit is a single enclosure containing one or more facilities.

Utility Strike – An unplanned contact of a utility (i.e., overhead and structures, aboveground, underground or submerged) during the course of work that results in damage requiring repairs, making a report to the utility owner or requiring further assessment to evaluate the potential for damage

EXHIBIT 2 – FIGURE 1 – TOLERANCE ZONE



Implementation Date 15 October 2015	Arcadis HS Standard Name Water Operations Safety Standard	ARCADIS Design & Consultancy for natural and built assets
Revision Date 15 October 2015	Arcadis HS Standard No. ARC HSFS002	Revision Number 01

EXECUTIVE SUMMARY

This Health and Safety Standard (HSS) sets forth minimum requirements for Arcadis personnel to safely conduct work activities while near, over, on, or in a body of water. ARC HSF002 does not cover Operation of a boat / vessel or diving activities which will be covered in the Field Health and Safety Handbook or working on Ice Sheets. Arcadis recognizes the risk for drowning or serious injury during water based operations and the following tools and components of this HSS can be effectively used to eliminate or reduce these hazards.

This HSS provides practices and policies that Arcadis personnel shall follow to identify, assess, and control risks associated with work activities while near, over, on, or in a body of water.

Activities that involve working near, over, on, or in a body of water, will require that the Project Team complete a Water Risk Assessment Form (WRAF). The WRAF will be used to assess the risks, identify safety critical equipment requirements, training requirements, and identify methods for prompt, safe rescue and notification methods.

Where the risk of drowning exists, Arcadis employee(s) must wear a U.S. Coast Guard (USCG)-approved life jacket or life preserver, commonly referred to as a personal flotation device (PFD). A U.S. Coast Guard-approved inherently buoyant Type I PFD will be worn when ARCDIS employee(s) are working near, over, or on an open ocean, rough seas, or remote water, where rescue may be slow coming. A USCG-approved inherently buoyant Type II or Type III PFD will be worn by Arcadis employee(s) when working near, over, on or in calm, inland waters, or where there is a good chance for fast rescue. The use of Type V & non-inherently buoyant PFDs is not approved and must not be considered for use unless approved by Corporate Health and Safety. The use of PFDs classified for recreational use are prohibited for use on ARCADIS controlled projects.

When the water temperature is below 60°F (Cold Water) additional PPE and rescue requirements must implemented and documented on the WRAF.

When the risk of drowning exists, ring buoys (life rings) with at least 90 feet of line must be provided and must be staged within 200 feet of working personnel. When water conditions allow, a rescue skiff will be made immediately available to assist in rescue.

Prior to each day or shift when work is being performed on water in a boat / vessel a Float Plan must be prepared using the U.S. Coast Guard smartphone app for boating safety by the Arcadis staff and/or boat operator/captain, and must be submitted to the Arcadis PM, TM or their designee and the SSO.

The information contained in this HSS covers Federal requirements. Some State specific requirements may apply, such as Michigan's, requirement for a collar on the Type I PFD that is able to flip an employee face up should they be unconscious in the water. Employees must review and understand state and/or local, and client requirements that may be more stringent than this HSS. In those instances, ARCADIS employee(s) must comply with the more stringent requirement(s).

1. POLICY

It is Arcadis' policy that Arcadis employees working near, over, on, or in a body of water where the risk of drowning exists, shall at a minimum follow this standard.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard sets forth the accepted practice for evaluation of work near, over, on, or in a body of water where the risk of drowning exists and mitigation of associated risks.

2.2 Scope

This standard identifies the general safety requirements for working near, over, on, or in a body of water where the risk of drowning exists including the required use of Personal Flotation Devices (PFDs), completion of the Water Risk Assessment Form (WRAF), Float Plan, cold water and emergency rescue planning.

3. DEFINITIONS

See Definitions in Exhibit 1.

4. RESPONSIBILITIES

4.1 Corporate Health & Safety

Corporate Health &Safety (H&S) will review and update this standard on a routine basis. In addition, Corporate H&S are responsible to provide technical assistance regarding the WRAF, Float Plan, selection of appropriate PFD:

4.2 Project Managers and Task Mangers

Project Managers (PM) and Task Managers (TM) are responsible for knowing, understanding and following applicable Arcadis HSS requirements and for ensuring work on their projects is conducted in accordance with policies/procedures established in this HSS.

4.3 Site Safety Officer (SSO)

Site Safety Officer (SSO) is responsible for knowing, understanding and following applicable Arcadis HSS requirements and for ensuring work on their projects is conducted in accordance with policies/procedures established in this HSS. Additionally the SSO is responsible for:

- Reviewing and signing of the WRAF;
- Training employees for onsite conditions which include risks, controls, work tasks, emergency procedures, and use of emergency equipment;
- Donning and doffing of PFDs and inspection of the PFDs will be covered during this training;

4.4 Arcadis Employees

Employees are required to follow the procedures and practices outline in this Health & Safety Standard (HSS). In addition, employees are required to use PPE provided to them as required by HASPs, JSA, and/or client requirements.

In addition, employees have the responsibility to:

- Complete training and/or have the experience in order to identify existing or predictable risks in surroundings and/or working conditions associated with near, over, on, or in a body of water;
- Understand safety requirements that must be implemented to protect themselves and others during work near, over, on or in water bodies; and
- Properly use emergency rescue equipment and PPE as specified by this standard, Task Specific JSA and in the site specific HASP.

4.5 Arcadis Subcontractors

Subcontractors working on behalf of Arcadis are responsible for establishing, implementing and managing their own water safety program, which includes identification and elimination or control of fall risks in compliance with Occupational Safety and Health Administration (OSHA) and USCG requirements.

5. PROCEDURE

5.1 General Safety Requirements

This standard establishes requirements to minimize the potential for accidental drowning associated with work near, over, on or in water bodies.

Several factors are relevant to determining whether a risk of drowning exists. These include the type (i.e., a pool, a river, and a canal), depth, presence or absence of a current, height above the water surface, and the use of fall protection.

Employees involved with work near, over, on, or in a body of water must:

- Complete a WRAF (Exhibit 2). The project Site Safety Officer (SSO) must review and sign off on the completed WRAF;
- Participate daily tailgate safety meetings to review the task specific risks and controls identified in the JSA;
- If working alone or at night near, over, on, or in a body of water without use of a boat / vessel, the employee will notify the Arcadis PM, TM or their designee and the SSO of the following prior to initiating work:
    - Start location
    - End location

- Estimated time work will start and estimated time of arrival at end location
- Emergency Action Plan discussion
- The discussion will be documented on the WRAF

- If working at night near, over, on, or in a body of water without use of a boat / vessel, Arcadis staff will use the buddy system at all times.
- If working in a boat / vessel, a Float Plan must be prepared (refer to Section 5.5.1) and
- If working in water within 3,000ft of a dam, dam overflow, water intake, or similar structure, Arcadis will notify the structure owner and discuss the appropriate safety requirements and work restrictions and document the requirements on the WRAF.

