P1 MPE System Restart and Seasonal Operation Workplan

Prepared for
Grant County Public Works

August 2024

Parametrix

P1 MPE System Restart and Seasonal Operation Workplan

Prepared for

Grant County Public Works
124 Enterprise Street SE
Ephrata, WA 98823

Prepared by

Parametrix
719 2nd Avenue, Suite 200
Seattle, WA 98104
T. 206.394.3700 F. 1.855.542.6353
www.parametrix.com

August 2024 | 553-1860-014

Citation

Parametrix. 2024. P1 MPE System Restart and Seasonal Operation Workplan. Prepared for Grant County Public Works by Parametrix, Seattle, Washington. August 2024.

Certification

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

Shira DeGrood

Prepared by Shira DeGrood

Amber Bailey

Prepared by Amber Bailey

Checked by Brian Pippin, PE

Approved by Jenifer Young

This Page Intentionally Left Blank

Contents

FIGURES

Contents (Continued)

TABLES

ATTACHMENTS

Acronyms and Abbreviations

MPE	Multi-Phase Extraction
Ecology	Washington State Department of Ecology
HAZWOPER	hazardous waste operations and emergency response
O&M	Operation and maintenance

1. Introduction

This Ephrata Landfill Phase 1 Multi-Phase Extraction (MPE) System Restart and Seasonal Operation Work Plan (workplan) describes the preparation, operation, and maintenance procedures to restart and operate the Ephrata Landfill MPE system.

1.1 Project Background

This work is required under the terms of Agreed Order No. DE 3810 (Order) Amendment No. 3 (Amendment) between the Washington State Department of Ecology (Ecology) and Grant County. The Amendment requires the County to develop a workplan, restart, and operate the MPE system from April through October until construction of an expanded MPE system starts. MPE system restart is required within 45-days after Ecology's approval of the workplan, or the following April if the restart would otherwise be after September 1.

Figure 1 shows the MPE system layout at the north end of the Ephrata Landfill. The MPE system comprises extraction and observation wells, field piping, a vapor treatment train (VTT), a liquid treatment train (LTT), a support building, electrical and controls systems, and an evaporation pond. The VTT and LTT are housed in intermodal shipping containers. The MPE system was installed in 2016 and 2017 and a pilot test was conducted in 2017 in prior interim actions under the second amendment of the Order.

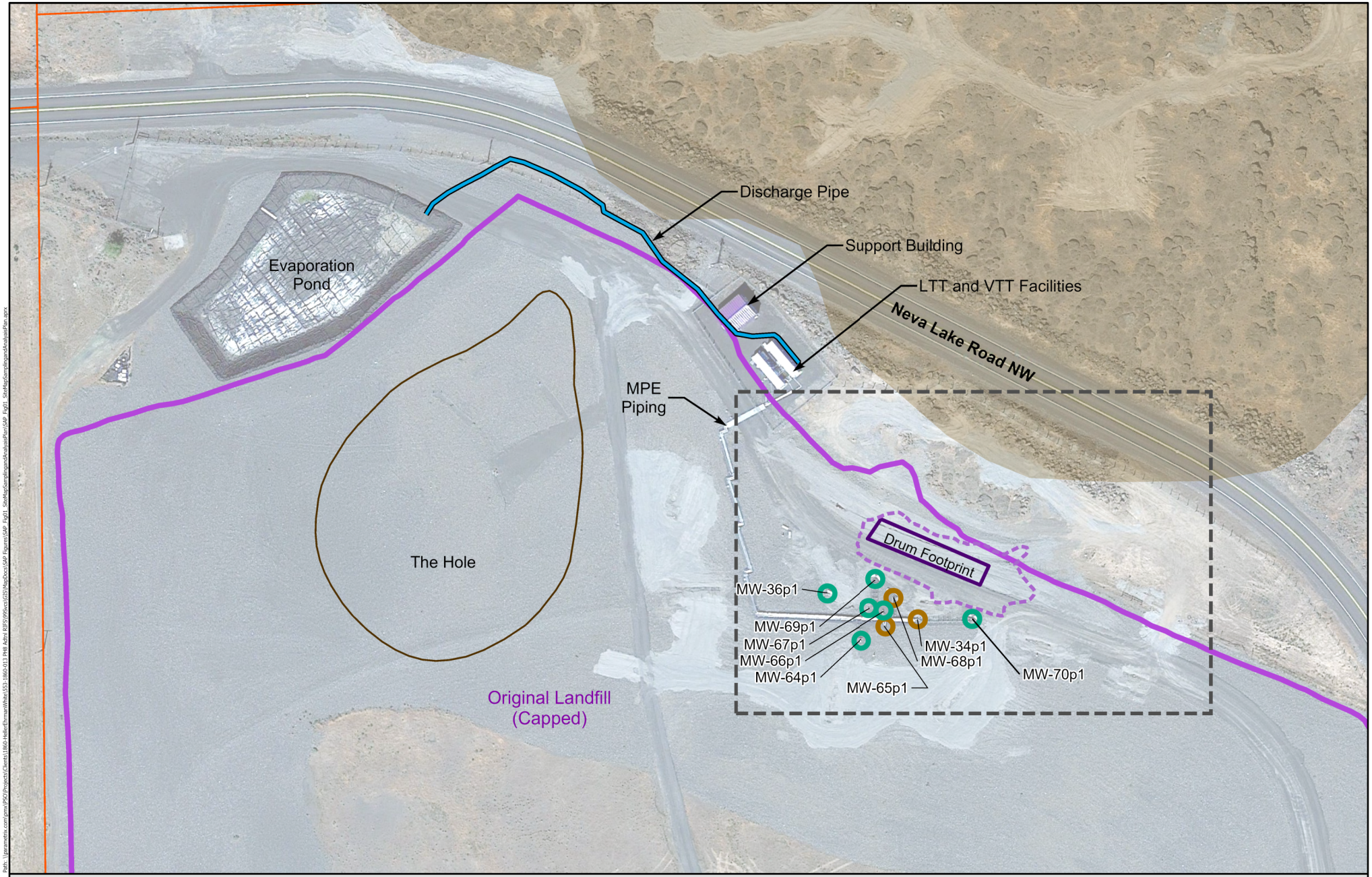
The MPE system was shut down after the 2017 pilot test. System shutdown comprised turning off process equipment, draining pipes and vessels, removing spent granular activated carbon (GAC) from the vapor filters, and removing, cleaning, and stowing the well pumps and water level transducers.

1.2 Related Documents

The following documents provide crucial information not directly included in this workplan:

- Health and Safety Plan (HASP)—Attachment A
- Sampling and Analysis Plan (SAP)—Attachment B
- MPE Pilot Test IRA Report (Parametrix 2018)—not attached, previously distributed to stakeholders, available on request

Appendix A of the 2018 IRA report contains MPE system details, including design and record drawings and the Operation and Maintenance (O&M) manual. Although the 2018 IRA report is not attached due to file size, it was distributed in 2018 and is available electronically from Parametrix on request. The O&M manual component document folder is also available electronically on request.



Date: 4/11/2024
Sources: 2019 Google Earth Aerial Photo
PCS: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Disclaimer: This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Parcel Boundary (County-owned)
Basalt Outcrop

Original Landfill (Capped)
Drum Footprint
Drum Area Excavation
Approximate Drum Source Area

2017 MPE Pilot Test
P1 Zone Extraction
P1 Zone Monitoring
Discharge Pipe

0 25 50 100 150 Feet

Figure 1 - Site Map
Sampling and Analysis Plan
Ephrata Landfill:
MPE System Restart

Grant County Public Works

2. Project Administration and Control

The list below contains the names, roles, and contact information for people involved with the P1 MPE restart and seasonal operation. A summary of each entity's involvement in the project follows the list.

Table 1. Project Contacts

Name	Role	Phone #1	Phone #2	email
Parametrix				
Dwight Miller	Principal in Charge, Principal Consultant	206-410-6446	+1-425-9411823	dmiller@parametrix.com
Brian Pippin	Project Manager, Senior Project Engineer	425-681-3602	206-394-3634	bpippin@parametrix.com
Mike Brady	Field Personnel, Senior Hydrogeologist	206-604-8570	206-519-5781	MBrady@parametrix.com
Sally Nguyen	Field Personnel, Hydrogeologist I	206-395-7367		SNguyen@parametrix.com
Tiffany Neier	Project Support, Project Engineer	206-696-2895	206-394-3671	TNeier@parametrix.com
Drew Norton	Field Personnel, Engineer IV	614-557-5988	206-394-3710	DNorton@parametrix.com
Shira DeGrood	Project Support, Senior Scientist	971-351-7968		sdegrood@parametrix.com
Katie Burke	Field Personnel, Hydrogeologist I	503-416-6075		kburke@parametrix.com
Scott Swedberg	Field Personnel, Engineer II	206-410-6446	206-410-6446	sswedberg@parametrix.com
Local Contractor				
Pat King	President, KRCI LLC	509-884-5258	509-670-4403	pat@krci.net
Joey Wedam	Senior Project Manager, KRCI LLC	509-884-5258	509-699-6353	joey@krci.net
Analytical Laboratory				
Eric Young	Friedman and Bruya, Inc.	206-683-1731	206-285-8282	eyoung@friedmanandbruya.com
Mott MacDonald				
Alla Skaskevych	Senior Project Manager - Hydrogeologist	816-642-7365	206-539-3765	alla.skaskevych@mottmac.com
Janet Knox	Senior Vice President	206-375-5432	206-838-2886	janet.knox@mottmac.com
Caner Zeyrek	Project Scientist - Hydrogeologic Analyst	531-218-9268	206-487-1312	Caner.Zeyrek@mottmac.com
Grant County Public Works				
Samuel Castro	Public Works Director	509-754-6082		samcastro@grantcountywa.gov
Jackey Tuetken	Landfill Foreman	509-350-9651		jdtuetken@grantcountywa.gov

Name	Role	Phone #1	Phone #2	email
Jason Collings	Solid Waste Supervisor	509-750-3351	509-754-4319	jcollings@grantcountywa.gov
Ecology				
Kristin Beck	Site Manager, Hydrogeologist	509-514-6806		kristin.beck@ecy.wa.gov
Jeremy Schmidt	Toxics Cleanup Program	509-724-1164		jesc461@ecy.wa.gov

Parametrix is the project engineer and lead operator of the MPE system. Parametrix will coordinate system repairs and personnel training, restart the system, and monitor and sample the system as described in this workplan. Parametrix will retain a local contractor to perform minor repairs prior to startup and from time to time when requested.

KRCI LLC is a local contractor retained by Parametrix to perform piping repairs, other repairs that may be needed from time to time and assist with maintenance activities.

Friedman and Bruya, Inc. is the analytical laboratory selected for liquid and vapor sample analysis for the MPE restart and seasonal operation.

Mott MacDonald is the project hydrogeologist and groundwater monitoring lead. They also manage the project database.

Grant County Public Works owns and operates the landfill and manages project contracts, invoicing, payment, and reimbursement requests. The County also controls access to landfill property.

Ecology regulates the site cleanup and controls grant funding.

2.1 Site Access Control

The Ephrata Landfill is a fully fenced facility that is locked except during business hours Monday through Saturday. Public access to the tipping area (active landfill) is through a gated entrance from Neva Lake Road approximately 1,500 feet south of the MPE project area. Public travel on landfill roads is regulated by signage to the tipping area. Landfill personnel monitor unauthorized vehicles that stray from onsite public routes. The MPE project area is physically accessible by driving north (i.e., opposite the signage) from the public entrance.

The MPE project area is more directly accessible from Neva Lake Road through a second gated entrance at the northwest corner of the landfill near the treatment and support buildings and evaporation pond. This gate is normally locked and is for authorized use only (i.e., County personnel and authorized people). The support building and the containers housing the main treatment equipment lock. The landfill fence and gates are the only physical barriers to public access to other MPE infrastructure (e.g., wells, piping, evaporation pond).

2.2 Training and Certification

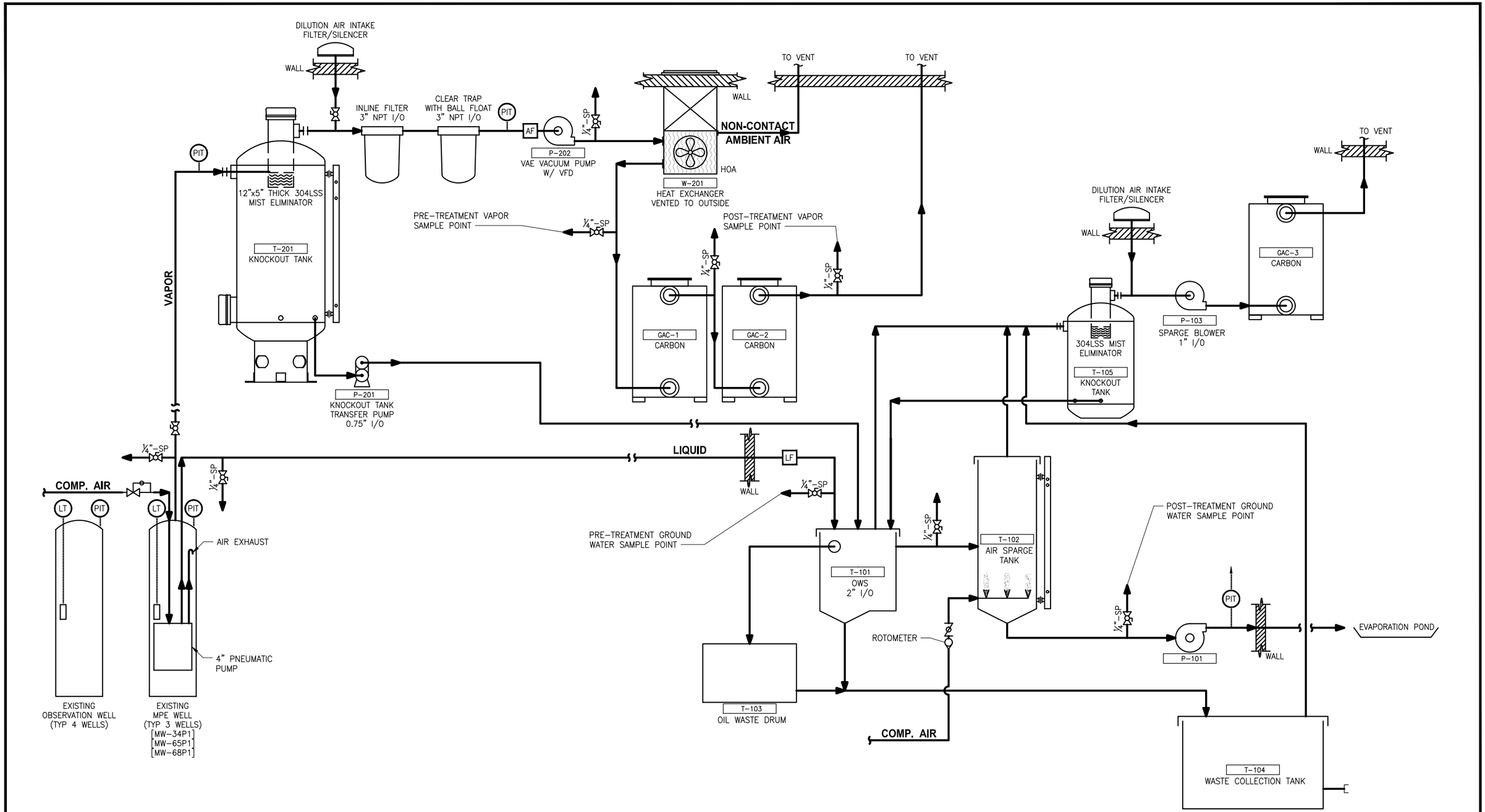
Field personnel will have current hazardous waste operations and emergency response training in accordance with 29 Code of Federal Regulations 1910.120(e) and consistent with their roles and duration on site in accordance with the HASP.

3. MPE Infrastructure

Figure 2 contains a schematic diagram of the MPE system taken directly from the MPE Pilot Test IRA Report (Parametrix 2018). The MPE system comprises the following components:

- Wells
  - Observation wells
  - Extraction wells
- Field piping
- LTT
  - Oil-water separator
  - Air sparge tank
  - Knockout tank
  - Vapor polishing filter
- VTT
  - Condensate sump
  - Knockout tank
  - Vacuum assisted extraction pump
  - Heat exchanger
  - Vapor polishing filters
  - Compressor
- Control system
- Evaporation pond

MPE system details, including design and record drawings, are in Appendix A of the MPE Pilot Test IRA Report.



Parametrix DATE: April 3, 2024 FILE: PS1860012-PFD-SAP FIGURE

LEGEND

- (PIT) PRESSURE INDICATING TRANSMITTER
- (LT) LIQUID LEVEL TRANSMITTER
- [LF] LIQUID FLOW METER
- [AF] AIR FLOW METER

Figure 2
MPE System Diagram

Sampling and Analysis Plan for Ephrata Landfill: MPE System Restart

3.1 Wells

Table 1 summarizes MPE and observation well data applicable to the MPE system restart and seasonal operation.

Table 2. P1 MPE Well Summary

Station ID	Well Type	Well Dia. (in)	Well Depth (ft)	Depth to Top of Screen (ft)	Depth to Bottom of Screen (ft)	Well Pump	Level Transducer Element No.	Pressure Indicating Transmitter Element No.	Comments
MW-34p1	Extraction	4	40.6	34.6	40.6	QED LDAP4	LT-34P1	PIT-34P1	Need to reinstall pumps and water level transducers
MW-65p1	Extraction	4	38.9	31.9	38.9	QED LDAP4	LT-65P1	PIT-65P1	
MW-68p1	Extraction	4	38.8	30.8	38.8	QED LDAP4	LT-68P1	PIT-68P1	
MW-36p1	Observation	2	42.2	37.2	42.2	--	--	--	No transducer
MW-64p1	Observation	4	44.2	39.2	44.2	--	LT-64P1	PIT-64P1	Need to reinstall water level transducers
MW-66p1	Observation	4	38.5	34.5	38.5	--	LT-66P1	PIT-66P1	
MW-67p1	Observation	4	43.7	34.7	43.7	--	LT-67P1	PIT-67P1	
MW-69p1	Observation	4	36.1	31.1	36.1	--	LT-69P1	PIT-69P1	
MW-70p1	Observation	4	36.3	30.3	36.3	--	LT-70P1	PIT-70P1	Transducer and cable to be replaced

Note:
Well and screen depths are below the top of the PVC casing.

The pumps and water level transducers were removed, cleaned, and stowed after MPE system shutdown in 2017. The pumps and transducers will need to be reinstalled prior to system restart. Although the pumps are interchangeable, cable and pipe lengths are unique to each well.

3.2 Field Piping

The conveyance piping system includes separate vapor and liquid pipes. The liquid pipe has a syphon break vent at a high point of the conveyance system. The vapor pipe connects to a condensate sump (10-inch diameter stainless steel pipe segment) outside the VTT container. Appendix A of the 2028 IRA report contains the field piping record drawing.

3.3 VTT and LTT

The MPE system O&M manual includes record drawings of the VTT and LTT. Both treatment trains are housed in insulated intermodal containers. Both containers are equipped with two emergency stop switches (they turn off any running equipment), a methane alarm, and low oxygen alarm. The methane and oxygen alarm and shutdown thresholds are user programmable.

Piping, sample ports, and system valves are present in multiple locations in both treatment trains. These are shown in the system schematic diagrams in the O&M manual. The sampling ports are

shown schematically in Figure 2. Most of the piping and valves within the LTT are 1” to 3” size Schedule 80 PVC or 3” stainless steel. Sample ports are 1/4” ball valve with barb fitting and Teflon tubing.

3.4 Control System

The control system is based on a programmable logic controller (PLC) with a human machine interface (HMI) and multiple analog and discreet inputs and outputs. The control room is in the VTT container. In addition to the treatment system schematics, the O&M manual includes control system record diagrams.

3.5 Electrical Power Supply

The electrical service entrance for the MPE facility is on the north wall of the support building. A dedicated circuit with its own disconnect switch extends from there to the 480-volt panel at the VTT container. Appendix A of the 2018 IRA report includes the electrical design drawings for the support building. The O&M manual includes VTT panel record drawings.

3.6 Evaporation Pond

The evaporation pond is a HDPE double lined treatment pond with leak detection. The design capacity (excluding 2 feet of freeboard) is 558,000 gallons, with a surface area of 26,000 square feet. Appendix A of the 2018 IRA report includes the pond record drawing.

4. P1 MPE Seasonal Operation

This section summarizes routine system operation and maintenance.

Operation and maintenance (O&M) will occur following procedures provided in the 2018 O&M manual (Parametrix 2018).

MPE system operation is planned from April through October until the start of system expansion construction. The system will be shut down and drained in the off season.

Well pumps and water level transducers will be removed, cleaned, and stowed following each extraction season and reinstalled for the next season.

4.1 Preparation for System Restart

This section includes steps prior to restarting the P1 MPE system following shutdown during the off season. Applicable steps below will be implemented after short-term shutdowns (i.e., for maintenance or minor repairs).

4.1.1 Wells

Prior to system startup, the wells listed in Table 2 will be monitored with an interface probe for water level and possible non-aqueous phase liquid (NAPL). Water quality samples and, if feasible, NAPL samples will be collected.

The SAP (Attachment B) contains well sampling details. Generally, the water level will be tagged, noting any light NAPL, groundwater samples, and, if feasible, light NAPL samples, then the well will be probed to bottom noting any dense NAPL. Dense NAPL samples will be collected if feasible. It is noted that no NAPL layer thick enough to sample has been observed in any well since 2009.

Reinstall the other water level transducers and well pumps after sampling.

The water level transducer cable is severed at MW-70p1. The transducer and cable comprise an intrinsically safe assemblage which is factory sealed. The transducer and cable will need to be replaced as a unit. The part will be ordered, and the transducer replaced on the next field event after it arrives. The water level in MW-70p1 will be checked with an interface probe during each field event until the transducer can be replaced. The system can be restarted without the MW-70p1 water level transducer.

4.1.2 Field Piping

Known pipe breaks at MW-70p1 and MW-69p1 were repaired on June 7, 2024. Visual inspection of the field piping system on May 8, 2024, revealed no obvious breaks other than at the two wells; however, the liquid, vapor, and pneumatic pipes are insulated. Because the liquid, vapor, and pneumatic pipes are insulated and leaks may not be readily apparent, a low-pressure air test will be performed prior to startup. Additionally, during startup, the pipe system will be observed for any indications of leakage.

The syphon break vent will be inspected to verify that air flow is not restricted through the vent.

The vapor pipe sump (outside the VTT container) will also be inspected for sludge or other debris and cleaned if needed.

4.1.3 VTT and LTT

The installed oxygen sensor in the VTT needs to be recalibrated, repaired, or replaced. The LTT oxygen sensor will be checked, along with methane sensors in both containers. Until the installed gas sensors are confirmed to work, a portable gas meter will be used to monitor the atmosphere prior to entry and while personnel are in either container.

Pre-startup inspection of VTT and LTT process piping, valves, and equipment will include the following:

- Visually inspect all piping, valves, and equipment, noting any visible corrosion or other damage.
- Ensure all valves open and close. Set all valves to their normal operating position prior to restarting the system.
- Fill all GAC canisters with fresh granules prior to restarting the system.
- Remove any debris from the oil water separator tank and add water.
- Add water to the air sparge tank (LTT; T-102) until 30 inches of water is present above the bottom-mounted diffusers.
- Add water to the knockout tank (VTT; T-201) to the level of the pump line connection. The pump (P-201) should be filled with water to avoid starting it dry.
- Ensure nothing is obstructing the forced air heater (LTT; Chromalox CXH).
- Check the air compressor (VTT; C-1) oil level and add oil if needed.
- Check the SVE blower (VTT; P-202) oil level and add oil if needed.
- Ensure nothing is obstructing the heat exchanger (VTT; W-201).

Equipment inspection and maintenance will follow the procedures in the O&M manual. The VTT was previously inspected in 2021 and found to be in good condition other than the oxygen sensor.

4.1.4 Control System

A new data logging module will be installed and connected to the PLC. The PLC program will be updated to accommodate the new module and set data collection intervals (hourly for transducers and total vapor and liquid flow). VTT and LTT equipment may be turned on briefly to confirm operation and connections to the control system. This work will be scheduled before the system restart.

4.1.5 Electrical Power Supply

The power has remained on since 2017 and there are no known issues. This will be verified when the control system work is performed.

4.1.6 Evaporation Pond

The evaporation pond will be visually inspected from the top of the bank prior to system restart. The leak detection system will be monitored before the system restarts and again once there is about a foot of water in the pond.

4.2 Operation and Maintenance

The MPE system should be ready to start and operate once the preparations described in Section 4.1 are completed. Operation and maintenance of equipment physical components (i.e., equipment, valves, gauges, and filters) should follow the O&M manual.

The seasonal operational sequence is summarized below:

- Start the system with groundwater pumping only, no vacuum. Inspect all wells, field piping, and VTT and LTT systems immediately once the system is running.
- Once liquid flow is established through the LTT, collect inlet and outlet liquid samples.
- Pump from MW-34p1, MW-65p1, and MW-68p1 without vacuum for 2 weeks in accordance with the SAP.
- After 2 weeks, activate the SVE blower and adjust the vacuum level to 3.5 inches of mercury. Inspect the wells, field piping and VTT and LTT systems immediately once the vacuum system is running. Collect inlet and outlet liquid and vapor samples at the treatment system. Obtain non-methane organic compound readings using a handheld photoionization detector at all GAC unit inlet and exhaust points.
- Before shutting down the system each season, collect inlet and outlet liquid and vapor samples at the treatment system. Obtain non-methane organic compound readings using a handheld photoionization detector at all GAC unit inlet and exhaust points.
- For seasonal shutdown, deenergize equipment, drain all pipes and vessels, remove the well pumps and water level transducers and clean according to the O&M manual. Inspect the air sparge tank diffusers and clean according to the O&M manual if needed. Leave the electrical power supply on and set thermostats to maintain container temperatures above 40°F.

4.3 Monitoring, Sampling, and Reporting

The SAP (Attachment 2) contains monitoring and sampling plans. Generally, liquid and vapor samples will be analyzed before and after treatment three times per season. Total liquid and vapor flow and transducer pressures are recorded by the PLC at user-definable intervals.

Reporting will follow Amendment requirements. Applicable monthly data will also be included in the interim action progress report (if needed) and interim action completion report.

5. References

Parametrix. 2018. Ephrata Landfill MPE Pilot Study Interim Action Pretreatment Facility and Evaporation Pond Operation and Maintenance Manual. Prepared by Parametrix, Seattle, WA. February 2018.

Parametrix and Pacific Groundwater Group. 2018. Multi-Phase Extraction Pilot Test Interim Remedial Action Ephrata Landfill. Prepared by Parametrix, Seattle, WA. February 2018.

Attachment A

Health and Safety Plan

Site-Specific Health and Safety Plan – Ephrata Landfill: MPE System Restart and Seasonal Operation

Prepared for
Grant County Public Works Department

August 2024

Parametrix

Site-Specific Health and Safety Plan – Ephrata Landfill: MPE System Restart and Seasonal Operation

Prepared for

Grant County Public Works Department
124 Enterprise Street SE
Ephrata, WA 98823

Prepared by

Parametrix
719 2nd Avenue, Suite 200
Seattle, WA 98104
T. 206.394.3700 F. 1.855.542.6353
www.parametrix.com

April 17, 2024 | 553-1860-014

Citation

Parametrix. 2024. Site-Specific Health and Safety Plan – Ephrata Landfill: MPE System Restart and Seasonal Operation. Prepared for Grant County Public Works Department by Parametrix, Seattle, Washington. April 17, 2024.

Site-Specific Health and Safety Plan – Ephrata Landfill: MPE System Restart and Seasonal Operation

The material and data contained in this document were prepared under the supervision and direction of the undersigned.

Molly Alar
Senior Scientist

Brian Pippin
Senior Consultant

Contents

Contents (continued)

Acronyms and Abbreviations

CFR	Code of Federal Regulations
CO2	carbon dioxide
COPCs	chemicals of potential concern
H25	hydrogen sulfide
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSC	health and safety coordinator
JHAs	job hazard analyses
LEL	lower explosive limit
LTT	liquid treatment train
MPE	multiphase extraction
NAPL	Non-Aqueous Phase Liquids
NIOSH	National Institute for Occupational Safety and Health
PID	photoionization detection
PPE	personal protective equipment
RELs	recommended exposure limits
SSO	site safety officer
TLVs	threshold limit values
VTT	vapor treatment train

1. Nearest Hospital/Emergency Medical Center

1.1 Nearest Hospital

Columbia Basin Hospital

200 Nat Washington Way, Ephrata, WA 98823

Phone: 509-754-4631

Distance: 5 miles

Travel Time: 9 minutes

1.2 Route to Hospital from Site

See map in Appendix A.

1.2.1 Driving Directions to Hospital from Site

1. Follow C 1 and Road 12 NW to Dodson Road NW
2. Turn left onto Dodson Road NW
3. Continue on A Street SE to Columbia Basin Hospital

1.3 Emergency Phone Numbers

In the event of an emergency, call 911. For nonemergency matters and whom to inform after an emergency event, see table below.

Site Contact	Contact No. 911
Brian Pippin Project Manager	Cell: 425-681-3602
Jason Collings Solid Waste Supervisor	Phone: 509-750-3351 Cell: 509-754-4319
Sam Castro Grant County Public Works Director	Phone: 509-754-6082

Alternate contacts:

- Dwight Miller, Principal-in-Charge, phone: 206-394-3644, mobile: 425-941-1823
- Melisa Peyton, Health and Safety Coordinator, phone: 253-604-6678, cell: 253-229-7894

2. Plan Summary

This health and safety plan (HASP) was developed to describe the procedures and practices necessary for protecting the health and safety of Parametrix employees conducting activities at

Ephrata Landfill Cleanup Site (the Site). Other employers, including contractors and subcontractors, will be required to develop and implement their own HASPs to manage the health and safety of their personnel.

Parametrix personnel conducting activities at the Site are responsible for understanding and adhering to this HASP. Before fieldwork begins, a site safety lead (SSO) who is familiar with health and safety procedures and with the Site will be designated. The SSO will generally be the most experienced person on site. Safety issues should be communicated first to the SSO, then the project manager and Parametrix's health and safety coordinator (HSC) as needed to resolve the issue.

All contractors and subcontractors have the primary responsibility for the safety of their own personnel on the Site. All personnel on the Site have "stop work" authority if they observe conditions that they believe create an imminent danger.

If Parametrix employees work on the Site for more than 1 year, this HASP will be reviewed at least annually. The plan will be updated as necessary to ensure that it reflects the known hazards, conditions, and requirements associated with the Site.

Parametrix personnel who will be working on the Site are required to read and understand this HASP. Parametrix personnel working on-site for the first time and following any formal HASP update must sign the Personnel Acknowledgment Sheet (see Section 16), certifying that they have read and that they understand this HASP and agree to abide by it.

3. Key Project Personnel

Name	Responsibility	Phone #1	Phone #2	Email
Dwight Miller	Principal in Charge	206-410-6446	+1-425-9411823	dmiller@parametrix.com
Brian Pippin	Project Manager	425-681-3602	206-394-3634	bpippin@parametrix.com
Mike Brady	Field Personnel	206-604-8570	206-519-5781	MBrady@parametrix.com
Scott Swedberg	Field Personnel	206-410-6446	206-410-6446	sswedberg@parametrix.com
Drew Norton	Field Personnel	614-557-5988	206-394-3710	DNorton@parametrix.com
Sally Nguyen	Field Personnel	206-395-7367		SNguyen@parametrix.com
Katie Burke	Field Personnel	503-416-6075		kburke@parametrix.com
Melisa Peyton	Health and Safety Coordinator	253-604-6678	+1-253-2297894	mpeyton@parametrix.com

4. Site Description and Background

4.1 Type of Site

The Site, or project area, is located on a portion of the Ephrata Landfill. In 2008, approximately 2,300 buried hazardous waste drums were removed from the Site. Grant County has requested that Parametrix lead restart and seasonal operation of the multiphase extraction (MPE) system on the Site. This will be followed by construction oversight when the system is expanded, then seasonal operation and monitoring of the expanded MPE system. Work conducted by Parametrix will predominately occur in the northern portion of the Ephrata Landfill, around the MPE system.

4.2 Building/Structures

The Ephrata landfill is a fully fenced facility. Structures proximate to and within the Site include an office/storage building, a pretreatment facility, and evaporation pond.

4.3 Topography

Parametrix personnel will be working in and around the vapor treatment train (VTT) and liquid treatment train (LTT) containers and support building. The VTT, LTT, and building are in a generally flat area of crushed rock surfacing material. Parametrix personnel will also be working on the landfill, which is sloped and uneven terrain. Roads and paths are crushed rock surfacing material. The landfill surface is covered with well-graded loose cobble in about the 3- to 6-inch diameter range.

4.4 Geologic/Hydrologic Setting

The Ephrata landfill is situated within the Columbia Plateau region of the Pacific Northwest, which is characterized by its basaltic lava flows and sedimentary deposits. Groundwater is present in the region with aquifers contained within the porous layers of basalt and sedimentary deposits.

4.5 Site Status

The Grant County Regional Landfill, which is immediately south of the Ephrata Landfill, is active and open to the public. The project area is signed off limits from the Regional Landfill roads, although there are no physical barriers such as gates.

4.6 Site History

This is Parametrix's project Phase 9 (Amendment Nine) of a site cleanup of the old Ephrata Landfill under the Model Toxics Control Act. Completed interim actions include the removal of more than 2,317 buried hazardous waste drums (2008), capping the landfill (2009), and MPE pilot testing and removal of soil contaminated with arsenic (2016 to 2018). Parametrix is the engineering lead, and Mott MacDonald (formerly PGG) is the hydrogeology lead. This work is required under the terms of Agreed Order No. DE 3810 Amendment No. 3 between the Washington State Department of Ecology (Ecology) and Grant County.

5. Hazard Evaluation

5.1 Site Tasks and Operations

Parametrix has completed job hazard analyses (JHAs) for specific tasks that likely could be completed on the Site, depending on the scope of work. See Section 5.3. The following list generally summarizes planned tasks and operations:

- General work near heavy equipment.
- Work in and around excavations.
- Collecting groundwater samples.
- VTT and LTT inlet and discharge sampling.
- Monitoring and sampling Non-Aqueous Phase Liquids (NAPL).
- Work around electrically powered equipment and controls.

The control measures that field personnel must use to eliminate or minimize these hazards, such as air monitoring, personal protective equipment (PPE), and decontamination procedures, are detailed in the JHAs and in subsequent sections of this plan.

5.2 Chemical Hazard Evaluation

Chemicals of potential concern and detected concentrations on the Site are summarized in Section 5.2.1 and Appendix C.

5.2.1 Landfill Gases and Chemical Hazards

Landfill work can potentially lead to exposure to gases like methane, carbon dioxide, and vinyl chloride. On occasion hydrogen sulfide is encountered especially in an actively decomposing moist environment. These gases may be encountered during excavation and other disturbance of landfill refuse.

Methane is a naturally occurring gas often found in decomposing landfills. It is lighter than air, flammable, and generally considered nontoxic at lower concentrations. If concentrations are high enough, as with any gas, methane can be asphyxiating. The Lower Explosive Limit (LEL) for methane is 5% by volume in air (50,000 parts per million [ppm]).

Carbon dioxide (CO2) is generated through decomposition, and asphyxiating levels can be measured in active landfill piping systems. CO2 is nontoxic but asphyxiating at high concentrations (several thousand ppm). Generally, in indoor office environments, it is desirable to maintain CO2 levels below 1,000 ppm to maintain occupant comfort. Normal outdoor concentrations of CO2 are around 300 ppm.

Vinyl chloride is often formed from decomposition of synthetic materials and can be encountered at municipal solid waste landfills. It is carcinogenic, very light in air, and dissipates very quickly. Consequently, it can be difficult, if not impossible, to measure in ambient air, thus reducing its chance of inhalation. Vinyl chloride, like the other gases, can be found in active landfill cells via the piping system or during excavation on an active cell or face. Vinyl chloride is also one of several volatile organic compounds found in the P1 zone immediately south of the former buried drums. The

recommended exposure limits (RELs) for vinyl chloride are 1 ppm averaged over a 10-hour period during a 40-hour workweek.

Hydrogen sulfide (H2S) can be formed from anaerobic bacterial action and is sometimes measured in landfill piping. It is corrosive, thought to cause heart problems, and can be asphyxiating at high concentrations (several hundred ppm). The REL for H2S is 10 ppm averaged over a 10-hour period during a 40-hour workweek and a ceiling limit of 15 ppm, which should not be exceeded at any time. The Immediately Dangerous to Life and Health is 100 ppm. A problem with H2S is its ability to temporarily paralyze the olfactory nerves, making it impossible to sense at high concentrations.

Personnel exposure to landfill gas is possible during sampling activities or if pipes break or equipment fails in such a way as to release landfill gas. Volatilization of organic compounds could occur in wells, piping, tanks, and equipment during pumping and treatment activities.

Arsenic occurs naturally in some Eastern Washington rock and soil and has been detected in soil and groundwater samples associated with this site. The principal route of exposure of arsenic at the site is from accidental ingestion of groundwater. Threshold Limit Values (TLVs) for employee exposure to arsenic are listed in Appendix C.

Chemicals in groundwater: In addition to vinyl chloride, there is potential for exposure to other organic chemicals during field sampling. TLVs for employee exposure to potential organic chemicals are listed in Appendix C. Any of these chemicals can affect the body if inhaled or swallowed or if contact occurs with the eyes or skin. The principal route of exposure at the Site is from inhalation and skin contact.

Wildfire smoke: Although there are many hazardous chemicals in wildfire smoke, the main harmful pollutant for people who are not close to the fire is "particulate matter", the tiny particles suspended in the air. These tiny particles can reach the deepest parts of the lungs and can be absorbed into the body. The Environmental Protection Agency has determined that particulate matter may cause or worsen cardiovascular disease, respiratory disease, cancer, and can harm the nervous system. A Job Hazard Analysis for wildfire smoke can be found in Appendix D .

5.3 Physical Hazards

The specific physical hazards and associated controls for work on the Site are described in the JHAs for the specific tasks likely to be completed on the Site. The control measures that field personnel must use to eliminate or minimize these hazards are detailed in the JHAs below and in the relevant sections of this plan.

5.3.1 Working Near Heavy Equipment

Job/Task Description
Employees will conduct work such as observation of construction activities and operation of the MPE system. This will require work near heavy equipment, construction operations, and MPE system equipment.

Physical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Bodily harm or death	Heavy equipment operating on-site creating a potential for site workers to be struck, crushed, or impacted by moving parts	Stay a safe distance from equipment and maintain eye contact with equipment operators. Wear a safety vest for enhanced visibility.

Physical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Eye injury	Construction debris (e.g., soil) coming into contact with eyes	Wear eye protection with side shields.
Head injury	Heavy equipment and/or tools impacting the head	Wear a hard hat.
Penetration of feet	Sharp objects that could be stepped on; large objects falling on feet	Wear steel-toe boots with steel shank.
Hearing loss	Noise generated by heavy equipment/machinery	Wear hearing protection such as earplugs or earmuffs.
Injury to bystanders	Pedestrians in the locality of work	Use cones and caution tape to cordon off the immediate work area. Watch for and escort pedestrians away from the work area. Pause work if necessary.
Hand injury	Pinch points	Wear protective gloves whenever possible. Avoid placing hands near operating equipment.

Biological and Chemical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
None	None specific to this JHA. Chemical hazards related to the site are described in the Chemical Hazards Summary Table.	None

Additional Control Measures and Guidance

Engineering Controls: No engineering controls are specified.

General Safe-Work Practices and Guidance:

- Personnel should stay upwind and out of the impact area of the heavy equipment if feasible.
- Cones, barrier tape, or other equivalent methods will be used to establish the impact area if feasible.
- Work conducted in the impact area must be coordinated with the equipment operator using pre-established methods of communication, such as direct eye contact, hand signals, and/or verbal communication.

Personal Protective Equipment: Hard hat, steel-toe work boots with steel shank, high-visibility safety vest or outer garment, safety glasses with side shields, nitrile gloves, and hearing protection—i.e., earplugs or earmuffs.

5.3.2 Working Around Excavations

Job/Task Description

Employees will conduct work such as excavation observation. This will require occasional work in close proximity to excavations.

Physical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Bodily harm or death	Possible to fall into open excavation from heights	Stay a safe distance from the excavation area. Signs, cones, barrier tape, or other equivalent methods will be used to mark open excavations.

Physical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Eye injury	Construction debris (e.g., soil) coming into contact with eyes	Wear eye protection with side shields.
Head injury	Possible to fall into open excavation from heights	Stay a safe distance from excavation area. Signs, cones, barrier tape, or other equivalent methods will be used to mark open excavations.

Biological and Chemical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Chemical	None specific to this JHA, unless contact made with contaminated materials	If necessary, see Chemical Hazards Summary Table for applicable chemical hazards.
Biological	No unique source of biological hazards warranting specific controls	None.

Additional Control Measures and Guidance
Engineering Controls: No engineering controls are specified.
General Safe-Work Practices and Guidance: Personnel will stay out of excavations at all times. If heavy equipment is being operated, the JHA for working around heavy equipment will be referenced. Signs, cones, barrier tape, or other equivalent methods will be used to mark open excavations if feasible. Any work that must be conducted near excavations will be conducted using a buddy system.
Personal Protective Equipment: Hard hat, work boots, high-visibility vest, safety glasses with side shields, hearing protection—i.e., earplugs or earmuffs—and nitrile gloves if handling potentially impacted media.

5.3.3 Groundwater Sampling

Job/Task Description
Employees will conduct work such as groundwater sampling.

Physical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Heat/cold/ sunburn	Weather	Wear sunscreen on exposed skin. Stop work if an employee feels symptoms of dehydration, overheating, or heat stroke. Move to a shaded area and consume water. During cold conditions, wear adequate clothing to reduce the potential for hypothermia.
Eye injury	Construction debris and splashes (e.g., soil, water) coming into contact with eyes	Wear eye protection with side shields.
Physical stress	Heavy lifting of equipment and bailing water	Use proper lifting techniques and take breaks and rest as needed.
Accidents with equipment/tools	Sample-collection equipment/tools	Use only appropriate equipment for its intended use. Secure equipment in vehicle with netting or straps. Do not leave loose.

Biological and Chemical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Chemical	Personnel performing tasks may come into direct contact with contaminated groundwater.	If necessary, see Chemical Hazards Summary Table for applicable chemical hazards. The personal protective equipment described below should be used during groundwater sampling to minimize direct contact with groundwater.
Biological—animals	Biting or stinging insects, spiders, snakes, and livestock	When necessary, use bug repellent. Use snake chaps or shin guards when grass is above the ankle. Use a bar to clear spiders and/or snakes from objects and/or vegetation.

Additional Control Measures and Guidance
Engineering Controls: No engineering controls are specified.
Chemical or Biological Concerns Specific to this JHA: None.
General Safe-Work Practices and Guidance: ▪ Do not eat or drink in the immediate area where sampling is being conducted. ▪ Wash hands and face before eating or drinking. ▪ Dispose of used nitrile gloves in an appropriate container. ▪ Avoid working with breathing zone directly above the opening of the well casing. When possible, work upwind of the well casing. ▪ If work is conducted in or near traffic areas, wear high-visibility vests. Use cones, flagging, or other devices to mark out the work area. ▪ Always carry a cellular phone while working in remote areas.
Personal Protective Equipment: Hard hat, work boots, high-visibility vest, safety glasses with side shields, and disposable nitrile gloves. Avoid direct contact with groundwater.

5.3.4 VTT and LTT Sampling

Job/Task Description
Employees will conduct work such as vacuum-assisted extraction discharge sampling.

Physical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Eye injury	Construction debris coming into contact with eyes	Wear eye protection with side shields.
Physical stress	Heavy lifting of sampling equipment, compressed gas cylinders, sample coolers; kneeling on hard or gravel surfaces	Use proper bending/lifting techniques by bending and lifting with legs and not with back. Do not twist at the waist when turning. Use buddy system for heavy objects. Use kneepads or a kneeling pad. Take breaks and rest as needed.
Accidents with equipment/tools	Sample-collection equipment/tools	Verify that you have the appropriate equipment/tools for your tasks. Use equipment/tools as intended by the manufacturer. Stow tools in vehicle properly; use appropriate cases and bags. Secure equipment in vehicle with netting and straps. Do not leave loose. Doing so can cause property damage or serious injuries to others or self.

Biological and Chemical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Chemical	Chemical hazards related to the site are described in the Chemical Hazards Summary Table.	If necessary, see Chemical Hazards Summary Table for applicable chemical hazards. Wear the appropriate personal protective equipment, including nitrile gloves, during sampling to prevent direct contact with contaminants in soil. If appropriate, use of a half-face respirator may be necessary.
Biological—animals	Spiders and rodents	Use nitrile gloves and a mask when working in enclosed areas where rodent droppings are present. Do not touch mouth, eyes, nose, or open wounds when working near rodent droppings.

Additional Control Measures and Guidance

Engineering Controls: No engineering controls are specified.

General Safe-Work Practices and Guidance:

- Always wear nitrile gloves when handling samples and sampling equipment.
- Do not eat or drink in the immediate area where sampling is conducted.
- Wash hands and face before eating or drinking.
- Used nitrile gloves should be disposed of in a container labeled for disposable items.
- During transport and use, properly secure compressed gas cylinders.
- Attach regulator and hose to compressed gas cylinder in appropriate manner.
- Grasp or secure hose when in use. Do not allow to whip.
- Employees should use caution when working around rodent droppings. If possible, use a shop vac to remove rodent droppings before commencing work.
- Secure equipment in vehicle with netting or straps; do not leave loose.

Personal Protective Equipment: Hard hat (if overhead hazard is present), work boots (if working near heavy equipment), high-visibility vest, safety glasses, disposable nitrile gloves, and hearing protection (i.e., earplugs or earmuffs) as needed, and respiratory protection if necessary.

5.3.5 Non-Aqueous Phase Liquids Monitoring and Sampling

Job/Task Description

Employees will conduct work such as light NAPL thickness measurements.

Physical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Heat/cold/sunburn	Weather	Wear sunscreen on exposed skin. Stop work if an employee feels symptoms of dehydration, overheating, or heat stroke. Move to a shaded area and consume water. During cold conditions, wear adequate clothing to reduce the potential for hypothermia.
Impact—eyes	Debris and splashes; opening pressurized wells	Wear eye protection.
Physical stress	Heavy lifting of equipment, purge water/NAPL, and sample coolers; kneeling on hard or gravel surfaces	Use proper lifting techniques by bending and lifting with legs and not the back. Do not twist at the waist when turning. Use buddy system for heavy objects. Take breaks and rest as needed.

Physical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Accidents with equipment/tools	Sample-collection equipment/tools	Verify you have the appropriate equipment/tools for your tasks. Use equipment/tools as intended by the manufacturer. Stow tools in vehicle properly; use appropriate cases and bags. Secure equipment in vehicle with netting and straps. Do not leave loose. It can cause property damage or serious injuries to others or yourself.
Slips, trips, and falls	Ice, plastic sheeting, uneven ground	Use caution when walking on plastic sheeting and uneven ground and in general when snowy and/or icy conditions exist. Avoid stepping in open well monuments. Sidestep/step over hazards on the ground.

Biological and Chemical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Biological—animals	Stinging insects, spiders, snakes, deer, rodents, and vegetation (e.g., blackberry bushes)	When necessary, use bug repellent. Insect nests should never be disturbed. If necessary, long pants and a long-sleeved shirt should be worn while on the site. Employees who are allergic to stings should not work in areas where there is a high risk of being stung. Check well vaults and security lids for insects; use caution when opening. Western diamondback rattlesnakes inhabit the region and have been seen on site.
Chemical	Chemical hazards related to the site are described in the Chemical Hazards Summary Table.	If necessary, see Chemical Hazards Summary Table for applicable chemical hazards.

Additional Control Measures and Guidance

Engineering Controls: Electric and/or pneumatic fans can be used to abate nuisance odors when working indoors or outdoors. Fans can also be used when air monitoring action levels have been exceeded.

General Safe-Work Practices and Guidance:

- Do not eat or drink in the immediate area where NAPL monitoring/sampling is being conducted.
- Wash hands and face before eating or drinking.
- Dispose of used nitrile gloves in appropriate container/manner.
- Avoid working with the breathing zone directly above the opening of the well casing. When possible, work upwind of the well casing.
- Keep face away from monument when removing well cap.
- Use plastic garbage bags or plastic sheeting to cover the work area. It is preferable to roll/berm the edges to catch any drips/spills. If raining, work underneath a rain canopy.
- When removing a dedicated bladder pump from a well, secure air/discharge lines to hose reel with a clamp prior to removal. Turn hose reel slowly to avoid splatter/spray.
- Avoid splashing/splattering NAPL or otherwise coming into direct contact with NAPL. If direct contact occurs, remove NAPL with a paper towel and immediately wash the affected area thoroughly with soap and water.
- Use caution when pulling up bailers full of NAPL, because NAPL-coated string and bailers can become slippery. Avoid jarring NAPL-coated string and bailers, as splattering can occur. Put lids on sample jars ASAP to avoid spilling.
- When pouring NAPL (or NAPL/groundwater mixture) from a bailer into a bucket, watch for fluid leaking from the back end (bottom) of the bailer. Consider setting up paper towels/sorbent pads or a second bucket to catch any leaks. Make sure to conduct all NAPL-related activities over plastic sheeting.
- Do not operate vehicle when wearing Tyvek that may have NAPL on it.
- If work is conducted in or near traffic areas, wear high-visibility vests and use cones, flagging, or other devices to mark out the work area.
- Clean monitoring and sampling equipment appropriately, using distilled water and Simple Green (or another detergent).

Additional Control Measures and Guidance
Personal Protective Equipment: Hard hat (when working around heavy equipment, including drill rigs), work boots (steel-toed when working around heavy equipment, including drill rigs), high-visibility vest (optional if wearing Tyvek), safety glasses, disposable nitrile gloves (multiple layers recommended), hearing protection (i.e., earplugs or earmuffs) as needed. This Site falls under the purview of Parametrix's voluntary respirator program. All field personnel should have their respirator available near the work area and don the respirator at their own discretion. Confined space entry is neither expected nor allowed. Chemical-resistant Tyvek (yellow/coated) is strongly recommended.

6. Health and Safety Training

Parametrix personnel performing monitoring, sampling, and system operations on-site must have completed training consistent with the Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements in 29 Code of Federal Regulations (CFR) 1910.120(e). The training will include:

- Identity of site safety and health personnel.
- Safety and health hazards identified on the Site.
- Proper use of required PPE.
- Safe work practices required on the Site, e.g., fall protection, confined space entry procedures, hot work permits, general safety rules.
- Safe use of engineering controls and equipment on the Site.
- Medical surveillance requirements, including the recognition of signs and symptoms that might indicate overexposure to hazards.
- The site emergency response plan/spill containment plan.

The HSC will oversee training for site personnel. Training records, including an outline, sign-offs, and competency records, will be maintained by the HSC.

7. Safety Equipment

7.1 Personal Protective Equipment

PPE must be worn by individuals on the Site to protect against physical hazards. PPE required on the Site is modified Level D, which consists of:

- Hard hat.
- High-visibility vest.
- Work boots.
- Safety glasses with side shields.
- Nitrile gloves or equivalent when handling known or potentially impacted media.
- Work gloves (if handling materials that might have sharp edges, protrusions, or splinters).

Additional PPE may be necessary for specific tasks with additional hazards. The SSO will be responsible for designating additional PPE for specific tasks. Depending on the activity, additional PPE may include:

- Hearing protection (during high-noise tasks).
- Chemical-resistant clothing, e.g., Tyvek coveralls.
- Chemical-resistant boots.
- Chemical-resistant goggles.
- Chemical-resistant gloves.
- Face shield.
- Respiratory protection.

Additional PPE may be required if workers discover unexpected contamination. Characteristics of unexpected contamination could include unusual odors, discolored media, a visible sheen, etc. The SSO and, if necessary, the HSC will be contacted as soon as possible after the discovery of unexpected contamination, and the SSO and/or the HSC will determine the need for additional controls and/or training.

PPE used at the Site must meet the requirements of recognized consensus standards (e.g., American National Standards Institute, National Institute for Occupational Safety and Health [NIOSH]), and respiratory protection shall comply with the requirements set forth in 29 CFR 1910.134.

Project personnel are not permitted to reduce the level of specified PPE without approval from the SSO or the HSC.

7.2 Safety Equipment

The SSO will be responsible for ensuring that the following safety equipment is available on-site and is properly inspected and maintained:

- Soap and water for decontamination.
- Caution tape, traffic cones, and/or barriers.
- First-aid kit.
- Fire extinguisher.
- Fluids for hydration, e.g., drinking water or sports drink.

7.3 Air Monitoring Equipment

The following air monitoring equipment will be immediately available to identify site conditions that may require additional controls. See Section 5.2.1 and Appendix C for specified action levels.

- 4-gas personal air monitor.
- Landtec SEM5000 portable methane detector.
- Landtec GEM5000 landfill gas meter.

7.4 Communications Equipment

Parametrix personnel should have a mobile phone or a radio available in case of emergency.

8. Decontamination Procedures

Parametrix employees will not ordinarily need to establish or work in exclusion or contaminant reduction zones. Communicate with the SSO or project manager at least 1 week in advance of establishing or working in such a zone so the necessary controls can be established and PPE and decontamination equipment provided. Monitoring, sample collection, and VTT and LTT system operations areas are not categorized as exclusion or contaminant reduction zones. Any PPE and supplies used during ordinary sampling and monitoring activities will be disposed of in labeled drums. Partial decontamination procedures should be followed as applicable after routine monitoring, sampling, and operations.

8.1 Partial Decontamination Procedure

Parametrix employees will implement the following partial decontamination procedures when exiting the exclusion zone but remaining on the Site.

- Wash and rinse boots and outer gloves in containers in the contamination-reduction zone.
- Inspect Tyvek suit for stains, rips, or tears. If the suit is contaminated, full decontamination will be performed as described in Section 8.2 if the suit is to be used again. If the suit is damaged, it should not be reused.
- Remove outer gloves. Inspect and discard in a container labeled for disposable items if ripped or damaged.
- Remove respirator, if worn, and clean with premoistened alcohol wipes. Discard used cartridges at the frequency dictated by the SSO.
- Wash hands and face with soap and water.

8.2 Full Decontamination Procedures

Parametrix employees will follow the full decontamination procedures listed below when exiting the exclusion zone and leaving the Site, e.g., at the end of the work shift.

- Wash and rinse boots and outer gloves in containers in the contamination-reduction zone.
- Remove outer gloves and Tyvek suit and deposit in a container labeled for disposable items.
- Remove respirator and discard used cartridges at the frequency dictated by the SSO.
- Wash and rinse respirator in a “respirators only” decontamination container.
- Remove work boots and put on street shoes. Place work boots in a plastic bag or container for later reuse.
- Remove inner gloves and deposit in a container labeled for disposable items.
- Wash hands and face with soap and water.
- Shower as soon after the work shift as practicable.

9. Medical Surveillance

Work on this project should generally not exceed thresholds for medical surveillance in 29 CFR 1910.120(f). Each Parametrix employee should monitor their total amount of work performed on all hazardous sites and evaluate potential exposure accordingly. Parametrix will ensure that its employees who meet the following criteria are enrolled in a medical surveillance program consistent with 29 CFR 1910.120(f):

- The employees are, or may be, exposed to hazardous substances or health hazards at or above established permissible exposure limits for 30 or more days per year.
- The employees are required to wear a respirator for 30 or more days per year.
- Parametrix employees who exhibit signs or symptoms consistent with overexposure to site contaminants will be offered medical surveillance consistent with Washington Administrative Code 296-843-21005.

Parametrix will ensure that its employees who are authorized to wear respirators are medically evaluated consistent with the respiratory protection standard (29 CFR 1910.134). The HSC or administrative designee (e.g., human resources manager) will maintain medical evaluation records.

The planned activities on this project fall within purview of Parametrix's voluntary respirator use program.

10. Air Monitoring

Based on site conditions, air monitoring is not anticipated; however, air monitoring equipment will be immediately available in case workers encounter conditions that indicate the presence of unexpected contamination, such as unusual odors, discolored media, or a visible sheen. If such conditions are discovered, workers will exit the area and contact the SSO and, as needed, the HSC. If necessary, Parametrix will use the air monitoring equipment to evaluate the conditions and determine whether additional controls and/or training are required. Action levels are provided in Appendix C.

Air monitoring, if conducted, must be performed by individuals familiar with the calibration, use, and care of the required instruments. Measurements shall be documented, and the records should include the following information:

- The name of the person conducting the measurements.
- The identity of workers, if any, who have exposure indicated by measurement result.
- Information about the instrument, e.g., type, make, model, serial number.
- The location of the measurement.
- The measurement date and start/stop time.
- Conditions represented by the measurement, including applicable activities, work practices, weather conditions, site conditions, and controls in place.
- Measurement results.
- Other relevant observations or notes.

10.1 Air Monitoring Action Levels

If air monitoring is conducted, the results will be compared to the action levels provided in Appendix C. The air monitoring action levels are established to comply with OSHA Permissible Exposure Levels, American Conference of Governmental Industrial Hygienists threshold limit values, and the National Institute for Occupational Health and Safety recommendations for the chemicals that may be encountered on the Site. The action levels are also adjusted for the relative response of common photoionization detection instruments to motor-fuel vapors.

10.2 Explosion Hazard Action Levels

Parametrix employees working on-site will take measurements when working near known or suspected sources of explosive gases or vapors. The instrument alarm should be set to sound at 10% of the LEL. When measurements exceed this level, Parametrix employees on-site will:

1. Extinguish ignition sources and shut down powered equipment in the work area.
2. Move personnel at least 100 feet away from the work area.
3. Contact the SSO and the HSC.
4. At the instruction of the HSC and after waiting 15 minutes for explosive gases to dissipate, the SSO may use the combustible gas meter to approach the worksite to measure combustible gases in the work area. The SSO shall not enter (or allow any personnel to enter) any area where the combustible gas meter readings exceed the explosivity action level, nor shall the SSO approach if there is a potential for fire or explosion.
5. The SSO may authorize personnel to reenter the work area after the source of the combustible gases has been identified and controlled.

10.3 Instrument Calibrations

Instruments shall be calibrated consistent with manufacturers' recommendations. Calibrations shall be coordinated by the SSO. Calibration and monitoring records shall be maintained by the SSO and/or the project manager.

11. Site Control Measures

Access to the Site will be controlled as part of the site preparation. Control measures may include fencing, gates, and signs limiting access to everyone except authorized personnel. A site map showing work zones and contaminant reduction zones is provided in Appendix A.

Parametrix requires the buddy system if personnel conduct operations that may involve exposure to site hazards. The buddy system may involve working with non-Parametrix personnel. Some low-hazard tasks, such as groundwater monitoring on familiar sites, may not require use of the buddy system. Contact the SSO and HSC if there are questions regarding the buddy system on the Site.

12. Emergency Response/Spill Containment/ Confined Space

Parametrix employees on-site will follow the emergency response, spill response, and confined space procedures described in the *Parametrix Health and Safety Manual*. Incidents will be documented on the incident report form included with Appendix B.

13. Pre-Entry Briefing

Parametrix employees on-site will conduct pre-entry briefings, e.g., tailgate meetings, before starting work on the Site and/or as the scope of work changes throughout the project to ensure that employees are familiar with the HASP and that the plan is being followed. Attendance and discussion topics will be documented on sign-in sheets, which will be maintained by the SSO.

14. Periodic Evaluation

The project manager or designee will evaluate the effectiveness of this HASP. As part of the evaluation, the project manager or designee will track ongoing health and safety feedback from field personnel working on the project. This feedback will be reviewed and incorporated into either immediate or annual updates of the HASP. HASPs will be reviewed and updated at least annually. Updating the plan as necessary ensures that it reflects the known hazards, conditions, and requirements associated with the Site. Parametrix will maintain periodic evaluation records and will track all HASP revisions.

15. Safe Work Practices

The following safe work practices are provided to supplement the other information included with this HASP.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in areas with potentially contaminated materials.
2. Field personnel will, whenever practicable, remain upwind of drilling rigs, open excavations, and other site-disturbing activities.
3. Subsurface work shall not be performed at any location until the area has been confirmed by a utility-locator firm to be free of underground utilities or other obstructions.

16. Acknowledgment

Parametrix cannot guarantee the health or safety of any person entering the Site. Because of the potentially hazardous nature of visits to active sites, it is not possible to discover, evaluate, and provide protection against all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness at the Site. The health and safety guidelines in this plan were prepared specifically for the Site and should not be used on any other site without prior evaluation by trained health and safety personnel.

Parametrix personnel who will work at the Site are to read, understand, and agree to comply with the specific practices and guidelines described in this HASP regarding field safety and health hazards.

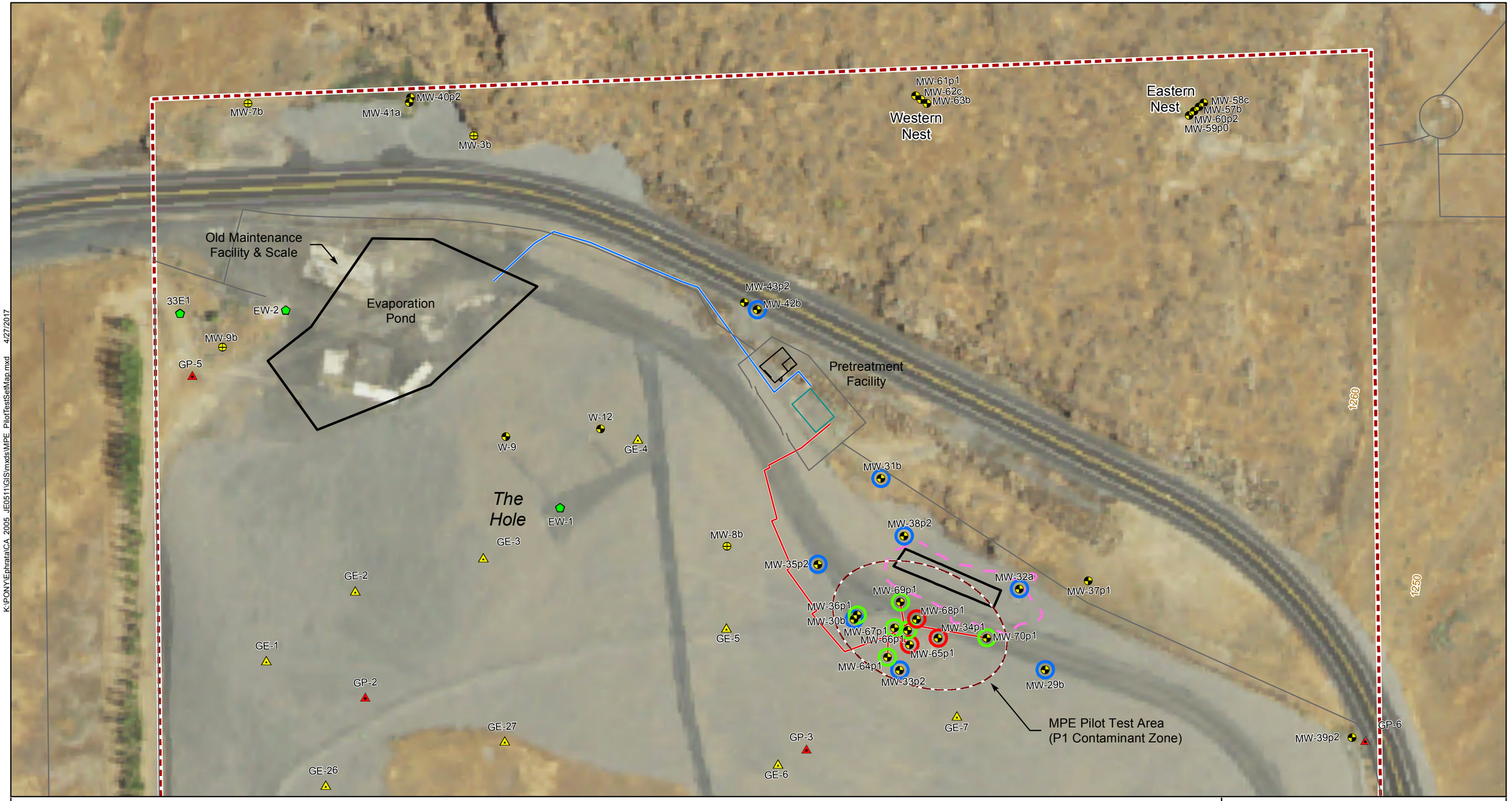
This HASP has been developed for the exclusive use of Parametrix personnel. Parametrix may make this plan available for review by contracted or subcontracted personnel for information only. This plan does not cover the activities performed by employees of any other employer on the Site. All contracted or subcontracted personnel are responsible for implementing their own health and safety program, including generating and using their own plan.

I have read, and I understand this HASP and all attachments and agree to comply with the requirements described herein:

Name	Title	Date

Appendix A

Site Map



K:\PONY\Ephrata\CA_2005_JE0511\GIS\mxds\MPE_PilotTestSetMap.mxd 4/27/2017

Existing Wells
- Quarterly Monitoring Well (MW)
- Remedial Investigation Monitoring Well (MW)
- Gas Extraction (GE)
- Gas Probe (GP)
- Other Well

- Former Drum
- Extent of Soil Removal to Bedrock 2008
- Groundwater Point of Compliance

- Evaporation Pond
- Office/Storage Building
- Discharge Pipe
- Well Utility Lines
- Fence
- Treatment Containers

Pilot Test Wells
- P1 MPE
- P1 Obsevation
- Other Observation

0 Feet 100

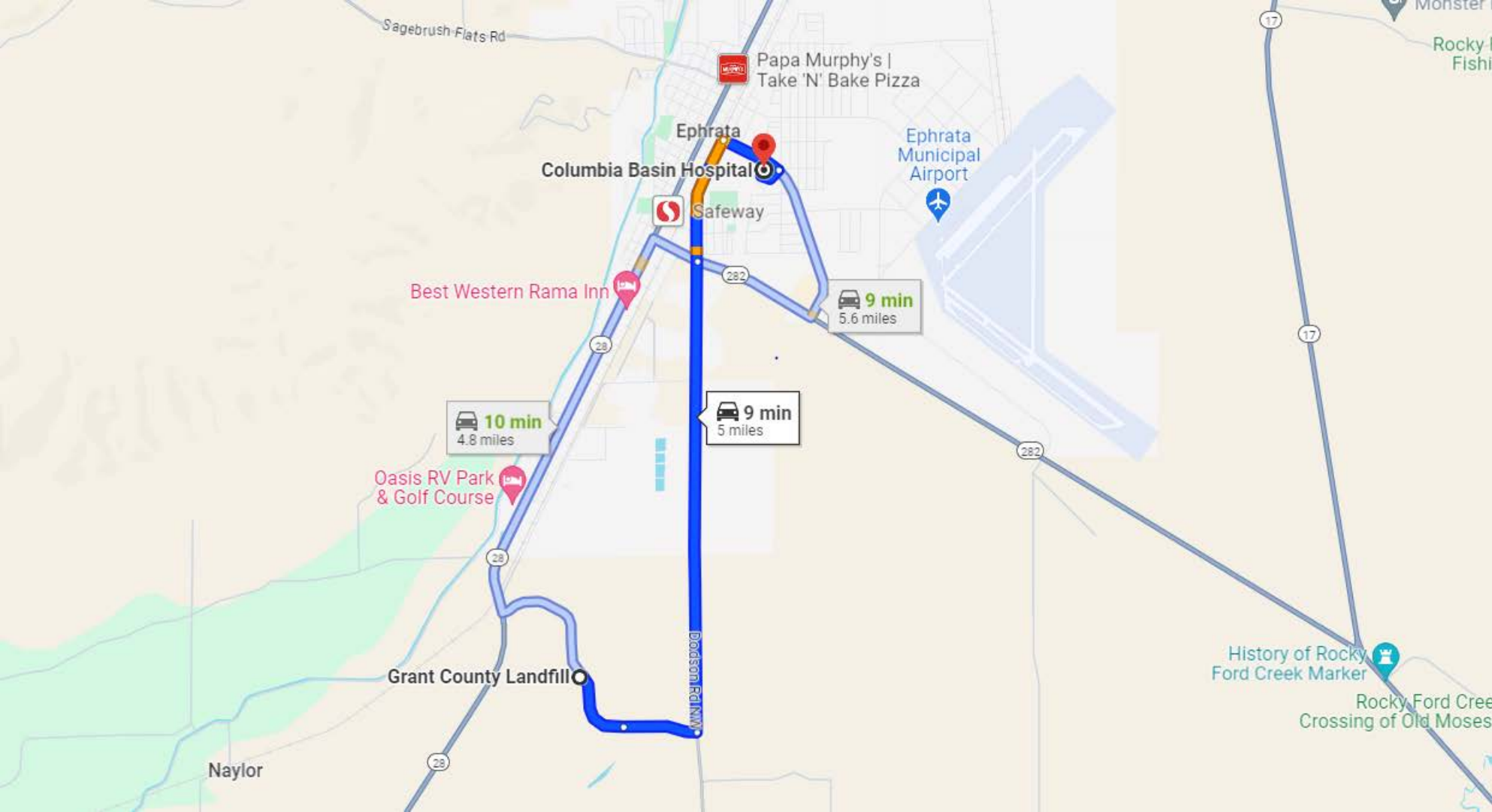
2015 NAIP Orthophoto

Figure 1

MPE Pilot Test Site Map

Ephrata Landfill
RIFS

PgG


Sagebrush Flats Rd
Papa Murphy's | Take 'N' Bake Pizza
Ephrata
Columbia Basin Hospital
Safeway
Ephrata Municipal Airport
Best Western Rama Inn
9 min
5.6 miles
9 min
5 miles
10 min
4.8 miles
Oasis RV Park & Golf Course
Grant County Landfill
Dodson Rd NW
Naylor
History of Rocky Ford Creek Marker
Rocky Ford Cree
Crossing of Old Moses
17
28
282

Appendix B

Incident Report Form

INCIDENT REPORT FORM

Project Name:			
Incident Date/Time:			
Incident Location:			
Contractor Involved:			
Employee Involved:			
Describe the Injury or Illness in Detail and Indicate the Part of Body Affected:			
Describe Accident and Task Being Performed When Accident Occurred:			
Was Medical Treatment Required?	☐ Yes ☐ No ☐ Unknown	**Number of Work Days missed:**	
Equipment Involved:	☐ Yes ☐ No ☐ Unknown List Equipment:		
Property Damaged:			
Witness(es): Name, Company, and Contact Information			
Notification Date and Time:			
Photos:	☐ Yes ☐ No (Attach photos if available)		

Completed by: _____ Date: _____

Appendix C

Chemicals of Potential Concern

Appendix C: Chemicals Detected in Media Samples at the Site

Chemical	Physical/Chemical Characteristics	Regulatory Standards	Exposure Routes/Systems
Arsenic	Metal: Silver-gray or tin-white, brittle, odorless solid.	OSHA PEL = TWA 0.010 mg/m^3 NIOSH = Ca C 0.002 mg/m^3	- ***Exposure Routes*** Inhalation, skin absorption, skin and/or eye contact, ingestion - ***Symptoms*** Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]
1,2-Dichloroethane (EDC)	Colorless liquid with a pleasant, chloroform-like odor.	OSHA PEL = TWA 50 ppm, C 100 ppm	- ***Exposure Routes*** Inhalation, ingestion, skin absorption, skin and/or eye contact - ***Symptoms*** Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]
1,1-Dichloroethane	Colorless, oily liquid with a chloroform-like odor.	OSHA PEL = TWA 100 ppm	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation skin; central nervous system depression; liver, kidney, lung damage
1,1,1-Trichloroethane	Colorless liquid with a mild, chloroform-like odor.	OSHA PEL = TWA 350 ppm	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin; headache; lassitude; central nervous system depression; poor equilibrium; dermatitis; cardiac arrhythmias; liver damage
Chloroethane	Colorless gas or liquid (below 54°F) with a pungent, ether-like odor.	OSHA PEL = TWA 1000 ppm	***Exposure Routes*** Inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact - ***Symptoms*** Incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage

Appendix C: Chemicals Detected in Media Samples at the Site

Chemical	Physical/Chemical Characteristics	Regulatory Standards	Exposure Routes/Systems
Tetrachloroethene (PCE)	Colorless liquid with a mild, chloroform-like odor.	OSHA PEL = TWA 100 ppm, C 200 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]
Trichloroethene (TCE)	Colorless liquid (unless dyed blue) with a chloroform-like odor.	OSHA PEL = TWA 100 ppm, C 200 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]
1,1-Dichloroethene	Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor.	OSHA PEL None	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]
cis-1,2-Dichloroethene	No data available	No data available	No data available
trans-1,2-Dichloroethene	No data available	No data available	No data available
Vinyl Chloride	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations.	OSHA PEL = TWA 1 ppm, C 5 ppm	- ***Exposure Routes*** Inhalation, skin, and/or eye contact (liquid) - ***Symptoms*** Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]

Appendix C: Chemicals Detected in Media Samples at the Site

Chemical	Physical/Chemical Characteristics	Regulatory Standards	Exposure Routes/Systems
Chloromethane	Colorless gas with a faint, sweet odor which is not noticeable at dangerous concentrations.	OSHA PEL = TWA 100 ppm, C 200 ppm	- ***Exposure Routes*** Inhalation, skin and/or eye contact (liquid) - ***Symptoms*** Dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]
Dichloromethane (Methylene Chloride)	Colorless liquid with a chloroform-like odor. [Note: A gas above 104°F.]	OSHA PEL = TWA 25 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential occupational carcinogen]
Trichlorofluoromethane	Colorless to water-white, nearly odorless liquid or gas (above 75°F).	OSHA PEL = TWA 1000 ppm	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Incoordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia; liquid: frostbite
1,2-Dichloropropane	Colorless liquid with a chloroform-like odor. [pesticide]	OSHA PEL = TWA 75 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, respiratory system; drowsiness, dizziness; liver, kidney damage; in animals: central nervous system depression; [potential occupational carcinogen]
Benzene	Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42°F.]	OSHA PEL = TWA 1 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]

Appendix C: Chemicals Detected in Media Samples at the Site

Chemical	Physical/Chemical Characteristics	Regulatory Standards	Exposure Routes/Systems
Toluene	Colorless liquid with a sweet, pungent, benzene-like odor.	OSHA PEL = TWA 200 ppm, C 300 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage
Ethyl benzene	Colorless liquid with an aromatic odor.	OSHA PEL = TWA 100 ppm	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma
Xylene (m, p, o)	Colorless liquid with an aromatic odor.	OSHA PEL = TWA 100 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis
Styrene (vinyl benzene)	Colorless to yellow, oily liquid with a sweet, floral odor.	OSHA PEL = TWA 100 ppm, C 200 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, nose, respiratory system; headache; lassitude; confusion; malaise; drowsy; unsteady gait; narcosis; dermatitis; possible liver injury; reproductive effects
1,2-Dichlorobenzene	Colorless to pale-yellow liquid with a pleasant, aromatic odor.	OSHA PEL = C 50 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, nose; liver, kidney damage; skin blisters

Appendix C: Chemicals Detected in Media Samples at the Site

Chemical	Physical/Chemical Characteristics	Regulatory Standards	Exposure Routes/Systems
1,4-Dichlorobenzene	Colorless or white crystalline solid with a mothball-like odor. [insecticide]	OSHA PEL = TWA 75 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]
1,2,4-Trichlorobenzene	Colorless liquid or crystalline solid (below 63°F) with an aromatic odor.	OSHA PEL = TWA None NIOSH = C 5 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** – Eye irritation; skin; mucous membrane; liver and kidney damage in animals; possible teratogenic effects.
1,3,5-Trimethylbenzene	Clear, colorless liquid with a distinctive, aromatic odor.	OSHA PEL = TWA None NIOSH = 25 ppm	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, nose, throat and respiratory system; bronchitis; hypochromic anemia; headache; drowsiness; lassitude; dizziness; nausea; incoordination; vomiting; confusion; chemical pneumontitis (aspiration liquid).
1,2,4-Trimethybenzene	Clear, colorless liquid with a distinctive, aromatic odor.	OSHA PEL = TWA None NIOSH = 25 ppm	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, nose, throat and respiratory system; bronchitis; hypochromic anemia; headache; drowsiness; lassitude; dizziness; nausea; incoordination; vomiting; confusion; chemical pneumontitis (aspiration liquid).
n-Propylbenzene	No data available	No data available	No data available
n-Butylbenzene	No data available	No data available	No data available

Appendix C: Chemicals Detected in Media Samples at the Site

Chemical	Physical/Chemical Characteristics	Regulatory Standards	Exposure Routes/Systems
Phenol	Colorless to light pink, crystalline solid with a sweet, acrid odor. [Note: phenol liquefied by mixing with about 8% water]	OSHA PEL = TWA 5 ppm (19 mg/m_3) [skin]	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Itching, irritation, reddening skin; hepatitis; hemolytic anemia, abdominal cramps; tachycardia; kidney damage; skin photophobia sensitization.
2-Methylphenol (cresol-o)	White crystals with a sweet, tarry odor. [Note: A liquid above 88°F]	OSHA PEL = TWA 5 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, and mucous membrane; central nervous system effects; confusion; depression; respiratory failure; dyspnea (breathing difficulty); irregular rapid respiration; weak pulse; eye and skin burns; dermatitis; lung, liver, kidney, pancreas damage.
4-Methylphenol (cresol-p)	Crystalline solid with a sweet, tarry odor. [Note: A liquid above 95°F]	OSHA PEL = TWA 5 ppm	- ***Exposure Routes*** Inhalation, skin absorption, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, and mucous membrane; central nervous system effects; confusion; depression; respiratory failure; dyspnea (breathing difficulty); irregular rapid respiration; weak pulse; eye and skin burns; dermatitis; lung, liver, kidney, pancreas damage.
2,4-Dimethylphenol	No data available	No data available	No data available
Benzoic Acid	No data available	No data available	No data available
Benzyl Alcohol	No data available	No data available	No data available
Isophorone	Colorless to white liquid with a peppermint-like odor.	OSHA PEL = TWA 25 ppm	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, nose, throat; headache; nausea; dizziness; lassitude (weakness, exhaustion); malaise; narcosis; dermatitis; kidney and liver damage in animals.