All employees, including office personnel that are involved with daily operations that involve water based work, must be familiar with emergency action procedures, daily operations and project safety requirements. When any project team member or subcontractor feels unsafe they have the authority to Stop Work at any time.

5.1.1 Personal Flotation Device

Arcadis employees working near, over, on, or in a body of water, where the risk of drowning exists, must wear a USCG-approved life jacket or life preserver, commonly referred to as a PFD. An inherently buoyant Type I PFD will be worn when employees are working in or near an open ocean, rough seas, or remote water where rescue may be slow coming. An inherently buoyant Type II or Type III PFD will be worn by employees when working around or on calm, inland waters, or where there is a good chance for fast rescue. The use of Type V and non-inherently buoyant PFDs is not approved unless approved by Corporate H&S. The use of PFDs classified for recreational use are prohibited for use on Arcadis projects.

Additional information on selection, use, wear, and care can be found in the USCG's PFD Selection, Use, and Wear & Care Guide.

Note: Some state specific requirements may apply, such as Michigan's requirement for a collar on the Type I PFD that is able to flip an employee face up should they be unconscious in the water. Be sure to review and understand local, state, federal, and client requirements that may be more stringent than this HSS. In those instances, Arcadis staff must comply with the more stringent requirement(s).

5.2 Water Risk Assessment Form

Activities that involve working near, over, on, or in a body of water, will require that the Project Team complete a WRAF, Exhibit 2.

The completion of a WRAF is required, but not limited to the following activities:

- Work near, above any body of water (ponds, lakes, streams, rivers, bays, oceans);
- Workers entering a body of water (i.e. perform ecological surveys);
- Working in a harbor, on boat docks, or bulkhead;
- Deployment of a boat / vessel for work activities;
- Working on a boat / vessel or barge;
- Working on a boat / vessel near a Dam;
- Working on a body of water performing Vibracoring / intrusive operations of sediments;
- Working near sludge impoundments, unprotected aeration ponds, retention / detention ponds; and/or
- Working on ice.

The final WRAF must include relevant JSAs and be reviewed and signed by SSO prior to work beginning. The WRAF must be shared with all personnel performing the work, and must also be available for review in the appropriate work area.

A client required permit may be used as long as it meets or exceeds the Arcadis WRAF.

The WRAF must be reviewed and updated at a minimum every 3 months, when the water temperature drops below 60°F or if any other site conditions or work activities (e.g., air/water temperature conditions; night vs day work, etc.) change.

5.3 Working Near or Over a Body of Water

Where feasible, Arcadis will first attempt to eliminate or minimize the potential risk of drowning. The risk assessment and controls will be detailed in the WRAF.

Where the risk of drowning exists, employees shall be provided with USCG-approved PFD. Refer to Section 5.1.1 for additional information regarding PFD use and care. When continuous fall protection is used (without exception) to prevent employees from falling into the water, this has effectively removed the drowning risk, and PFDs are not needed.

If an employee cannot fall into the water as a result of use of fall protection and there is no risk of drowning, then a PFD is not required. The exception is that PFDs must be worn by employees when safety nets constitute the fall protection system. Employees who exit the basket of an aerial lift to a location that is over or near water and the risk of drowning exists as a result of a fall, or who do not maintain 100% fall protection, must wear a PFD.

Employees walking or working on unguarded piers or docks (e.g., open edge to water where drowning risk exists) must wear USCG-approved PFD. Fall protection will be used if there is a possibility that persons could fall 6 or more feet to a lower level, deck, tethered boat / vessel, dock/pier or water. Where feasible, guardrail systems meeting OSHA requirements should be used to address the fall risk.

Example: Where an employee is working on a steep slope and could fall into water in which a drowning risk exists, then a PFD is required. Safety lines that prevent employees from reaching the water eliminate the risk of drowning, and negate the need for PFD use. The same is true when working on a barge or floating platform with a railing system that meets OSHA requirements.

When the risk of drowning exists, ring buoys (life rings) with at least 90 feet of line must be provided and must be staged within 200 feet of working personnel. When water conditions allow, a rescue skiff will be made immediately available to assist in rescue.

5.4 Working In Water Bodies

Employees may perform work in a body of water under two scenarios; wading or snorkeling/diving. Each activity presents a unique set of risks. Wading requirements are addressed in this HSS. Refer to the Field H&S Handbook for requirements pertaining to snorkeling and diving activities. Additionally, prior to engaging in snorkeling or diving work these activities must undergo review and approval by the Arcadis Diving Control Board (DCB).

Wading activities require similar controls as working near or over water including the use of a PFD when the risk of drowning exists. Staff should also use the buddy system when wading. Additional rescue/self-extraction aids (ring buoy, probing rod, and tether to stable object on shore) should be used when necessary based on site conditions.

Some general wading guidance:

- Monitor weather conditions in the work area and upstream from the work area to avoid rapidly changing water levels;
- Use a wading stick or staff, when feasible and cross the current facing upstream;
- Where feasible and permitted by work activity and local regulations, use waders that have felt soles to keep your feet from slipping off of slippery rocks;
- If using waders, use a wader belt to help prevent water from getting down into your waders;
- Carry a whistle in case you need to call for help;
- Shuffle your feet and take one step at a time; and
- If water penetrates the waders, immediately initiate the emergency action plan and evacuate the water.
- A risk assessment must be completed to insure the use of non safety toe waders is acceptable. This will be documented in the HASP & JSA.

5.5 Working On Water Bodies

When working in a boat / vessel on water, including the open ocean, rough seas, remote waters, or any location where rescue may be slow coming, employees will be required to wear a USCG-approved inherently buoyant Type I PFD. A USCG-approved inherently buoyant Type II or Type III PFD will be worn by employees when working on calm, inland waters, or where there is a good chance for fast rescue. Refer to Section 5.1.1 for additional information regarding PFD use and care.

A Float Plan is required when working in a boat / vessel on water. Refer to Section 5.5.1 for additional information.

5.5.1 Float Plan

Prior to each day or shift when work is being performed on water in a boat / vessel a Float Plan must be prepared using the U.S. Coast Guard smartphone app for boating safety by the Arcadis staff and/or boat operator/captain, and must be submitted to the Arcadis PM, TM or their designee and the SSO. All optional information must be submitted. Additionally an electronic copy will remain with the worker(s).