Appendix C: Chemicals Detected in Media Samples at the Site

Chemical	Physical/Chemical Characteristics	Regulatory Standards	Exposure Routes/Systems
Acetone	Colorless liquid with a fragrant, mint-like odor	OSHA PEL = TWA 1000 ppm	- ***Exposure Routes*** - Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, nose, throat; headache; dizziness; central nervous system depression; dermatitis.
2-Butanone (MEK)	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor.	OSHA PEL = TWA 200 ppm	- ***Exposure Routes*** - Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis.
Hexone (MIBK)	Colorless liquid with a pleasant odor.	OSHA PEL = TWA 100 ppm	- ***Exposure Routes*** - Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, skin, nose; headache; narcosis; coma; dermatitis; liver and kidney damage in animals.
2-Hexanone (MBK)	Colorless liquid with an acetone-like odor.	OSHA PEL = TWA 100 ppm	- ***Exposure Routes*** - Inhalation, ingestion, skin absorption; skin and/or eye contact - ***Symptoms*** Irritation eyes, nose; peripheral neuropathy; lassitude; paresthesia; dermatitis; headache; drowsiness.
Naphthalene	Colorless to brown solid with an odor of mothballs. [Note: shipped as a molten solid]	OSHA = TWA 10 ppm	- ***Exposure Routes*** - Inhalation, ingestion, skin absorption; skin and/or eye contact - ***Symptoms*** Irritation eyes; headache; confusion; excitement; malaise; nausea; vomiting; abdominal pain; irritated bladder; profuse sweat; jaundice; hematuria (blood in urine); renal shutdown; dermatitis; optical neuritis; corneal damage.

Appendix C: Chemicals Detected in Media Samples at the Site

Chemical	Physical/Chemical Characteristics	Regulatory Standards	Exposure Routes/Systems
1-Methylnaphthalene	No Data Available	No Data Available	No Data Available
2-Methylnaphthalene	No Data Available	No Data Available	No Data Available
Bis(2-ethylhexyl) Phthalate	Colorless, oily liquid with a slight odor.	OSHA PEL = TWA 5 mg/m³	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation eyes, mucous membrane; in animals: liver damage; teratogenic effects; [potential occupational carcinogen]
Dimethylphthalate	Colorless, oily liquid with a slight, aromatic odor [Note: A solid below 42°F]	OSHA = TWA 5 mg/m³	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation to eyes, upper respiratory system; stomach pain.
Diethylphthalate	Colorless to water-shite, oily liquid with a very slight, aromatic odor [pesticide]	OSHA = TWA None NIOSH 5 mg/m³	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation to eyes, skin, nose, and throat; headache; dizziness; nausea; lacrimation (discharge of tears); possible polyneur; vestibular dysfunction; pain, numbness, lassitude, and spasms in arms and legs; reproductive effects in animals.
Di-n-Butylphthalate (DBP-)	Colorless to faint-yellow, oily liquid with a slight, aromatic odor.	OSHA = TWA 5 mg/m³	- ***Exposure Routes*** Inhalation, ingestion, skin and/or eye contact - ***Symptoms*** Irritation to eyes, upper respiratory system and stomach.
Butylbenzylphthalate	No Data Available	No Data Available	No Data Available
Di-n-Octyl phthalate	No Data Available	No Data Available	No Data Available
N-nitrosodiphenylamine	No Data Available	No Data Available	No Data Available

Appendix C: Chemicals Detected in Media Samples at the Site

Chemical	Physical/Chemical Characteristics	Regulatory Standards	Exposure Routes/Systems
Aroclor 1242 (PCB)	Colorless to light-colored, viscous liquid with a mild, hydrocarbon odor.	OSHA = TWA 0.5 mg/m_3 [skin]	- ***Exposure Routes*** - Inhalation, ingestion, skin absorption; skin and/or eye contact - ***Symptoms*** Irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]
Aroclor 1260 (PCB)	No Data Available	No Data Available	No Data Available

C = Ceiling Limit.
Ca = Carcinogen.
OSHA = Occupational Safety and Health Administration.
NIOSH = National Institute for Occupational Safety and Health.
TWA = Time Weighted Average (8-hour during 40-hour week).

Appendix D

Job Hazard Analysis-Wildfire Smoke

1. Job Hazard Analysis: Outdoor Work During Wildfires

Project Number: 553-1960-014	**Location/Site Where Task/Operation Performed**: Ephrata Landfill
Date Prepared: 8/28/2024	**Employee Preparing this JHA**: Amber Bailey, Senior Scientist
Date Reviewed:8/30/2024	**Employee Reviewing and Certifying this JHA**: Brian Pippin

Job/Task Description

This job hazard analysis (JHA) describes hazards related to outdoor work during wildfire season and required safe-work practices where ambient air quality has been degraded.

Relevant Standard Operating Procedures

☐ Hazard Communication	☐ Fall Protection
☐ Noise and Hearing Conservation	☒ Selection and Use of Personal Protective Equipment
☐ Working Near Traffic	☐ Underground Utility Locate and Emergency Response During a Utility Strike

Wildfire Smoke Standard Operating Procedure

Review the Air Quality Index (AQI) locally. For Washington, the current AQI can be reviewed at the following sources:
https://www.airnow.gov/
https://enviwa.ecology.wa.gov/home/map
https://www.iqair.com/us/air-quality-map

For evaluation of air quality at the site we will be using the Soap Lake station, if available.
https://www.iqair.com/us/usa/washington/soap-lake/soap-lake-4th-ave-se

Physical Hazards

Hazard/Risk	Source of Hazard/Risk	Hazard/Risk Mitigation
Smoke / Particulates inhalation **AQI above 72**	Wildfires	Reduce, reschedule, or relocate work with less smoke if possible Utilize enclosed buildings or vehicles where the air is filtered, if possible Reduce work intensity or increase resting periods
Smoke / Particulates inhalation **AQI above 101**	Wildfires	Follow the steps above, Voluntary N95/KN95 respirators may be worn
Smoke / Particulates inhalation **AQI above 300**	Wildfires	Follow the steps above, Voluntary use of N95/KN95 respirators highly recommended but not required
Smoke / Particulates inhalation **AQI above 849**	Wildfires	Stop work or wear a P100 half-face or full-face respirator. Note: Use of a P100 requires a medical evaluation and fit testing in accordance with the respiratory protection program.

Wildfire Smoke Standard Operating Procedure
Review the Air Quality Index (AQI) locally. For Washington, the current AQI can be reviewed at the following sources: https://www.airnow.gov/ https://enviwa.ecology.wa.gov/home/map https://www.iqair.com/us/air-quality-map For evaluation of air quality at the site we will be using the Soap Lake station, if available. https://www.iqair.com/us/usa/washington/soap-lake/soap-lake-4th-ave-se

Physical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Smoke/Particulates visual effects, **AQI above 150**	Wildfires	Voluntary foam sealed eye protection goggles and eyewear may be worn when working outdoors, ANSI dust/splash protection rated

Additional Control Measures and Guidance

Engineering Controls:

Limit the time outdoors. If work is to be scheduled during a known wildfire smoke event, consider rescheduling the work until the air quality resumes a lower AQI.

Note: Sensitivity of individual may vary greatly

Personal Protective Equipment (PPE): See HASP

- ☐ Safety shoes/boots with safety toe and shank
- ☐ Hard hat
- ☐ High-visibility traffic safety vest
- ☒ Safety glasses
- ☐ Work gloves
- ☐ Disposable nitrile gloves
- ☐ Hearing protection (i.e., earplugs or earmuffs)
- ☒ N95 / KN95 Respirators
- ☒ P100 Half face/full face respirators for individual
- ☐ that have completed respirator fit tests and have__
- ☐ medical clearance_____

The following summarizes the U.S. Air Quality Index

Green	**Good**	**0 to 50**	**Air quality is satisfactory, and air pollution poses little or no risk.**
Yellow	**Moderate**	**51 to 100**	**Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.**
Orange	**Unhealthy for Sensitive Groups**	**101 to 150**	**Members of sensitive groups may experience health effects. The general public is less likely to be affected.**
Red	**Unhealthy**	**151 to 200**	**Some members of the general public may experience health effects; members of sensitive**

			groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

Below is the overall Wildfire Smoke Response Plan.

2. Wildfire Smoke Response Plan

Ephrata Landfill
553-1860-014

2.1 Introduction

Wildfire smoke is a health hazard for our employees when present in a work area. This wildfire smoke plan includes our policies and procedures related to protecting our employees from exposure to wildfire smoke. This plan was created to meet the Washington State workplace wildfire smoke regulations (Chapter 296-820 WAC and WAC 296-307-09805 through 09860 for agriculture).

The specific jobs and tasks at our workplace covered under this wildfire smoke plan include:

- General work near heavy equipment.
- Work in and around excavations.
- Collecting groundwater samples.
- VTT and LTT inlet and discharge sampling.
- Monitoring and sampling Non-Aqueous Phase Liquids (NAPL).
- Work around electrically powered equipment and controls.

3. Health Effects and Adverse Symptoms of Wildfire Smoke

Although there are many hazardous chemicals in wildfire smoke, the main harmful pollutant for people who are not close to the fire is "particulate matter", the tiny particles suspended in the air.

These tiny particles can reach the deepest parts of the lungs and can be absorbed into the body. The Environmental Protection Agency has determined that particulate matter may cause or worsen cardiovascular disease, respiratory disease, cancer, and can harm the nervous system.

Exposure to particulate matter in wildfire smoke can cause a wide range of symptoms including (but not limited to):

Respiratory:

- Cough
- Difficulty breathing
- Wheezing
- Shortness of breath
- Asthma attack
- Runny nose
- Sore throat

- Sinus pain or pressure
- Phlegm.

Cardiovascular:

- Chest pain or discomfort
- Fast or irregular heartbeat
- Feeling weak, light-headed, faint, or dizzy
- Pain or discomfort in the jaw, neck, or back.

Symptoms concerning for a stroke:

- Sudden numbness or weakness in the face, arm, or leg, especially on one side of the body
- Sudden confusion, trouble speaking, or difficulty understanding speech
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance, or lack of coordination
- Sudden severe headache with no known cause.
- Headache, scratchy or irritated eyes, fatigue or tiredness, or nausea or vomiting.

Symptoms requiring immediate medical attention can include, but is not limited to:

Symptoms that can lead to a heart attack, such as:

- Chest pain or discomfort
- Feeling weak, light-headed, faint, or dizzy
- Pain or discomfort in the jaw, neck, or back
- Pain or discomfort in one or both arms or shoulders
- Shortness of breath, especially if accompanied by chest discomfort

Symptoms that can lead to a stroke, such as:

- Sudden numbness or weakness in the face, arm, or leg, especially on one side of the body
- Sudden confusion, trouble speaking, or difficulty understanding speech
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance, or lack of coordination
- Sudden severe headache with no known cause
- Wheezing, difficulty breathing, or shortness of breath
- Asthma attacks
- Nausea or vomiting
- Any symptom that is concerning or per a health care providers advice.

Our employees may follow medical advice they have been given or seek medical attention for any symptoms they may experience that are potentially related to wildfire smoke exposure, regardless of

the severity. Parametrix will not retaliate against our employees for seeking medical attention or following medical advice they have been given.

Additionally, sensitive groups are more at risk of experiencing the adverse health effects of wildfire smoke. These sensitive groups can include:

- Outdoor workers.
- Smokers.
- Workers under 18 or over 65 years old.
- People with respiratory infections, like colds. Conditions can include pneumonia, acute bronchitis, bronchiolitis, colds, flus, or those recovering from COVID-19.
- People with certain medical conditions like lung diseases, heart or circulatory problems, diabetes, pregnancy, and other conditions. Conditions can include asthma, COPD, bronchitis, emphysema, irregular heartbeat, congestive heart failure, coronary artery disease, angina, those who have had a heart attack or stroke, and those with medical conditions that can be worsened by exposure to wildfire smoke as determined by a medical provider.
- Tribal and indigenous people.
- People with low income.

Wildfire smoke is a serious work-related hazard for exposed outdoor workers. It is important to notify the Project Manager and Site Safety Officer (SSO) when an employee is experiencing symptoms of wildfire smoke exposure so management can respond appropriately. Our employees must watch for symptoms of wildfire smoke exposure as a sign to reduce exposure. Wildfire smoke can harm healthy people. Smoke can harm someone even if they are exposed over a short period or a long period. The wildfire smoke rule is designed to limit the harm to employees from wildfire smoke.

By law, we will **not** retaliate against our employees for:

- Reporting symptoms,
- Seeking medical attention,
- Following medical advice they have been given,
- Or for filing a workers' compensation claim.

Note: Our employees have the right to file a workers' compensation claim to have their symptoms or any work-related injury evaluated. Labor and Industries (L&I) workers' compensation is in part funded by employee salaries and is separate from personal health insurance. In most cases, L&I will pay for an initial medical evaluation, even if the claim is denied. If the claim is allowed, the workers' compensation system will cover medical bills directly related to our employees' condition and partial wage replacement benefits if our employee cannot work.

3.1 Identification of Harmful Wildfire Smoke Exposures

The main pollutant in smoke is the small particles in the air called fine particulate matter, also called $PM_{2.5}$. $PM_{2.5}$ measurements are reported in two ways:

- As micrograms per cubic meter ($\mu g/m^3$), or

- NowCast AQI for $PM_{2.5}$, which is an index produced by the EPA to communicate general air quality based on $PM_{2.5}$. AQI stands for “air quality index”.

The wildfire smoke regulations require employers look at hourly $PM_{2.5}$ averages, which is reported as “Current $PM_{2.5}$”. NowCast Air Quality Index (AQI) for $PM_{2.5}$ can also be used, which is a unitless index which uses $PM_{2.5}$ data averaged over the past 3 to 12 hours. The EPA updated how the Air Quality Index relates to $PM_{2.5}$ on May 6, 2024, and L&I rules will be updated to reflect those changes. The levels of smoke and particulate matter in the air which require action are not changing.

The SSO will determine employee exposure to current $PM_{2.5}$, to protect the health of our workers. We will use one of these sites to determine employee exposure to the current $PM_{2.5}$:

https://www.airnow.gov/
https://enviwa.ecology.wa.gov/home/map
https://www.iqair.com/us/air-quality-map

3.2 Summary of the Wildfire Smoke Rule Requirements

The following table summarizes the key requirements of the rule. See the wildfire smoke rules for more details. The EPA updated how the Air Quality Index relates to $PM_{2.5}$ on May 6, 2024, and L&I rules will be updated to reflect those changes. The levels of smoke and particulate matter in the air which require action are not changing.

Current $PM_{2.5}$	NowCast Air Quality Index for $PM_{2.5}$	Requirements at Current $PM_{2.5}$ Level
0.0-20.4 μg/m³	0-71	▪ Prepare a written wildfire smoke response plan. ▪ Provide wildfire smoke training to employees. ▪ Watch the $PM_{2.5}$ conditions and forecasts. ▪ Prepare a two-way communication system and notify employees of $PM_{2.5}$ conditions. ▪ Make provisions for prompt medical attention and permit that medical attention without retaliation.
20.5-35.4 μg/m³	72-100	All of the above and: ▪ Notify employees of PM2.5 conditions and forecasts. ▪ Ensure only trained employees work outdoors. ▪ Consider implementing exposure controls. ▪ Consider providing voluntary use respirators.
35.5-250.4 μg/m³	101-350	All of the above and: ▪ Implement exposure controls. ▪ Make N95 respirators available for voluntary use.
250.5-500.3 μg/m³	351-848	All of the above and: ▪ Ensure workers experiencing symptoms requiring immediate medical attention be moved to a location that ensures sufficient clean air. ▪ Directly distribute N95 respirators to employees for voluntary use.
500.4-554.9 μg/m³	849-956	▪ All of the above and:

		▪ Implement a complete required use respiratory protection program, including fit-testing, medical evaluations, requiring employees to be clean-shaven, and requiring the use of particulate respirators.
555 µg/m³ or more	957 or more	All of the above and: ▪ Require respirators with an assigned protection factor (APF) of 25 or more. N95 Respirators are not sufficient at this level of smoke.

3.3 Wildfire Smoke Hazard Communication for Our Employees

We will communicate wildfire smoke hazards to our employees when the air quality is at or above 20.5 µg/m³ of $PM_{2.5}$ (AQI 72). Additionally, we encourage our employees to monitor the air quality where they are working and to notify their supervisor when the air quality is above 20.5 µg/m³ (AQI 69 or AQI 72 after May 6. 2024).

We will inform our employees of the following:

- When at least two consecutive current $PM_{2.5}$ readings are 20.5 µg/m³ (AQI 72) or more.
- When the current $PM_{2.5}$ reaches 35.5 (AQI 101), 250.5 (AQI 351), 500.4 (AQI 849), and/or 555 µg/m³ (AQI 957) or more.
- What available protective measures are available to employees to reduce their wildfire smoke exposures at each level.

Current air quality levels will be texted, emailed, or verbally communicated to field personnel.

We will not punish employees who show signs of injury or illness that may potentially be due to wildfire smoke exposure for reporting those symptoms, seeking medical attention, or following medical advice they have been given.

All employees should notify the SSO of any health effects so that proper mitigation measures can be implemented or so that medical evaluations can be completed.

3.3.1 Employee and Supervisor Training

We train all covered workers and supervisors with wildfire smoke training. Supervisors will complete additional training.

The site-specific HASP provides the training protocols required for on-site field work. Additionally, employees can see the company Health and Safety manual for further information.

3.4 Responding to Wildfire Smoke Exposure Symptoms

We require that our employees inform the SS and the Health and Safety Coordinator if they experience symptoms of wildfire smoke exposure. This is so we can monitor these employees to determine whether medical attention is necessary.

Our employees may seek medical attention or follow medical advice they have been given for symptoms potentially related to wildfire smoke exposure. We will not retaliate against those employees for seeking medical attention or following medical advice they have been given.

When employees are experiencing health symptoms related to wildfire smoke, follow the site-specific HASP including:

- Stop work, contact your supervisor and the SSO
- Take breaks
- Call 911 related to emergencies
- Rotation of personnel

Where the current $PM_{2.5}$ is 250.5 µg/m^3 (AQI 351) or more, we will ensure workers experiencing adverse symptoms requiring medical attention be moved to a location that ensures sufficient clean air. We will move these workers to:

- A vehicle with a sufficient air filtration mechanism.

Employees exhibiting wildfire smoke exposure symptoms will be monitored by the SSO landfill personnel. Employees should have regular check-ins with the other Parametrix personnel on-site, if present, to ensure the health and safety of employees.

This includes evaluation of recovery, when to seek medical attention, and shifting work schedules to ensure exposure is mitigated for the employee.

3.5 Controlling Employee Exposures to Wildfire Smoke

We care about the health of our employees and will implement these methods to protect our employees from wildfire smoke:

When the current $PM_{2.5}$ is 35.5 µg/m^3 (AQI 101,) or more, we will implement these exposure controls:

- Use vehicles where the air is adequately filtered.
- Changing work schedules to a time with a lower ambient air concentration of $PM_{2.5}$.
- Avoiding, or reducing work that creates additional dust, fumes, or smoke.
- Reducing work intensity.
- Providing additional rest periods.
- Provide N95/KN95 respirators for voluntary use.

When the current $PM_{2.5}$ is 500.4 µg/m^3 (AQI 849,) or more, we will implement these exposure controls:

Stop work, or

- Use a P100 half-mask or full-face respirator, this requires a medical evaluation and fit testing in accordance with the respiratory protection program.

3.6 Respirator Use for Wildfire Smoke

When the current $PM_{2.5}$ is 35.5 µg/m^3 (AQI 101) or more, we will make NIOSH approved N95 (or KN95) respirators available at no cost to all employees, and we will encourage employees to use the

respirators, but they are optional. Respirator use can be beneficial even when the current $PM_{2.5}$ is less than 35.5 µg/m³ (AQI 101).

When the current $PM_{2.5}$ is or more, Parametrix will stop work. Continued work at 500.4 µg/m³ (AQI 849) or above will require personnel to enroll in a complete respiratory protection program (including fit-tests and respirator medical evaluations) in accordance with the Washington State Respirator Standard, WAC 296-842 because National Institute for Occupational Safety and Health (NIOSH) approved air purifying respirators must be worn, either half-face piece or full-face air purifying respirator with P100 filters.

The respiratory protection program includes fit tests and respirator medical evaluations.

Section 7 of the Parametrix Health and Safety Plan and Respiratory Protection Program have further details on medical evaluations, training, and fit testing for P100 air purifying respirators.

Attachment B

Sampling and Analysis Plan

Sampling and Analysis Plan for Ephrata Landfill: MPE System Restart and Seasonal Operation

Prepared for
Grant County Public Works

August 2024

Parametrix

Sampling and Analysis Plan for Ephrata Landfill: MPE System Restart and Seasonal Operation

Prepared for

Grant County Public Works
124 Ephrata Street SE
Ephrata, WA 98823

Prepared by

Parametrix
719 2nd Avenue, Suite 200
Seattle, WA 98104
T. 206.394.3700 F. 1.855.542.6353
www.parametrix.com

August 2024 | 553-1860-014

Citation

Parametrix. 2024. Sampling and Analysis Plan for Ephrata Landfill: MPE System Restart and Seasonal Operation. Prepared for Grant County Public Works by Parametrix, Seattle, Washington. August2024.

Approvals

Prepared by Molly Alar	Date
Checked by Shira DeGrood	Date
Approved by Jenifer Young	Date

Contents

Contents (continued)

FIGURES

TABLES

APPENDICES

Acronyms and Abbreviations

SAP	Sampling and Analysis Plan
MPE	multi-phase extraction
Site	old Ephrata Landfill
WAC	Washington Administrative Code
LTT	Liquid Treatment Train
GAC	granulated activated carbon
VTT	Vapor Treatment Train
LNAPL	light non-aqueous phase liquid
QC	quality control
COC	chain of custody
QC	quality control
ID	identification
CAS	Chemical Abstracts Service
LNAPL	light non-aqueous phase liquids
VAE	vacuum assisted extraction
SVE	soil vapor extraction
PLC	program logic controller
gpm	gallons per minute
VOCs	volatile organic compounds
VAE	vacuum assisted extraction
PPE	personal protective equipment
QA	quality assurance
MDL	Method detection limit
RL	reporting limits
DQIs	data quality indicators
LCS	laboratory control samples
MS	matrix spikes
RPD	relative percent difference

1. Introduction

Parametrix prepared this Sampling and Analysis Plan (SAP) to describe data collection, groundwater sampling, and vapor sampling procedures for restart and seasonal operation of the multi-phase extraction (MPE) system at the old Ephrata Landfill (Site). This work is required under the terms of Agreed Order No. DE 3810 Amendment No. 3 (Amendment) among between the Washington State Department of Ecology (Ecology), and Grant County. The Amendment requires the County and City (Potentially Liable Parties [PLPs]) to develop a workplan, restart, and operate the MPE system until construction of an expanded MPE system starts. This SAP was prepared in accordance with Washington Administrative Code (WAC) 173-340-820.

1.1 Project Description and Schedule

The P1 MPE system restart and seasonal operation will provide contaminant removal from the P1 zone while MPE system expansion is planned.

Liquids and vapor extracted from MPE wells will be conveyed to an onsite pretreatment facility. Liquids will be conveyed to the Liquid Treatment Train (LTT) consisting of oil water separation, air sparging, waste tanks, knockout tank, and granulated activated carbon (GAC) before being discharged to an evaporation pond. Extracted vapor will be conveyed to the Vapor Treatment Train (VTT) consisting of GAC treatment before being vented to air. Figure 1 shows a Site map of the MPE system area and Figure 2 shows a diagram of the MPE system LTT and VTT.

MPE system restart operations will involve field monitoring of depth to groundwater, total vapor and liquid extraction monitoring, and collection of extracted groundwater and vapor samples from the treatment system. For this SAP, extracted groundwater processed through the MPE system will be referred to as groundwater.

Field monitoring will be conducted three times each year. The first event will be conducted within 2 days of MPE system restart, the second event will be conducted approximately 2 weeks after MPE system restart, and the third event will be conducted during the month prior to seasonal shut down of the MPE system. A field monitoring summary is included in Table 1 and a sampling and analysis summary is included in Table 2. Figure 2 identifies sample locations within the LTT and VTT. The P1 MPE system is designed to operate without people present, although it cannot be restarted or operated remotely. Parametrix plans to train three people to restart and operate the system and who will respond to the Site within 1 week following notification of a system shutdown. Grant County Landfill personnel will check the system on regular workdays to confirm it is running and notify Parametrix of shutdowns. Grant County plans to hire an additional landfill technician, who could be trained to restart and operate the system starting as soon as 2024.

Figure 1. Site Map

Figure 2. MPE System Diagram

1.2 Project Organization

Parametrix is the project engineer and lead operator of the MPE system restart. Parametrix will coordinate system repairs and personnel training, restart the MPE system, and monitor and sample the system. Parametrix will collect vapor and groundwater samples for laboratory analysis for both MPE performance and compliance monitoring. Parametrix will be responsible for field and laboratory data management and reporting.

Parametrix plans to use Friedman & Bruya, Inc. (laboratory), located in Seattle, Washington, for liquid and gas sample analyses for the P1 MPE restart and seasonal operation.

Mott MacDonald, Ltd is the project hydrogeologist and groundwater monitoring lead. Groundwater monitoring at wells not directly involved in the P1 MPE restart and seasonal operation will be performed by Mott MacDonald under a separate workplan to be developed by Mott MacDonald.

1.3 Quality Objectives and Criteria for Measurement Data

The purpose of this SAP is to ensure that the data are of sufficient quality to support contaminant removal and emission calculations. Section 2.5 describes quality control (QC).

1.3.1 Objective

The objective of the MPE restart monitoring and sampling is to measure contaminate concentrations in extracted groundwater and vapor before and after treatment in the LTT and VTT.

1.4 Training Requirements/ Certification

Field personnel performing MPE system sampling, monitoring, and maintenance will be trained in accordance with the project health and safety plan (Parametrix 2024b).

1.5 Documents and Records

1.5.1 SAP Distribution

The Parametrix Project Manager will be responsible for preparing and distributing any SAP amendments.

1.5.2 Field Documentation and Records

Field sampling will be documented in several ways, including field and sampling forms, photographs, sample labels, and sample chain of custody (COC) forms.

1.5.2.1 Field Forms

Sampling and monitoring will be documented on the field forms included in Appendix A.

Any corrections made while recording information in the field will use single line strikethroughs and include initials and date.

Field instrument calibration will be noted.

Field forms and any photos will be retained in Parametrix's project records.

1.5.2.2 Sample Labels

Each sample will be labeled with laboratory provided labels. Each label includes the following information:

- Project name/number.
- Name of sample collector.
- Date and time of sample collection.
- Place of collection.
- Sample identification (ID) (i.e., groundwater influent, groundwater effluent, vapor pre-treatment, vapor post-treatment).
- Presence of any preservation or filtration.

1.5.2.3 Chain-of-Custody Forms and Custody Seals

COC forms and self-adhesive custody seals for individual samples and coolers will be provided by the laboratory. A blank COC form is included in Appendix B. Copies of completed COC forms will be kept in Parametrix's project records. Additional details regarding sample handling and custody are provided in Section 2.

1.5.3 Laboratory Documentation and Records

Laboratory data packages will be provided by the laboratory in electronic (PDF and .xlsx or .csv) format. These packages will include a case narrative discussing any problems with the analyses, corrective actions taken, changes to the referenced methods, and an explanation of data qualifiers. In addition to sample results, reporting limits, and method detection limits, the data packages will also report all QC results associated with the study data, including results for all blanks, surrogate compounds, and check standards included in the sample batch, as well as results for analytical duplicates. Legible copies of all COC forms and sample receiving logs associated with the samples analyzed will also be included. This information will be used to evaluate data accuracy.

In addition to the data packages, the laboratory will provide electronic data files containing sample results. The electronic files will be in unprotected .xlsx or .csv format and will include the following fields at a minimum:

- Laboratory sample ID.
- Sample ID.
- Sample type.
- Date analyzed.
- Analytical method.
- Sample filter flag.
- Chemical Abstracts Service (CAS) number.
- Parameter name.

- Units.
- Result value.
- Result qualifier.
- Dilution factor.
- Reporting limit and detection limit.

Each data file will include all laboratory results and will be consistent with the data reported in the corresponding laboratory data package.

1.5.4 Reporting

This sampling and monitoring data described in this SAP will be reported as required in the Amendment. The Amendment calls for monthly progress reports, which are to include data obtained during the preceding month. Calculations of emissions and contaminant removal during each season of operations will be included in one of the monthly reports after the system is shut down and analytical results have been evaluated each season of operation.

2. Data Generation and Acquisition

This section describes procedures for collecting field measurements and for collecting samples for laboratory analysis. It also provides quality assurance and data management protocols. Sample locations are described in the *P1 MPE System Restart and Seasonal Operation Workplan*.

2.1 Monitoring Methods

This subsection describes field monitoring methods. Monitoring will occur at locations described in Table 1.

2.1.1 Non-Aqueous Phase Liquid

Depth to water and NAPL (non-aqueous phase liquids) will be manually measured in MPE and P1 observation wells to confirm transducer measurements (for those wells instrumented with pressure transducers) and to monitor for accumulation of NAPL in these wells. Depths to water, light NAPL (LNAPL), and dense NAPL (DNAPL) will be measured in these wells using an electric interface probe by first measuring potential LNAPL and depth to water at the water surface and then lowering the probe to the bottom of the well to measure potential DNAPL.

Manual measurements of water level and NAPL depths in these wells will require temporary removal of vacuum pressures during the vacuum assisted extraction (VAE) and soil vapor extraction (SVE) portion of the test. When MPE wells are under vacuum, water levels in these wells would be abnormally high relative to conditions in which the wellhead was at atmospheric pressure (i.e., if the water pumps were not being used to depress water levels). However, operation of the pumps will depress water levels in all MPE wells regardless of wellhead pressure, and water levels will take some time to adjust to changes in wellhead pressures when collecting measurements.

The length of the non-equilibrium period will be relatively long because P1 aquifer transmissivity is low. Thus, at least two manual measurements will be collected as quickly as possible from MPE wells after removing the vacuum from the wellheads.

The following procedures will be used to measure depth to LNAPL and DNAPL in MPE wells:

- Remove vacuum from MPE wells by either unthreading the 3/4-inch wellhead port (with VAE line still open), or by first shutting off the VAE line, then unthreading the wellhead port after vacuum pressure is reduced.
- Lower interface probe into 3/4-inch access port and record date, time, depth to water, and depth to LNAPL on MPE Well Form (Appendix A). If there is no measurable LNAPL, record as "0" on form. Record observer's initials.
- Lower interface probe to the bottom of the well and record date, time, bottom of well, and depth to DNAPL on MPE Well Form. If there is no measurable DNAPL, record as "0" on form. Record observer's initials.
- Measuring point on these wells will be consistent between measurements and will be the top of the 3/4-inch access port.
- Repeat measurements and record depths on MPE Well Form.

P1 observation wells will be under less vacuum and have no pumps or VAE line. The following procedures will be used to collect measurements in P1 Observation Wells:

- Remove vacuum by unthreading the 3/4-inch wellhead sample port (Note that all P1 wells except MW-36p1 and MW-67p1 are fitted with QED well plates with 3/4-inch threaded sample ports. MW-36p1 is fitted with a temporary PVC well cap with threaded 3/4-inch sample port, and MW-67p1 is fitted with a temporary well cap plug that will have to be removed for data collection).
- Lower interface probe into 3/4-inch access port and record date, time, depth to water, and depth to LNAPL on the Observation Well Form (Appendix A). If there is no measurable LNAPL, record as "0" on form. Record observer's initials.
- Lower interface probe to the bottom of the well and record date, time, bottom of well, and depth to DNAPL on the Observation Well Form. If there is no measurable DNAPL, record as "0" on form. Record observer's initials.
- Measuring point on these wells will be consistent between measurements and will be the top of the 3/4-inch access port for those wells fitted with well plates having access ports. The measuring point for observation wells without well plates having access ports shall be the top of the PVC well casing.
- Repeat measurements and record depth on the Observation Well Form in Appendix A.

2.1.2 Groundwater Well Monitoring

Depth to water will be manually measured in the vented observations wells.

Depths to water will be collected in these wells using a water level probe as follows:

- Open monument cap and remove well cap.
- Collect depth to water using top of PVC well casing (north side) as measurement point.
- Record date, time, initials, and depth to water on Observation Well Form in Appendix A.

2.1.3 Total Vapor and Liquid Extraction

Total liquid and vapor extraction rates and volumes data will be occasionally recorded manually on the Extraction Form in Appendix A. A vapor flow meter, which records pressure differential (in H_20), and a pressure gage, which records pipe vacuum (in Hg), are in the VTT container near the intake to the VAE. Readings from these meters are used in standard air flow formulas to calculate air flow rates. Readings are transmitted to the program logic controller (PLC) but will also be manually read and recorded on the Extraction Form as backup. A liquid flow meter, which reads total cumulative volume (gallons) and instantaneous flow (gpm), is in the VTT container before influent to the oil-water separator. Readings from the liquid meter are transmitted to the PLC but will also be manually read and recorded on the Extraction Form as backup.

2.1.4 Ambient Air Monitoring

The VTT and LTT systems are designed for operation in Class 1, Division 1 areas to safely handle flammable mixtures containing methane and other volatile substances. However, it may be feasible to avoid handling flammable mixtures through system adjustments. The following thresholds for oxygen and methane have been established:

- Oxygen = over 10% volume
- Methane = over 20% LEL by volume

Although not anticipated, if the above thresholds are both exceeded at the VAE blower discharge, gas concentrations will be measured at individual wellheads to evaluate which well(s) may be contributing to elevated methane and possibly entraining landfill gas and/or atmospheric air.

Elevated methane in extracted vapor could be from a landfill gas source and/or from volatilization of dissolved methane in the P1 zone groundwater. However, volatilization of dissolved gases in the P1 zone is not likely to produce significant vapor volumes relative to the entrainment of landfill gases.

Actions to mitigate combustible gas mixtures will be discussed with the Project Manager and could include one of the following options:

1. Throttle or isolate the well producing high methane or oxygen, presuming one is identified.
2. Throttle all MPE wells and reduce the VAE blower speed.
3. Vent the MPE wells by opening sample port and reduce the VAE blower speed to minimum, essentially reverting to non-vacuum-assisted groundwater extraction.
4. Evaluate piping modifications to route rich gas to the landfill flare.
5. Evaluate well, piping, and electrical modifications to extract from a different well.
6. Evaluate adjustments to nearby LFG collection wells to offset LFG migration into the P1 zone.

As mentioned, the systems are designed to handle combustible mixtures. MPE operations may continue when the above mitigation options result in a non-flammable condition.

2.2 Sampling Methods

2.2.1 Groundwater Sampling

Groundwater (liquid) samples will be collected for laboratory analysis for both MPE performance monitoring purposes and pre-and-post-treatment performance monitoring purposes following the schedule in Table 2.

Groundwater samples will be collected at the following locations:

- Pre-treatment samples will be collected at the liquid sample port at the oil-water separator inlet.
- Post-treatment samples will be collected at the air sparge effluent sample port.

Sample locations are shown on the MPE system diagram in Figure 2.

Groundwater samples will be sampled for analytes listed in Table 3. See Table 4 for required analyses and bottles for each sample. Groundwater samples will be collected from in-line liquid sample ports (i.e. quarter-turn ball valve with PTFE tube whip) at locations summarized above using the following procedures:

- All sampling personnel will wear clean, disposable, latex gloves.
- Place a 5-gallon bucket on the ground below the sample port to collect overflow liquid during sampling. The overflow water should be contained in sealed/labeled 55-gallon drums and eventually run through the LLT.
- Connect a multiparameter water quality meter with a flow-thru cell (YSI ProDSS or equivalent) to the sample port, then open the sample port (allowing water to fill the flow-thru cell) and a small stream of discharge of about 100 to 500 millimeters per minute (ml/min) will be maintained. The following field parameters will be monitored with the water quality meter:
    - pH (standard unit).
    - Dissolved oxygen (%).
    - Electrical conductivity (µS/cm or mS/cm).
    - Temperature (degrees C).
    - Oxidation reduction potential (mV).
    - Turbidity (NTU).
- Allow water to continue moving through the flow-thru cell until parameter readings are stable for at least 30 seconds. Record field parameter values on the Groundwater Sample Form included in Appendix A. If parameter values continue to trend after 2 minutes, record values and indicate on the Groundwater Sample Form that the parameter value is trending upward or downward. Also, note visual appearance on the sample form (opaqueness, color, odor, etc.).
- Once field parameters have been collected, disconnect the sample port from the flow-thru cell and collect samples for laboratory analysis. Fill sample bottles in a manner that minimizes contact of the samples with air following individual sample container requirements, handling, and preservation. Samples for volatile organic compounds (VOCs) should contain no bubbles (headspace) after filling.

- Samples for dissolved metals analysis will be filtered in the field using a 0.45-micron in-line filter and recorded on field forms, metals sample bottle, and COC form.
- Record all sample information on the Groundwater Sample Form in Appendix A (sample ID, date, time, field parameters, analytical parameters, shipment date to the lab, and observer/comments).
- Record the information on each sample bottle label in accordance with the following subsection.

2.2.2 Vapor Sampling

Vapor samples will be collected for laboratory analysis for both MPE performance monitoring purposes and pre-and-post-treatment performance monitoring purposes following the schedule in Table 2.

Vapor samples will be collected from combined MPE vapor at the following locations in the VTT:

- Pre-treatment samples will be collected at discharge end of the VAE blower (positive pressure) in the VTT container downgradient of the heat exchanger but upgradient of the first carbon adsorber.
- Post-treatment samples will be collected at the vapor sample port at the discharge end of the first carbon adsorber.

Vapor samples will be collected using laboratory-supplied SUMMA canisters and analyzed for VOCs. See Table 5 for a list of VOCs. Vapor samples will be collected from in-line 1/4-inch sample ports at locations summarized and shown on Figure 2 using the following procedures:

- All sampling personnel will wear clean, disposable, latex gloves.
- Measure and record field measurements of gas concentrations (methane, oxygen, photo ionization detection [PID] readings) at discharge end of VAE blower using the following procedures:
    - Attach clean disposable 1/4-inch flexible tubing (silicone or polyethylene) to PID meter's air intake port (use compression fittings if needed) and turn meter on.
    - Purge ambient air vapor through open end of tubing and meter until readings are fairly stable for at least 30 seconds.
    - Record ambient air concentrations on Extraction Form (also record date, time, units of concentration, and observer's initials).
    - Turn PID meter off and attach open end of tubing to 1/4-inch vapor sample port (use compression fitting if needed).
    - Open sample port and turn on meter.
    - Purge vapor through meter until readings are fairly stable for 30 seconds.
    - Record the vapor concentrations on Extraction Form included in Appendix A (record date, time, units of concentration, and observer's initials).
    - Except for ambient air readings, repeat above steps for measuring vapor concentrations of methane and oxygen with landfill gas meter.
- Verify and record initial vacuum of canister.

- Confirm VAE sample port and canister valves are both closed.
- Attach particulate filter to canister.
- Connect canister intake to VAE sample port with lab supplied compression fittings to achieve airtight connection.
- Open VAE sample port and open canister valve (1/2 turn). Record start time—a 6-liter canister typically takes about 16 seconds to fill.
- Once full, record the end time, final vacuum pressure, and close the canister valve. (Note that maintaining a residual vacuum is not required as the lab performs a leak test both prior to shipment and upon receipt of canisters.)
- Fill out the canister label in accordance with Section 1.5.2.2.
- Record all sample information on the Vapor Sample Form included in Appendix A (sample ID, date, time, field parameters, analytical parameters, canister readings, shipment date to the lab, and observer/comments).

2.3 Field Health and Safety Procedures

Parametrix will follow the Site-specific Health and Safety Plan (Workplan Attachment A).

2.4 Field Variances

If conditions in the field vary such that modifications to the sampling procedures and protocols described in this SAP become necessary, field personnel will notify the Project Manager of the situation to obtain a verbal approval prior to implementing any changes. The approval will be recorded in the field forms.

2.5 Decontamination Procedures

The Site-specific Health and Safety Officer, as identified in the Site-specific Health and Safety Plan, is responsible for maintaining and enforcing personnel and equipment decontamination procedures. Any decontamination modifications and/or changes shall be noted in the field forms.

2.5.1 Personnel Decontamination

Personnel decontamination will include the following:

- After completion of sampling activities in the field, personnel must deposit all equipment and/or sample bottles in segregated areas on plastic sheeting. Highly contaminated equipment is to be kept separate from minimally contaminated and difficult-to-clean equipment, such as air monitoring meters.
- If field personnel personal protective equipment (PPE) comes into contact with contaminated material, all surfaces of gear, including boot soles, must be scrubbed until visible contamination is removed. PPE are to be rinsed with tap water using a brush. PPE is removed and set on plastic sheeting.
- If worn, coveralls are to be removed and disposed of in a disposal container.
- Disposable gloves are to be disposed of in a disposal container.

2.5.2 Equipment Decontamination

Disposable tools and sampling equipment will be used when possible. Decontamination of tools will include brushing with decontamination solution, such as Alconox, and rinsing with tap water, followed by rinsing with deionized water. The tools shall be segregated and placed in clean bags or containers.

Decontamination of sampling equipment will include the following:

- Clean tubs or buckets will be set up to collect wash and rinse solutions.
- Sampling tools will be scrubbed with a decontamination solution, such as Alconox, until visibly clean.
- Tool will be rinsed with tap water.
- Tool will be rinsed with deionized water. A garden prayer or squirt bottle may be used.

2.5.3 Container Decontamination

Samples will be collected directly into sample containers provided by the laboratory. No container decontamination in the field is necessary. The containers will be provided and certified clean by the laboratory according to procedures described in the laboratory's quality assurance (QA) manual included in Appendix C.

2.6 Disposal of Waste Materials

Waste that will be generated from sampling operations include soiled PPE and disposable sampling equipment, and excess purge water from the groundwater sampling ports. Waste will be collected and stored in a 55-gallon drum or watertight container and disposed of in accordance with applicable federal and state waste regulations.

2.7 Sample Handling and Custody

2.7.1 Sample Containers and Preservatives

Table 4 lists groundwater sample volume, container size and type, and preservation requirements for each parameter/parameters group to be measured. Vapor samples will be collected in Summa Canisters. Prior to each event, the Project Manager or designee will contact the laboratory to order sample containers. The laboratory will provide sampling kits containing precleaned and pre-preserved sample containers. After sample collection, samples will be placed in a cooler with ice at approximately 4 degrees C to retain cold temperature for at least 24 hours. No samples will be split in the field.

2.7.2 Sample Custody

Each sample will be listed on the COC form(s), an example of which is provided in Appendix B. The laboratory will provide COC form(s) with each sample kit. The field personnel will record all sample custody transfers on the COC form(s) and return it to the laboratory with the samples.

A sample is under a person's custody if it is:

- In that person's physical possession.
- Within that person's sight.
- Secured in a tamper-proof way by that person.
- Secured by that person in an area restricted to authorized personnel.

Field personnel are responsible for custody of the samples until they are delivered to the laboratory. The field portions of COC forms shall be completed in the field by the sampler. Each time one person relinquishes control of the samples to another person, both individuals must complete the appropriate portions of the COC form by signing the form and filling in the date and time of the custody transfer. For this reason, one field personnel individual should retain sample custody during the sampling event whenever feasible.

The laboratory's sample receipt coordinator will sign and date the COC form(s) promptly when the samples arrive. The laboratory is then responsible for the care and custody of samples. The laboratory will track sample custody through their facility using a separate sample tracking form, as discussed in the laboratory QA manual included in Appendix D. Copies of completed COC forms will be kept in the project files.

2.7.3 Sample Disposal

Following sample analysis, the laboratory will store the unused portions for 30 days after the final laboratory data package and invoice is delivered then dispose of all the samples following their standard procedures.

2.8 Analytical Methods

2.8.1 Laboratory Analysis Methods

Laboratory analysis methods for each parameter are listed in Tables 3 and 5. Sample analysis will be performed by the laboratory in accordance with Environmental Protection Agency (EPA) method specifications. The method detection limit (MDL) and reporting limit (RL) for each sample parameter method are listed in the laboratory summary table (Appendix D).

After analyzing samples from each sampling event, the laboratory will summarize the data and associated QC results in a data report and electronic data file and provide these to Parametrix within 1 month of sample receipt. Quarterly sample data report and electronic data file contents are described in Section 1.5.3.

2.9 Quality Control

2.9.1 Measurement Performance and Acceptance Criteria

This section identifies data quality indicators (DQIs) for each analytical parameter and decisions regarding how each DQI will be assessed. The DQIs include sensitivity, bias, representativeness, precision, accuracy, completeness, and comparability.

The general approach to assessing each DQI is provided below, including quantitative measurements where appropriate. Analytical methods are specified in Tables 3 and 5.

Sensitivity

Sensitivity is the MDL which a laboratory following an analytical method can detect and quantify an analyte with reasonable confidence. Laboratory MDLs and RLs are listed the summary table included in Appendix D.

Bias

Bias is the difference between the population mean and the true value of the parameter being measured. Bias in water samples will be calculated based on the analyses of field blanks, method blanks, matrix spikes, and laboratory control samples (LCS).

Field blank results that are greater than the RL will be flagged as blank contamination. Typically, associated project samples within 10 times the blank concentration will be qualified as an estimate.

Some of the parameters listed in Tables 3 and 5 require matrix spikes (MS) and MS duplicates. MS and MS duplicates will be performed for these parameters following the laboratory's standard procedure. Percent recoveries are required to be within the ranges shown in the LCS analysis included in Appendix D.

Representativeness

Representativeness is the degree to which sample data represent a characteristic environmental condition or specific site conditions. Samples will be collected at different stages of MPE system restart.

Precision

Precision is the closeness of results for a sample and duplicate sample, as defined by the relative percent difference (RPD). Required RPD ranges are shown in the LCS analysis included in Appendix D.

Accuracy

Accuracy is the measure of agreement between a measurement's result and the true or known value. LCS, MS, and MS duplicates percent recoveries are required to be within the acceptance criteria ranges in the LCS analysis included in Appendix D.

Completeness

Completeness is a percentage calculated as the ratio of measurements determined to be valid over the total number of measurements collected. The completeness goal is set in terms of the minimum number of samples meeting DQIs. To evaluate groundwater and vapor for this study, all samples must be valid. Other practices to ensure achievement of the completeness goal include using prepared sample containers and coolers from the laboratory, using trained staff, following the sampling procedures in this SAP, icing samples, packaging samples for transport to avoid breakage, and timely sample processing. Laboratory analysis can improve completeness by processing samples within their holding times. For data analysis, valid sample data may include all unflagged data and J-flagged data reviewed by the Project Manager.

2.9.2 Field Sampling QC

No field QC samples will be collected during sampling events.

2.9.3 Laboratory Analysis QC

Laboratory QA/QC procedures are described in the laboratory's QA manual included in Appendix C. Analysis for LCS and method blanks for each sample parameter method is included in Appendix D.

2.9.4 Field Monitoring Instruments/ Equipment

Installation and procedures for field sampling and monitoring equipment use are discussed in Sections 2.1 and 2.2. Field devices will be calibrated and maintained in accordance with the manufacturer's guidelines and specifications. Records of equipment calibration and maintenance will be recorded and maintained in field notes.

Documentation will include the following information, as applicable:

- Name of person maintaining or calibrating the instrument/equipment.
- Date and description of the maintenance or calibration procedure.
- Date and description of any instrument/equipment problem(s).
- Date and description of action to correct problem(s).
- List of follow-up activities after maintenance (i.e., system checks).

For leased equipment, calibration by the lessor is acceptable.

2.9.5 Laboratory Analysis Instruments/ Equipment

Inspection and maintenance of laboratory equipment is the responsibility of the laboratory and is described in the laboratory's QA manual included in Appendix C.

2.10 Data Management

Data collected by this study, as described in previous subsections, will be maintained as electronic data files. Preparation, maintenance, and storage of documents and records are described in Section 1.5.

The laboratory will provide data in electronic form via unprotected .xlsx or .csv format, with full data reports provided in Adobe PDF. The Project Manager or designee will review the results for consistency of results and qualifiers across file formats. Any discrepancies will be identified for resolution by the laboratory.

Data presented in the final report will be checked against the original sources. Any data summaries and calculations included in the final report will be checked to confirm the appropriate source data and calculation methods are used.

Data will be submitted to Ecology as required in the Amendment.

3. Oversight

This section describes oversight to confirm that field sampling and monitoring activities are conducted according to procedures outlined in this SAP.

3.1 Field and Laboratory Oversight

For this study, field oversight will include readiness reviews of the Field Sampling Team prior to initiating quarterly sampling efforts, field activity audits, and post-event review of field sampling and measurement activities.

3.1.1 Readiness Procedure

Field staff training will include review of this SAP and laboratory instructions with the field kits. Prior to each sampling and monitoring event, the field sample team will confirm the following:

- Equipment is operational and ready for field use.
- Field instruments are calibrated and in proper working order.
- Field logs are on hand.
- The sample kit includes all containers listed in the COC and this SAP for the event.
- All sample containers are intact and properly closed.

3.1.2 Post-Event Review of Field Sampling and Measurement Activities

Field data verification after each sampling and monitoring event will involve review of the field data for errors or omissions and examining the results for compliance with QC acceptance criteria outlined in this SAP. Review of field measurements will include the following:

- Evaluate field records for consistency.
- Confirm calibration procedures were followed and documented.
- Review QC information (any corrections on field forms and confirm QC of data transferred to electronic format).
- Summarize any deviations from methods specified in this SAP, determine any impact on data quality, and identify any necessary modifications to sampling activities prior to the next quarterly event.

Tables

Table 1. Field Monitoring Schedule and Summary
Ephrata Landfill, Grant County, Washington

MPE System Restart Project Phase	Field Parameters	Locations of Measurement	Location of Data Collection	Data Collection Frequency		Data Collection Form
				Automated (PLC)	Manual (Forms- record off of PLC)	
PUMPING WITH NO VACUUM	Manual Depth to Groundwater	All Extraction and Observation Wells	Wellhead Measuring Point (MP)		Once per sampling event	Observation and MPE Well Forms
	Manual Depth to LNAPL	All P1 Zone Extraction and Observation Wells	Wellhead Measuring Point (MP)		Once per sampling event	Observation and MPE Well Forms
	LT Readings	LTs in wells	PLC	Hourly	Once per sampling event	Observation and MPE Well Forms
	PIT readings	PITs at wells	PLC	Hourly	Once per sampling event	Observation and MPE Well Forms
	Pump Cycle Count and Rate	Active MPE Wells	MPE Well		Once per sampling event	MPE Well Forms
	Liquid Flow Rate and Total Volume	Meter before OWS (LTT Container)	PLC	Hourly	Once per sampling event	Extraction Form
	Vapor Extraction Rate and Volume	Meter near blower (VTT Container)	PLC	Hourly	Once per sampling event	Extraction Form
	Pump Supply Air Pressure	Regulators on air supply lines to pumps	MPE Well	Hourly	Once per sampling event	MPE Well Forms
	VAE Blower Speed	(VTT Container)	VTT Container		Once per sampling event	Operations Form
	Compressed Air Supply Rate	(VTT Container)	VTT Container		Once per sampling event	Operations Form
	Methane and Oxygen, Total Organics (PID)	VAE Sample Port (Discharge End of Heat Exchanger)	VTT Container		Once per sampling event	Extraction Form
SOIL VAPOR EXTRACTION TEST	Manual Depth to Groundwater	All Extraction and Observation Wells	Wellhead Measuring Point (MP)		Once per sampling event	Observation and MPE Well Forms
	Manual Depth to LNAPL	All P1 Zone Extraction and Observation Wells	Wellhead Measuring Point (MP)		Once per sampling event	Observation and MPE Well Forms
	Manual Vacuum Reading	MW-36p1	Wellhead		Once per sampling event	Observation Well Forms
	LT Readings	LTs in wells	PLC	Hourly	Once per sampling event	Observation and MPE Well Forms
	PIT readings	PITs at wells	PLC	Hourly	Once per sampling event	Observation and MPE Well Forms
	Pump Cycle Count and Rate	Active MPE Wells	MPE Well		Once per sampling event	MPE Well Forms
	VAE Flow Control Valves	Active MPE Wells	MPE Well		Once per sampling event	MPE Well Forms
	Liquid Flow Rate and Total Volume	Meter before OWS (LTT Container)	PLC	Hourly	Once per sampling event	Extraction Form
	Vapor Extraction Rate and Volume	Meter near blower (VTT Container)	PLC	Hourly	Once per sampling event	Extraction Form
	Pump Supply Air Pressure	Regulators on air supply lines to pumps	MPE Well	Hourly	Once per sampling event	MPE Well Forms
	VAE Blower Speed	(VTT Container)	VTT Container		Once per sampling event	Operations Form
	VAE Blower Makeup Air	(VTT Container)	VTT Container		Once per sampling event	Operations Form
	Compressed Air Supply Rate	(VTT Container)	VTT Container		Once per sampling event	Operations Form
	Methane and Oxygen, Total Organics (PID)	VAE Sample Port (Discharge End of Heat Exchanger)	VTT Container		Once per sampling event	Extraction Form

Notes:
Additional readings may be collected during seasonal startup.

LNAPL- light non-aqueous phase liquids
LT- level transducers
LTT- Liquid Treatment Train
MP- wellhead measuring point
MPE- multi-phase extraction

PIT- pressuring indicating transducers
PLC- programmable logic controller (i.e., computer)
VAE- vacuum assisted extraction
VTT- Vapor Treatment Train

Table 2. Laboratory Sampling Schedule and Summary
Ephrata Landfill, Grant County, Washington

MPE System Restart Project Phase	Estimated Duration of Each Step	Sample Location	Sampling Purpose	Media	Parameters	Sample Frequency	Total Number of Groundwater Samples per Phase	Total Number of Vapor Samples per Phase	Documentation Form
Pumping with No Vacuum	2 weeks	OWS inlet liquid sample port	MPE and pretreatment performance	Groundwater	COCs, TPH	Once during seasonal restart	1		Groundwater Sample Form
		Air sparge effluent sample port	Post-treatment performance	Groundwater	COCs, TPH	Once during seasonal restart	1		Groundwater Sample Form
Soil Vapor Extraction	Seasonal operation until	OWS inlet liquid sample port	MPE and pretreatment performance	Groundwater	COCs, TPH	Collect one sample 2 weeks after system restart and collect one sample during the month prior to system seasonal shut down	2		Groundwater Sample Form
		Air sparge effluent sample port	Post-treatment performance	Groundwater	COCs, TPH	Collect one sample 2 weeks after system restart and collect one sample during the month prior to system seasonal shut down	2		Groundwater Sample Form
		VAE blower discharge sample port	MPE and pretreatment performance	Vapor	VOCs	Collect one sample 2 weeks after system restart and collect one sample during the month prior to system seasonal shut down		2	Vapor Sample Form
		First carbon absorber discharge sample port	Post-treatment performance	Vapor	VOCs	Collect one sample 2 weeks after system restart and collect one sample during the month prior to system seasonal shut down		2	Vapor Sample Form

Notes:
COCs- contaminants of concern
MPE- multi-phase extraction
OWS- oil-water separator
TPH- total petroleum hydrocarbons
VOCs- volatile organic compounds

Table 3. Groundwater Analytical Parameters

Ephrata Landfill, Grant County, Washington

Parameters	Units	Analytical Method
Organic Parameters- VOCs		
1,4-Dioxane	ug/L	EPA 8260D SIM
1,1,1,2-Tetrachloroethane	ug/L	EPA 8260D
1,1,1-Trichloroethane	ug/L	EPA 8260D
1,1,2,2-Tetrachloroethane	ug/L	EPA 8260D
1,1,2-Trichloroethane	ug/L	EPA 8260D
1,1-Dichloroethane	ug/L	EPA 8260D
1,1-Dichloroethene	ug/L	EPA 8260D
1,1-Dichloropropene	ug/L	EPA 8260D
1,2,3-Trichlorobenzene	ug/L	EPA 8260D
1,2,3-Trichloropropane	ug/L	EPA 8260D
1,2,4-Trichlorobenzene	ug/L	EPA 8260D
1,2,4-Trimethylbenzene	ug/L	EPA 8260D
1,2-Dibromo-3-chloropropane	ug/L	EPA 8260D
1,2-Dibromoethane (EDB)	ug/L	EPA 8260D
1,2-Dichlorobenzene	ug/L	EPA 8260D
1,2-Dichloroethane (EDC)	ug/L	EPA 8260D
1,2-Dichloropropane	ug/L	EPA 8260D
1,3,5-Trimethylbenzene	ug/L	EPA 8260D
1,3-Dichlorobenzene	ug/L	EPA 8260D
1,3-Dichloropropane	ug/L	EPA 8260D
1,4-Dichlorobenzene	ug/L	EPA 8260D
2,2-Dichloropropane	ug/L	EPA 8260D
2-Butanone (MEK)	ug/L	EPA 8260D
2-Chlorotoluene	ug/L	EPA 8260D
2-Hexanone	ug/L	EPA 8260D
4-Chlorotoluene	ug/L	EPA 8260D
4-Methyl-2-pentanone	ug/L	EPA 8260D
Acetone	ug/L	EPA 8260D
Benzene	ug/L	EPA 8260D
Bromobenzene	ug/L	EPA 8260D
Bromodichloromethane	ug/L	EPA 8260D
Bromoform	ug/L	EPA 8260D
Bromomethane	ug/L	EPA 8260D
Carbon tetrachloride	ug/L	EPA 8260D
Chlorobenzene	ug/L	EPA 8260D
Chloroethane	ug/L	EPA 8260D
Chloroform	ug/L	EPA 8260D
Chloromethane	ug/L	EPA 8260D
cis-1,2-Dichloroethene	ug/L	EPA 8260D
cis-1,3-Dichloropropene	ug/L	EPA 8260D
Dibromochloromethane	ug/L	EPA 8260D
Dibromomethane	ug/L	EPA 8260D

Parameters	Units	Analytical Method
Dichlorodifluoromethane	ug/L	EPA 8260D
Ethylbenzene	ug/L	EPA 8260D
Hexachlorobutadiene	ug/L	EPA 8260D
Hexane	ug/L	EPA 8260D
Isopropylbenzene	ug/L	EPA 8260D
m,p-Xylene	ug/L	EPA 8260D
Methyl t-butyl ether (MTBE)	ug/L	EPA 8260D
Methylene chloride	ug/L	EPA 8260D
Naphthalene	ug/L	EPA 8260D
n-Propylbenzene	ug/L	EPA 8260D
o-Xylene	ug/L	EPA 8260D
p-Isopropyltoluene	ug/L	EPA 8260D
sec-Butylbenzene	ug/L	EPA 8260D
Styrene	ug/L	EPA 8260D
tert-Butylbenzene	ug/L	EPA 8260D
Tetrachloroethene	ug/L	EPA 8260D
Toluene	ug/L	EPA 8260D
trans-1,2-Dichloroethene	ug/L	EPA 8260D
trans-1,3-Dichloropropene	ug/L	EPA 8260D
Trichloroethene	ug/L	EPA 8260D
Trichlorofluoromethane	ug/L	EPA 8260D
Vinyl chloride	ug/L	EPA 8260D
Organic Parameters-SVOCs		
1,2,4-Trichlorobenzene	ug/L	EPA 8270E
1,2-Dichlorobenzene	ug/L	EPA 8270E
1,2-Diphenylhydrazine	ug/L	EPA 8270E
1,3-Dichlorobenzene	ug/L	EPA 8270E
1,4-Dichlorobenzene	ug/L	EPA 8270E
1-Methylnaphthalene	ug/L	EPA 8270E
2,2'-Oxybis(1-chloropropane)	ug/L	EPA 8270E
2,2’-Oxybis(1-chloropropane)	ug/L	EPA 8270E
2,4,5-Trichlorophenol	ug/L	EPA 8270E
2,4,6-Trichlorophenol	ug/L	EPA 8270E
2,4-Dichlorophenol	ug/L	EPA 8270E
2,4-Dimethylphenol	ug/L	EPA 8270E
2,4-Dinitrophenol	ug/L	EPA 8270E
2,4-Dinitrotoluene	ug/L	EPA 8270E
2,6-Dinitrotoluene	ug/L	EPA 8270E
2-Chloronaphthalene	ug/L	EPA 8270E
2-Chlorophenol	ug/L	EPA 8270E
2-Methylnaphthalene	ug/L	EPA 8270E
2-Methylphenol	ug/L	EPA 8270E
2-Nitroaniline	ug/L	EPA 8270E
2-Nitrophenol	ug/L	EPA 8270E
3,3'-Dichlorobenzidine	ug/L	EPA 8270E

Parameters	Units	Analytical Method
3-Methylphenol + 4-Methylphenol	ug/L	EPA 8270E
3-Nitroaniline	ug/L	EPA 8270E
4,6-Dinitro-2-methylphenol	ug/L	EPA 8270E
4-Bromophenyl phenyl ether	ug/L	EPA 8270E
4-Chloro-3-methylphenol	ug/L	EPA 8270E
4-Chloroaniline	ug/L	EPA 8270E
4-Chlorophenyl phenyl ether	ug/L	EPA 8270E
4-Nitroaniline	ug/L	EPA 8270E
4-Nitrophenol	ug/L	EPA 8270E
Acenaphthene	ug/L	EPA 8270E
Acenaphthylene	ug/L	EPA 8270E
Anthracene	ug/L	EPA 8270E
Benz(a)anthracene	ug/L	EPA 8270E
Benzo(a)pyrene	ug/L	EPA 8270E
Benzo(b)fluoranthene	ug/L	EPA 8270E
Benzo(g,h,i)perylene	ug/L	EPA 8270E
Benzo(k)fluoranthene	ug/L	EPA 8270E
Benzoic acid	ug/L	EPA 8270E
Benzyl alcohol	ug/L	EPA 8270E
Benzyl butyl phthalate	ug/L	EPA 8270E
Bis(2-chloroethoxy)methane	ug/L	EPA 8270E
Bis(2-chloroethyl) ether	ug/L	EPA 8270E
Bis(2-ethylhexyl) phthalate	ug/L	EPA 8270E
Carbazole	ug/L	EPA 8270E
Chrysene	ug/L	EPA 8270E
Dibenzo(a,h)anthracene	ug/L	EPA 8270E
Dibenzofuran	ug/L	EPA 8270E
Diethyl phthalate	ug/L	EPA 8270E
Dimethyl phthalate	ug/L	EPA 8270E
Di-n-butyl phthalate	ug/L	EPA 8270E
Di-n-octyl phthalate	ug/L	EPA 8270E
Fluoranthene	ug/L	EPA 8270E
Fluorene	ug/L	EPA 8270E
Hexachlorobenzene	ug/L	EPA 8270E
Hexachlorobutadiene	ug/L	EPA 8270E
Hexachlorocyclopentadiene	ug/L	EPA 8270E
Hexachloroethane	ug/L	EPA 8270E
Indeno(1,2,3-cd)pyrene	ug/L	EPA 8270E
Isophorone	ug/L	EPA 8270E
Naphthalene	ug/L	EPA 8270E
Nitrobenzene	ug/L	EPA 8270E
N-Nitrosodimethylamine	ug/L	EPA 8270E
N-Nitroso-di-n-propylamine	ug/L	EPA 8270E
N-Nitrosodiphenylamine	ug/L	EPA 8270E
Pentachlorophenol	ug/L	EPA 8270E

Parameters	Units	Analytical Method
Phenanthrene	ug/L	EPA 8270E
Phenol	ug/L	EPA 8270E
Pyrene	ug/L	EPA 8270E
1,2,4-Trichlorobenzene	ug/L	EPA 8270E
1,2-Dichlorobenzene	ug/L	EPA 8270E
1,2-Diphenylhydrazine	ug/L	EPA 8270E
1,3-Dichlorobenzene	ug/L	EPA 8270E
1,4-Dichlorobenzene	ug/L	EPA 8270E
1-Methylnaphthalene	ug/L	EPA 8270E
2,2'-Oxybis(1-chloropropane)	ug/L	EPA 8270E
2,2’-Oxybis(1-chloropropane)	ug/L	EPA 8270E
2,4,5-Trichlorophenol	ug/L	EPA 8270E
2,4,6-Trichlorophenol	ug/L	EPA 8270E
2,4-Dichlorophenol	ug/L	EPA 8270E
2,4-Dimethylphenol	ug/L	EPA 8270E
2,4-Dinitrophenol	ug/L	EPA 8270E
2,4-Dinitrotoluene	ug/L	EPA 8270E
2,6-Dinitrotoluene	ug/L	EPA 8270E
2-Chloronaphthalene	ug/L	EPA 8270E
2-Chlorophenol	ug/L	EPA 8270E
2-Methylnaphthalene	ug/L	EPA 8270E
2-Methylphenol	ug/L	EPA 8270E
2-Nitroaniline	ug/L	EPA 8270E
2-Nitrophenol	ug/L	EPA 8270E
3,3'-Dichlorobenzidine	ug/L	EPA 8270E
3-Methylphenol + 4-Methylphenol	ug/L	EPA 8270E
3-Nitroaniline	ug/L	EPA 8270E
4,6-Dinitro-2-methylphenol	ug/L	EPA 8270E
4-Bromophenyl phenyl ether	ug/L	EPA 8270E
4-Chloro-3-methylphenol	ug/L	EPA 8270E
4-Chloroaniline	ug/L	EPA 8270E
4-Chlorophenyl phenyl ether	ug/L	EPA 8270E
4-Nitroaniline	ug/L	EPA 8270E
4-Nitrophenol	ug/L	EPA 8270E

Parameters	Units	Analytical Method
Acenaphthene	ug/L	EPA 8270E
Acenaphthylene	ug/L	EPA 8270E
Anthracene	ug/L	EPA 8270E
Benz(a)anthracene	ug/L	EPA 8270E
Benzo(a)pyrene	ug/L	EPA 8270E
Benzo(b)fluoranthene	ug/L	EPA 8270E
Benzo(g,h,i)perylene	ug/L	EPA 8270E
Benzo(k)fluoranthene	ug/L	EPA 8270E
Benzoic acid	ug/L	EPA 8270E
Benzyl alcohol	ug/L	EPA 8270E
Benzyl butyl phthalate	ug/L	EPA 8270E
Bis(2-chloroethoxy)methane	ug/L	EPA 8270E
Bis(2-chloroethyl) ether	ug/L	EPA 8270E
Bis(2-ethylhexyl) phthalate	ug/L	EPA 8270E
Carbazole	ug/L	EPA 8270E
Chrysene	ug/L	EPA 8270E
Dibenzo(a,h)anthracene	ug/L	EPA 8270E
Dibenzofuran	ug/L	EPA 8270E
Diethyl phthalate	ug/L	EPA 8270E
Dimethyl phthalate	ug/L	EPA 8270E
Di-n-butyl phthalate	ug/L	EPA 8270E
Di-n-octyl phthalate	ug/L	EPA 8270E
Fluoranthene	ug/L	EPA 8270E
Fluorene	ug/L	EPA 8270E
Hexachlorobenzene	ug/L	EPA 8270E
Hexachlorobutadiene	ug/L	EPA 8270E
Hexachlorocyclopentadiene	ug/L	EPA 8270E
Hexachloroethane	ug/L	EPA 8270E
Indeno(1,2,3-cd)pyrene	ug/L	EPA 8270E
Isophorone	ug/L	EPA 8270E
Naphthalene	ug/L	EPA 8270E
Nitrobenzene	ug/L	EPA 8270E
N-Nitrosodimethylamine	ug/L	EPA 8270E
N-Nitroso-di-n-propylamine	ug/L	EPA 8270E
N-Nitrosodiphenylamine	ug/L	EPA 8270E
Pentachlorophenol	ug/L	EPA 8270E
Phenanthrene	ug/L	EPA 8270E
Phenol	ug/L	EPA 8270E
Pyrene	ug/L	EPA 8270E

Parameters	Units	Analytical Method
Total Petroleum Hydrocarbons		
Gasoline-range hydrocarbons	ug/L	NWTPH-Gx
Diesel-range hydrocarbons	ug/L	NWTPH-Dx
Oil-range hydrocarbons	ug/L	NWTPH-Dx
Inorganic Parameters		
Chloride	mg/L	SW-846
Sulfate	mg/L	SW-846
Nitrate as Nitrogen	mg/L	EPA 353.2
Total Suspended Solids	mg/L	SM2540D
Antimony, Total & Dissolved	ug/L	EPA 200.8
Arsenic, Total & Dissolved	ug/L	EPA 200.8
Barium, Total & Dissolved	ug/L	EPA 200.8
Beryllium, Total & Dissolved	ug/L	EPA 200.8
Cadmium,Total & Dissolved	ug/L	EPA 200.8
Chromium, Total & Dissolved	ug/L	EPA 200.8
Cobalt, Total & Dissolved	ug/L	EPA 200.8
Copper, Total & Dissolved	ug/L	EPA 200.8
Iron, Total & Dissolved	ug/L	EPA 200.8
Lead, Total & Dissolved	ug/L	EPA 200.8
Manganese, Total & Dissolved	ug/L	EPA 200.8
Mercury, Total & Dissolved	ug/L	EPA 200.8
Molybdenum, Total & Dissolved	ug/L	EPA 200.8
Nickel, Total & Dissolved	ug/L	EPA 200.8
Selenium, Total & Dissolved	ug/L	EPA 200.8
Silver, Total & Dissolved	ug/L	EPA 200.8
Thallium, Total & Dissolved	ug/L	EPA 200.8
Vanadium, Total & Dissolved	ug/L	EPA 200.8
Zinc, Total & Dissolved	ug/L	EPA 200.8

Notes:

BTEX- benzene, toluene, ethylbenzene, and xylenes

MC- methylene chloride

mg/l- milligrams per liter

SVOCs- semi-volatile organic compounds

TMB- trimethylbenzene

TPH- total petroleum hydrocarbons

ug/l- micrograms per liter

VOCs- volatile organic compounds

Table 4. Groundwater Laboratory Analyses

Ephrata Landfill, Grant County, Washington

Analysis	No. of Bottles per Analysis	Bottle	Preservative	Hold Time
Total Metals	1	500 mL HDPE	HNO3	6 Months
Dissolved Metals	1	500 mL HDPE	HNO3	6 Months
VOC-8260	3	40 mL Vials	HCL	14 Days
Semi-VOC-8270	2	500 mL Amber Glass	None	7 Days
Nitrate/Sulfate/Chloride	1	500 mL HDPE	None	48 Hours
Total Suspended Solids	1	1 L HDPE	None	7 Days
Gasoline-range hydrocarbons (NWTPH-Gx)	2	40 mL Vials	HCL	14 Days
Diesel-range and oil-range hydrocarbons (NWTPH-Dx)	2	500 mL Amber Glass	None	14 Days

Notes:

As- arsenic

COCs- contaminants of concern

Fe- iron

HCL- hydrochloric acid

HDPE- high-density polyethylene

HNO3- nitric acid

mL- milliliter

Mn- manganese

TPH- total petroleum hydrocarbons

VOCs- volatile organic compounds

Table 5. Vapor Analytical Parameters

Ephrata Landfill, Grant County, Washington

Parameters	Units	Analytical Method (Sample Collected in Summa Canister)[1]
1,1,1-Trichloroethane	ug/m3	TO-15
1,1,2,2-Tetrachloroethane	ug/m3	TO-15
1,1,2-Trichloroethane	ug/m3	TO-15
1,1-Dichloroethane	ug/m3	TO-15
1,1-Dichloroethene	ug/m3	TO-15
1,2,4-Trichlorobenzene	ug/m3	TO-15
1,2,4-Trimethylbenzene	ug/m3	TO-15
1,2-Dibromoethane (EDB)	ug/m3	TO-15
1,2-Dichlorobenzene	ug/m3	TO-15
1,2-Dichloroethane (EDC)	ug/m3	TO-15
1,2-Dichloropropane	ug/m3	TO-15
1,3,5-Trimethylbenzene	ug/m3	TO-15
1,3-Butadiene	ug/m3	TO-15
1,3-Dichlorobenzene	ug/m3	TO-15
1,4-Dichlorobenzene	ug/m3	TO-15
1,4-Dioxane	ug/m3	TO-15
2,2,4-Trimethylpentane	ug/m3	TO-15
2-Butanone (MEK)	ug/m3	TO-15
2-Chlorotoluene	ug/m3	TO-15
2-Hexanone	ug/m3	TO-15
2-Propanol	ug/m3	TO-15
3-Chloropropene	ug/m3	TO-15
4-Ethyltoluene	ug/m3	TO-15
4-Methyl-2-pentanone	ug/m3	TO-15
Acetone	ug/m3	TO-15
Acrolein	ug/m3	TO-15
Benzene	ug/m3	TO-15
Benzyl chloride	ug/m3	TO-15
Bromodichloromethane	ug/m3	TO-15
Bromoform	ug/m3	TO-15
Bromomethane	ug/m3	TO-15
Butane	ug/m3	TO-15
Carbon disulfide	ug/m3	TO-15
Carbon tetrachloride	ug/m3	TO-15
CFC-113	ug/m3	TO-15
Chlorobenzene	ug/m3	TO-15
Chloroethane	ug/m3	TO-15
Chloroform	ug/m3	TO-15
Chloromethane	ug/m3	TO-15
cis-1,2-Dichloroethene	ug/m3	TO-15
cis-1,3-Dichloropropene	ug/m3	TO-15
Cyclohexane	ug/m3	TO-15
Dibromochloromethane	ug/m3	TO-15

Parameters	Units	Analytical Method (Sample Collected in Summa Canister)[1]
Dichlorodifluoromethane	ug/m3	TO-15
Ethanol	ug/m3	TO-15
Ethyl acetate	ug/m3	TO-15
Ethylbenzene	ug/m3	TO-15
F-114	ug/m3	TO-15
Heptane	ug/m3	TO-15
Hexachlorobutadiene	ug/m3	TO-15
Hexane	ug/m3	TO-15
Isopropylbenzene	ug/m3	TO-15
m,p-Xylene	ug/m3	TO-15
Methyl Methacrylate	ug/m3	TO-15
Methyl t-butyl ether (MTBE)	ug/m3	TO-15
Methylene chloride	ug/m3	TO-15
Naphthalene	ug/m3	TO-15
Nonane	ug/m3	TO-15
o-Xylene	ug/m3	TO-15
Pentane	ug/m3	TO-15
Propene	ug/m3	TO-15
Propylbenzene	ug/m3	TO-15
Styrene	ug/m3	TO-15
t-Butyl alcohol (TBA)	ug/m3	TO-15
Tetrachloroethene	ug/m3	TO-15
Tetrahydrofuran	ug/m3	TO-15
Toluene[2]	ug/m3	TO-15
trans-1,2-Dichloroethene	ug/m3	TO-15
trans-1,3-Dichloropropene	ug/m3	TO-15
Trichloroethene	ug/m3	TO-15
Trichlorofluoromethane	ug/m3	TO-15
Vinyl acetate	ug/m3	TO-15
Vinyl bromide	ug/m3	TO-15
Vinyl chloride	ug/m3	TO-15
Gasoline Range Organics	ug/m3	TO-15

Notes:

BTEX- benzene, toluene, ethylbenzene, and xylenes

DCP- dichloropropane

MC- methylene chloride

TMB- trimethylbenzene

ug/l- micrograms per liter

[1, 2] EPA Method TO-15 is the primary analytical method. However, during the first sampling event, both EPA Methods TO-15 and TO-17 will be used to measure specifically for toluene to verify any breakthrough. Following that, If vapor concentrations exceed the upper bound qauntitatve limits of Method TO-15, then EPA Method TO-17 may be evaluated as a alternative analysis method for all VOCs.