Changes to the float plan will be relayed to the Arcadis PM, TM or their designee and the SSO as soon as the boat / vessel operator/captain becomes aware of the changes. When cell phone service is not available, use of a marine radio is required. The project team will communicate their arrival back to port at the completion of operations or end of shift. If the project team fails to check in at the designated time, the onshore contact person will use the contact numbers/method to communicate with the boat / vessel members. If the Arcadis PM, TM or their designee and the SSO fail to reach the boat / vessel, the PM, TM or their designee and/or the SSO will initiate the emergency action plan and contact the following based on operating area:

- 911 (First responders), plant emergency series, or other emergency services.
- United States Coast Guard District in which the work is taking place, if area is not covered by 911 or other emergency services.
- Arcadis LIFELine (443-569-8585) to notify the Crisis Response Team.

It is recommended that motorized boats / vessels have a self-contained mounted global positioning system (GPS) system or some other sufficient way of tracking boats / vessels (i.e. all boats / vessels can be viewed from the shoreline or launch point with a dedicated person on shore).

5.6 Cold Water

Work that will be performed where cold water conditions exist (water temperature is below 60°F) will require additional planning and personal protective equipment.

When the risk of drowning exists and:

- Water temperatures are between 60 °F and 50°F and the air temperature is above 60°F and when rescue can be achieved within 15 minutes, an inherently buoyant Type I PFD shall be worn.

- Water temperature is at or below 60°F and when rescue can be achieved within 1 hour, an anti-exposure work suit with a minimum immersed CLO value of 0.40 or greater shall be worn. The work suit is approved as a PFD, and does fall above the minimum buoyancy requirements of the U.S. and Canadian Coast Guard and are to be worn at all times

- Water temperature is at or below 50°F and/or when rescue is anticipated to exceed greater than 1 hour, a survival / immersion suit with a minimum immersed CLO value of 0.96 or greater shall be worn. Immersion suits are classified as Dry Suits and are to be worn at all times.

According to the USCG, each anti-exposure work suit and survival / immersion suit must:

- Be fitted with Type I retro reflective material;

- Have a lifejacket light securely attached to the front shoulder area of the immersion suit;

- Have a whistle firmly secured by a cord to the immersion suit; and

- Survival suits construction and performance requirements are outlined within 46 CFR Part 160.171 – Immersion Suits

5.7 Emergency Rescue Equipment & Planning and Implementation

When the risk of drowning exists, ring buoys (life rings) with at least 90 feet of line must be provided and must be staged within 200 feet of working personnel. When water conditions allow, a rescue skiff will be made immediately available to assist in rescue.

The emergency rescue skiff or boat will be equipped with 2 paddle or 2 oars; a ring buoy (with 90ft of line); additional PFD's; and a reach extension device (ball pointed boat hook). Where water current exists, the skiff or boat must be motorized or occupied at all times. It is recommend that the rescue skiffs engine be running to expedite rescue. A safety line may be connected between the boat and a structural member capable of maintaining the position of the boat. All occupants of boats must wear a PFD.

Employees working near, over, on, or in a body of water when the risk of drowning exists will be required to follow the PFD requirements at a minimum as set forth in Section 5.1.1. All PFDs and emergency rescue equipment must be inspected prior to use and be in good working condition. Any equipment that is found to be in poor condition will be deemed out of service. Employees must be trained in the proper use and care of PFDs and emergency equipment.

Emergency Rescue Teams will ensure that all safety, rescue, and emergency equipment is in place prior to commencement of work. Thorough onsite orientation and training on use of the equipment will be provided to employees involved in the work by the SSO. Where applicable, local Emergency Medical Service should be notified and given pertinent information regarding the water based activities. It should be documented on the WRAF if self-rescue is feasible or if outside rescue support is needed.

If the Arcadis PM, TM or their designee and the SSO fail to reach the boat / vessel, as required in the Communication Plan, the PM, TM or their designee and/or the SSO will initiate the emergency action plan and contact the following based on operating area:

- 911 (First responders) or plant emergency series
- United States Coast Guard District in which the work is taking place (If area is not covered by 911 or other emergency series)
- Arcadis LIFELine (443-569-8585) to notify the Crisis Response Team.

6. TRAINING

6.1 Water Awareness Training

All employees that are involved with daily operations that involve water based work, are required to review this HSS and complete project specific training.

6.2 Project Specific Training

Each project SSO will be responsible for training employees for onsite conditions which include risks, controls, work tasks, emergency procedures, and use of emergency equipment. Donning and doffing and inspection of the PFDs and anti-exposure work suit will be covered during this training. The donning and doffing and inspection of survival / immersion suit will be provided by a qualified vendor.

7. REFERENCES (regulation citation, technical links, publications, etc.)

29 CFR 1926.106 – Working over or near water:
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=10669&p_table=STANDARDS

US Army Corps of Engineers EM 385-1-1. 15 Sep 08
http://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_385-1-1_2008Sep_Consolidated_2011Aug.pdf

CFR Subpart 160.001 – Life Preservers, General http://www.gpo.gov/fdsys/pkg/CFR-2003-title46-vol6/pdf/CFR-2003-title46-vol6-sec160-001-2.pdf

United State Coast Guard – PFD Selection, Use, Wear & Care
http://www.uscg.mil/hq/cg5/cg5214/pfdselection.asp

8. RECORDS - DATA RECORDING AND MANAGEMENT

All records regarding will be maintained in the project files. Employee training will be documented on the daily Tailgate Form.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Tony Tremblay, CSP – Corporate H&S, Director of Technical Programs

History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
15 October 2015	01	Kurt Merkle/Andrew McDonald/Julie Santaniello/Tony Tremblay	Original document

Exhibit 1 – Definitions

Aerial Lift - A piece of equipment, extendible and/or articulating, designed to position personnel and/or materials in elevated locations.

ANSI - American National Standards Institute.

Boat – See Vessel.

Buoyancy - The tendency of a body to float or sink in water or any other fluid. Most people will naturally float in water, especially if they fill their lungs with air. Most require only about 11 pounds (50 Newton's) of extra buoyancy to keep their head out of water. That is why a PFD with just 15.5 pounds (70 Newton's) of buoyancy can provide adequate flotation for an adult -- even a very large person. PFDs with 22 to 34 pounds (100 to 155 Newton's) can provide superior performance.

In technical terms, buoyancy is determined by Archimedes' Principle:
Anybody partially or completely submerged in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the body.