Appendix A

Field Forms

Observation Well Form

Ephrata Landfill MPE System- Observation Well Data Form

Well _____ Sheet _____ of _____

Describe measuring point _____

Date	Time	Depth to				Pressures		Observer, Comment
		Water	LNAPL	DNAPL	Bottom	PIT	LT	
	24 hrs	x.xx ft btoc				x.xx inch water		

If found, call 206-329-0141

MPE Well Form

Ephrata Landfill MPE System - Well Data Form

Well _____ Sheet _____ of _____

Describe measuring point _____

Date	Time	Depth to				Pressures		Pump						Vapor Concentrations at Wellhead (Ambient Air or VAE Vapor, indicate under Comments)			Observer, Comment
								Pump On	Pump Off	Total Pump Cycle Count	Pump Cycle Rate		Supply Air Press.				
		Water	LNAPL	DNAPL	Bottom	PIT	LT				Number of Cycle Counts	Delta Time		CH4	O2	Total Organics	Record VAE Flow Valve Settings Here
	24 hrs	x.xx ft btoc				x.xx inch water		Date:Time	Date:Time	count	count	mm:ss	PSI	%	PPM	PPM	

If found, call 206-329-0141

Liquid and Vapor Extraction Form

Ephrata Landfill MPE System- Liquid and Vapor Extraction Form

Sheet _____ of _____

		Liquid Extraction		Vapor Extraction		Ambient Air Concentrations (Through Tubing)	Total Vapor Concentrations in VAE Line (Downgradient of Blower)			Observer/Comment
Date	Time	Volume	Rate	Pressure Differential	Vacuum Pressure	Total Organics	CH4	O2	Total Organics	
	24 hrs	x.xx gallons	x.xx gpm	x.xx in H2O	x.xx in Hg	PPM	%	PPM	PPM	

If found, call 206-329-0141

Groundwater Sample Form

Ephrata Landfill MPE System- Groundwater Sample Form

			Field Parameters								Analytical Parameters (Y/N)									
					Electrical Conductivity															
Sample ID (Well/Location)	Sample Date	Sample Time 24 hrs	pH (units)	DO (%)	EC Value	EC Units (uS/cm or mS/cm)	Temp (Degrees C)	ORP (mV	Turbidity (NTU)	Visual (color, odor, etc)	Total Metals	Dissolved Metals	Dissolved Metals Field Filtered (Y/N)	VOC-8260	VOC-8270	NO3/SO4/Cl	TDS	Lab	Shipment Date to Lab	Observer/Comment

Vapor Sample Form

Ephrata Landfill MPE System- Vapor Sample Form

Sample ID (Well/Location)	Sample Date	Sample Time 24 hrs	Field Parameters			Analytical Parameter (Y or N)	Canister Recordings				Lab	Shipment Date to Lab	Observer/Comment
			CH4 %	O2 PPM	Total Organics PPM	VOC-TO15 (Summa Canister)	Time Start	Time Stop	Canister Vacuum Start ("Hg)	Canister Vacuum Stop ("Hg)			

Appendix B

Chain-of-Custody Form

SAMPLE CHAIN OF CUSTODY

Report To_____

Company_____

Address_____

City, State, ZIP_____

Phone_____Email_____

SAMPLERS (*signature*)	
PROJECT NAME	PO #
REMARKS Project Specific RLs - Yes / No	INVOICE TO

Page # _____ of _____

TURNAROUND TIME
Standard Turnaround
RUSH_____
Rush charges authorized by:
_____

SAMPLE DISPOSAL
Dispose after 30 days
Archive Samples
Other_____

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082						Notes

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
5500 4th Avenue S
Seattle, WA 98108
Ph. (206) 285-8282

Appendix C

Laboratory Quality Assurance Manual

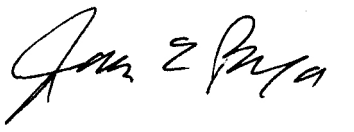
QUALITY ASSURANCE MANUAL

Friedman & Bruya, Inc.

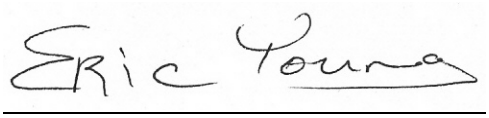
5500 4th Avenue South
Seattle, Washington 98108-2419
(206) 285-8282

Revision Number 18
December 9, 2022

Approved by

Executive Committee Representative: 

James E. Bruya

Laboratory Director: 

Eric Young

Quality Assurance Officer: 

Stephanie Pham

Document Control Number: 218

2.0 TABLE OF CONTENTS

3.0 QUALITY SYSTEM POLICY STATEMENT

Quality Assurance/Quality Control (QA/QC) is of fundamental importance to any chemical testing program. It is the goal of Friedman & Bruya, Inc. (F&BI) to provide analytical data which is scientifically sound and of known and documented quality. To achieve this objective, a quality system has been established to ensure that adequate QA/QC procedures are followed and documented, from sample receipt through to the final report provided to the client. The quality system has been established to meet the requirements of the National Environmental Laboratory Accreditation Program (NELAP). The policies and procedures established are designed to meet the quality requirements of our clients, as well as those of accrediting authorities.

F&BI laboratory management is committed to following good professional practices, and to providing the highest quality of environmental testing services to our clients. An important part of this commitment is the requirement that all F&BI personnel involved with environmental testing activities, including management, are familiar with the established quality system, and implement the policies and procedures of the system in their work.

4.0 ETHICS POLICY STATEMENT

Friedman & Bruya, Inc. (F&BI) believes the practice of chemistry requires training, care, attention to detail and personal integrity that must withstand significant pressure from interested parties. We believe we stand firmly for the chemist's right to practice his/her profession with the highest level of support. For this reason, fraud or the falsification of analytical data by an employee is grounds for immediate dismissal. Management shall review data and perform internal audits to ensure ethical conduct on the part of its employees.

Waste of our clients' time and money, as well as natural resources, is strongly discouraged. Environmental analyses can be very costly and their results exponentially more so. Friedman & Bruya, Inc. was formed to provide our clients with analytical information that met their chemical and analytical needs, while at the same time minimizing cost wherever possible.

Friedman & Bruya, Inc. is proud of its employees. Upon employment, a manual is issued to each employee that describes the policies of Friedman and Bruya, Inc. with regards to employee conduct, fraud, waste and abuse. We believe abuse or harassment is degrading to our employees and our clients. Such behavior is not condoned by Friedman & Bruya, Inc. This covers interactions amongst our employees, as well as those between us and our clients. Where abuse or harassment can be documented, a written warning is issued. If the action or behavior continues, dismissal may result.

All employees of Friedman & Bruya, Inc. are charged with the task of reporting any occurrence of fraud or data falsification to the highest authority within our organization. Management will continually look for fraud and data falsification through standard review practices such as those conducted during the course of data review and internal audits. Management will not attempt to create policies that conflict with our fraud policy. If any employee feels or believes that a management policy conflicts with our fraud policy or that any such policy encourages fraudulent practices on the part of employees, they are encouraged to bring these issues to the attention of their supervisor or to the highest authority within our organization.

5.0 LABORATORY ORGANIZATION

5.1 Ownership and Facility Description

F&BI is a privately owned corporation. No other business affiliations or external business entities exist. The F&BI laboratory is comprised of one building, with approximately 12,000 square feet, which is located at 3012 16 Ave. W., Seattle WA. This laboratory was built with safety, efficiency and quality control in mind. Separate rooms are designated for inorganic, organic and volatiles extractions. Fume hoods are located in each of these rooms as well as in standard storage and preparation rooms. Separate areas are also designated for sample storage, instruments/analysis, office space and records storage. Floor plans of the building can be furnished upon request.

5.2 Personnel Organization

The qualifications and responsibilities for key personnel are listed below. An organizational chart is provided in Figure 5-1.

Laboratory/Technical Director

Qualifications:
The Laboratory/Technical Director should be an individual who has a history of laboratory and personnel management. She/He should have a knowledge of all analyses performed by the laboratory and of QA/QC standards of performance. This person should have a bachelors degree in chemical, environmental, biological sciences, physical sciences or engineering, with at least 24 college semester credit hours in chemistry and with at least 2 years of relevant experience. (A masters or doctoral degree may be substituted for 1 year experience.)
Responsibilities:
The Laboratory/Technical Director reports directly to the Executive Committee.
He/She has overall responsibility for the technical operation of the laboratory. Specific responsibilities include the following:
Monitor standards of performance in quality control and quality assurance.
Monitor the validity of the analyses performed and data generated to assure reliable data.
Ensure sufficient numbers of qualified personnel are employed.
Provide educational direction to laboratory staff.
Assign workloads and arranges schedules of Project Leaders.
Evaluate overall effectiveness of the laboratory activity.
Propose new methods and modifications as needed. Institute new programs and procedures as directed by the Executive Committee.
Review all new work to ensure that appropriate facilities and resources are available.
Fill in for the QA Officer in her/his absence.

Quality Assurance Officer

Qualifications:
The Quality Assurance Officer should be an individual who has a history of establishing inter-laboratory and intra-laboratory quality assurance programs. She/He should be capable of evaluating analytical data to distinguish between sample variability, instrument variability and method errors. This person is expected to have a degree in chemistry plus several years practice as an environmental chemist evaluating analytical data for technical validity.
Responsibilities:
The Quality Assurance Officer reports to the Executive Committee and Laboratory/Technical Director. She/He has the responsibility of overseeing the inter-laboratory, intra-laboratory studies, non-conformance report reviews, and demonstration of capability program. She/He also works in a team with other qualified staff to complete all of the quality assurance tasks conducted at F&B. These specific responsibilities include the following:
Training and documentation of F&B staff with regards to QA policy and procedures including coordinated quarterly meetings.
Evaluate data for compliance with standard operating procedures and acceptance criteria.
Conduct internal audits on the entire technical operation annually.
Propose changes in the Quality Assurance Program to improve the quality, efficiency, and/or defensibility of the data generated.
Manage laboratory participation in inter-laboratory comparisons and proficiency programs.
Maintain or modify laboratory accreditation.
Notification of laboratory management and project managers, in writing, of any changes to accreditation.
Assist in training of analysts in analytical quality control procedures.
Maintaining the QA manual, DOCs, and SOPs.

Project Leader

Qualifications:
Project Leaders should be individuals who have a history of analyzing environmental samples. They should have knowledge of quality assurance and how it relates to the validity of analytical data. They should also have knowledge of the specific analytical testing requirements for the needs of our clients. They should be able to recognize problems which can arise when analyzing samples, and be able to discuss with the client proper analytical techniques for meeting the clients' goals. This person is expected to have a degree in chemistry or several years experience in the environmental chemistry field.
Responsibilities:
The Project Leaders report directly to the Quality Assurance Officer on all quality assurance matters. They report directly to the Technical/Laboratory Director on all other matters such as project status and projected work loads. Specific responsibilities include the following:
Support the quality assurance program within the project.

Determine effectiveness of the quality assurance program in the project.
Recommend to the Quality Assurance Officer changes in the quality assurance program.
Document for the client any quality control problems which could not be resolved.
Provide technical overview of laboratory activities.

Laboratory Analysts

Qualifications:
Laboratory Analysts should be individuals who have a history of analyzing environmental samples. They should have knowledge of quality assurance. They should recognize quality assurance results which are out of conformance and be able to determine and remedy possible causes. Laboratory Analysts are expected to have a degree in chemical, environmental, biological sciences, physical sciences or engineering and/or experience in the environmental chemistry field.
Responsibilities:
Specific responsibilities include the following:
Perform analytical procedures and data recording in accordance with accepted methods.
Consult with the Quality Assurance Officer to verify that the laboratory is meeting stated quality control goals.
Evaluate new analytical techniques, procedures, instrumentation and quality control methods, and provide recommendations to the Technical/Laboratory Director and Quality Assurance Officer.
Lead the training of new analysts in laboratory operations and analytical procedures.
Evaluate instrument performance and implement instrument calibration and preventive maintenance program.
Perform data processing and validation.
Initiate non-conformance report forms for out-of-control situations, instrument malfunction, calibration failure, or other non-conformances as appropriate.
Prepare and maintain laboratory quality control records.

General Personnel

Qualifications:
General personnel include all other staff, such as laboratory technicians, sample check-in technicians and office personnel. General personnel should be individuals that pay very close attention to detail and follow written and oral instructions precisely.

Responsibilities:
General personnel are responsible for following established procedures and reporting any quality control problems or questions.

Figure 5-1
Laboratory Organization

Executive Committee/Technical Director:
Responsibilities: Appointed by owner to oversee all operations and functions of the laboratory.

Laboratory Director:
Responsibilities: Reports directly to the Executive Committee.

Quality Assurance Officer:
Responsibilities: Reports directly to The Executive Committee and Laboratory/Technical Director.

Project Leaders:
Responsibilities: Report directly to the Quality Assurance Officer on QA/QC matters and to the Technical/Laboratory Director on all other matters.

Laboratory Analysts/Calculations Chemists:
Responsibilities: Report directly to the Quality Assurance Officer on QA/QC matters and to the Technical/Laboratory Director and/or Executive Committee on all other matters.

Laboratory Analyst/Extraction Manager:
Responsibilities: Reports directly to the Quality Assurance Officer on QA/QC matters and to the Technical/Laboratory Director and/or Executive Committee on all other matters.

Technicians:
Responsibilities: Report directly to the Extraction Manager.

Safety Officer/Committee:
Responsibilities: Reports directly to the Technical/Laboratory Director and/or Executive Committee.

General Personnel:
Responsibilities: Reports directly to the Executive Committee.

6.0 STANDARD OPERATING PROCEDURES

Standard operating procedures (SOPs) are maintained which accurately reflect current laboratory activities. These documents may include, for example, equipment manuals provided by the manufacturer, published analytical methods with any changes or specifications documented, or internally written documents. Hardcopies of all SOPs are organized in folders which are easily accessible to all personnel. (The exception is equipment manuals, which are kept with the corresponding equipment.) There are two general types of SOPs; method SOPs and administrative SOPs. A list of administrative SOPs, along with other quality system documents, is included in Appendix A.

Method SOPs

Method SOPs are generated for each accredited method performed by F&BI. They provide detailed, laboratory specific, procedures for analytical testing methods. Each method SOP references the published analytical procedure upon which it is based. When the referenced analytical procedure has stated QA/QC requirements, the SOP meets the stated requirements. Any additional, laboratory specific, QA/QC requirements are detailed in the method and/or administrative SOPs.

Administrative SOPs

Administrative SOPs provide detailed procedures for all activities of the quality system not included in specific analytical methods, such as sample receiving, personnel training, and creating client reports. Administrative SOPs may be separate documents, or may be included in this document.

6.1 Deviation from SOPs

When a client (or project) has specific requirements of the laboratory, a deviation from existing procedures may be necessary. Typical examples include addition of target analytes and project specific reporting limits. If a deviation is requested, the project manager is responsible for discussing the request with the manager in charge of the analysis and obtaining her/his approval to accept the project. The project manager is also responsible for documenting the request on the appropriate analysis extraction worksheets, and on the final report if necessary.

Deviations from SOPs are documented using the extraction worksheet, sequence tables, injection logs, and/or other documents such as the non-conformance report form as discussed in section 13.3. Frequent departure from policy is not encouraged. However, if frequent departure from a particular policy is noted, the technical/laboratory director will address the possible need for a change in the policy.

7.0 TRAINING

Our company is designed around the idea that our employees are our most valuable asset. We are committed to the professional development of our employees. Since we are a relatively small laboratory, many of our employees wear several hats, and cross training is critical.

7.1 Quality System, Data Integrity, and Safety Training

When hired, each employee receives a company policy manual, data integrity SOP, quality assurance manual, and any SOPs relevant to their responsibilities. She/he also receives a safety training form and an employee attestation form, including data integrity training, to fill out and sign. The office manager is responsible for providing each new employee with copies of the policy manual and quality assurance manual. Each new employee is also provided with safety and general training forms, and copies of the relevant SOPs. Each employee is responsible for completing the required training documents, and for complying with all QA/QC and data integrity requirements. Each employee is also responsible for maintaining the current quality system documents which are relevant to their position, in their individual document file.

7.2 Initial Demonstration of Capability

The first step in training for analytical procedures is to familiarize the trainee with the method. This is achieved through a combination of reading the method SOP and observing an experienced analyst performing the method. The trainee then performs the method under close supervision. Prior to independently performing an analysis, each analyst completes an initial demonstration of capability (DOC). The DOC is performed as follows:

Obtain a quality control sample from an outside source. If not available, the QC sample may be prepared by the laboratory using stock standards that are prepared independently from those used in instrument calibration.
Dilute/prepare enough of the QC sample to make 4 separate aliquots (samples) of the specified concentration. If the concentration is not otherwise specified, it should be approximately 10 times the MDL. Laboratory control samples or MDL study samples may be used to meet this requirement.
Extract and/or analyze each of the 4 samples either concurrently or over a period of days.
Use all of the results to calculate the mean recovery (accuracy) and the standard deviation (precision) for each parameter/analyte. Compare the mean and standard deviation to method acceptance criteria.
If all parameters/analytes meet the acceptance criteria, the DOC is complete and independent analysis of actual samples can begin. If one or more of the parameters/analytes fail at least one of the acceptance criteria, then locate and correct the source of the problem and repeat the entire test (above) for either all of the parameters/analytes or just the parameter(s)/analyte(s) that failed.

7.3 Continuing Demonstration of Capability

At least one of the following, once per year, is completed by each analyst to demonstrate continuing proficiency.

Acceptable performance of a blind sample
Another demonstration of capability
At least four consecutive laboratory control samples with acceptable levels of precision and accuracy (calculated as for DOC above).
Successful analysis of a blind performance sample on a similar test method using the same technology (e.g. GC/MS volatiles by methods 624 and 8260 are considered equivalent).
If none of the above can be performed, analysis of authentic samples with results statistically indistinguishable from those obtained by another trained analyst.

7.4 Continuing Quality System, Data Integrity, and Safety Training

Company wide training meetings are held at least once a quarter. At these meetings quality system, data integrity, and/or safety topics are discussed by the QA officer, technical/laboratory director, and/or safety officer/committee respectively. Employees are also encouraged to participate in relevant external training, such as seminars and instrument training courses.

7.5 Documentation of Training

Documentation of education, experience and training prior to employment at F&BI is kept on file with personnel records. The office manager is responsible for maintaining personnel records. All employees document on the Employee Attestation Form that they have read, understood and will follow the Policy Manual, QA Manual and each SOP distributed to him/her. The attendance at each quarterly training meeting is documented using the Quarterly Training Meeting form. These and other completed training documents, including DOC certificates, are filed. In addition a database summarizing DOC training is maintained. The QA officer is responsible for maintaining the DOC database. The office personnel are responsible for maintaining training files. Additional details of training documentation are found in the "Training" SOP.

8.0 MATERIAL PROCUREMENT AND CONTROL

The quality of reagents, solvents, gases, water, and laboratory vessels used in analyses should be known so that their effect upon analytical results can be defined and anticipated. Materials and equipment purchased by F&BI should meet the requirements stated below or as denoted in specific analytical procedures, and be controlled as stated.

The following general guidelines are used for purchasing and using materials and equipment. More specific requirements can be found in section 9 below, and in administrative and method SOPs.
Specify within the purchase requests the suitable grades of materials.
Verify upon receipt that materials meet requirements and that, as applicable, material certificates/records are provided and maintained in the laboratory record system.
Date all chemicals, standards and reagents with date of receipt, date opened and expiration date.
Store reagents and solvents in accordance with manufacturer's recommendations.
Verify that material storage is properly maintained, and remove materials from use when shelf life has expired.
Record the date put into service for equipment such as balances and analytical instruments.
Record preventive and corrective maintenance procedures performed on equipment.
Verify that equipment, including analytical balances, thermometers, volumetric glassware etc., is properly calibrated prior to use.
Clearly mark any equipment which has been taken out of service.

8.1 Requirements for Reagents, Solvents, and Gases

Chemical reagents, solvents, and gases are available in a variety of grades of purity, ranging from technical grade to ultrapure grades. The purity required varies with the type of analysis and project requirements. For many analyses analytical reagent (AR) grade is satisfactory. Other analyses, such as trace organic analyses, frequently require special ultrapure reagents, solvents, and gases.

General Inorganic Analyses
In general, AR grade reagents and solvents are adequate for inorganic analyses. Primary standard reagents should be used for standardizing all volumetric solutions. All prepared reagents should be checked for accuracy.

Trace Metals Analyses
All standards used for emission spectroscopy should be spectro-quality. It is recommended that other reagents and solvents also be spectro-quality. In many cases, AR grade may be satisfactory. Standards are prepared by the analyst, or purchased provided that purchased materials meet the requirements of the analytical method. Gases used for emission spectroscopy should be high purity.

Organic Chemical Analyses

AR grade is generally the minimum acceptable grade for materials used for organic analyses. Reference grade standards should be used as necessary. Pesticide-quality solvents are generally required for low-concentration work. AR grade solvents are adequate for analyzing industrial waste samples. However, the contents of each solvent lot should be checked to determine suitability for the analyses.

For sample cleanup procedures, the adsorbents most commonly used are florisil, silica gel, and alumina. These are pre-activated according to the analytical method requirements and checked for interfering constituents.

Water

Deionized water is used for dilution and preparation of reagent solutions. Deionized water prepared in the laboratory should be ASTM Type I or better. For trace level inorganic work, Type I Reagent grade is required. Organic-free water is required for organic analyses. Organic-free water may be verified by GC or GC/MS. However, when determining trace organics by solvent extraction and gas chromatography, specialty water such as HPLC grade water with sufficiently low background may need to be used.

8.2 Requirements for Laboratory Containers

Containers used in the laboratory can affect the quality of results. Material composition and volumetric tolerances are discussed below.

Material Composition of Laboratory Vessels

The glass recommended for general use is chemically resistant borosilicate glass, such as that manufactured under the trade names of Pyrex or Kimax. The use of plastic vessels, containers and other apparatus made of Teflon, polyethylene, polystyrene, and polypropylene is desirable for certain specified applications.

Volumetric Tolerances of Laboratory Vessels

All volumetric measurements are made using measuring devices with tolerances appropriate to the level of accuracy needed.

Glassware Cleaning Requirements

All glassware used for sample extraction and analysis is cleaned sufficiently to meet the sensitivity of the method. This is tested on an ongoing basis with method blank samples. The same types of glassware and glassware cleaning techniques are used for method blank samples and client samples. In general, the following glassware cleaning procedures are followed.

Beakers - wash with laboratory grade soap, triple rinse with water

Separatory funnels - remove stopcock, wash stopcock, cap and funnel with laboratory grade soap, triple rinse with water, triple rinse with extraction solvent

KD flasks - wash with laboratory grade soap, triple rinse with water, triple rinse with extraction solvent

Snyder columns - triple rinse with extraction solvent

Concentrator tubes - wash with laboratory grade soap, triple rinse with water, triple rinse with extraction solvent

Syringes - triple rinse with extraction solvent
If lower than normal reporting limits are required or if highly contaminated samples have been extracted, glassware may need additional cleaning such as acid rinsing.

9.0 MEASUREMENT TRACEABILITY AND CALIBRATION

All measuring operations and testing equipment having an effect on the accuracy or validity of analytical results are calibrated and/or verified prior to being put into service and on a continuing basis. Wherever possible, reference standards (such as Class 1 weights and traceable thermometers) and analytical reagent calibration standards are traceable to national standards of measurement. For accredited analyses, where traceability to national standards is not applicable, correlation of results is confirmed using proficiency testing and/or independent analysis.

All equipment and reference materials necessary for correct performance of analysis are under the permanent control of F&BI. A list of major analytical equipment is given in Appendix B.

9.1 Support Equipment Calibration

Support equipment includes devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, thermometers, ovens, refrigerators, freezers, water baths and volumetric dispensing devices such as autopipetes and syringes. In cases where quantitative results are dependent on their accuracy, these devices are calibrated as described below.

Calibration/Verification Prior to Use

When new support equipment is purchased, it is the responsibility of the extraction manager to verify its calibration and traceability prior to putting it into service. Each piece of equipment is numbered, or otherwise identified, and the date put in service is recorded. Any certificates provided by the manufacturer are marked with the equipment identification and kept on file. Specific procedures for calibration (including on-going calibration) of specific types of support equipment are detailed in the “Support Equipment Monitoring and Calibration" SOP. These procedures include:
reference standard(s) used for calibration
specific calibration technique employed
acceptable performance tolerances
calibration frequency
documentation procedures

On-Going Calibration

Requirements for on-going calibration are provided in the specific equipment SOPs. The requirements are based on the type of equipment, stability characteristics of the equipment, and required accuracy. Some equipment is calibrated each working day, some monthly and some less frequently. All support equipment is calibrated annually, using nationally traceable reference standards if possible, over the entire range of use. It is the responsibility of the extraction manager to complete all on-going calibrations.

Corrective Actions

If equipment does not meet the calibration requirements, it is taken out of service unless and until necessary repairs have been made. All such equipment is marked as "out of service" and, if possible, placed in a different location until repaired. Records of all repairs, including service calls, are kept with the equipment records. When a piece of equipment is repaired another initial calibration is performed prior to being put back into service. If equipment cannot be repaired, it is discarded as appropriate. It is the responsibility of the laboratory manager to mark out of service equipment, arrange for repairs, re-calibrate and document all such activities.

In addition, if equipment goes outside the direct control of the laboratory, it is the responsibility of the extraction manager to verify satisfactory function and calibration status before the equipment is returned to service.

If an item of equipment is found to be defective, the effect of the defect on previous calibrations or analyses is examined, and corrective actions are taken if necessary. It is the responsibility of the person who finds a defect to inform the QA officer, Technical Director, or Executive Committee.

9.2 Instrument Calibration

Initial instrument calibration and continuing instrument calibration verification of all analytical instruments is performed to ensure that the data are of known quality. Specific method SOPs describe detailed calibration requirements for each method. It is the responsibility of each analyst to follow and document established calibration procedures. The following sections describe the calibration requirements for all accredited analyses performed by F&BI.

Initial Calibration

The following are essential elements of initial instrument calibration:
Sufficient raw data records are retained to permit reconstruction of the calibration.
Sample results are quantitated against the initial calibration, and may not be quantitated from any continuing instrument calibration verification.
Initial calibrations are verified with a second source standard (a standard obtained from a second manufacturer or lot, if the lot can be demonstrated from the manufacturer as prepared independently from other lots), unless a different requirement is specified in the method.
Appropriate criteria for the acceptance of an initial calibration are established.
If the initial calibration results are outside of the established acceptance criteria corrective action is taken (see below).
Any reported sample results which fall outside of the calibration range are reported as having less certainty.
At least one calibration standard is at or below the method reporting limit.
The lowest calibration standard is above the method detection limit (MDL), with the following exception:
For instrument technology (such as ICP/MS) with validated techniques which use a zero point and a single point calibration standard, the following apply:
Prior to analysis of samples the linear range is established.

Zero point and single point calibration standard are analyzed with each analytical batch. Additional standards may also be analyzed.
A standard corresponding to the limit of quantitation is analyzed with each analytical batch.
The linearity is verified at a frequency established by the method and/or the manufacturer.

Continuing Instrument Calibration Verification

When the initial instrument calibration is not performed on the day of analysis, the validity of the initial calibration is verified prior to sample analysis by a continuing instrument calibration verification (CCV). The following items are essential elements of continuing instrument calibration verification:
A CCV is repeated at the beginning and end of each analytical batch. The concentrations of the calibration verification are varied within the established calibration range. If an internal standard is used, only one CCV is analyzed per batch.
Sufficient raw data records are retained to permit reconstruction of the CCV. These records explicitly connect the continuing verification data to the initial instrument calibration.
Criteria for the acceptance of a CCV are established.
If the CCV results are outside established acceptance criteria, corrective actions are performed (see below).

Corrective Actions

Specific corrective actions are included in method SOPs. Following are general corrective action guidelines:
If the initial calibration results are outside established acceptance criteria, corrective actions are performed. This may include preparation of new standard solutions or instrument maintenance. Data associated with an unacceptable initial instrument calibration should not be reported. However, if such data are reported (usually due to insufficient sample for reanalysis) then it is reported with appropriate qualifiers.
If a CCV falls outside of established acceptance criteria, then corrective actions are performed. This may include preparation of new standard solutions or instrument maintenance. If routine corrective action procedures fail to produce a second consecutive (immediate) CCV within acceptance criteria, then either acceptable performance is demonstrated after corrective action with two consecutive CCVs, or a new initial calibration is performed. If possible, samples associated with a failing CCV are reanalyzed. If reanalysis is not performed, then results are qualified. In the following two situations, results may be reported, even if reanalysis is possible.
a) If the CCV fails high, then associated sample results which are non-detect may be reported.
b) If the CCV fails low, then associated sample results which are above a level which provides sufficient data for client use (if known) may be reported.

9.3 Maintaining Traceability of Standards, Solvents, and Reagents

The following steps are taken to maintain traceability of standards:

All standards are logged into the Standards Logbook and given a Date Code which is written on each container and certificate (if included). Also recorded are description, supplier and manufacturer's Lot # (if provided). The sample check-in technician is responsible for logging in standards.
When opened, all original containers (as provided by the vendor) are labeled with the date opened and an expiration date (based on the date opened). The extraction analyst is responsible for labeling original containers when opened.
Documentation of standards prepared from purchased stocks or neat compounds is maintained in the Standards Prep Logbook. Information recorded includes the Date Code, the preparation date, the expiration date, the amount used, and the preparer's initials. The person preparing the standard is responsible for proper documentation.
Containers of prepared standards are labeled with a unique Standards Prep Logbook ID linking them to the above preparation documentation. They are also labeled with the preparation and expiration dates. The expiration date of a prepared standard may not exceed the expiration date of any of the primary standards used in its preparation. The person preparing the standard is responsible for labeling correctly.
Whenever a standard is used for sample extraction or analysis (e.g. calibration standard, surrogate, etc.) the Standards Prep Logbook ID is written in the sample extraction and analysis records. The extraction analyst is responsible for recording the Logbook ID.
Standards are not used past their expiration dates.

The following steps are taken to maintain traceability of solvents and reagents.

All solvents and reagents are logged into the Solvents and Reagents Logbook and assigned a Solvent Code which is written on each container and certificate (if included). Also recorded are description, supplier and manufacturer's Lot # (if provided). The sample check-in technician is responsible for logging in solvents and reagents.
When a solvent or reagent is used to prepare a standard, the Solvent Code is recorded in the Standards Prep Logbook. The person preparing the standard is responsible for proper documentation. Note: If a reagent solution is prepared, then that is documented in the Standards Prep Logbook as described above.
When a solvent or reagent is used for extraction or analysis, the Solvent Code is recorded in the sample extraction and analysis records. The extraction analyst is responsible for recording the Solvent Code.

9.4 Equipment Maintenance

Preventive maintenance is an important part of the F&BI quality system. A maintenance program has been outlined to provide an organized program of actions to maintain proper instrument performance which will ensure reliability of the measurements and prevent instrument failure during use. This equipment maintenance program is included as Appendix C. Additional information about routine

and special maintenance activities can be found in instrument manuals and troubleshooting guides, and in method SOPs.

Implementation

The implementation of the preventive maintenance program is dependent upon the specific instruments and equipment used. The extraction manager is responsible for performing and/or coordinating all support equipment maintenance. The GC, GC/MS, and inorganics supervisors are responsible for performing and/or coordinating all analytical instrument maintenance.

Documentation

Preventive maintenance is documented in maintenance log books. Each instrument has its own maintenance logbook which is updated each time any type of work is performed on the instrument.

10.0 SAMPLE HANDLING PROCEDURES

10.1 Sampling and Sample Acceptance Policy

The quality of analytical results is highly dependent upon the quality of the procedures used to collect, preserve and store samples. Factors that are taken into account to ensure accurate, reliable results include:
Type of container used
Sample preservation
Amount of sample taken
Sample storage (holding) time
Proper sample labeling/identification
Proper chain-of-custody (COC) documentation

Container, volume, preservation and holding time information for selected analyses for water and soil samples is included in Appendix D. F&BI provides sample containers, including preservative, to our clients when requested.

Each sample container should be labeled, using a durable label and indelible ink, to identify the following:
Client name
Client project name
Sampling date and time
Sample name/number
Sample preservation

A chain-of-custody (COC) form should be filled out for every client project. An example COC form is shown in Figure 10-1. The following information should be included on the COC:
Client (company) name and contact information
Client project name/number
Sampler's name
Sample ID (name/number)
Date and time sampled
Type of sample (e.g. soil, water, etc.)
Requested analysis

Sample Acceptance Policy
It is the client's responsibility to follow proper sampling and documentation protocol. If any samples are received with incomplete documentation, unclear sample labeling, incorrect or damaged sample containers, expired holding time, insufficient sample volume, incorrect sample preservation or any other circumstances that could affect data quality, the sample custodian and/or project manager will notify the client. If the problem can be resolved (e.g. documentation provided) normal analysis will be initiated. If not, data will be reported with qualifiers if necessary. The sample acceptance policy is posted at the sample receiving area, and copies are available upon request.

10.2 Sample Receipt Protocols

Chain-of-Custody
Evidence of sample collection, shipment, laboratory receipt, and laboratory custody until disposal is documented to maintain quality control. Documentation is accomplished through the COC records, shipping records and sample check-in and disposal records.

Sample Condition
Upon receipt, the condition of the samples is recorded. A copy of the sample condition receipt checklist is included in Figure 10-2. If a sample does not meet the sample receipt acceptance criteria the client is consulted for further instructions before proceeding. A record of the client's request is retained.

Sample Tracking
A permanent chronological sample receipt logbook is used to document receipt of all samples. The laboratory project number assigned is recorded on the sample condition checklist and on the COC, providing an unequivocal link to the laboratory and field ID's, the sample collection and analysis information provided on the COC, and the sample condition record.

Each sample received is assigned a unique laboratory ID that maintains an unequivocal link with the unique field ID assigned to each container. The laboratory ID is placed on the sample container as a durable label and is recorded on the COC. The laboratory ID is the link that associates the sample with subsequent laboratory activities such as sample preparation or calibration.

Sample Check-In
Upon sample receipt, the sample custodian completes the following steps (more details are found in the "Sample Receiving" SOP):
Sign and date the COC and attach the waybill (if applicable) to the COC.
Examine all samples and accompanying paperwork, using the Sample Condition Upon Receipt Checklist as a guide.
Verify that sample holding times have not been exceeded and are not close to their limit.
Notify the Project Leader if there are any samples that should be analyzed immediately because of holding time or client request.

The sample custodian then logs the samples into the Sample Check-In Logbook, which contains the following information:
Date received in laboratory
Name of client
Client project name/number
Type and condition of samples as received
Analyses requested
F&BI project number
Initials of person logging in samples

Container size(s) and cooler/sample temperature

The sample custodian then initiates sample analysis by:
Completing the COC documentation
Labeling each container with the unique laboratory ID
Placing the samples in proper laboratory storage
Notifying the project leader of sample arrival by placing copies of the COC and all other project documents in the project leader bin.

10.3 Sample Storage

Samples and sample extracts are stored according to the conditions specified by preservation protocols. The temperatures of sample storage refrigerators are monitored each working day and recorded in the refrigerator temperature logbook. Samples and sample extracts are stored away from all standards, reagents, food and other potentially contaminating sources, and are stored in such a manner to prevent cross contamination. In addition, samples and sample extracts are stored in a secured area in order to protect sample condition and integrity. Placing of samples in the proper storage environment is the responsibility of the sample custodian. Placing of extracts in the proper storage environment is the responsibility of the extraction analyst.

10.4 Sample Disposal

There are several possibilities for sample disposition:
The sample may be consumed during analysis.
Samples may be returned to the client for disposal.
Samples are incorporated into the laboratory waste streams.

The samples may be stored for 30 days after arrival. Proper environmental control and holding times are observed if reanalysis is anticipated. If reanalysis is not anticipated, environmental conditions for storage may not be observed.

The project leader and/or sample custodian determine disposition of samples if not specified on the COC. In general, F&BI will not maintain samples and extracts longer than one month beyond completion of analysis, unless otherwise requested.

After the appropriate storage time, the samples and extracts are disposed of by following approved disposal procedures. All materials known contain hazardous substances are disposed of as a separate waste streams. F&BI has identified 4 primary waste streams; solid waste, organic liquid waste, PCB (HazMat) waste, and acid waste. Disposal procedures are in compliance with all EPA, DOT, and Washington State waste disposal regulations. The extraction manager is responsible for overseeing sample and waste disposal.

Figure 10-1
Chain of Custody Form

SAMPLE CHAIN OF CUSTODY

Page # _____ of _____

Send Report To _____ SAMPLERS *(signature)*

Company _____ PROJECT NAME/NO. PO #

Address _____

City, State, ZIP _____ REMARKS

Phone # _____ Fax # _____

TURNAROUND TIME
- ☐ Standard (2 Weeks)
- ☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL
- ☐ Dispose after 30 days
- ☐ Return samples
- ☐ Will call with instructions

Sample ID	Lab ID	Date	Time	Sample Type	# of containers	ANALYSES REQUESTED: TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260	SVOCs by 8270	HFS				Notes

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:					
Received by:					
Relinquished by:					
Received by:					

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

Figure 10-2

SAMPLE CONDITION UPON RECEIPT CHECKLIST

PROJECT # _____ **CLIENT**_____ **INITIALS/ DATE:**_____

If custody seals are present on cooler, are they intact? ☐ NA ☐ YES ☐ NO

Cooler/Sample temperature _____ °C

Were samples received on ice/cold packs? ☐ YES ☐ NO

How did samples arrive?
☐ Over the Counter
☐ Picked up by F&BI
☐ FedEx/UPS/GSO

Number of days samples have been sitting prior to receipt at laboratory _____ days

Is there a Chain-of-Custody* (COC)? ☐ YES ☐ NO
*or other representative documents, letters, and/or shipping memos

Are the samples clearly identified? (explain "no" answer below) ☐ YES ☐ NO

Is the following information provided on the COC* ? (explain "no" answer below)

Sample ID's	☐ Yes	☐ No	# of Containers	☐ Yes	☐ No
Date Sampled	☐ Yes	☐ No	Relinquished	☐ Yes	☐ No
Time Sampled	☐ Yes	☐ No	Requested analysis	☐ Yes	☐ No

Were all sample containers received intact (i.e. not broken, leaking etc.)? (explain "no" answer below) ☐ YES ☐ NO

Were appropriate sample containers used? (explain "no" answer below) ☐ YES ☐ NO

If custody seals are present on samples, are they intact? ☐ NA ☐ YES ☐ NO

Are samples requiring no headspace, headspace free? ☐ NA ☐ YES ☐ NO

Explain "no" items from above (use the back if needed)

11.0 QUALITY CONTROL OBJECTIVES

F&BI follows a comprehensive internal quality control (QC) program to insure precision, accuracy, and reliability of data. QC objectives are established to determine if data generated is acceptable. These objectives are either specified by the method, or are statistically derived from historical laboratory data. Individual method SOPs include details of method QC requirements, which may supersede those given here.

11.1 Demonstration of Capability

Prior to using any test method, and at any time there is a significant change in instrument type or test method, a demonstration of capability (see section 7.2) is performed. In general, this does not test the performance of the method in real world samples, but in the applicable clean matrix.

11.2 Precision

Precision is a measure of the reproducibility of a result. Except as otherwise specified by an accredited method, the QC objective for precision is 20% as measured by Relative Percent Difference (RPD), as determined by duplicate analyses. It is recognized that for analytes at concentrations of less than five to ten times the method detection limit (MDL), it may be difficult to meet this objective.

Precision is usually expressed as Relative Percent Difference (RPD) based on duplicate analyses of a sample. The RPD is calculated as:

$$RPD = \frac{|X1 - X2|}{[(X1+X2)/2]} \times 100$$

where X1 and X2 are, respectively, the first and second values obtained for the analysis. Precision may be evaluated from duplicate sample, matrix spike and/or laboratory control sample analyses.

11.3 Accuracy

Accuracy is a measure of the closeness of a result to the true or expected value. It is generally determined using matrix spike and/or laboratory control sample recoveries. Control charts (see section 11.4) are generated to calculate laboratory specific accuracy objectives. For accredited analysis without enough QC data, or where the method specifies accuracy objectives, method prescribed limits are used. If the method does not specify control limits, then reasonable default limits are used. It is recognized that, for matrix spike samples, unless the sample is homogeneous and the spike concentration is greater than or approximately equal to the native concentration and greater than five to ten times the reporting limit, this objective may be difficult to meet, and therefore such samples will not be used to generate new QA/QC objectives/criteria. Alternatively, accuracy may be assessed through the analysis of appropriate standard reference materials or certified standards or samples, as available.

Accuracy is usually expressed as percent recovery (%R). The %R is calculated as:

$$\%R = ((Xs - Xa)/Ct) \times 100$$

where Xs is the observed concentration of the spiked sample, Xa is the observed concentration of the unspiked sample, and Ct is the concentration of the spike.

11.4 Uncertainty

Laboratory generated control limits (see below) for laboratory control samples represent an estimation of the uncertainty of measurement for a particular analysis.

Control Limits
Control limits are the acceptance criteria used for evaluating the accuracy and precision of results. F&BI has established control limits for precision of 0% to 30% for all accredited analyses, unless method specified limits are more stringent. Initial control limits for accuracy are taken from the method or regulatory requirements. If no method or regulatory criteria exist, control limits are assigned default values. These default values are assigned using the following guidelines.

For laboratory control samples default control limits are 70% to 130%, and default warning limits are 80% to 120%.
For matrix spike samples and surrogate compounds default control limits are 50% to 150%, and default warning limits are 65% to 135%.
Established control limits for a similar method/matrix may be used instead of default limits.

When sufficient data has been generated, the laboratory specific acceptance limits for accuracy are usually used. After a minimum of 20 samples have been analyzed for a particular matrix/method, the mean and standard deviation of the results are calculated. Warning limits are set at 2 standard deviations from the mean, and control (action) limits are set at 3 standard deviations from the mean. Control limits are generally reviewed at least monthly, or when sufficient data has been generated to warrant review, and updated annually.

Control Charts
Control charts are prepared for accredited analytical methods to document the trends in percent recoveries (accuracy) for laboratory control samples, matrix spike samples and surrogates. Results are monitored routinely by the analyst. If 10 consecutive results fall outside of warning or control limits (either all 10 above, or all 10 below), the cause is investigated and necessary corrective actions are taken.

11.5 Completeness

Completeness is determined as the percentage of the sample data for which the associated QC data are found to be acceptable. The QC goal for completeness, as determined by the percentage of valid data generated, is 100%. Precision and accuracy

determinations, if outside the QA objectives due to sample-related causes, may be regarded as qualifying, rather than invalidating, the associated data.

11.6 Representativeness

Representativeness is the degree to which the field sample represents the overall sample site or material. F&BI will make every reasonable effort to assure that the samples are adequately homogenized prior to taking aliquots for analysis, so that the reported results are representative of the sample received. However, F&BI does not represent that the samples submitted for analysis are representative of the conditions in the field. Of particular importance is that mixing may substantially lower the measured levels of volatile components. (For this reason, mixing is avoided as much as possible for samples being analyzed for those compounds.)

11.7 Comparability

Comparability is an expression of the confidence with which one data set can be compared to another. To ensure comparability, standard operating procedures as defined in the quality system are used for handling and analysis of all samples.

11.8 Method Detection Limits and Reporting Limits

Method Detection Limits

The method detection limit (MDL) is the minimum concentration that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. For each applicable test method and matrix, MDLs are determined for the compounds of interest by spiking the analyte(s) at a level approximately 5 times the expected MDL into a clean matrix and processing as a sample. A minimum of seven replicates are processed and the mean result is multiplied by the applicable students' value to obtain the MDL. MDLs are determined for each new test method (prior to sample analysis), annually, and each time there is a change in the test method that affects how the test is performed, or when a change in instrumentation occurs that affects the reliability of the analysis.

Reporting Limits

Reporting limits (RL), or practical quantitation limits (PQL), are the routinely reported lower limits of quantitation. RLs are calculated from the MDL and are typically 2 to 10 times the MDL, or equal to or greater than the concentration of the lowest calibration standard. The RLs take into account the day-to-day fluctuations in instrument reliability and other factors. These RLs are the levels to which F&BI routinely reports results. If a result below the RL is reported, typically due to client request, it is qualified as an estimated value.

12.0 ANALYSIS AND EVALUATION OF QUALITY CONTROL SAMPLES

Quality control samples are routinely analyzed with each analytical batch (see below) of field samples to demonstrate that the laboratory is operating within the QC objectives. QC samples are evaluated on an on-going basis, and QC acceptance criteria are defined and used to determine the validity of the data. Specific types of QC samples are described below. Individual method SOPs include details of method QC requirements. A summary of frequency and acceptance limit requirements for QC elements described in this and previous sections is given in Table 12-1. If method requirements are different than those given here, the method requirements will be followed.

12.1 Preparation Batch

The preparation batch is the basic unit for quality control. To ensure that QC results for accredited analyses are representative, all of the samples in a batch, both field and QC samples, are extracted, analyzed and calculated in the same way. In the absence of specific program or method requirements, the requirements for a preparation batch are as follows:

A maximum of 20 (field) samples are in a batch.
All samples in a batch are the same matrix.
QC samples (see below) processed with a batch are; 1 method blank, 1 LCS, 1 MS (if suitable), and either 1 MSD or 1 matrix duplicate (if suitable, if not, then 1 LCSD).
The same reagent lot(s) are used to process the batch.
The same analyst(s) process the entire batch.
The maximum time between the start of processing of the first and last sample in a batch is 24 hours.
QC samples are prepared and analyzed with the associated field samples. However, if field samples in the batch are reanalyzed for a reason not affecting the QC samples (e.g. dilution, surrogate recovery etc.), the QC samples do not require analysis each time a field sample from the preparation batch is analyzed.
Each batch is assigned a unique ID which links it to the associated field samples.

12.2 Method Blank Samples

Purpose
The method blank is used to assess the preparation batch for possible contamination during the preparation and processing steps. It is processed along with and under the same conditions as the associated samples.

Frequency
One method blank is analyzed with each preparation batch.

Composition
The method blank consists of a matrix that is similar to the associated samples and is free of the analytes of interest.

Evaluation Criteria and Corrective Action
The goal is to have no detectable contaminants. If contamination is detected in the method blank sample, the nature of the interference and the effect on the analysis of each sample in the batch is evaluated. The source of contamination is investigated and measures taken to minimize or eliminate the problem. Affected samples are reprocessed, or data are appropriately qualified if:
The concentration of a targeted analyte in the blank is at or above the reporting limit AND is greater than 1/10 of the amount measured in the sample.
The blank contamination otherwise affects the sample results as per the test method requirements or the individual project data quality objectives.
Results of method blank analyses are maintained with the corresponding analytical data set and reported with project results.

12.3 Laboratory Control Sample (LCS)

Purpose
The LCS is used to evaluate the performance of the total analytical system, including all preparation and analysis steps.

Frequency
One LCS is analyzed with each preparation batch. Exceptions are for analytes for which no spiking solutions are available such as total suspended solids, pH or turbidity.

Composition
The LCS is a controlled matrix, free of the analytes of interest, spiked with known and verified concentrations of analytes. Alternatively the LCS may consist of a media containing known and verified concentrations of analytes or as Certified Reference Material (CRM). All analyte concentrations are within the calibration range of the methods. The components spiked are specified in individual method SOPs.

Evaluation Criteria and Corrective Action
LCS results are calculated in percent recovery (see section 11.3). Results are compared to established acceptance criteria. A LCS that is determined to be within the criteria effectively establishes that the analytical system is in control and validates system performance for the samples in the associated batch. If a LCS result is found to be outside the criteria, this indicates that the analytical system is "out of control". Any affected samples associated with an out of control LCS are reprocessed and re-analyzed (if possible), or the results reported with appropriate data qualifying codes. LCS results are reported on the quality control data summary forms.

12.4 Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Samples

Purpose
Matrix specific QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from

these controls is sample/matrix specific and is not normally used to determine the validity of the entire batch.

Frequency
One MS sample is analyzed with each preparation batch, if a sufficient amount of sample is provided.

Composition
MS/MSD analysis is performed on aliquots of actual samples. The composition is not usually known. Samples are spiked with known and verified concentrations of analytes. All analyte spiking concentrations are within the calibration range of the methods. The components spiked are specified in individual method SOPs.

Evaluation and Corrective Action
The results from MS/MSD analyses are primarily designed to assess the precision and accuracy of analytical results in a given matrix and are expressed as percent recovery (%R) and relative percent difference (RPD) (see section 11). Results are compared to the established acceptance criteria. If results are outside the criteria, the cause is investigated and corrective actions are taken if necessary, or the MS/MSD data are reported with appropriate qualifiers. MS/MSD results are reported on the quality control data summary forms.

12.5 Matrix Duplicate Samples

Purpose
Matrix duplicates are replicate aliquots of the same sample taken through the entire analytical procedure. The results from this analysis indicate the precision of the results for the specific sample using the selected method.

Frequency
One duplicate sample is analyzed with each preparation batch. If sufficient sample is provided, this will be either a MSD or a matrix duplicate. If not, a laboratory control sample duplicate (LCSD) is analyzed.

Composition
Matrix duplicates are performed on replicate aliquots of actual samples. The composition is not usually known.

Evaluation and Corrective Action
The results from matrix duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as RPD. Results are compared to established acceptance criteria. If results are outside the criteria, the cause is investigated and corrective actions are taken if necessary, or the matrix duplicate data are reported with appropriate qualifiers. Duplicate analysis results are summarized on the quality control data summary forms.

12.6 Surrogate Standard Analyses

Purpose
Surrogates are used most often in organic chromatography test methods and are chosen to reflect the chemistries of the targeted components of the method. Added prior to sample preparation/extraction, they provide a measure of recovery for every sample matrix.

Frequency
Except where the matrix precludes its use or when not available, surrogate compounds are added to all samples, standards, and blanks for all appropriate test methods.

Composition
Surrogate compounds are chosen to represent the various chemistries of the target analytes in the method. Individual method SOPs specify the surrogate compound(s) used.

Evaluation Criteria and Corrective Action
Surrogate results are calculated in percent recovery (see section 11.3). Results are compared to established acceptance criteria. Surrogates outside the acceptance criteria are evaluated for the effect indicated for the individual sample results. Corrective actions are taken if necessary, or affected results are reported with appropriate qualifiers. Surrogate results are reported with associated sample results.

12.7 Proficiency Testing (PT) Samples

Purpose
PT samples are blind samples purchased from a certified provider. They are used to evaluate the performance of the total analytical system, including all preparation and analysis steps. They are processed under the same conditions and in the same manner as client samples.

Frequency
F&BI participates in certified proficiency testing programs at a frequency required by accrediting agencies. PT samples are analyzed twice a year for each analyte, method and matrix, when available, for which F&BI is accredited.

Composition
PT samples are either prepared in a clean matrix by the provider, or are prepared in a clean matrix at the laboratory according to the provider's instructions. The specific analyte spiking levels are unknown to the laboratory.

Evaluation Criteria and Corrective Action
PT results are evaluated by the provider and reported directly to the regulatory agency as well as to the laboratory. Any PT results which are reported as not acceptable are reviewed and corrective actions implemented as needed. Reports received from PT sample providers and corrective action documentation are kept on file.

F&BI does not send any PT sample, or portion of a PT sample, to another laboratory for any analysis. Also, F&BI does not knowingly receive any PT sample, or portion of a

PT sample, from another laboratory, or communicate with another laboratory concerning PT samples.

Table 12-1
QC Frequency and Acceptance Limits Summary
(For Accredited Analysis, Method requirements may supersede these.)

Quality Control Element	Frequency	Acceptance Limits
Method Detection Limit (MDL)	Initially, quarterly, and with substantial change to method or instrument.	40CFR Part 136, Appendix B calculations.
Demonstration of Capability (DOC)	Annually for each analyst.	Average of replicates within method established control limits of true value, and not >20% RSD for each analyte.
Initial Calibration	Initially and if ICV or CCV fail.	Per method specific requirements.
Initial Calibration Verification (ICV/Second Source)	Following every initial calibration, prior to sample analysis.	Per method specific requirements.
Continuing Calibration Verification (CCV)	When an initial calibration has not been performed: i) At the beginning and end of analysis of 20 samples (max). Concentrations vary. ii) At the beginning of 12 hour shift if internal calibration used.	Per method specific requirements.
Method Blank (MB)	1 per preparation batch of 20 (or fewer) samples.	Concentration for each analyte below RL or method specific.
Laboratory Control Sample (LCS)	1 per preparation batch of 20 (or fewer) samples.	Per laboratory established control limits (or default limits.)
Matrix Spike (MS)	1 per preparation batch of 20 (or fewer) samples.	Per laboratory established control limits (or default limits.) Does not control batch.
Duplicate Analysis (Sample Duplicate (Dup), MSD or LCSD)	1 per preparation batch of 20 (or fewer) samples. i) Dup or MSD if sufficient sample. ii) LCSD if not.	Percent recovery per laboratory established control limits (or default limits.) RPD 0% to 30%. Dup and MSD do not control batch.
Surrogate	Each field and QC sample for accredited organic analyses.	Per laboratory established control limits (or default limits.)
Proficiency Testing (PT)	Twice per year per accredited	Per PT provider.

Samples	method/analyte/matrix.	

13.0 CORRECTIVE ACTIONS

Corrective actions may be implemented as a result of failure of quality control results to meet established criteria, failure of reported results to meet client's needs, or deviation from established policies and procedures in the SOPs and this QA manual. These are documented with the non-conformance report form which includes an investigation of the root cause, identification of possible corrective actions, and a description of the corrective action taken.

The QA officer reviews each non-conformance report form. This documentation is kept on file with each affected client report, and a copy is kept by the QA officer. During the annual internal audit (see section 16), the QA officer or other qualified F&B staff reviews all non-conformance report forms to look for chronic systematic problems that need more in-depth investigation and alternative corrective action consideration.

In addition, corrective actions may be implemented as a result of internal or external audit findings, or management review (see section 16). These are documented with the internal audit corrective action form, external audit correspondence, and the management review corrective action form respectively.

If corrective action procedures do not resolve or identify the problem, personnel will notify management for direction to take. The findings and actions taken are documented and sent to the QA officer or Technical Director for follow-up during an internal audit.

13.1 QC Analysis Failure

If any quality control results fail to meet established criteria, corrective action procedures are immediately implemented if possible. Corrective actions are identified by the individual responsible for a particular analytical method or instrument. In addition, the analyst performing data calculation or review may initiate corrective actions if needed. Corrective actions may include a review of calculations, a check of instrument maintenance, a review of analytical techniques, and reanalysis of affected samples. Table 13-1 has a general summary of QC analyses and corrective actions. Individual method SOPs detail method specific corrective actions. Corrective actions are documented by the analyst in the analysis records.

If, following corrective actions, quality control results still fail, then affected results are reported with appropriate qualifying flags and the analyst may use a non-conformance report form to further document the causes of the qualified data. In some cases it may not be possible to follow standard QC procedures and/or corrective actions. For example, if insufficient sample is provided, duplicate sample analysis, matrix spike analysis and/or sample re-extraction may not be possible. In these cases, all possible QC procedures are followed, reported data are qualified if needed, and the analyst uses the extraction worksheet, sequence tables, injection logs, and/or non-conformance report form to document.

If the quality control failure may require that analysis is halted for a particular method and/or instrument, it is the responsibility of the analyst to notify his/her supervisor. The supervisor then determines the required action and notifies the laboratory/technical director if analysis should be halted. The analysis can then be resumed only after approval from the laboratory/technical director.

13.2 Client Complaints

Any client complaints are resolved promptly. The project manager has primary responsibility for handing client complaints. Complaints which are not able to be resolved by the project manager may be referred to the laboratory/technical director or executive committee. Complaints are documented by the project manager using the non-conformance report form, client communication form, project notes macro, or a printed record of an e-mail correspondence.

13.3 Deviation from SOPs or QA Manual

Deviations from established policies and procedures as written in laboratory SOPs and this QA manual are documented using the extraction worksheet, sequence tables, injection logs, and/or other documents such as the non-conformance report form. A deviation may occur due to a specific client request, or due to laboratory circumstances.

13.4 Audit Findings

Corrective actions needed as a result of audit findings (internal or external) are initiated by the quality assurance manager or the laboratory/technical director. Audit related corrective actions may include providing additional staff training, updating SOPs or establishing new procedures. Internal audit corrective action documentation is kept on file with internal audit findings. External audit corrective actions are documented through correspondence with the auditor(s).

13.5 Record-Keeping Errors

Entries in records are not obliterated by methods such as erasures, overwritten files or markings. Corrections to record-keeping errors are made by one line marked through the error. The individual making the correction initials and dates the correction, and writes a brief explanation as needed. These criteria are also followed for electronically maintained records as applicable.

13.6 Corrective Actions Which Affect Reported Results

If audits or further data review indicate a substantial error in any data which has already been issued in a final report, the client is notified within 30 days and an amended report is issued if necessary.

Table 13-1
QC Corrective Actions
(For Accredited Analysis, Method requirements may supersede these.)

Quality Control Element	Corrective Action(s)	Documentation
Method Detection Limit (MDL)	Determine source of problem, correct, reanalyze (re-extract if necessary).	Instrument raw data.
Demonstration of Capability (DOC)	Determine source of problem, correct, reanalyze (re-extract if necessary).	Instrument raw data. DOC Certificate
Initial Calibration	Determine source of problem and recalibrate. Reanalyze any affected samples.	Instrument raw data. Flag sample results if not corrected. Non-Conformance Form if not corrected.
Initial Calibration Verification (ICV/Second Source)	Re-inject ICV. If ICV fails a second time, a new initial calibration is required. Reanalyze any affected samples.	Instrument raw data. Flag sample results if not corrected. Non-Conformance Form if not corrected.
Continuing Calibration Verification (CCV)	Determine source of problem and re-inject CCV. If second CCV fails, either correct problem and pass two consecutive CCVs, or a new initial calibration is required. Reanalyze any affected samples unless: i) CCV is high and sample is ND. ii) CCV is low and sample result is above regulatory/action limit.	Instrument raw data. Flag sample results if not corrected. Non-Conformance Form if not corrected.
Method Blank (MB)	Reduce background contamination. Re-extract and reanalyze MB and all affected samples in batch. Sample result can be reported if MB is <1/10 of sample result, or if sample is ND.	Instrument raw data. Flag MB and sample results if not corrected. Non-Conformance Form if not corrected.
Laboratory Control Sample (LCS/LCSD)	Determine source of problem. Correct and: i) If instrument related, reanalyze LCS and all affected samples in batch. ii) If spike related, re-extract and reanalyze LCS. iii) If other, re-extract and reanalyze LCS and all affected samples in batch.	Instrument raw data. Flag LCS and sample results if not corrected. Non-Conformance Form if not corrected.

Note: Verify calculations prior to other corrective actions.

Table 13-1
QC Corrective Actions (continued)
(For Accredited Analysis, Method requirements may supersede these.)

Quality Control Element	Corrective Action(s)	Documentation
Matrix Spike (MS)	Determine source of problem. i) If instrument related, reanalyze MS and all affected samples in batch. ii) If spike related, re-extract and reanalyze MS. iii) If LCS passes, flag failing MS result as matrix effect.	Instrument raw data. Flag MS result if not corrected. Non-Conformance Form if not corrected.
Duplicate Analysis (Sample Duplicate (Dup), or MSD)	Determine source of problem. i) If instrument related, reanalyze duplicate and all affected samples in batch. ii) If other, re-extract and reanalyze sample and duplicate (or MS and MSD). iii) If LCS passes, flag failing result as matrix effect.	Instrument raw data. Flag duplicate result if not corrected. Non-Conformance Form if not corrected.
Surrogate	Determine source of problem. i) If instrument related, reanalyze sample. ii) If spike related, re-extract and reanalyze sample. iii) If matrix related, flag failing result as matrix effect.	Instrument raw data. Flag surrogate result if not corrected. Non-Conformance Form if not corrected.
Proficiency Testing (PT) Samples	Determine and correct source of problem. Pass minimum of 2 of last 3 for each accredited method/analyte/matrix.	PT provider report. Corrective action letters to regulatory agency.

Note: Verify calculations prior to other corrective actions.

14.0 DATA PROCESSING, VALIDATION, AND REPORTING

All analytical data reported by F&BI to a client in a final report is calculated, reviewed and validated, following established quality system procedures. Individual method SOPs describe specific calculation procedures. The following describes our general data reduction, validation and reporting procedures.

14.1 Data Processing and Review

Analytical results are generated from raw data by the analyst, using procedures specific to the analytical methods, and described in the appropriate method SOP. Results for most analyses are generated by computer. However, analysts usually enter data, such as sample volume/weight, to complete the calculations. Summary pages containing these entries are printed for review. Data generated is electronically transferred into the proper electronic form(s) for reporting. These forms are also printed for review.

For analyses which do not have computer generated data, results are hand entered into the computer for reporting. These results are printed and a 100% review of calculations and data entry is completed. If a particular result, which would normally be computer generated, is manually calculated (usually due to a manual integration) then the entire calculation is documented clearly so that the review analyst can perform a complete review.

Manual Integrations

Integration settings are adjusted to minimize the need for manual integrations. However, a manual integration is necessary if the automatic integration of the peak or integration area (for TPH analyses) is clearly affected (e.g. does not extend from baseline to baseline, peak is split, integration is inconsistent between full strength and diluted peak).

If manual integration is performed, this is clearly documented. The raw data affected by the re-integration is printed and included in the instrument data package along with the original integration, and any manual calculations which are done as a result, are documented. The analyst records his/her initials and the date the manual integrations were made. In addition, all manual integrations are reviewed carefully to check for bias.

Quality Control Results

The analyst also calculates and evaluates all quality control results. Analytical data for quality control samples (e.g. method blank, LCS, MS) are calculated and reviewed in the same manner as for all other samples. Results are evaluated using established acceptance criteria, and corrective actions are taken prior to releasing, as final, any associated sample results. After all calculations and QC evaluations are complete, the analyst signs the worksheet(s) and gives it to the calculation review analyst.

Calculation Review

An analyst, independent from the person performing the analysis, is responsible for a 100% review of all raw data, calculations, transcriptions (if needed) and results. Each worksheet reviewed is initialed. Corrections are reviewed by the calculations analyst, and any disagreements are resolved by the QA officer or Technical Director. Upon completion of review, worksheets are given to the project manager to generate a final report.

14.2 Analytical Data Reports

Analytical data and quality control data are summarized in standard report formats, either designed by F&BI or supplied by the client. The project manager combines the electronic files of reviewed analytical results to generate a final report. Prior to release of the report to the client, the project manager reviews and approves the entire report for completeness, and to ensure that any client-specified objectives were successfully achieved. The project manager then authorizes and electronically releases the final report file to office personnel to generate a hardcopy report. Specific procedures for generating a final analytical report are provided in the "Creating Reports" SOP. The following information is included in each final analytical data report issued by F&BI.
The F&BI name, address and phone number, and project manager's name and electronic signature.
The client's project number/name, the F&BI project number, and date of issue (all on each page).
The sample identification provided by the client and the sample identification number assigned by F&BI
Chemical parameters analyzed, reported values, and units of measurement
Reporting limit of the analytical procedure
The dates the samples were received and analyzed
A summary of quality control sample results
Footnotes referenced to specific data if required to explain/qualify reported values

Explanatory text or the cover letter may also include:
Person(s) receiving and transmitting the data
Documentation of samples which did not meet acceptance criteria when received
Brief discussion of samples analyzed and the analytical program
Discussion of any apparent data anomalies
Reference to specific accreditation requirements

<u>Reports for Additional Results</u>
If additional analysis is requested after a final report for a specific laboratory project has been issued, then those additional results are issued in a separate report. A statement that these are additional results for the project is included in the cover letter.

<u>Reports Including Subcontracted Analysis</u>
If any analysis is subcontracted to another laboratory, a statement is included in the cover letter and/or case narrative indicating the subcontracting laboratory and the analysis they performed. The original copy of the subcontracting laboratory's report is

provided to the client and a copy is kept with the F&BI project file. No subcontracted work is ever reported as being F&BI data.

Report Review

After the hardcopy data report is prepared, the report is subject to a complete review by another reviewer. Entries such as dates, sample IDs, names and addresses are reviewed. The reviewer completes a report review checklist and attaches it to the report. If any errors are found, they are noted and the report is given back to the project leader to correct.

The final draft is reviewed by the executive committee or its designee to assure that all of the steps listed to this point have been followed. He/She then initials the draft which is filed. After approval, a final report bearing the appropriate signatures is issued to the client.

Amending Issued Final Reports

After issuance of a final report, the laboratory report remains unchanged. If a report which has already been issued as final to the client is amended, the amended report is issued separately. A cover letter is included, which states that amended results are being provided. If needed, further explanation of the amendment is included in the cover letter. All amended reports receive final approval before being released to the client.

15.0 DOCUMENT CONTROL AND RECORDS MANAGEMENT

15.1 Document Control

Internally generated documents which are used to define and implement the quality system are controlled. This includes the Quality Assurance Manual, all SOPs and laboratory logbooks. Documents are controlled in two ways. Each document clearly indicates the effective date of the document, the revision number, and the signature(s) of the approving authority (revision number and signature may not be applicable for logbooks). In addition, a record is kept of who received a signed copy of each document.

Preparation of Controlled Documents

Quality system documents are written by the personnel most familiar with the procedures described. The author of the document is responsible for including the correct revision number and date. The documents are reviewed and released by the QA officer, laboratory/technical director and/or executive committee representative as applicable. They are implemented on the revision date indicated on the document. More specific procedures for writing and organizing quality system documents are described in the "Quality System Document Organization" SOP.

Office personnel are responsible for controlling logbooks. Laboratory logbooks are sequentially assigned a number, which is clearly written on the logbook. The name/use and starting date of the logbook are also written on the logbook and are recorded in the Master Log of Laboratory Logbooks. Completed logbooks are filed with office records, or with the associated instrument, if applicable.

Revision of Controlled Documents

Currently existing quality system documents are reviewed annually during the internal laboratory audit (see section 16). Documents may be revised due to changes initiated by an internal or external audit; or due to changes such as new instrumentation, updated instrument parameters, updated concentrations used for chemical standards etc. A new quality system document is generated if a new quality system procedure is implemented.

To ensure that the beginning and ending effective dates for a document are clearly documented, revision numbers are always whole numbers (starting with revision 1) which are increased by one whole number for each document revision. Therefore the beginning date of a particular revision is the ending date for the immediately previous revision.

Documentation of Controlled Documents

Office personnel are responsible for keeping a record of who received each signed controlled document. The Controlled Document Record includes the document name, a sequentially assigned number which is written on the document before releasing, the person (or company) the document was released to, and the date released. Unsigned copies of documents are not considered controlled.

15.2 Records Management

The purpose of the Records Management system is to standardize the organization, storage and retrieval of all data and documents pertinent to quality and the analytical process. Also, in many cases, F&BI project files must be legally defensible, that is, admissible by the courts and believed as fact. To fulfill these documentation requirements, F&BI maintains a Records Management System which meets the following criteria:

Data and documents are indexed and easily retrievable.
Files are secure.
A formal document inventory can be produced if required by the contract/project.
Laboratory operation/QC documents are cross referenced to applicable projects.
The system is documented in the Quality Assurance Manual and Standard Operating Procedures.
Specific regulatory or contractual requirements can be accommodated.

Analysis Records

Data generated using instruments driven by computers is stored on computer disks coded by the instrument number and date the samples were analyzed. Hard copies of all of the electronic data are also kept. For each instrument, a list of all samples analyzed for each date is kept for easy sample searching. For instruments not controlled by a computer, data are recorded in individual instrument logbooks.

Worksheets are documents filled out by extraction analysts as a sample is processed. These sheets contain measurements such as the weight of the sub-sample, identification and volume of solvent used for any extraction, and documentation of any dilutions or concentrations made. These worksheets are kept with our file copy of any report that is sent to a client.

Laboratory Files

Laboratory records/documents are of two types:
1) Project/Client Files - Documents which are specific to a project/client. All records pertaining to a specific project contain a reference to the laboratory project number which is assigned during sample check-in.
2) Laboratory Files - Documents which pertain to the overall functioning of the laboratory

Project/Client files contain the following:
Chain-of-Custody documents for the project
Extraction worksheets for the project
Electronic file of data generated by Analyst for each sample delivery group and analysis
Electronic file of compiled data for the results of analyses for each sample delivery group generated by Project Manager
Non-conformance report forms for the project
Contract files pertinent to a client
Communication records between project management and the client

Final reports submitted to the client

Laboratory files contain the following:
Sample Check-in Logbook
Raw instrument data, including calibration data
Instrument maintenance records
Internal and external audit records
Training records
QA Manual and SOPs
Any other QA/QC documents pertaining to the overall functioning of the laboratory
General office/business records

15.3 Archived Records

All files are stored at F&BI, in a safe and secure area, for a minimum of 5 years. Access to archived information is documented with an access log. After 5 years, records are purged only with approval from the executive committee representative.

15.4 Change of Ownership

If there is a change of ownership, records will be retained, and details of record availability will be specified in the transaction.

16.0 QUALITY SYSTEM AUDITS

Quality audits are an essential part of F&BI's quality system program. Two types of audits are used: system audits which qualitatively evaluate the operational details of the quality system program, and performance audits which quantitatively evaluate the outputs of the various measurement systems.

16.1 System Audits

Internal Audits

The QA officer arranges for annual internal audits to verify that laboratory operations continue to comply with the requirements of the quality system. These audits are carried out by trained and qualified personnel who are, wherever possible, independent of the activity to be audited. An internal audit of all or part of the system may also be performed at any time due to any circumstance which raises concern regarding compliance with established policies or procedures, or with the data quality.

Target dates for completion of any corrective action investigations resulting from an internal audit are set within a reasonable time frame so that, if necessary, laboratory practice can be changed and/or clients can be contacted. Where the audit findings indicate a substantial error in calibrations or test results, immediate corrective action is taken and any client whose work was involved is notified within 30 days in writing.

Audit findings and any corrective actions that arise from them are documented using the Internal Audit forms, which are included in Appendix E.

External Audits

F&BI is audited on a regular basis by state and independent auditors, as required for accreditation and by client contracts. External audits are documented through correspondence with the auditors.

Managerial Review

The laboratory/technical director conducts an annual review of the quality system and testing and calibration activities to ensure their continuing suitability and effectiveness, and to introduce any necessary changes or improvements in the quality system and laboratory operations.

The review takes account of reports from managerial and supervisory personnel, the outcome of recent internal and external audits, the results of interlaboratory comparisons or proficiency tests, any changes in the volume and type of work undertaken, feedback from clients, corrective actions, and other relevant factors. In addition, pro-active suggestions for preventive actions are included. These include either technical or quality system improvements which will reduce the likelihood of potential non-conformances.

Review findings and any corrective actions that arise from them are documented using the Managerial Review forms, which are included in Appendix E.

16.2 Performance Audits

In addition to periodic system audits, the quality of results is ensured through ongoing checks which monitor the quality of the laboratory's analytical activities. Examples of such checks are:
Internal quality control procedures, as described in section 12 above
Participation in proficiency testing programs, as described in section 12 above
Use of second source standards and/or certified reference materials
Replicate analysis using the same or different test methods
Re-testing of retained samples
Correlation of results for different but related analysis of a sample
Review of historical data from the same sample

17.0 CLIENT COMMUNICATION

17.1 Client Confidentiality

Strict client confidentiality is maintained at all times. No records or results are discussed with, or provided to, anyone other than the client unless the client has given specific permission. Clients are notified by the project manager or office personnel whenever any other party requests information about their records.

In addition, when clients require transmission of test results by facsimile, email or other electronic or electromagnetic means, care is taken to ensure that client confidentiality is maintained. To avoid accidental transmission to a different party, commonly used email addresses are included in an email address book, and commonly used fax numbers are pre-programmed. Also, in case of accidental transmission to the wrong party, email messages and facsimile cover sheets contain a message which states that the information is privileged, confidential, and intended only for the addressee named. Office personnel are responsible for maintaining email addresses and pre-programmed fax numbers.

17.2 Review of Requests, Tenders, and Contracts

Before agreeing to a written or oral contract to provide a client with environmental testing services, a review is conducted to ensure that F&BI has the capability and resources necessary to meet the client's requirements. For routine and other simple tasks, the project leader can provide an oral agreement. For more complex tasks, the laboratory/technical director conducts a review. This may include items such as review of previous proficiency testing results, and running trial testing to determine detection limits or other essential quality control requirements. The laboratory's current accreditation status, and any subcontracted work are also reviewed. The client is informed if, at any time before and during the agreement, F&BI is unable to fulfill the requirements of the contract. Records of written contracts, and other communication regarding the contract, are documented in the Client Report Template, and/or kept in the project/client files.

17.3 Specific Project Communication

After samples have been received, the F&BI project manager communicates with the client, when necessary, regarding sample receipt conditions, specific analysis needs, laboratory capability, and integrity of reported results. Communication is documented in the Project Notes macro, and/or with the Client Communication Record form, which is kept in the project/client files. In addition, any fax or email communication is also kept in the project/client files.

18.0 SUBCONTRACTING ANALYTICAL SAMPLES

It is the policy of F&BI not to subcontract work which we are normally able to perform. For requested analyses which we do not normally perform, the project manager informs the client of the need to subcontract. Work may also be subcontracted if we are temporarily unable to perform one of our normal analyses due to instrument malfunction, or if the client requires certification which we do not have. In these cases the same procedures are followed.

In those cases where we subcontract work, the results reported by the outside laboratory appear under the letterhead of the laboratory reporting the data. Data generated by another laboratory is never reported under our company letterhead. The original report from the contracted laboratory is provided to the client, and a copy is kept with the F&BI project file.