That means someone immersed in water is "buoyed" upward by a force equal to the weight of the volume of water that their body takes up (displaces). Gravity pulls a person's body downward by a force equal to their weight. The difference between these forces is a person's net buoyancy. A PFD is very light weight, but displaces enough water to make the PFD and the person wearing it very buoyant.

It also follows that the people hardest to float are those with compact, dense bodies. These tend to be people with athletic body builds, with a lot of bone and muscle mass, and not much fat. Fat is not as dense as muscle and bone, so people who are overweight can actually be easier to float than someone who is much smaller and leaner. Heavy people do not need a higher buoyancy PFD because of their weight.

Cold Water Conditions – A body of water that is 60°F or colder which requires the use of a Work or Survival Suit.

Controlled Access Zones (CAZ's) - An area where a recognized risk exists requiring demarcation by a competent person through the use of signs, wires, tapes, ropes, chains, or other devices. All protective elements of the CAZ shall be implemented prior to beginning work.

Dry Suit – Traps air as an insulation layer between the body and the suit, insulating the user from the cold water. Most dry suits utilize seals at the wrist, neck, and ankles, unless incorporating gloves and boots. These seals are made from waterproof material, insulated or non-insulated.

Floating Work Platform - Platform or barge capable of safely supporting workers, equipment, and materials necessary to perform work.

Hypothermia - Hypothermia is a physical condition that occurs when the body's core temperature falls below a normal 98.6° F (37° C) to 95° F (35° C) or cooler.

Inflatable - A device which depends on flexible air chambers which can be filled with air or other gas (usually carbon dioxide) for flotation.

Inherently Buoyant - A device which relies on buoyant material for flotation. Buoyant materials used in Personal Flotation Devices include -
Kapok - A natural silky fiber produced from the seed of the kapok (ceiba) tree which floats because of air trapped in the fibers' hollow cells.
Plastic Foams - Materials consisting of closed plastic cells which trap air and provide flotation. Flexible plastic foams used for buoyancy include Polyvinyl Chloride (PVC), Polyethylene (PE), and Neoprene. Rigid foams used in ring lifebuoys are often polyurethane.

Lanyard – ANSI approved line designed for supporting one person, with one end fastened to a safety belt or full body harness, and the other end secured to a safety line or structural member. Lanyards shall not exceed 6' in length, and preferably include a "deceleration device" to attenuate fall impact.

Newton - The metric (SI) system measure of force. A one pound force equals about 4.4 Newton's.

OSHA - Occupational Safety & Health Administration.

Personal Flotation Device – Type I, II, III, V
TYPE I PFDS / OFF-SHORE LIFE JACKETS: Best for all waters, Open Ocean, rough seas, or remote water, where rescue may be slow coming. Abandon-ship lifejacket for commercial boat / vessels and all boat / vessels carrying passengers for hire:

- Inherently Buoyant Type I PFDs - SOLAS Service
- Inherently Buoyant Type I PFDs - U.S. Service
- Inflatable Type I PFDs - SOLAS and Domestic
- Hybrid Type I PFDs - US Services

TYPE II PFDS / NEAR-SHORE BUOYANT VESTS: For general boating activities. Good for calm, inland waters, or where there is a good chance for fast rescue:

- Inherently Buoyant Type II PFDs
- Inflatable Type II PFDs
- Hybrid Type II PFDs

TYPE III PFDS / FLOTATION AIDS: For general boating or the specialized activity that is marked on the device such as water skiing, hunting, fishing, canoeing, kayaking and others. Good for calm, inland waters, or where there is a good chance for fast rescue. Designed so that wearing it will complement your boating activities:

- Inherently Buoyant Type III PFDs
- Inflatable Type III PFDs
- Hybrid Type III PFDs

TYPE V PFDS / SPECIAL USE DEVICES: Only for special uses or conditions.
See label for limits of use:

- Hybrid Inflatable PFDs

- Canoe/Kayak Vest
- Boardsailing Vests
- Deck Suits
- Work Vests for Commercial boat / vessels
- Commercial Whitewater Vests
- Man-Overboard Rescue Devices
- Law Enforcement Flotation Devices

Positioning Device - Body belt or harness system limiting free fall to 2 feet or less.

Safety Body Belt/Full Body Harness – ANSI approved body device designed for fall protection, which by reason of its attachment to a lanyard and safety line or structure will limit a fall to 6' or less. A full body harness is the preferred device for fall protection in aerial lift devices. However, safety body belts may be used as “positioning devices” in aerial lift equipment, where employees stand with both feet on the floor of the bucket or platform; and are an acceptable alternative to harnesses only in this application. Because aerial lifts have passive fall protection systems (bucket or rail system), the intent of the belt is to keep the occupant(s) in the device upon impact, not to attenuate a fall from it.

Serviceable condition- A PFD is considered to be in serviceable condition only if the following conditions are met:

1. No PFD may exhibit deterioration that could diminish the performance of the PFD including:
   - Metal or plastic hardware used to secure the PFD on the wearer that is broken, deformed, or weakened by corrosion;
   - Webbings or straps used to secure the PFD on the wearer that are ripped, torn, or which have become separated from an attachment point on the PFD; or
   - Any other rotted or deteriorated structural component that fails when tugged.
2. In addition to meeting the requirements of paragraph 1 of this definition, no inherently buoyant PFD, including the inherently buoyant components of a hybrid inflatable PFD, may exhibit:
   - Rips, tears, or open seams in fabric or coatings that are large enough to allow the loss of buoyant material;
   - Buoyant material that has become hardened, non-resilient, permanently compressed, waterlogged, oil-soaked, or which shows evidence of fungus or mildew; or loss of buoyant material or buoyant material that is not securely held in position.
3. In addition to meeting the requirements of paragraph 1 of this definition, an inflatable PFD, including the inflatable components of a hybrid inflatable PFD, must be equipped with:
   - Except as provided in paragraph 4 of this section, a properly armed inflation mechanism, complete with a full inflation medium cartridge and all status indicators showing that the inflation mechanism is properly armed;
   - Inflatable chambers that are all capable of holding air;

- Oral inflation tubes that are not blocked, detached, or broken;
- A manual inflation lanyard or lever that is not inaccessible, broken, or missing; and
- Inflator status indicators that are not broken or otherwise non-functional.

4. The inflation system of an inflatable PFD need not be armed when the PFD is worn inflated and otherwise meets the requirements of paragraphs 1 and 3 of this definition.

Vessel – A boat, ship or any watercraft that is used to travel or carry employees on a water body and maybe powered.

Wet Suit – Allows some water in, but restrict water movement into and out of the suit. Your body heats up the water that becomes, more or less, trapped in the suit. If the openings of the suite become restricted, the warmed water stays inside the suit longer, reducing heat loss. If a wet suit is damaged or torn, the level of protection is reduced.

Exhibit 2: Water Risk Assessment Form

ARCADIS Design & Consultancy for natural and built assets

Water Risk Assessment Form

Project Name:	Project Location:
Project Number:	Date / Time:
Project Manager:	Evaluation Completed By:
Expiration Date: (At a minimum the WRAF must be reviewed and update every 3 months)	

1. Description of Water Operations

Scope of work:	
Type or Water Body (Stream, Pond, River, Ocean, etc.):	
Depth range of Water Body: _____ to _____	Typical Working Hours: _____ to _____
Water Body Flow Rate or Current (List unit of measurement):	
Water Body Temperature Range (List unit of measurement):	
Geographic Limits of Work Area inlcuding Sart/End Location:	
Surrounding Topography or Site Conditions:	

2. Identification & Control of Water Hazards [1,2]

(Circle Answer that applies)

1) Will work be conducted at height or 6ft or greater with unprotected edges? If **YES**, completion of Elevated Work Permit required. See Section 5.3 of Water Operations Standard	**YES**	**NO**
2) Will work be conducted when water temperature is at or below 60˚F? If **Yes**, below select type of cold water work PPE to be used : (See Section 5.2 of Water Operations Standard)	**YES**	**NO**
Water temperatures are between 60 °F and 50°F and the air temperature is above 60°F and when rescue can be achieved within 15 minutes	**Type I PFD**	
Water temperature is at or below 60°F and when rescue can be achieved within 1 hour	**Work Suit**	
Water temperature is at or below 50°F and/or when rescue is anticipated to exceed greater than 1 hour	**Immersion Suit**	
2) Does the Water Operations listed in Section 1. present a risk of drowning? If **YES**, select type of Inherently Buoyant PFD to be used: (See Section 5.1.1 of Water Operations Standard)	**YES**	**NO**
Worn when employees are working in or near an open ocean, rough seas, or remote water where rescue may be slow coming. See Section 2.	**Type I**	
Worn by employees when working around or on calm, inland waters, or where there is a good chance for fast rescue	**Type II**	
Worn by employees when working around or on calm, inland waters, or where there is a good chance for fast rescue	**Type III**	
4) Does the work require the use of a boat / vessel ? If **YES**, an electronic Float Plan must be completed and submitted prior to starting work. (See Section 5.5.1 of Water Operations Standard)	**YES**	**NO**
5) Will work on boat/vessel be conducted within 3,000ft of a Dam, Spillway, Similar Fearture? If **YES**, completion of a communication plan is required. (See Section 5.5 of Water Operations Standard)	**YES**	**NO**

ARCADIS Design & Consultancy for natural and built assets

2. Identification & Control of Water Hazards [1,2]

(Circle Answer that Applies)

6) Will staff be working alone (Lone Worker)? If YES, the use of the buddy system is required and completion of a communication plan is required. (See Section 5.1 of Water Operations Standard)	YES	NO
7) Will work be conducted at night with out the use of a boat / vessel? If YES, completion of a communication plan is required. (See Section 5.1 of Water Operations Standard)	YES	NO

2) If YES is selected for any questions 3, 4, 5, and 6 must be reviwed and completed.

3.Communcition Plan

(List Minimum Requirements as required in Section 5.1 of the Water Operations Safety Standard)

1) If working in water within 3,000ft of a dam, dam overflow, water intake, or similar structure, Arcadis will notify the structure owner and discuss the appropriate safety requirements and work restrictions and document the requirements here.

4. Emergency Action / Rescue Plan

(List the Rescue Requirements as requireed in Section 5.1 & 5.2 of the Water Operations Safety Standard)

5.Restrictions

Minimum restrictions are listed below

1) The use of Type V and non-inherently buoyant PFDs is not approved unless approved by Corporate H&S.
2) The use of PFDs classified for recreational use are prohibited for use on Arcadis projects.
3) Snorkeling or diving work is prohibited unless reviewed and approval by the Arcadis Diving Control Board (DCB)

6.Site Safety Officer (SSO) Review and Signature

The signatory has reviewed this WRAF and has reviewed the Water Operations Safety Standard. The WRAF must be shared with all personnel performing the work, and must also be available for review in the appropriate work area. After activation of the Emergency Response Plan contact **Arcadis LIFELine (443-569-8585)**

Name (Print):	Date:
Signature:	Time:

APPENDIX D

Emergency Response Plan

ARCADIS Design & Consultancy for natural and built assets

Respondents to Administrative Order on Consent for Remedial Design

EMERGENCY RESPONSE PLAN

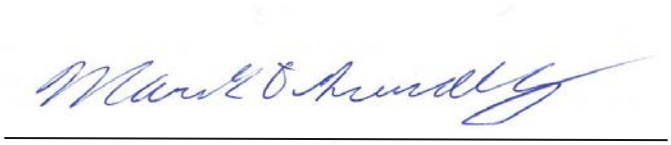
Lower Ley Creek Sub-site

Operable Unit 25 of the Onondaga Lake Superfund Site

City of Syracuse/Town of Salina

Onondaga County, New York

December 2016



Mark O. Gravelding
Project Coordinator

Todd Cridge
Project Manager

EMERGENCY RESPONSE PLAN

Lower Ley Creek Sub-site
Operable Unit 25 of the Onondaga Lake Superfund Site
City of Syracuse/Town of Salina
Onondaga County, New York

Prepared for:

Respondents to Administrative Order on Consent for Remedial Design

Prepared by:

Arcadis of New York, Inc.
6723 Towpath Road
P.O. Box 66
Syracuse
New York 13214-0066
Tel 315 446 9120
Fax 315 449 0017

Our Ref.:

B0035101.0001

Date:

December 2016

CONTENTS

1 INTRODUCTION

This Emergency Response Plan (ERP) has been prepared associated with field investigation and remedial construction activities at the Lower Ley Creek Sub-site (the Sub-site) of the Onondaga Lake Superfund Site. The Sub-site (Superfund Site Identification Number: NYD986913580) is located in Onondaga County, New York within the City of Syracuse and the Town of Salina. The ERP outlines response procedures for potential emergencies that may occur during the performance of field activities at the Site.

1.1 ERP Responsibilities

Todd Cridge of Arcadis will assume the role of Site Health and Safety Officer (SHSO). The SHSO will be made aware of any emergencies and coordinate any response activities conducted at the Site. The SHSO will also serve as the overall Project Emergency Coordinator (PEC) and have the ultimate authority in specifying and facilitating any contingency action.