END OF DOCUMENT

APPENDIX A

LIST OF ADMINISTRATIVE SOPS AND QUALITY SYSTEM DOCUMENTS

LIST OF ADMINISTRATIVE SOPS AND QUALITY SYSTEM DOCUMENTS

ADMINISTRATIVE STANDARD OPERATING PROCEDURES	
Title	**Location**
Creating Reports	sops\admin\Reports
Data Integrity	Sops\admin\Data Integrity
Project Manager Procedure (includes Client Communication Record form)	sops\admin\Project Manager
Qualifiers	Sops\admin\Qualifier
Quality System Document Organization	sops\admin\Document Organization
Sample, Extract, and Waste Disposal	sops\admin\Disposal
Sample Receiving	sops\admin\Sample Receiving
Support Equipment Monitoring and Calibration	sops\admin\Support Equipment
Training Records (includes training forms)	sops\admin\Training
ADDITIONAL QUALITY SYSTEM DOCUMENTS	
Archive Access Log	forms\office\archive
Controlled Document Record	sops\Controlled Document Record
DOC Training Summary Database	fbi\nelap\doc_sum
F&BI Certifications/Accreditations	office records
Final Report Checklist	forms\chklist
Internal Audit/Managerial Review Forms	QAM Appendix E
Laboratory Organization/Personnel Qualifications	fbi\nelap\Lab Organization Chart – Personnel Qualifications
Master Log of Laboratory Logbooks	forms\logbooks\ Master Log
Non-Conformance Report Form	forms\nonconformance
Policy and Health & Safety Manual	sops\Policy and Health & Safety Manual
Quality Assurance Manual	sops\QAM
Sample Condition Upon Receipt Checklist Form	forms\checkin\ SampleCondition
Signature List	office records

APPENDIX B

MAJOR ANALYTICAL EQUIPMENT

MAJOR ANALYTICAL EQUIPMENT

Make/Model	Type	Identifier	Software
Agilent 5890	GC/FID	GC 1	ChemStation
Agilent 5890 with Varian Archon and OI 4560	GC/FID/PID Autosampler Purge & Trap	GC 2	 ChemStation
Agilent 5890 with Varian Archon and OI 4560	GC/FID/PID Autosampler Purge & Trap	GC 3	 ChemStation
Agilent 5890	GC/FID	GC 4	ChemStation
Agilent 5890	GC/TCD	GC 5	ChemStation
Agilent 5890	GC/FID	GC 6	ChemStation
Agilent 6890	GC/ECD/ECD	GC 7	EnviroQuant
Agilent 5890 with Tekmar 7000	GC/FID Headspace Autosampler	GC 8	ChemStation
Agilent 6890	GC/ECD/ECD	GC 9	EnviroQuant
Agilent 6890 with Agilent 5973	GC MSD	GC/MS 3	 EnviroQuant
Agilent 6890N with Agilent 5973N and OI 7361 and OI 4660	GC MSD Autosampler Purge & Trap	GC/MS 4	 EnviroQuant
Agilent 6890 with Agilent 5973	GC MSD	GC/MS 6	 EnviroQuant
Agilent 7890A with Agilent 5975C Entech Model #7200 CTS and Entech Model #7016D and Entech Model #3100D and Entech Model #31-350ER and Entech Model #39-FP-01 and Entech DDS Model #PG7-50.00-PSIA	GC MSD Preconcentrator Autosampler/ Vacuum Cleaning System Oven/Vacuum Flow Professor Digital Dilution System (DDS)	GC/MS 7	 EnviroQuant Maveric Entech Entech Entech 3100D Entech Flow Professor

MAJOR ANALYTICAL EQUIPMENT
(Continued)

Make/Model	Type	Identifier	Software
Agilent 6890N with Agilent 7975C Entech Model #7200 CTS and Entech Model #7016D and Entech Model #3100D and Entech Model #31-350ER and Entech Model #39-FP-01 and Entech DDS Model #PG7-50.00-PSIA	GC MSD Preconcentrator Autosampler/ Vacuum Cleaning System Oven/Vacuum Flow Professor Digital Dilution System (DDS)	GC/MS 8	 EnviroQuant Maveric Entech Entech Entech 3100D Entech 3100D Entech Flow Professor
Agilent 7890 with Agilent 5975C	GC MSD	GC/MS 9	 EnviroQuant
Agilent 7890B with Agilent 5977A and Markes Model # TD- 100	GC MSD Autosampler/ Concentrator	GC/MS 10	EnviroQuant Maveric
Agilent 7890B with Agilent 5977B and OI 4100 and OI 4760	GC MSD Autosampler Purge & Trap	GC/MS 11	 EnviroQuant
Agilent 7890B with Agilent 5977B	GC MSD	GC/MS 12	EnviroQuant
Agilent 7890B with Agilent 5977B and OI 4100 and OI 4760	GC MSD Autosampler Purge & Trap	GC/MS 13	 EnviroQuant
Agilent 8890	GC	GC10, GC13, GC14	EnviroQuant
Agilent 8890 with OI 4100	GC Autosampler	GC11	

and OI 4760	Purge & Trap		EnviroQuant
PerkinElmer NexION 300D	ICP/MS	ICP/MS	PerkinElmer Syngistix
PerkinElmer S10 Autosampler	ICP/MS Autosampler	ICP/MS	PerkinElmer S10 Utility
PerkinElmer SC4DX Autosampler	ICP/MS Autosampler	ICP/MS	ESI SC
Tekran 2600	CVAFS	CVAFS	Tekran
Hach TL2300	Turbidimeter	Turbidimeter	N/A
Mettle-Toledo Seven Compact	pH Meter	pH Meter	N/A
Rae Systems, Model# PGM-30 (2)	Hand Held PID	Hand Held PID	N/A
Buck Scientific, Model# HC-404 (1)	IR analyzer	IR analyzer	N/A
Beckman Model TJ-6 (2)	Centrifuge	Centrifuge	N/A
Vortex Genie 2, Model G-560 (3)	Vortex Mixer	Vortex Mixer	N/A
Buchi Syncore	Concentrator	Concentrator No.1	N/A
Buchi Syncore	Concentrator	Concentrator No.2	N/A
Buchi Syncore	Concentrator	Concentrator No.3	N/A
Thermo Scientific Precision Water Bath, Model #2849	Water Bath	Water Bath	N/A
Organomation Associates, Inc. Model #120 (1)	Water Bath	Water Bath	N/A
Sonics VibraCell	Sonicator	Sonicator No.1	N/A

MAJOR ANALYTICAL EQUIPMENT
(Continued)

Make/Model	Type	Identifier	Software
Branson Ultrasonics Corporation, Sonifier Model# 450	Sonicator	Sonicator No.2	N/A
Branson Ultrasonics Corporation, Sonifier Model# 450	Sonicator	Sonicator No.3	N/A
Sonics VibraCell	Sonicator	Sonicator No.4	N/A
Marathon Electric, Model 0523-N191Q-G588 (1)	Sonicator	Sonicator	N/A
Sonics and Material, Inc. Model# VC600 (1)	Sonicator	Sonicator	N/A
Brenson Ultrasonic Bath, Model #M3800	Cavitator	Cavitator No.1	N/A
Brenson Ultrasonic Bath, Model #M3800	Cavitator	Cavitator No.2	N/A
Torbal, Fulcrum Inc., Model #AGCN 100	Analytical Balance	Analytical Balance	N/A
AND Model #HA-120M (1) (white)	Analytical Balance	Analytical Balance	N/A
AND Model #EK-1200A (1)	Analytical Balance	Analytical Balance	N/A
Mettler Toledo, Model #ML1502E/03 (2)	Analytical Balance	Analytical Balance	N/A
Denver Instrument Model #XP-1500 (1)	Analytical Balance	Analytical Balance	N/A
AEAdams CoreBalance	Analytical Balance	Analytical Balance	N/A
US Electrical Motors, Model #E438 (1)	Tumbler	Tumbler	N/A
Emerson Electric Co. (2)	Vacuum Pump	Vacuum Pump	N/A
ThermoScientific Isotemp 100L Oven FA 120V	Oven	Oven	N/A
Stabil-Therm Gravity Oven Model# OV-484A (1)	Oven	Oven	N/A
Thermolyne Corporation, Model # F6000 (1)	Muffle Furnace	Muffle Furnace	N/A

MAJOR ANALYTICAL EQUIPMENT
(Continued)

Make/Model	Type	Identifier	Software
Barnstead/Thermolyne Model#1415M (1)	Muffle Furnace	Muffle Furnace	N/A
Thermolyne Corporation, Model # HPA2245M (2)	Hot Plate	Hot Plate	N/A
Corning Laboratory, Model#PC-300 (1)	Hot Plate	Hot Plate	N/A
Corning Laboratory Model #PC-420 (1)	Hot Plate/Stirrer	Hot Plate/Stirrer	N/A
CPI-MOD Block (70 mL) Digest Heater Block with Controller (2)	Digester/Heater Block	Digester/Heater Block	N/A
Julabo Labortachnik, Model#FC600 or equivalent (2)	Chilling Unit	Chilling Unit	N/A
PolyScience 6000 Series Chiller Model #0772046	Chilling Unit	Chilling Unit	N/A

APPENDIX C
EQUIPMENT MAINTENANCE PROGRAM
(GENERAL GUIDANCE)

EQUIPMENT MAINTENANCE PROGRAM
(GENERAL GUIDANCE)

Instrument	Activity	Approximate Frequency
GC 1, GC 4, and GC 6 *(Semivolatile TPH)* Agilent 5890 Series II	Clean FID	Weekly or as needed
	Check Gases	Replace at 200 PSI
	Change Liner	Every 200 injections or as needed due to response change
	Change Septum	Every 200 injections
	Replace Syringe	As needed if clogged or broken
	Clip Column	As needed to improve chromatography
	Replace Column	As needed
	Change Gold Seal	As needed
GC 2 and GC 3 *(Volatile TPH and BTEX by 8021B)* Agilent 5890 Series II	Clean FID	Weekly or as needed
	Check Gases	Replace at 200 PSI
	Clean PID	As needed
	Replace PID Lamp	As needed to improve sensitivity
	Replace Column	As needed
OI 4560/4660 Concentrator (GC 2, GC 3, GC/MS 4, GC/MS 9, and GC/MS 7)	Check Purge Flow	Monthly
	Replace Trap	As needed
	Clean Sparge Cell	As needed
	Clean Sparge Filter	As needed if clogged
4552/4551 Autosampler (GC 2, GC 3, GC/MS 4, GC/MS 9, and GC/MS 7)	Tighten Syringe Nut	Once a week
	Autocalibrate	As needed
GC 7 *(PCBs, Organic Lead, Canadian Pulp, EDB)* Agilent 5890 Series II	Check Gases	Replace at 200 PSI
	Change Liner	Every 200 injections or as needed due to response change
	Change Septum	Every 200 injections
	Replace Syringe	As needed if clogged or broken
	Clip Column	As needed to improve chromatography
	Replace Column	As needed
	Change Gold Seal	As needed
	Clean ECD	As needed to improve chromatography

EQUIPMENT MAINTENANCE PROGRAM
(GENERAL GUIDANCE)

Instrument	Activity	Approximate Frequency
GC 5 *(Helium Analyzer)* Agilent 5890 Series II	Clean TCD	As needed
	Check Gases	As needed
	Change Liner	As needed
	Change Septum	As needed
	Replace Syringe	As needed
	Clip Column	As needed
	Replace Column	As needed
GC/MS 3, GC/MS 6, GC/MS 8, and GC/MS 10 *(Semivolatiles and Methamphetamine)*	Check Gases	Replace at 200 PSI
	Change Liner	Every 200 injections or if tune fails due to degradation of DDT > 20
	Change Septum	Every 200 injections
	Replace Syringe	As needed if clogged or broken
	Clip Column	As needed to improve chromatography
	Replace Column	As needed
	Change Gold Seal	As needed
	Change Pump Oil	Every 6 months
	Clean Source	As needed
GC/MS 4, GC/MS 9, and GC/MS 7 *(Volatiles)*	Check Gases	Replace at 200 PSI
	Replace Column	As needed
	Change Pump Oil	Every 6 months
	Clean Source	As needed
CVAFS *(Mercury)*	Clean Liquid Gas Separator	Before each run
	Clean Cuvette	As needed
	Replace Lamp	As needed
	Change Tubing	As needed
ICP/MS *(Metals)*	Change Torch	As needed
	Change Tubing	As needed
	Change Coolant	As needed
	Clean Cones	As needed

APPENDIX D

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Parameter	Method	Matrix	Minimum Sample Volume	Container	Preservation	Maximum Holding Time
Organic Analysis						
Diesel Range Organics (Extractable TPH)	8015M NWTPH-Dx	Water	500 mL	500 mL glass	*Cool, ≤6°C	*7 days to extract, 40 days after extr.
	AK 102	Water	1 L	1 L glass		
	8015M NWTPH-Dx AK102/103	Soil	50 grams	4 oz glass	Cool, ≤6°C	14 days to extract, 40 days after extr.
Gasoline Range Organics (Purgable TPH)	8015M NWTPH-Gx AK101	Water	40 mL	40 mL VOA	Cool, ≤6°C, HCl to pH<2, no headspace	14 days
	8015M NWTPH-Gx	Soil	20 grams	3 x 5035 kit or MeOH pres. vial	Cool, ≤6°C/Freeze <-7°C	14 days
	AK101	Soil	app. 50 g	4 oz glass septum top	Methanol	28 days
HCID	NWTPH-HCID	Water	500 mL	500 mL glass	Cool, ≤6°C	7 days to extract, 40 days after extr.
		Soil	50 grams	4 oz glass	Cool, ≤6°C	14 days
HEM (O&G), SGT-HEM	1664	Water	1 Liter	1 L glass	Cool, ≤6°C, H_2SO_4 to pH<2	28 days
PCBs	8082A	Water	1 Liter	1 L glass	Cool, ≤6°C	none
	8082A	Soil	50 grams	4 oz glass	Cool, ≤6°C	none
PNAs (PAHs)	8270D or 8270D SIM	Water	500 mL	500 mL glass	Cool, ≤6°C	7 days to extract, 40 days after extr.
	8270D or 8270D SIM	Soil	50 grams	4 oz glass	Cool, ≤6°C	14 days to extract, 40 days after extr.
Purgable Aromatic Hydrocarbons (BTEX, MTBE)	8021B or AK101	Water	40 mL	40 mL VOA	Cool, ≤6°C, HCl to pH<2, no headspace	14 days
	8021B	Soil	20 grams	3 x 5035 kit or MeOH pres. vial	Cool, ≤6°C/Freeze <-7°C	14 days
	AK101	Soil	app. 50 g	4 oz glass septum top	Methanol	28 days
Semivolatile Organic Compounds (SVOCs, BNAs)	8270D	Water	1 Liter	1 L glass	Cool, ≤6°C	7 days to extract, 40 days after extr.
	8270D	Soil	50 grams	4 oz glass	Cool, ≤6 °C	14 days to extract, 40 days after extr.

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Parameter	Method	Matrix	Minimum Sample Volume	Container	Preservation	Maximum Holding Time
Organic Analysis (Continued)						
Volatile Organic Compounds (VOCs)	8260C	Water	40 mL	40 mL VOA	Cool, ≤6°C, HCl to pH<2, no headspace	14 days
	8260C	Soil	10 grams	40 mL VOA	Freeze within 48 hrs., ≤0°C	14 days

* For NWTPH-Dx and AK102 methods, if preserved with HCl or H_2SO_4 to pH<2, holding time is 14 days to extract.

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Parameter	Method	Matrix	Minimum Sample Volume	Container	Preservation	Maximum Holding Time
Inorganic Analysis						
Alkalinity	SM2320B	Water	100 mL	500 mL poly	Cool, ≤6°C	14 days
BOD	405.1	Water	1 Liter	1 L glass	Cool, ≤6°C	48 hours
Chloride	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
COD	410.4	Water	100 mL	500 mL poly	H_2SO_4 to pH<2	28 days
Conductivity	120.1	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
Cyanide, total	335.2	Water	1 Liter	1 L glass	NaOH to pH 12	14 days
Fluoride	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
Hardness	SM2340B	Water	100 mL	500 mL poly	HNO_3 to pH,<2	6 months
Nitrate	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	48 hours
Nitrite	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	48 hours
Nitrate-Nitrite	353.2	Water	100 mL	500 mL poly	Cool, ≤6°C, H_2SO_4 to pH<2	28 days
pH	9040/150.1	Water	20 mL	500 mL poly	None	As soon as possible
	9045	Soil	20 grams	4 oz glass	None	28 days
Phosphorus, total	365.2	Water	100 mL	500 mL poly	Cool, ≤6°C, H_2SO_4 to pH<2	28 days
Sulfate	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
Sulfide	376.2	Water	500 mL	500 mL poly	Cool, ≤6°C ZnAcetate plus NaOH to pH>9	7 days
Sulfite	377.1	Water	100 mL	500 mL poly	None	24 hours
Total Dissolved Solids (TDS)	SM2540C/ 160.1	Water	500 mL	500 mL poly	Cool, ≤6°C	7 days
Total Organic Carbon (TOC)	415.1/ 9060M	Water	100 mL	500 mL poly	H_2SO_4 to pH<2	28 days
Total Suspended Solids (TSS)	SM2540D	Water	250 mL	500 mL poly	Cool, ≤6°C	7 days
Turbidity	SM2130B	Water	20 mL	500 mL poly	Cool, ≤6°C	48 hours
Metals Analysis						
Metals (except Cr VI and Mercury)	200.8/6020 or 6010	Water	200 mL	500 mL poly or glass	HNO_3 to pH<2 at least 24 hours prior to analysis	6 months
	200.8/6020 or 6010	Soil	20 grams	4 oz glass	Cool, ≤6°C	6 months
Chromium VI	SM3500Cr	Water	100 mL	500 mL poly	Cool, ≤6°C	24 hours
	7196A	Soil	50 grams	4 oz glass	Cool, ≤6°C	30 days
Mercury	1631/200.8/ 6020/7040	Water	125 mL	250 mL poly, fluoropolymer, or glass	HNO_3 to pH<2	28 days (48 hours if not preserved)
	1631/200.8/ 6020/7041	Soil	50 grams	4 oz glass	Cool, ≤6°C	28 days

APPENDIX E

INTERNAL AUDIT/MANAGERIAL REVIEW FORMS

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Summary

Areas audited

1. Quality System:

Quality Assurance Manual and SOPs reviewed ☐
(attach "List of Current SOPs" with reviewed documents marked)

2. Support Equipment ☐

3. Non-Conformance reports (review) ☐

4. Project Management/Reports ☐

5. Sample receiving, storage, disposal ☐

6. Document Control/Training ☐

7. Extractions:

Organic		Inorganic		Volatiles	
3510	☐	200.8	☐	5030	☐
3550	☐	1631	☐	5035	☐
3580	☐	3005	☐	3580	☐
3630	☐	3050	☐		

8. Analysis/Calculations:

8260	☐	RSK-175	☐	TPHD	☐	200.8	☐
8270	☐	1664	☐	TSS	☐	6020	☐
8082	☐	Methamphetamine	☐	pH	☐	1631	☐
524.2	☐	Hardness	☐	Spec. Grav.	☐	TO-15	☐
8011	☐	TPHG/BTEX	☐	Turbidity	☐	TO-17	☐
8081	☐	Other	☐				

Total number of corrective actions_____

Comments:_____

Does any non-conformance/corrective action require further notification?

Yes ☐ No ☐ (If yes, explain)

_____

Attach all internal audit checksheets and corrective action forms and file in the internal QA/QC audit folder.

QA Officer's Signature_____

Date Audit Review Completed_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Sample receiving, storage, disposal

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO
Is the Master Sample Log-In book in order?	_____	_____
Are COCs filled out correctly during sample check-in?	_____	_____
Are all samples/projects traceable, i.e. labeled?	_____	_____
Are samples stored in the correct refrigerators?	_____	_____
Are refrigerator temperatures recorded daily?	_____	_____
Are standards/solvents logged in?	_____	_____
Are sample disposal records kept?	_____	_____
Disposal Area:		
Does each drum have an up to date contents list?	_____	_____
Are drums properly labeled?	_____	_____
Are waste materials contained properly in each drum?	_____	_____
Are waste disposal records kept?	_____	_____
Are all prior external and internal findings addressed?	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Extractions

Organic ☐ Inorganic ☐ Volatiles ☐

Method(s): _____ _____ _____

_____ _____ _____

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO	N/A
Are waste containers properly labeled and stored?	_____	_____	_____
Was any new equipment properly validated prior to use?	_____	_____	_____
Are manufacturer's certificates which verify calibration/accuracy available?	_____	_____	_____
Are analytical balances checked daily?	_____	_____	_____
Are autopipets calibrated at least monthly?	_____	_____	_____
Are bottle top dispensers calibrated at least monthly?	_____	_____	_____
Is the oven temperature recorded daily?	_____	_____	_____
Is the water bath temperature recorded daily?	_____	_____	_____
Is the hot block temperature recorded daily?	_____	_____	_____
Is equipment which falls out of calibration repaired or taken out of service?	_____	_____	_____
Are all prior external and internal findings addressed?	_____	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Analysis/Calculations Method:_____

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO
Are standards traceable to a certified source?	_____	_____
Are standards labeled with an expiration date?	_____	_____
Are standards taken out of use after the expiration date?	_____	_____
Do initial calibrations meet the method requirements?	_____	_____
Are initial calibrations verified with a second source standard?	_____	_____
Are initial calibrations verified with continuing calibration verification standards?	_____	_____
Do QC sample results (method blanks, LCS, MS) meet the method requirements?	_____	_____
Are corrective actions taken for any result which falls outside of acceptance criteria?	_____	_____
Is the SOP up to date?	_____	_____
Are instrument maintenance logs up to date?	_____	_____
Are MDLs up to date?	_____	_____
Are reporting limits based on MDLs?	_____	_____
Are data calculations based on the initial calibration?	_____	_____
Is data flagged with qualifiers if necessary?	_____	_____
Are all prior external and internal findings addressed?	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Project Management/Reports

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO
Are extraction worksheets filled out completely and clearly?	_____	_____
Are capability issues communicated to the client and clearly documented?	_____	_____
Are any changes to the COC initialed/dated with the name of the person requesting the change clearly indicated?	_____	_____
Are the subcontracted samples documented to client?	_____	_____
Is the Non-Conformance form used to document client complaints?	_____	_____
Are subcontract lab reports forwarded without change to the client, and clearly identified in our final report?	_____	_____
Are amended reports clearly identified?	_____	_____
Are additional reports clearly identified?	_____	_____
Are draft results/reports clearly identified?	_____	_____
Are flags from analysts left as is?	_____	_____
Is data flagged in an unambiguous manner?	_____	_____
Is there a case narrative when the validity of the data is in question?	_____	_____
Are all prior external and internal findings addressed?	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Document Control/Training

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO
Is the employeed signature list up to date?	_____	_____
Are all logbooks numbered and listed in the Master Log of Laboratory Logbooks?	_____	_____
Is the Controlled Document Record used to track distribution of controlled documents?	_____	_____
Is the Archive Access Log used?	_____	_____
Is the List of Current SOPs up to date?	_____	_____
Are the Current SOP binders up to date?	_____	_____
Do Employee Attestation forms list current SOPs and revision numbers?	_____	_____
Have employees initialed Attestation forms for the current revision of all applicable SOPs?	_____	_____
Are DOCs complete and clearly identified?	_____	_____
Is the DOC training summary database up to date?	_____	_____
Are Laboratory Organization and Personnel Qualifications summaries up to date?	_____	_____
Is current accreditation summary up to date?	_____	_____
Are all prior external and internal findings addressed?	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Support Equipment

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO
Are primary reference weights and thermometers clearly labeled?	_____	_____
Are standards NIST traceable?	_____	_____
Are daily standards referenced in logbooks?	_____	_____
Are logbooks (refrigerator, water bath, hot block, oven, balance autopipete, etc.) completed as required?	_____	_____
Are logbooks (refrigerator, water bath, hot block, oven, balance autopipete, etc.) bound or in a 3 ring binder?	_____	_____
Is all calibrated support equipment (thermometers, autopipetes, bottle top dispensers, hot blocks, etc.) clearly labeled?	_____	_____
If any equipment is out of specifications, is it taken out of service and clearly labeled as such?	_____	_____
Are all prior external and internal findings addressed?	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

_____

INTERNAL QA/QC AUDIT CORRECTIVE ACTION

Area/Analysis_____

Corrective action given to (name):_____

Given by (name):_____
(Keep a copy of this form for tracking)

Date given:_____ Target response date:_____
(set based on potential need to notify clients and on work load)

Description of non-compliance:_____

_____

_____

Description of root cause and required corrective action:_____
_____

_____

_____

_____

Specific documentation required: (Return this form to the auditor with the required documentation attached.)

_____

_____

_____

Corrective action reviewed and approved:

QC Officer (or designee):_____ Date:_____

(Return this form to QC officer along with attached documentation)

QUALITY SYSTEM
MANAGERIAL REVIEW

Date:_____ Auditor:_____

Review of Calendar Year 20___

Write comments, as needed, in a separate file and attach.

1. Review of most recent internal audit (Date(s)_____)

All areas audited Yes ☐ No ☐

Corrective actions implemented and documented Yes ☐ No ☐

2. Review of non-conformance reports

Corrective actions implemented and documented Yes ☐ No ☐

3. Review of proficiency testing (PT) samples

Analysis completed two times per year per analyte per matrix (for NELAP accredited analyses) Yes ☐ No ☐

Corrective actions implemented and documented Yes ☐ No ☐

4. Review of current accreditation status.

5. Review of recent audits/assessments by external bodies.

External audit(s) by: State/Company_____ Date_____

Corrective actions implemented and documented. Yes ☐ No ☐

6. If audits or data review resulted in changes to previously reported data, were affected clients notified within 30 days? Yes ☐ No ☐ n/a ☐

7. Changes in volume and/or type of work undertaken which may affect quality.

8. Feedback from clients regarding quality. (Include review of any client complaints.)

9. Other relevant factor(s) which may affect quality.

10. Pro-active preventive actions to avoid potential non-conformances.

MANAGERIAL REVIEW CORRECTIVE ACTION

Area/Analysis_____

Corrective action given to (name):_____

Given by (name):_____
(Keep a copy for tracking)

Date given:_____ Target Response Date:_____
(set based on potential need to notify clients and on work load)

Description of non-compliance:_____

_____

_____

Root Cause:_____

_____

Description of required corrective action:_____

_____

Specific documentation required: (Return this sheet to the auditor with the required documentation attached.)

_____

_____

Corrective action reviewed and approved:

Name:_____ Date:_____
(Technical/Laboratory Director or designee)

File along with attached documentation in the management review folder.

APPENDIX F

DEFINITIONS

DEFINITIONS

Acceptance Criteria: specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: the process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one. (NELAC)

Accrediting Authority: the Territorial, State, or federal agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation. (NELAC)

Accuracy: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Analyst: the designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (NELAC)

Audit: a systematic evaluation to determine the conformance to quantitative *and qualitative* specifications of some operational function or activity. (EPA-QAD)

Batch: environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. (NELAC Quality Systems Committee)

Blank: a sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. Blanks include:
Equipment Blank: a sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)
Field Blank: blank prepared in the field by filling a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)

Instrument Blank: a clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)
Method Blank: a sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. (NELAC)
Reagent Blank: (method reagent blank): a sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Blind Sample: a sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process. (NELAC)

Calibration: to determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration Curve: the graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (NELAC)

Calibration Standard: a substance or reference material used to calibrate an instrument. (QAMS)

Certified Reference Material (CRM): a reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO Guide 30 - 2.2)

Chain of Custody Form: record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; collector; time of collection; preservation; and requested analyses. (NELAC)

Confirmation: verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: Second column confirmation, Alternate wavelength, Derivatization, Mass spectral interpretation, Alternative detectors or, Additional cleanup procedures. (NELAC)

Conformance: an affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

Corrective Action: the action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Audit: a qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality (i.e., that they meet specified acceptance criteria). (NELAC)

Data Reduction: the process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (EPA-QAD)

Demonstration of Capability: a procedure to establish the ability of the analyst to generate acceptable accuracy. (NELAC)

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

Holding Times (Maximum Allowable Holding Times): the maximum times that samples may be held prior to analysis and still be considered valid or not compromised. (40 CFR Part 136)

Internal Standard: a known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method. (NELAC)

Laboratory: a body that calibrates and/or tests. (ISO 25)

Laboratory Control Sample (LCS): a sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. (NELAC)

Laboratory Control Sample Duplicate (LCSD): a second replicate LCS prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte. (QAMS)

Matrix: the substrate of a test sample.

Laboratory Duplicate: aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently. (NELAC)

Matrix Spike (MS): a sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency. (QAMS)

Matrix Spike Duplicate (MSD): a second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte. (QAMS)

Method: see Test Method

Method Detection Limit: the minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136, Appendix B)

National Institute of Standards and Technology (NIST): an agency of the US Department of Commerce's Technology Administration that is working with EPA, States, NELAC, and other public and commercial entities to establish a system under which private sector companies and interested States can be accredited by NIST to provide NIST-traceable proficiency testing (PT) to those laboratories testing drinking water and wastewater. (NIST)

National Environmental Laboratory Accreditation Conference (NELAC): a voluntary organization of State and Federal environmental officials and interest groups purposed primarily to establish mutually acceptable standards for accrediting environmental laboratories. A subset of NELAP. (NELAC)

National Environmental Laboratory Accreditation Program (NELAP): the overall National Environmental Laboratory Accreditation Program of which NELAC is a part. (NELAC)

National Voluntary Laboratory Accreditation Program (NVLAP): a program administered by NIST that is used by providers of proficiency testing to gain accreditation for all compounds/matrices for which NVLAP accreditation is available, and for which the provider intends to provide NELAP PT samples. (NELAC)

Performance Audit: the routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory. (NELAC)

Performance Based Measurement System (PBMS): a set of processes wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting measurement processes which will meet those needs in a cost-effective manner. (NELAC)

Precision: the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (NELAC)

Preservation: refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample. (NELAC)

Proficiency Testing: a means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (NELAC)

Proficiency Testing Study Provider: any person, private party, or government entity that meets stringent criteria to produce and distribute NELAC PT samples, evaluate study results against published performance criteria and report the results to the laboratories, primary accrediting authorities, PTOB/PTPA, and NELAP. (NELAC)

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

Protocol: a detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) which must be strictly followed. (EPA-QAD)

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

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

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

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

Quality Manual: a document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (NELAC)

Quality System: a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC. (ANSI/ASQC E-41994)

Quantitation Limits: levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported at a specified degree of confidence. (NELAC)

Range: the difference between the minimum and the maximum of a set of values. (EPA-QAD)

Raw Data: any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments. If exact copies of raw data have been prepared (e.g., tapes which have been transcribed verbatim, data and verified accurate by signature), the exact copy or exact transcript may be submitted. (EPA-QAD)

Reference Material: a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (ISO Guide 30-2.1)

Reference Method: a method of known and documented accuracy and precision issued by an organization recognized as competent to do so. (NELAC*)*

Reference Standard: a standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived. (VIM-6.08)

Replicate Analyses: the measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval. (NELAC)

Reporting Limits: routinely reported lower limits of quantitation, typically 2 to 10 times the MDL.

Sample Tracking: procedures employed to record the possession of the samples from the time of sampling until analysis, reporting, and archiving. These procedures include the use of a Chain of Custody Form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples. (NELAC)

Selectivity: the capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. (EPA-QAD)

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

Spike: a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes. (NELAC)

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

Standardized Reference Material (SRM): a certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method. (EPA-QAD)

Supervisor (however named): the individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses. (NELAC)

Surrogate: a substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes. (QAMS)

Technical Director: individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory. (NELAC)

Test: a technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate. (ISO/IEC Guide 2-12.1, amended)

Test Method: an adoption of a scientific technique for a specific measurement problem, as documented in a laboratory SOP or published by a recognized authority. (NELAC)

Testing Laboratory: a laboratory that performs tests (ISO/IEC Guide 2-12.4)

The NELAC Institute (TNI): A non-profit organization whose mission is to foster the generation of environmental data of known and documented quality through an open, inclusive and transparent process that is responsive to the needs of the community. (TNI)

Traceability: the property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons. (VIM-6.12)

United States Environmental Protection Agency (EPA): the federal governmental agency with responsibility for protecting public health and safeguarding and improving the natural environment (i.e., the air, water, and land) upon which human life depends. (US-EPA)

Validation: the process of substantiating specified performance criteria. (EPA-QAD)

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

Sources:
40CFR Part 136

American Society for Quality Control (ASQC), Definitions of Environmental Quality Assurance Terms

American National Standards Institute (ANSI), Style Manual for Preparation of Proposed American National Standards, Eighth Edition, March 1991

ANSI/ASQC E4, 1994

International Standards Organization (ISO) Guides 2, 30, 8402

International Vocabulary of Basic and General Terms in Metrology (VIM): 1984. Issued by BIPM, IEC, ISO and OIML

National Institute of Standards and Technology (NIST)

National Environmental Laboratory Accreditation Conference (NELAC), July 1998 Standards

The NELAC Institute (TNI), Web site, January 2009.

US EPA Quality Assurance Management Section (QAMS), Glossary of Terms of Quality Assurance Terms, 8/31/92 and 12/6/95

US EPA Quality Assurance Division (QAD)

Appendix D

Laboratory Sample Quality Control and Detection Limits

Analysis For Total Metals By EPA Method 6020/200.8

Client ID:	Method Blank	Client:	Friedman & Bruya
Date Received:	NA	Project:	Study SM-137, UST-112
Date Extracted:	04/13/23	Lab ID:	I3-288 mb
Date Analyzed:	04/13/23	Data File:	I3-288 mb.128
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<1
Arsenic	<1
Barium	<1
Beryllium	<1
Cadmium	<1
Chromium	<5
Cobalt	<1
Copper	<5
Lead	<1
Manganese	<1
Mercury	<1
Molybdenum	<1
Nickel	<2
Selenium	<1
Silver	<1
Thallium	<1
Vanadium	<1
Zinc	<5

Analysis For Total Metals By EPA Method 6020/200.8

Client ID:	Method Blank	Client:	
Date Received:	NA	Project:	
Date Extracted:	05/05/23	Lab ID:	I3-349 mb2
Date Analyzed:	05/05/23	Data File:	I3-349 mb2.038
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<1
Arsenic	<1
Barium	<1
Beryllium	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Iron	<50
Lead	<1
Manganese	<1
Mercury	<1
Molybdenum	<1
Nickel	<1
Selenium	<1
Silver	<1
Thallium	<1
Vanadium	<1
Zinc	<5

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	02/21/24	Lab ID:	04-374 mb 1/30
Date Analyzed:	02/21/24	Data File:	022107.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	AL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	67	20	157
Decachlorobiphenyl	96	28	158

Compounds:	Concentration mg/kg (ppm) Dry Weight
alpha-BHC	<0.01
gamma-BHC (Lindane)	<0.01
beta-BHC	<0.01
delta-BHC	<0.01
Heptachlor	<0.01
Aldrin	<0.01
Heptachlor Epoxide	<0.01
trans-Chlordane	<0.01
cis-Chlordane	<0.01
4,4'-DDE	<0.01
Endosulfan I	<0.01
Dieldrin	<0.01
Endrin	<0.01
4,4'-DDD	<0.01
Endosulfan II	<0.01
4,4'-DDT	<0.01
Endrin Aldehyde	<0.01
Methoxychlor	<0.01
Endosulfan Sulfate	<0.01
Endrin Ketone	<0.01
Toxaphene	<1

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	04/01/24	Lab ID:	04-755 mb
Date Analyzed:	04/01/24	Data File:	040116.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	60	20	121
Decachlorobiphenyl	46	11	159

Compounds:	Concentration ug/L
alpha-BHC	<0.005
gamma-BHC (Lindane)	<0.005
beta-BHC	<0.005
delta-BHC	<0.005
Heptachlor	<0.005
Aldrin	<0.005
Heptachlor Epoxide	<0.005
trans-Chlordane	<0.005
cis-Chlordane	<0.005
4,4'-DDE	<0.005
Endosulfan I	<0.005
Dieldrin	<0.005
Endrin	<0.005
4,4'-DDD	<0.005
Endosulfan II	<0.005
4,4'-DDT	<0.005
Endrin Aldehyde	<0.005
Methoxychlor	<0.005
Endosulfan Sulfate	<0.005
Endrin Ketone	<0.005
Toxaphene	<0.05

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	04/02/24	Lab ID:	04-758 mb 1/30
Date Analyzed:	04/02/24	Data File:	040222.D
Matrix:	Soil	Instrument:	GC7
Units:	mg/kg (ppm) Dry Weight	Operator:	AL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	102	11	162
Decachlorobiphenyl	105	11	152

Compounds:	Concentration mg/kg (ppm) Dry Weight
Aroclor 1221	<0.02
Aroclor 1232	<0.02
Aroclor 1016	<0.02
Aroclor 1242	<0.02
Aroclor 1248	<0.02
Aroclor 1254	<0.02
Aroclor 1260	<0.02
Aroclor 1262	<0.02
Aroclor 1268	<0.02

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	04/04/24 06:00	Lab ID:	04-0767 mb
Date Analyzed:	04/04/24 11:25	Data File:	040412.D
Matrix:	Soil	Instrument:	GCMS4
Units:	mg/kg (ppm) Dry Weight	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	86	114
Toluene-d8	102	86	115
4-Bromofluorobenzene	96	83	116

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Ethanol	<50	trans-1,3-Dichloropropene	<0.05
Dichlorodifluoromethane	<0.5	1,1,2-Trichloroethane	<0.05
Chloromethane	<0.5	2-Hexanone	<0.5
Vinyl chloride	<0.05	1,3-Dichloropropane	<0.05
Bromomethane	<0.5	Tetrachloroethene	<0.025
Chloroethane	<0.5	Dibromochloromethane	<0.05
Trichlorofluoromethane	<0.5	1,2-Dibromoethane (EDB)	<0.05
2-Propanol	<0.5	Chlorobenzene	<0.05
Acetone	<5	Ethylbenzene	<0.05
1,1-Dichloroethene	<0.05	1,1,1,2-Tetrachloroethane	<0.05
Hexane	<0.25	m,p-Xylene	<0.1
Methylene chloride	<0.5	o-Xylene	<0.05
t-Butyl alcohol (TBA)	<2.5	Styrene	<0.05
Methyl t-butyl ether (MTBE)	<0.05	Isopropylbenzene	<0.05
trans-1,2-Dichloroethene	<0.05	Bromoform	<0.05
Diisopropyl ether (DIPE)	<0.05	n-Propylbenzene	<0.05
1,1-Dichloroethane	<0.05	Bromobenzene	<0.05
Ethyl t-butyl ether (ETBE)	<0.05	1,3,5-Trimethylbenzene	<0.05
2,2-Dichloropropane	<0.05	1,1,2,2-Tetrachloroethane	<0.05
cis-1,2-Dichloroethene	<0.05	1,2,3-Trichloropropane	<0.05
Chloroform	<0.05	2-Chlorotoluene	<0.05
2-Butanone (MEK)	<1	4-Chlorotoluene	<0.05
t-Amyl methyl ether (TAME)	<0.05	tert-Butylbenzene	<0.05
1,2-Dichloroethane (EDC)	<0.05	1,2,4-Trimethylbenzene	<0.05
1,1,1-Trichloroethane	<0.05	sec-Butylbenzene	<0.05
1,1-Dichloropropene	<0.05	p-Isopropyltoluene	<0.05
Carbon tetrachloride	<0.05	1,3-Dichlorobenzene	<0.05
Benzene	<0.03	1,4-Dichlorobenzene	<0.05
Trichloroethene	<0.02	1,2-Dichlorobenzene	<0.05
1,2-Dichloropropane	<0.05	1,2-Dibromo-3-chloropropane	<0.5
Bromodichloromethane	<0.05	1,2,4-Trichlorobenzene	<0.25
Dibromomethane	<0.05	Hexachlorobutadiene	<0.25
4-Methyl-2-pentanone	<1	Naphthalene	<0.05
cis-1,3-Dichloropropene	<0.05	1,2,3-Trichlorobenzene	<0.25
Toluene	<0.05		