If the SHSO is not able to perform the duties of the PEC, the SHSO will specify another senior individual (involved in the performance of day to day field activities) to serve as the PEC, such as an on-site foreman and/or supervisor.

1.2 Identifying Hazards and Assessing Risk

The objectives during any emergency are to first protect human health and safety, and then the environment. Possible hazards to human health or the environment that may result from any emergency situation shall be identified by the PEC. The PEC shall take into consideration both direct and indirect effects of the incident. The PEC shall assess the possible risks to human health or the environment that may result from the emergency (e.g., release, fire, explosion, or severe weather conditions). The PEC shall make this assessment by:

- Identifying the materials involved in the incident
- Consulting the appropriate occupational health guideline or safety data sheets (SDSs) to determine the potential effects of exposure/release, and appropriate safety precautions
- Identifying the exposure and/or release pathways and the quantities of materials involved

Based on this information, the PEC shall determine the best course of action for dealing with the emergency and identify possible follow-up requirements (e.g., equipment repair and material disposal).

If the incident cannot be controlled without incurring undue risk, the PEC shall implement the Site Evacuation Procedures described in Section 3.1. If the off-site neighboring population is at risk, the PEC shall implement the Off-Site Evacuation Procedures described in Section 3.2. The PEC shall notify the Remediation Engineer, USEPA, and the appropriate government agencies and departments that a situation resulting in the need for evacuation has occurred. Should emergency assistance in treating injuries or carrying out the evacuation be required, the PEC shall request assistance of local emergency response personnel (e.g., ambulance service, fire department, and police department), as detailed in the site specific Health and Safety Plan (HASP).

1.3 Conditions for Implementing the ERP

Potential emergency conditions that require implementation of this ERP include the following:

- Fire or explosion
- Occurrence of a spill or material release
- Severe weather conditions
- Physical or chemical injury to a worker

These emergency conditions are discussed in the following subsections. Additional emergency conditions that may require implementation of this ERP shall be identified by the PEC.

1.3.1 Fire and/or Explosion Conditions

Contingency procedures shall immediately be implemented upon notification that any of the following scenarios involving a fire and/or explosion are imminent or have occurred:

- A fire that causes, or could cause, the release of toxic fumes
- A fire that could possibly ignite nearby flammable materials or could cause heat-induced explosions
- A fire that could possibly spread to off-site areas
- A danger that an explosion could occur, causing a safety or health hazard
- An explosion

1.3.2 Spill or Material Release Conditions

The following scenarios involving a spill or material release, whether imminent or having already occurred, shall cause implementation of contingency procedures:

- A spill or material release that could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard
- A spill or material release that could cause the release of toxic vapors or fumes into the atmosphere in concentrations higher than the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs)
- A spill or material release that can be contained on Site where a potential exists for groundwater or surface water contamination
- A spill or material release that cannot be contained on Site, resulting in a potential for off-site soil contamination, sediment contamination, and/or groundwater or surface water pollution

All spills or material releases shall be reported immediately to the PEC. The PEC shall immediately identify the character, source, amount, and extent of any release. Initial identification shall be based on visual analysis of the material and location of the release.

1.3.3 Severe Weather Conditions

The following severe weather conditions, whether imminent or having already occurred, shall cause implementation of contingency procedures:

- A tornado has been sighted in the area
- A tornado warning is in effect for the area
- A lightning storm is underway in the area (storm center less than 5 miles away)
- Other severe weather or weather-induced conditions (e.g., hurricane or flood)

1.3.4 Physical or Chemical Injury Conditions

The following worker injuries shall cause implementation of contingency procedures:

- Major physical injuries
- Chemical injuries
- Severe symptoms of chemical overexposure

2 CONTINGENCY PROCEDURES

If any of the aforementioned conditions for implementing the ERP are met, the appropriate following contingency procedure(s) shall be performed.

2.1 Contingency Procedures for Fire/Explosion

When a fire or explosion appears imminent or has occurred, all normal site activity shall cease. The PEC shall assess the potential risk and severity of the situation and decide whether the emergency event is or is not readily controllable with existing portable fire extinguishers or site equipment and materials at hand. Firefighting shall not be conducted at the risk to site workers. Local fire departments shall be contacted in all situations in which fires and/or explosions have occurred. The following steps shall be taken for a localized fire:

- Contact local fire departments
- Move all personnel to an upwind location at an appropriately safe distance away
- Determine if fire is within on-site personnel capabilities to attempt initial firefighting
- Determine if smoke and/or fumes from fire are potentially impacting off-site areas
- If fire is not impacting off-site areas and is within on-site personnel capabilities, utilize the most appropriate means of extinguishing fire (e.g., fire extinguishers, water, covering with soil)
- Once fire is extinguished, containerize and properly dispose of any spilled material, runoff, or soil

If the situation appears uncontrollable and poses a direct threat to human life, fire departments shall be contacted and the evacuation procedures described in Section 3 shall be implemented. If the potential for an impending explosion is high, the entire area within a 1,000-foot radius of the fire source shall be evacuated. The PEC shall alert personnel when all danger has passed, as determined by the chief fire fighter from the responding fire departments. All equipment (e.g., fire extinguishers) used in the emergency shall be cleaned and refurbished as soon as possible after the emergency has passed so that it will be ready for use in the event of any future emergency.

2.2 Contingency Procedures for Severe Weather

When severe weather is forecasted or occurs, the information shall be immediately relayed to the PEC. In the case of a tornado sighting, the PEC shall initiate emergency evacuation procedures (see Section 3), and all personnel shall be directed to proceed indoors after completing appropriate shutdown procedures. In the case of a tornado warning, or lightning storm, the PEC shall have operations stopped and direct all personnel to stand by for information regarding emergency procedures. Other types of weather or weather-induced conditions (e.g., hurricane or flooding) for which long-range prediction is available may also require action as identified herein.

When the severe weather has passed, the PEC shall direct the Remediation Contractor to inspect on-site equipment to check its readiness for operation prior to restarting operations. If an inspection indicates a fire, explosion, or release has occurred as a result of a severe weather condition, the contingency procedures for those events shall be followed.

If flooding is anticipated based on the results of weather and Susquehanna River flow monitoring, the Remediation Contractor shall implement the following contingency measures:

- Secure all water-based vessels from flooding conditions and move all heavy equipment to the highest landside elevation
- If overbank flooding is possible, secure (or remove from the Site, if possible) all chemicals and materials, including impacted material within staging areas

2.3 Contingency Procedures for Physical Injury to Workers

Regardless of the nature and degree of the injury, the PEC shall be notified of all injuries requiring first aid treatment of any kind. The PEC shall complete a report of the injury or incident.

Upon notification that a worker has been injured, the PEC shall immediately determine the severity of the accident, and whether the victim can be safely moved from the incident site. Local medical assistance shall be requested immediately, if appropriate.

Minor injuries sustained by workers shall be treated on Site using materials from first aid kits. Whenever possible, such treatment shall be administered by trained personnel in a “clean” support zone. Examples of minor injuries include small scrapes and blisters. Minor injuries would not be expected to trigger implementation of the ERP.

A major injury sustained by a worker will require professional medical attention at a hospital. The PEC shall immediately call for an ambulance and contact the hospital to which the injured worker will be transported. The PEC shall notify the NYSEG Project Manager as soon as practical. The hospital and ambulance should be advised of:

- The nature of the injury
- Whether the injured worker will be decontaminated prior to transport
- When and where the injury was sustained
- The present condition of the injured worker (e.g., conscious, breathing)

2.4 Contingency Procedures for Chemical Injury to Workers

Injuries involving hazardous chemicals or symptoms of severe chemical overexposure shall result in implementation of the ERP. Upon notification that a chemical injury has been sustained or severe symptoms of chemical exposure are being experienced, the PEC shall notify the hospital and ambulance of the occurrence. The PEC shall provide, to the extent possible, the following information:

- The nature of the injury (e.g., eyes contaminated)
- The chemical(s) involved
- The present condition of the injured worker (e.g., conscious, breathing)
- Whether the injured worker will be decontaminated prior to transport
- When and where the injury was sustained

The victim shall be immediately removed from the incident site using appropriate personal protective equipment (PPE) and safety equipment. Rescuers shall check for vital signs and, if possible, remove contaminated outer clothing. If the victim's eyes have been contaminated, personnel trained in administering first aid shall flush the victim's eyes with eyewash solution until the emergency response team arrives.

Details on the nature of the contaminant and methods for treating exposure or injury can be obtained from the SDSs or occupational health guidelines.

2.5 Contingency Procedures for Spills or Material Releases

If a hazardous waste spill, material release, or process upset resulting in a probable vapor release is identified, the PEC shall immediately assess the magnitude and potential seriousness of the spill or release based upon:

- SDS for the material spilled or released
- Source of the release or spillage of hazardous material
- An estimate of the quantity released and the rate at which it is being released

- The direction in which the spill or air release is moving
- Personnel who may be or may have been in contact with the material, or air release, and possible injury or sickness as a result
- Potential for fire and/or explosion resulting from the situation
- Estimates of area under influence of the release

If the spill or release is determined to be within the on-site emergency response capabilities, the PEC shall initiate implementation of the necessary remedial action. If the accident is beyond the capabilities of the operating crew, all personnel not involved with emergency response activity shall be evacuated from the immediate area and the appropriate emergency response group(s) shall be contacted.

3 EMERGENCY EVACUATION PROCEDURES

In the event that emergency conditions require evacuation, the site and off-site evacuation procedures described in the following subsections shall be implemented.

3.1 Site Evacuation Procedures

If an emergency occurs that requires the evacuation of an on-site area to ensure personnel safety, including, but not limited to, fire, explosion, severe weather, hazardous waste/material spills, or a significant release of vapors into the atmosphere, an air horn shall be sounded on the Site by the nearest person aware of the event. The horn shall sound continuously for approximately 15 seconds, signaling that immediate evacuation of all personnel from the area is necessary, as a result of an existing or impending danger. In areas where only two or three people are working side by side, and the need to evacuate can be communicated verbally by the nearest person aware of the event, the air horn is not necessary.

All heavy equipment in the area shall be shut down. Under no circumstances shall incoming visitors (other than emergency response personnel) be allowed to enter any area where an emergency is occurring. Visitors or observers and all non-essential personnel present in the area of an emergency shall be instructed to evacuate the area immediately.

All site supervisors and subcontractors will be responsible for ensuring that emergency response requirements specific to their own operations are implemented. These parties shall report their activities to the PEC. The PEC, however, has final authority regarding all emergency response activities.

All non-essential personnel shall evacuate the emergency areas and notify personnel in adjacent areas to evacuate. The evacuated workers shall assemble at the site construction office trailer, where the PEC shall give directions for implementing necessary actions. In the event that the primary assembly area is involved, unapproachable, or unsafe due to the event, evacuated workers shall assemble at the alternate assembly area identified by the PEC.

Personnel are to avoid encountering smoke/gas plumes as practicable during evacuation and assembling.

The PEC shall take charge of all emergency response activities and dictate the procedures to be followed until emergency personnel arrive. The PEC shall assess the seriousness of the situation, and direct whatever efforts are necessary until the emergency response units arrive.

After initiating emergency response procedures, the PEC shall assign appropriate personnel to check and attempt to ensure that access roads are not obstructed. If traffic control is necessary (e.g., in the event of a fire or explosion), personnel who have been trained in traffic control procedures and designated at the project safety meeting shall take over these duties until emergency units arrive.

The PEC shall remain at the Site to provide any assistance requested by emergency response personnel when arriving at the Site. The PEC shall have the authority to shut down any part of or the entire project after an emergency, until the PEC deems it safe to continue operations. The PEC shall dictate any necessary changes in project safety practices as a result of the emergency that has occurred, or as required for preventing further emergencies.

3.2 Off-Site Evacuation Procedures

If the PEC deems that human health beyond the site limits is at risk, the PEC shall notify the appropriate agencies and departments (e.g., USEPA Project Manager, police, New York State Department of Environmental Conservation, fire department) of the need, or potential need, to institute off-site evacuation procedures. The PEC shall provide, at a minimum, the following information:

- His or her name and telephone number
- Name and address of facility
- Time and type of incident (e.g., release, fire)
- Name and quantity of material or materials involved, to the extent this information is known
- The extent of injuries, if any
- The possible hazards to human health or environment
- Cleanup procedures

3.3 Personnel Accountability Procedures After Evacuation

After evacuation, all personnel are responsible for reporting to his or her foreman and/or supervisor so an accurate role call can be made. The foreman and/or supervisor will report the role call for their group to the PEC, who is responsible for accounting for each employee. All personnel will be accounted for by name. The PEC will then report their role call to the SHSO.

All site personnel and visitors not assigned to a foreman and/or supervisor will be required to sign in with the SHSO upon entering the Site. Upon evacuation, site personnel and visitors not assigned to a foreman and/or supervisor shall proceed promptly to the designated rallying point and report directly to the SHSO.

4 SPILL PREVENTION, CONTROL, AND COUNTERMEASURES

Performance of field activities at the site poses a potential for accidental spills and discharges. The immediate containment of a spill or discharge of hazardous materials is necessary to minimize the potential impact to human health and the environment. This section contains procedures to be followed in the event of a spill or release at the work area during field activities.

4.1 Spill Prevention

Spill prevention has been developed as an integral part of this project. The key elements of the spill prevention program include:

- Impermeable containment bins (e.g., steel drums) to store impacted soils
- Portable fuel tanks with dual wall or secondary containment (i.e. diesel and gasoline)
- Lockable steel containers – small chemical storage (i.e. oils, greases, etc.)
- On-site inventory of spill response materials including sorbent pads and booms

4.2 Emergency/Spill Response Plan

This section addresses spill response measures for potential spills or discharges of contaminated-related materials that could occur at the subject site during the work activities. Release of any amount of a chemical or petroleum product to the environment, may be considered a reportable spill. A release constitutes potential for groundwater, surface water or atmospheric contamination.

Releases that could occur during the performance of work at this location include, but are not limited to the following:

- Oil/petroleum spills (diesel, gasoline, hydraulic fluid, etc.).
- Hazardous waste spills (impacted sediments).
- Chemical spills/releases (solvents, acid, paints, etc.).
- Soil/sediment spill or release.

Spilled or released materials can be in the form of a solid, liquid, gas, or any combination thereof. The state of the discharged product at the time of release and the physical characteristics of the location could yield the following movements:

- Vertical movement – downward seepage through soil horizons and upward movement of vapors and dust in the atmosphere.
- Lateral movement – horizontal movement of product following the contour of ground surfaces
- Combination – it is important to recognize the three-dimensional movement when containing a hazardous material.

In the event of a reportable spill Arcadis will immediately notify the following entities, but in no case later than two hours after the discharge:

- SHSO – Todd Cridge
- USEPA Project Manager – Pam Thames

Arcadis will then immediately notify the Owner. Arcadis and/or the Owner will be responsible for calling the appropriate agencies for notification of a spill. Other notifications may include the National Response Center (NRC), if applicable (800-424-8802).

Arcadis' Superintendent and/or SHSO will notify the Owner, and provide the following information:

- Exact location of the release.
- Type and description of released material.
- Estimated amount of material released.
- Extent of any injury or property damage.
- Extent of actual or potential environmental damage, if known.
- What actions, if any, have been taken to control the release.

4.3 Spill Prevention and Countermeasures

Where hazardous substances may be released by spilling sediments or other hazardous substances, such that employees may be exposed to these hazards, HAZMAT trained employees must perform the appropriate spill containment procedures. Countermeasures will be implemented by Arcadis and will include the following general procedures:

- Solid Spills (soil/sediment):
    - Take timely action to control and clean-up the release so that any hazard or potential hazard to human health, life or the environment will be expeditiously controlled and eliminated.
    - Immediately remove and place impacted materials into staging piles or containers.
    - Cover piles, secure and protect containers as appropriate.
    - Perform waste characterization and disposal.
- Liquid and/or Sludge Spills (fuel, construction water, misc. chemicals):
    - Take timely action to control and clean-up the release so that any hazard or potential hazard to human health, life or the environment will be expeditiously controlled and eliminated.
    - Apply absorbtive materials (e.g., sand, clean fill, or other absorbent).
    - Remove and place the absorbent/spill mixture into staging piles or containers.
    - Cover piles, secure and protect containers as appropriate.
    - Perform waste characterization and disposal.
    - Application of absorbents, e.g. sorbent pads

- Fuel spills on water:
  - All work activities shall be halted.
  - Take timely action to control and clean-up the release so that any hazard or potential hazard to human health, life or the environment will be expeditiously controlled and eliminated.
  - Will be managed with floating oil booms, sorbent pads and other typical water based spill management practices.
  - Remove and containerize spent sorbents.
  - Decon impacted equipment (i.e. boat walls, deck, etc.).
  - Waste characterization and disposal.
- General Techniques:

  When choosing the containment techniques to be employed, the possible movements of the material must be considered. The following actions can be employed to limit the movement of a spill:
  - Place a dam – Dams may be constructed of earth, sandbags, absorbent booms, boards, concrete, or other suitable material.
  - Dig a trench – Trenching is often used in lieu of damming. The trenches can be lined to serve as a collection area.
  - Use a dike – Dikes are like dams, only they are typically pre-built as a means of aiding containment at a storage staging area.
  - Remove the source – Retrieve liquids or sludge, if possible.
  - Limit upward movement – Reduce vapors and dust by spraying with water, foam, or other suitable material.

Employees performing these procedures are required to wear the proper protective clothing and equipment for the materials present, and to follow established standard operating procedures for spill control. The SHSO will evaluate the conditions of the spill and determine the appropriate level of PPE. In many cases, the HASP may provide quick guidance. Arcadis will conduct air monitoring to determine the appropriate level of PPE needed in response to the spill/release. Arcadis will determine the appropriate use of resources to conduct the air monitoring.

Once contained, the spill shall be cleaned up in accordance with standard remediation methods. Upon completion of a satisfactory cleanup, the spill incident shall be reviewed by all management personnel in order to determine the conditions leading to the spill, additional prevention methods, and corrective actions to be immediately implemented.

Following the spill/release incident, the Arcadis Superintendent or SHSO will investigate its causes, evaluate response, re-evaluate procedures (and propose procedure modifications, if necessary) and write a report on the findings to be submitted to the Engineer/Owner within 48 hours. Arcadis will maintain onsite the following equipment for spill containment and cleanup to be stored in main staging area and near each active work area (minimum quantities noted):

- Sorbent Pads
- Disposable bags
- PPE for two individuals
- Shovels, brooms, etc.
- Speedi-Dri 1 bag

4.4 Training

At a minimum all site personnel shall receive instruction and training of this ERP prior to beginning work on site. Additional training may be held as a result of site specific changes in conditions/layout or replacement of key personnel. During this training selected topics to be reviewed and discussed shall include

- Notification/reporting of an emergency
- Fire prevention
- Emergency response equipment
- Names of key personnel and their responsibilities
- Evacuation procedures and rallying points
- Securing equipment
- Spill prevention and reporting

Arcadis of New York, Inc.

6723 Towpath Road

P O Box 66

Syracuse, New York 13214-0066

Tel 315 446 9120

Fax 315 449 0017

www.arcadis.com

Arcadis of New York, Inc.

6723 Towpath Road

P.O. Box 66

Syracuse, New York 13214-0066

Tel 315 446 9120

Fax 315 449 0017

www.arcadis.com