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	03/28/24 05:46	Lab ID:	04-0685 mb
Date Analyzed:	03/28/24 10:51	Data File:	032809.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	IJL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	93	71	132
Toluene-d8	94	68	139
4-Bromofluorobenzene	103	62	136

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Ethanol	<1,000	trans-1,3-Dichloropropene	<0.4
Dichlorodifluoromethane	<1	1,1,2-Trichloroethane	<0.5
Chloromethane	<10	2-Hexanone	<10
Vinyl chloride	<0.02	1,3-Dichloropropane	<1
Bromomethane	<5	Tetrachloroethene	<1
Chloroethane	<1	Dibromochloromethane	<0.5
Trichlorofluoromethane	<1	1,2-Dibromoethane (EDB)	<0.01
2-Propanol	<10	Chlorobenzene	<1
Acetone	<50	Ethylbenzene	<1
1,1-Dichloroethene	<1	1,1,1,2-Tetrachloroethane	<1
Hexane	<5	m,p-Xylene	<2
Methylene chloride	<5	o-Xylene	<1
t-Butyl alcohol (TBA)	<50	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<5
Diisopropyl ether (DIPE)	<1	n-Propylbenzene	<1
1,1-Dichloroethane	<1	Bromobenzene	<1
Ethyl t-butyl ether (ETBE)	<1	1,3,5-Trimethylbenzene	<1
2,2-Dichloropropane	<1	1,1,2,2-Tetrachloroethane	<0.2
cis-1,2-Dichloroethene	<1	1,2,3-Trichloropropane	<1
Chloroform	<1	2-Chlorotoluene	<1
2-Butanone (MEK)	<20	4-Chlorotoluene	<1
t-Amyl methyl ether (TAME)	<1	tert-Butylbenzene	<1
1,2-Dichloroethane (EDC)	<0.2	1,2,4-Trimethylbenzene	<1
1,1,1-Trichloroethane	<1	sec-Butylbenzene	<1
1,1-Dichloropropene	<1	p-Isopropyltoluene	<1
Carbon tetrachloride	<0.5	1,3-Dichlorobenzene	<1
Benzene	<0.35	1,4-Dichlorobenzene	<1
Trichloroethene	<0.5	1,2-Dichlorobenzene	<1
1,2-Dichloropropane	<1	1,2-Dibromo-3-chloropropane	<10
Bromodichloromethane	<0.5	1,2,4-Trichlorobenzene	<1
Dibromomethane	<1	Hexachlorobutadiene	<0.5
4-Methyl-2-pentanone	<10	Naphthalene	<1
cis-1,3-Dichloropropene	<0.4	1,2,3-Trichlorobenzene	<1
Toluene	<1		

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	04/01/24	Lab ID:	04-0751 mb 1/5
Date Analyzed:	04/02/24	Data File:	040135.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	85	14	115
Phenol-d6	97	29	121
Nitrobenzene-d5	106	16	137
2-Fluorobiphenyl	106	46	122
2,4,6-Tribromophenol	104	17	154
Terphenyl-d14	115	31	167

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
N-Nitrosodimethylamine	<0.05	3-Nitroaniline	<5
Phenol	<0.5	Acenaphthene	<0.01
Bis(2-chloroethyl) ether	<0.05	2,4-Dinitrophenol	<1.5
2-Chlorophenol	<0.5	Dibenzofuran	<0.05
1,3-Dichlorobenzene	<0.05	2,4-Dinitrotoluene	<0.25
1,4-Dichlorobenzene	<0.05	4-Nitrophenol	<1.5
1,2-Dichlorobenzene	<0.05	Diethyl phthalate	<0.5
Benzyl alcohol	<0.5	Fluorene	<0.01
2,2'-Oxybis(1-chloropr...	<0.05	4-Chlorophenyl phenyl ...	<0.05
2-Methylphenol	<0.5	1,2-Diphenylhydrazine	<0.05
Hexachloroethane	<0.05	N-Nitrosodiphenylamine	<0.05
N-Nitroso-di-n-propyla...	<0.05	4-Nitroaniline	<5
3-Methylphenol + 4-Met...	<1	4,6-Dinitro-2-methylph...	<1.5
Nitrobenzene	<0.05	4-Bromophenyl phenyl e...	<0.05
Isophorone	<0.05	Hexachlorobenzene	<0.05
2-Nitrophenol	<0.5	Pentachlorophenol	<0.25
2,4-Dimethylphenol	<0.5	Phenanthrene	<0.01
Benzoic acid	<2.5	Anthracene	<0.01
Bis(2-chloroethoxy)met...	<0.05	Carbazole	<0.05
2,4-Dichlorophenol	<0.5	Di-n-butyl phthalate	<0.5
1,2,4-Trichlorobenzene	<0.05	Fluoranthene	<0.01
Naphthalene	<0.01	Benzidine	<1
Hexachlorobutadiene	<0.05	Pyrene	<0.01
4-Chloroaniline	<5	Benzyl butyl phthalate	<0.5
4-Chloro-3-methylphenol	<0.5	3,3'-Dichlorobenzidine	<0.5
2-Methylnaphthalene	<0.01	Benz(a)anthracene	<0.01
1-Methylnaphthalene	<0.01	Chrysene	<0.01
Hexachlorocyclopentadiene	<0.15	Bis(2-ethylhexyl) phth...	<0.8
2,4,6-Trichlorophenol	<0.5	Di-n-octyl phthalate	<0.5
2,4,5-Trichlorophenol	<0.5	Benzo(a)pyrene	<0.01
2-Chloronaphthalene	<0.05	Benzo(b)fluoranthene	<0.01
2-Nitroaniline	<0.25	Benzo(k)fluoranthene	<0.01
Dimethyl phthalate	<0.5	Indeno(1,2,3-cd)pyrene	<0.01
Acenaphthylene	<0.01	Dibenz(a,h)anthracene	<0.01

2,6-Dinitrotoluene	<0.25	Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	04/01/24	Lab ID:	04-750 mb
Date Analyzed:	04/01/24	Data File:	040114.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	35	10	60
Phenol-d6	25	10	49
Nitrobenzene-d5	82	15	144
2-Fluorobiphenyl	83	25	128
2,4,6-Tribromophenol	78	10	142
Terphenyl-d14	108	41	138

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
N-Nitrosodimethylamine	<0.2	3-Nitroaniline	<20
Phenol	<2	Acenaphthene	<0.02
Bis(2-chloroethyl) ether	<0.2	2,4-Dinitrophenol	<6
2-Chlorophenol	<2	Dibenzofuran	<0.02
1,3-Dichlorobenzene	<0.2	2,4-Dinitrotoluene	<1
1,4-Dichlorobenzene	<0.2	4-Nitrophenol	<6
1,2-Dichlorobenzene	<0.2	Diethyl phthalate	<2
Benzyl alcohol	<2	Fluorene	<0.02
2,2'-Oxybis(1-chloropr...	<0.2	4-Chlorophenyl phenyl ...	<0.2
2-Methylphenol	<2	1,2-Diphenylhydrazine	<0.2
Hexachloroethane	<0.2	N-Nitrosodiphenylamine	<0.2
N-Nitroso-di-n-propyla...	<0.2	4-Nitroaniline	<20
3-Methylphenol + 4-Met...	<4	4,6-Dinitro-2-methylph...	<6
Nitrobenzene	<0.2	4-Bromophenyl phenyl e...	<0.2
Isophorone	<0.2	Hexachlorobenzene	<0.2
2-Nitrophenol	<2	Pentachlorophenol	<1
2,4-Dimethylphenol	<2	Phenanthrene	<0.02
Benzoic acid	<20	Anthracene	<0.02
Bis(2-chloroethoxy)met...	<0.2	Carbazole	<0.02
2,4-Dichlorophenol	<2	Di-n-butyl phthalate	<2
1,2,4-Trichlorobenzene	<0.2	Fluoranthene	<0.02
Naphthalene	<0.2	Benzidine	<4
Hexachlorobutadiene	<0.2	Pyrene	<0.02
4-Chloroaniline	<20	Benzyl butyl phthalate	<2
4-Chloro-3-methylphenol	<2	3,3'-Dichlorobenzidine	<2
2-Methylnaphthalene	<0.2	Benz(a)anthracene	<0.02
1-Methylnaphthalene	<0.2	Chrysene	<0.02
Hexachlorocyclopentadiene	<0.6	Bis(2-ethylhexyl) phth...	<3.2
2,4,6-Trichlorophenol	<2	Di-n-octyl phthalate	<2
2,4,5-Trichlorophenol	<2	Benzo(a)pyrene	<0.02
2-Chloronaphthalene	<0.2	Benzo(b)fluoranthene	<0.02
2-Nitroaniline	<1	Benzo(k)fluoranthene	<0.02
Dimethyl phthalate	<2	Indeno(1,2,3-cd)pyrene	<0.02
Acenaphthylene	<0.02	Dibenz(a,h)anthracene	<0.02

2,6-Dinitrotoluene	<1	Benzo(g,h,i)perylene	<0.04

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Collected:	04/03/24	Lab ID:	04-0689 mb
Date Analyzed:	04/03/24	Data File:	040311.D
Matrix:	Air	Instrument:	GCMS8
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	94	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<75
APH EC9-12 aliphatics	<25
APH EC9-10 aromatics	<25

Date Extracted: 03/25/24
Date Analyzed: 03/26/24

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
Method Blank 04-618 MB	<0.02	<0.02	<0.02	<0.06	<5	81

Date Extracted: 03/28/24
Date Analyzed: 03/29/24

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
Method Blank 04-627 MB	<1	<1	<1	<3	<100	104

Date Extracted: 03/27/24
Date Analyzed: 03/27/24

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES
FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL
USING METHOD NWTPH-Dx
Extended to Include Motor Oil Range Compounds
Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Diesel Extended (C_{10}-C_{36})	Surrogate (% Recovery) (Limit 50-150)
Method Blank 04-734 MB	<50	104

Date Extracted: 03/28/24
Date Analyzed: 03/28/24

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND RESIDUAL RANGE USING METHOD NWTPH-Dx

Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Residual Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 50-150)
Method Blank 04-734 MB2	<50	<250	87

Date Extracted: 03/29/24
Date Analyzed: 03/29/24

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND RESIDUAL RANGE USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Residual Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
Method Blank 04-745 MB	<100	<250	121

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Collected:	04/03/24	Lab ID:	04-0689 mb
Date Analyzed:	04/03/24	Data File:	040311.D
Matrix:	Air	Instrument:	GCMS8
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	94	70	130

Compounds:	Concentration ug/m3	Concentration ppbv	Compounds:	ug/m3	ppbv
Propene	<1.2	<0.7	1,2-Dichloropropane	<0.23	<0.05
Dichlorodifluoromethane	<0.99	<0.2	1,4-Dioxane	<0.36	<0.1
Chloromethane	<3.7	<1.8	2,2,4-Trimethylpentane	<4.7	<1
F-114	<2.1	<0.3	Methyl methacrylate	<4.1	<1
Vinyl chloride	<0.26	<0.1	Heptane	<4.1	<1
1,3-Butadiene	<0.044	<0.02	Bromodichloromethane	<0.067	<0.01
Butane	<4.8	<2	Trichloroethene	<0.11	<0.02
Bromomethane	<3.9	<1	cis-1,3-Dichloropropene	<0.91	<0.2
Chloroethane	<2.6	<1	4-Methyl-2-pentanone	<8.2	<2
Vinyl bromide	<0.44	<0.1	trans-1,3-Dichloropropene	<0.45	<0.1
Ethanol	<7.5	<4	Toluene	<7.5	<2
Acrolein	<0.11	<0.05	1,1,2-Trichloroethane	<0.055	<0.01
Pentane	<5.9	<2	2-Hexanone	<4.1	<1
Trichlorofluoromethane	<2.2	<0.4	Tetrachloroethene	<6.8	<1
Acetone	<4.8	<2	Dibromochloromethane	<0.085	<0.01
2-Propanol	<8.6	<3.5	1,2-Dibromoethane (EDB)	<0.077	<0.01
1,1-Dichloroethene	<0.4	<0.1	Chlorobenzene	<0.46	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1	Ethylbenzene	<0.43	<0.1
Methylene chloride	<35	<10	1,1,2,2-Tetrachloroethane	<0.14	<0.02
t-Butyl alcohol (TBA)	<12	<4	Nonane	<5.2	<1
3-Chloropropene	<3.1	<1	Isopropylbenzene	<9.8	<2
CFC-113	<1.5	<0.2	2-Chlorotoluene	<5.2	<1
Carbon disulfide	<6.2	<2	Propylbenzene	<4.9	<1
Methyl t-butyl ether (MTBE)	<7.2	<2	4-Ethyltoluene	<4.9	<1
Vinyl acetate	<7	<2	m,p-Xylene	<0.87	<0.2
1,1-Dichloroethane	<0.4	<0.1	o-Xylene	<0.43	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1	Styrene	<0.85	<0.2
Hexane	<3.5	<1	Bromoform	<2.1	<0.2
Chloroform	<0.049	<0.01	Benzyl chloride	<0.052	<0.01
Ethyl acetate	<7.2	<2	1,3,5-Trimethylbenzene	<4.9	<1
Tetrahydrofuran	<0.59	<0.2	1,2,4-Trimethylbenzene	<4.9	<1
2-Butanone (MEK)	<5.9	<2	1,3-Dichlorobenzene	<0.6	<0.1
1,2-Dichloroethane (EDC)	<0.04	<0.01	1,4-Dichlorobenzene	<0.23	<0.038
1,1,1-Trichloroethane	<0.55	<0.1	1,2-Dichlorobenzene	<0.6	<0.1
Carbon tetrachloride	<0.31	<0.05	1,2,4-Trichlorobenzene	<0.74	<0.1
Benzene	<0.32	<0.1	Naphthalene	<0.26	<0.05
Cyclohexane	<6.9	<2	Hexachlorobutadiene	<0.21	<0.02

Calculation Data	040311.D04-0689 mb ve15	Air	1	1
15	11	**STANDARD**		

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES
FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	85	87	85-115	2
Arsenic	mg/kg (ppm)	10	96	97	85-115	1
Barium	mg/kg (ppm)	50	92	93	85-115	1
Beryllium	mg/kg (ppm)	5	104	104	85-115	0
Cadmium	mg/kg (ppm)	10	97	98	85-115	1
Chromium	mg/kg (ppm)	50	100	99	85-115	1
Cobalt	mg/kg (ppm)	20	102	103	85-115	1
Copper	mg/kg (ppm)	50	101	101	85-115	0
Lead	mg/kg (ppm)	50	101	101	85-115	0
Manganese	mg/kg (ppm)	20	98	98	85-115	0
Mercury	mg/kg (ppm)	5	110	111	85-115	1
Molybdenum	mg/kg (ppm)	20	95	94	85-115	1
Nickel	mg/kg (ppm)	25	96	97	85-115	1
Selenium	mg/kg (ppm)	5	91	89	85-115	2
Silver	mg/kg (ppm)	10	96	96	85-115	0
Thallium	mg/kg (ppm)	5	101	102	85-115	1
Vanadium	mg/kg (ppm)	30	113	112	85-115	1
Zinc	mg/kg (ppm)	50	100	101	85-115	1

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES
FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 402378-01 rr (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	ug/L (ppb)	20	1.05	97	96	70-130	1
Arsenic	ug/L (ppb)	10	<1	93	92	70-130	1
Barium	ug/L (ppb)	50	9.10	96	96	70-130	0
Beryllium	ug/L (ppb)	5	<1	92	91	70-130	1
Cadmium	ug/L (ppb)	5	<1	96	94	70-130	2
Chromium	ug/L (ppb)	20	<1	94	93	70-130	1
Cobalt	ug/L (ppb)	20	<1	93	92	70-130	1
Copper	ug/L (ppb)	20	<5	93	91	70-130	2
Iron	ug/L (ppb)	100	156	88 b	85 b	70-130	3 b
Lead	ug/L (ppb)	10	<1	89	88	70-130	1
Manganese	ug/L (ppb)	20	8.99	90 b	90 b	70-130	0 b
Mercury	ug/L (ppb)	5	<1	84	83	70-130	1
Molybdenum	ug/L (ppb)	10	<1	94	93	70-130	1
Nickel	ug/L (ppb)	20	<1	94	93	70-130	1
Selenium	ug/L (ppb)	5	<1	96	91	70-130	5
Silver	ug/L (ppb)	5	<1	88	87	70-130	1
Thallium	ug/L (ppb)	5	<1	90	88	70-130	2
Vanadium	ug/L (ppb)	20	<1	93	93	70-130	0
Zinc	ug/L (ppb)	50	32.9	91 b	90 b	70-130	1 b

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	ug/L (ppb)	20	94	85-115
Arsenic	ug/L (ppb)	10	92	85-115
Barium	ug/L (ppb)	50	96	85-115
Beryllium	ug/L (ppb)	5	95	85-115
Cadmium	ug/L (ppb)	5	93	85-115
Chromium	ug/L (ppb)	20	96	85-115
Cobalt	ug/L (ppb)	20	97	85-115
Copper	ug/L (ppb)	20	95	85-115
Iron	ug/L (ppb)	100	97	85-115
Lead	ug/L (ppb)	10	94	85-115
Manganese	ug/L (ppb)	20	95	85-115
Mercury	ug/L (ppb)	5	87	85-115
Molybdenum	ug/L (ppb)	10	93	85-115
Nickel	ug/L (ppb)	20	96	85-115
Selenium	ug/L (ppb)	5	97	85-115
Silver	ug/L (ppb)	5	91	85-115
Thallium	ug/L (ppb)	5	94	85-115
Vanadium	ug/L (ppb)	20	97	85-115
Zinc	ug/L (ppb)	50	96	85-115

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 403229-01 x10 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	mg/kg (ppm)	5	<0.025	134	152	71-125	13

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Mercury	mg/kg (ppm)	5	123	68-143

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES FOR
TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 403411-01 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	<0.1	78	94	71-125	18

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Mercury	ug/L (ppb)	0.01	99	66-126

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES
FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 403297-01 x5 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	<5	92	104	75-125	12
Arsenic	mg/kg (ppm)	10	6.39	76 b	108 b	75-125	35 b
Barium	mg/kg (ppm)	50	68.1	67 b	90 b	75-125	29 b
Beryllium	mg/kg (ppm)	5	<5	98	98	75-125	0
Cadmium	mg/kg (ppm)	10	<5	97	96	75-125	1
Chromium	mg/kg (ppm)	50	13.5	93 b	98 b	75-125	5 b
Cobalt	mg/kg (ppm)	20	<5	96	98	75-125	2
Copper	mg/kg (ppm)	50	<25	87	94	75-125	8
Lead	mg/kg (ppm)	50	36.1	97 b	187 b	75-125	63 b
Manganese	mg/kg (ppm	20	387	<1.00	25	75-125	
Mercury	mg/kg (ppm	5	<5	98	100	75-125	2
Molybdenum	mg/kg (ppm)	20	<5	93	96	75-125	3
Nickel	mg/kg (ppm)	25	21.1	77 b	99 b	75-125	25 b
Selenium	mg/kg (ppm)	5	<5	86	91	75-125	6
Silver	mg/kg (ppm)	10	<5	90	92	75-125	2
Thallium	mg/kg (ppm)	5	<5	84	82	75-125	2
Vanadium	mg/kg (ppm)	30	31.4	69 b	235 b	75-125	109 b
Zinc	mg/kg (ppm)	50	142	49 b	83 b	75-125	52 b

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/kg (ppm)	20	104	80-120
Arsenic	mg/kg (ppm)	10	87	80-120
Barium	mg/kg (ppm)	50	98	80-120
Beryllium	mg/kg (ppm)	5	111	80-120
Cadmium	mg/kg (ppm)	10	103	80-120
Chromium	mg/kg (ppm)	50	116	80-120
Cobalt	mg/kg (ppm)	20	109	80-120
Copper	mg/kg (ppm)	50	102	80-120
Lead	mg/kg (ppm)	50	100	80-120
Manganese	mg/kg (ppm)	20	97	80-120
Mercury	mg/kg (ppm)	5	90	80-120
Molybdenum	mg/kg (ppm)	20	91	80-120
Nickel	mg/kg (ppm)	25	105	80-120
Selenium	mg/kg (ppm)	5	97	80-120
Silver	mg/kg (ppm)	10	99	80-120
Thallium	mg/kg (ppm)	5	99	80-120
Vanadium	mg/kg (ppm)	30	110	80-120
Zinc	mg/kg (ppm)	50	103	80-120

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL/SOLID SAMPLES
FOR TCLP METALS USING
EPA METHODS 6020B AND 1311

Laboratory Code: 403454-01 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/L (ppm)	2.0	<1	110	110	75-125	0
Arsenic	mg/L (ppm)	1.0	<1	99	99	75-125	0
Barium	mg/L (ppm)	5.0	3.5	101 b	103 b	75-125	2 b
Beryllium	mg/L (ppm)	0.5	<1	96	96	75-125	0
Cadmium	mg/L (ppm)	0.5	<1	99	100	75-125	1
Chromium	mg/L (ppm)	2.0	<1	86	88	75-125	2
Cobalt	mg/L (ppm)	2.0	<1	86	88	75-125	2
Copper	mg/L (ppm)	2.0	<5	87	88	75-125	1
Iron	mg/L (ppm)	10	<50	85	89	75-125	5
Lead	mg/L (ppm)	1.0	<1	97	98	75-125	1
Manganese	mg/L (ppm)	2.0	5.0	72 b	81 b	75-125	12 b
Molybdenum	mg/L (ppm)	1.0	<1	101	103	75-125	2
Nickel	mg/L (ppm)	2.0	<1	88	89	75-125	1
Selenium	mg/L (ppm)	0.5	<1	107	105	75-125	2
Silver	mg/L (ppm)	0.5	<1	86	87	75-125	1
Thallium	mg/L (ppm)	0.5	<1	88	88	75-125	0
Vanadium	mg/L (ppm)	2.0	<1	89	91	75-125	2
Zinc	mg/L (ppm)	5.0	<5	88	89	75-125	1

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/L (ppm)	2.0	103	80-120
Arsenic	mg/L (ppm)	1.0	91	80-120
Barium	mg/L (ppm)	5.0	95	80-120
Beryllium	mg/L (ppm)	0.5	94	80-120
Cadmium	mg/L (ppm)	0.5	94	80-120
Chromium	mg/L (ppm)	2.0	83	80-120
Cobalt	mg/L (ppm)	2.0	83	80-120
Copper	mg/L (ppm)	2.0	84	80-120
Iron	mg/L (ppm)	10	85	80-120
Lead	mg/L (ppm)	1.0	98	80-120
Manganese	mg/L (ppm)	2.0	80	80-120
Molybdenum	mg/L (ppm)	1.0	94	80-120
Nickel	mg/L (ppm)	2.0	85	80-120
Selenium	mg/L (ppm)	0.5	98	80-120
Silver	mg/L (ppm)	0.5	86	80-120
Thallium	mg/L (ppm)	0.5	86	80-120
Vanadium	mg/L (ppm)	2.0	84	80-120
Zinc	mg/L (ppm)	5.0	86	80-120

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES
FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 404039-06 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	ug/L (ppb)	20	<1	99	101	75-125	2
Arsenic	ug/L (ppb)	10	1.20	103	105	75-125	2
Barium	ug/L (ppb)	50	25.6	99 b	102 b	75-125	3 b
Beryllium	ug/L (ppb)	5	<1	98	100	75-125	2
Cadmium	ug/L (ppb)	5	<1	98	99	75-125	1
Chromium	ug/L (ppb)	20	<1	88	91	75-125	3
Cobalt	ug/L (ppb)	20	<1	87	89	75-125	2
Copper	ug/L (ppb)	20	<5	83	83	75-125	0
Iron	ug/L (ppb)	100	3,600	143 b	233 b	75-125	48 b
Lead	ug/L (ppb)	10	<1	85	86	75-125	1
Manganese	ug/L (ppb)	20	1,190	283 b	406 b	75-125	36 b
Mercury	ug/L (ppb)	5	<1	92	94	75-125	2
Molybdenum	ug/L (ppb)	10	<1	107	109	75-125	2
Nickel	ug/L (ppb)	20	1.75	84	86	75-125	2
Selenium	ug/L (ppb)	5	<1	103	102	75-125	1
Silver	ug/L (ppb)	5	<1	93	95	75-125	2
Thallium	ug/L (ppb)	5	<1	85	87	75-125	2
Vanadium	ug/L (ppb)	20	<1	92	93	75-125	1
Zinc	ug/L (ppb)	50	<5	86	87	75-125	1

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	ug/L (ppb)	20	103	80-120
Arsenic	ug/L (ppb)	10	90	80-120
Barium	ug/L (ppb)	50	104	80-120
Beryllium	ug/L (ppb)	5	89	80-120
Cadmium	ug/L (ppb)	5	102	80-120
Chromium	ug/L (ppb)	20	88	80-120
Cobalt	ug/L (ppb)	20	91	80-120
Copper	ug/L (ppb)	20	96	80-120
Iron	ug/L (ppb)	100	89	80-120
Lead	ug/L (ppb)	10	93	80-120
Manganese	ug/L (ppb)	20	88	80-120
Mercury	ug/L (ppb)	5	94	80-120
Molybdenum	ug/L (ppb)	10	87	80-120
Nickel	ug/L (ppb)	20	94	80-120
Selenium	ug/L (ppb)	5	94	80-120
Silver	ug/L (ppb)	5	90	80-120
Thallium	ug/L (ppb)	5	86	80-120
Vanadium	ug/L (ppb)	20	89	80-120
Zinc	ug/L (ppb)	50	97	80-120

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
ORGANOCHLORINE PESTICIDES
BY EPA METHOD 8081B

Laboratory Code: 402374-01 1/30 (Matrix Spike) 1/30

end

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
alpha-BHC	mg/kg (ppm)	0.1	<0.01	76	76	17-122	0
gamma-BHC (Lindane)	mg/kg (ppm)	0.1	<0.01	77	77	18-128	0
beta-BHC	mg/kg (ppm)	0.1	<0.01	74	79	17-130	7
delta-BHC	mg/kg (ppm)	0.1	<0.01	76	82	20-124	8
Heptachlor	mg/kg (ppm)	0.1	<0.01	84	84	15-133	0
Aldrin	mg/kg (ppm)	0.1	<0.01	81	81	26-125	0
Heptachlor Epoxide	mg/kg (ppm)	0.1	<0.01	75	80	19-132	6
trans-Chlordane	mg/kg (ppm)	0.1	<0.01	81	84	15-157	4
cis-Chlordane	mg/kg (ppm)	0.1	<0.01	79	82	17-133	4
4,4'-DDE	mg/kg (ppm)	0.1	<0.01	81	83	17-139	2
Endosulfan I	mg/kg (ppm)	0.1	<0.01	71	76	19-130	7
Dieldrin	mg/kg (ppm)	0.1	<0.01	79	83	17-140	5
Endrin	mg/kg (ppm)	0.1	<0.01	88	89	20-143	1
4,4'-DDD	mg/kg (ppm)	0.1	<0.01	84	83	20-143	1
Endosulfan II	mg/kg (ppm)	0.1	<0.01	80	80	21-133	0
4,4'-DDT	mg/kg (ppm)	0.1	<0.01	85	83	10-385	2
Endrin Aldehyde	mg/kg (ppm)	0.1	<0.01	65	74	12-123	13
Methoxychlor	mg/kg (ppm)	0.1	<0.01	87	86	10-226	1
Endosulfan Sulfate	mg/kg (ppm)	0.1	<0.01	80	79	17-134	1
Endrin Ketone	mg/kg (ppm)	0.1	<0.01	80	79	10-153	1
Toxaphene	mg/kg (ppm)	4	<0.1	39	42	12-123	7

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
ORGANOCHLORINE PESTICIDES
BY EPA METHOD 8081B

Laboratory Code: Laboratory Control Sample 1/30

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
alpha-BHC	mg/kg (ppm)	0.1	90	57-116
gamma-BHC (Lindane)	mg/kg (ppm)	0.1	91	59-118
beta-BHC	mg/kg (ppm)	0.1	92	63-113
delta-BHC	mg/kg (ppm)	0.1	98	58-124
Heptachlor	mg/kg (ppm)	0.1	100	60-117
Aldrin	mg/kg (ppm)	0.1	98	63-113
Heptachlor Epoxide	mg/kg (ppm)	0.1	96	70-130
trans-Chlordane	mg/kg (ppm)	0.1	98	70-130
cis-Chlordane	mg/kg (ppm)	0.1	99	70-130
4,4'-DDE	mg/kg (ppm)	0.1	101	69-121
Endosulfan I	mg/kg (ppm)	0.1	95	70-130
Dieldrin	mg/kg (ppm)	0.1	98	70-130
Endrin	mg/kg (ppm)	0.1	105	65-140
4,4'-DDD	mg/kg (ppm)	0.1	98	70-130
Endosulfan II	mg/kg (ppm)	0.1	95	70-130
4,4'-DDT	mg/kg (ppm)	0.1	99	57-135
Endrin Aldehyde	mg/kg (ppm)	0.1	88	25-133
Methoxychlor	mg/kg (ppm)	0.1	101	57-147
Endosulfan Sulfate	mg/kg (ppm)	0.1	92	70-130
Endrin Ketone	mg/kg (ppm)	0.1	93	70-130
Toxaphene	mg/kg (ppm)	4	88	53-143

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES FOR
ORGANOCHLORINE PESTICIDES
BY EPA METHOD 8081B

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
alpha-BHC	ug/L (ppb)	0.25	65	61	41-101	6
gamma-BHC (Lindane)	ug/L (ppb)	0.25	66	63	43-105	5
beta-BHC	ug/L (ppb)	0.25	56	64	49-104	13
delta-BHC	ug/L (ppb)	0.25	69	68	45-108	1
Heptachlor	ug/L (ppb)	0.25	60	56	39-104	7
Aldrin	ug/L (ppb)	0.25	62	58	43-98	7
Heptachlor Epoxide	ug/L (ppb)	0.25	69	64	52-110	8
trans-Chlordane	ug/L (ppb)	0.25	73	64	39-119	13
cis-Chlordane	ug/L (ppb)	0.25	70	63	47-106	11
4,4'-DDE	ug/L (ppb)	0.25	71	65	48-114	9
Endosulfan I	ug/L (ppb)	0.25	70	65	10-140	7
Dieldrin	ug/L (ppb)	0.25	69	64	54-115	8
Endrin	ug/L (ppb)	0.25	74	69	39-136	7
4,4'-DDD	ug/L (ppb)	0.25	75	70	31-161	7
Endosulfan II	ug/L (ppb)	0.25	74	68	10-144	8
4,4'-DDT	ug/L (ppb)	0.25	74	68	50-121	8
Endrin Aldehyde	ug/L (ppb)	0.25	55	57	47-113	4
Methoxychlor	ug/L (ppb)	0.25	74	69	51-126	7
Endosulfan Sulfate	ug/L (ppb)	0.25	73	69	58-110	6
Endrin Ketone	ug/L (ppb)	0.25	70	66	57-120	6
Toxaphene	ug/L (ppb)	4	100	100	56-123	0

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
POLYCHLORINATED BIPHENYLS AS
AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: 404010-01 1/30 (Matrix Spike) 1/30

end

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Control Limits	RPD (Limit 20)
Aroclor 1016	mg/kg (ppm)	0.25	<0.02	95	94	29-125	1
Aroclor 1260	mg/kg (ppm)	0.25	<0.02	92	105	12-177	13

Laboratory Code: Laboratory Control Sample 1/30

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Aroclor 1016	mg/kg (ppm)	0.25	107	55-137
Aroclor 1260	mg/kg (ppm)	0.25	104	51-150

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES FOR
POLYCHLORINATED BIPHENYLS AS
AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Aroclor 1016	ug/L (ppb)	0.25	59	66	20-94	11
Aroclor 1260	ug/L (ppb)	0.25	59	72	23-123	20

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 404057-03 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	mg/kg (ppm)	2	<0.5	42	41	10-142	2
Chloromethane	mg/kg (ppm)	2	<0.5	65	62	10-126	5
Vinyl chloride	mg/kg (ppm)	2	<0.05	69	66	10-138	4
Bromomethane	mg/kg (ppm)	2	<0.5	66	61	10-163	8
Chloroethane	mg/kg (ppm)	2	<0.5	77	70	10-176	10
Trichlorofluoromethane	mg/kg (ppm)	2	<0.5	81	79	10-176	2
Acetone	mg/kg (ppm)	10	<5	79	71	10-163	11
1,1-Dichloroethene	mg/kg (ppm)	2	<0.05	90	85	10-160	6
Hexane	mg/kg (ppm)	2	<0.25	87	82	10-137	6
Methylene chloride	mg/kg (ppm)	2	<0.5	86	84	10-156	2
Methyl t-butyl ether (MTBE)	mg/kg (ppm)	2	<0.05	87	83	21-145	5
trans-1,2-Dichloroethene	mg/kg (ppm)	2	<0.05	94	85	14-137	10
1,1-Dichloroethane	mg/kg (ppm)	2	<0.05	93	87	19-140	7
2,2-Dichloropropane	mg/kg (ppm)	2	<0.05	102	96	10-158	6
cis-1,2-Dichloroethene	mg/kg (ppm)	2	<0.05	89	86	25-135	3
Chloroform	mg/kg (ppm)	2	<0.05	88	84	21-145	5
2-Butanone (MEK)	mg/kg (ppm)	10	<1	80	74	19-147	8
1,2-Dichloroethane (EDC)	mg/kg (ppm)	2	<0.05	89	84	12-160	6
1,1,1-Trichloroethane	mg/kg (ppm)	2	<0.05	89	84	10-156	6
1,1-Dichloropropene	mg/kg (ppm)	2	<0.05	89	86	17-140	3
Carbon tetrachloride	mg/kg (ppm)	2	<0.05	90	86	9-164	5
Benzene	mg/kg (ppm)	2	<0.03	90	86	29-129	5
Trichloroethene	mg/kg (ppm)	2	<0.02	87	80	21-139	8
1,2-Dichloropropane	mg/kg (ppm)	2	<0.05	92	86	30-135	7
Bromodichloromethane	mg/kg (ppm)	2	<0.05	90	83	23-155	8
Dibromomethane	mg/kg (ppm)	2	<0.05	89	83	23-145	7
4-Methyl-2-pentanone	mg/kg (ppm)	10	<1	96	87	24-155	10
cis-1,3-Dichloropropene	mg/kg (ppm)	2	<0.05	93	85	28-144	9
Toluene	mg/kg (ppm)	2	<0.05	85	82	35-130	4
trans-1,3-Dichloropropene	mg/kg (ppm)	2	<0.05	87	83	26-149	5
1,1,2-Trichloroethane	mg/kg (ppm)	2	<0.05	86	81	10-205	6
2-Hexanone	mg/kg (ppm)	10	<0.5	80	79	15-166	1
1,3-Dichloropropane	mg/kg (ppm)	2	<0.05	84	80	31-137	5
Tetrachloroethene	mg/kg (ppm)	2	<0.025	89	89	20-133	0
Dibromochloromethane	mg/kg (ppm)	2	<0.05	86	79	28-150	8
1,2-Dibromoethane (EDB)	mg/kg (ppm)	2	<0.05	85	83	28-142	2
Chlorobenzene	mg/kg (ppm)	2	<0.05	91	83	32-129	9
Ethylbenzene	mg/kg (ppm)	2	<0.05	86	82	32-137	5
1,1,1,2-Tetrachloroethane	mg/kg (ppm)	2	<0.05	85	84	31-143	1
m,p-Xylene	mg/kg (ppm)	4	<0.1	88	85	34-136	3
o-Xylene	mg/kg (ppm)	2	<0.05	88	84	33-134	5
Styrene	mg/kg (ppm)	2	<0.05	87	85	35-137	2
Isopropylbenzene	mg/kg (ppm)	2	<0.05	88	86	31-142	2
Bromoform	mg/kg (ppm)	2	<0.05	83	82	21-156	1
n-Propylbenzene	mg/kg (ppm)	2	<0.05	87	82	23-146	6
Bromobenzene	mg/kg (ppm)	2	<0.05	87	82	34-130	6
1,3,5-Trimethylbenzene	mg/kg (ppm)	2	<0.05	85	82	18-149	4
1,1,2,2-Tetrachloroethane	mg/kg (ppm)	2	<0.05	90	83	28-140	8
1,2,3-Trichloropropane	mg/kg (ppm)	2	<0.05	82	78	25-144	5
2-Chlorotoluene	mg/kg (ppm)	2	<0.05	86	81	31-134	6

4-Chlorotoluene	mg/kg (ppm)	2	<0.05	84	79	31-136	6
tert-Butylbenzene	mg/kg (ppm)	2	<0.05	86	82	30-137	5
1,2,4-Trimethylbenzene	mg/kg (ppm)	2	<0.05	85	80	10-182	6
sec-Butylbenzene	mg/kg (ppm)	2	<0.05	87	82	23-145	6
p-Isopropyltoluene	mg/kg (ppm)	2	<0.05	89	84	21-149	6
1,3-Dichlorobenzene	mg/kg (ppm)	2	<0.05	87	85	30-131	2
1,4-Dichlorobenzene	mg/kg (ppm)	2	<0.05	85	82	29-129	4
1,2-Dichlorobenzene	mg/kg (ppm)	2	<0.05	87	82	31-132	6
1,2-Dibromo-3-chloropropane	mg/kg (ppm)	2	<0.5	76	69	11-161	10
1,2,4-Trichlorobenzene	mg/kg (ppm)	2	<0.25	87	81	22-142	7
Hexachlorobutadiene	mg/kg (ppm)	2	<0.25	83	76	10-142	9
Naphthalene	mg/kg (ppm)	2	<0.05	83	78	14-157	6
1,2,3-Trichlorobenzene	mg/kg (ppm)	2	<0.25	83	77	20-144	7

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Dichlorodifluoromethane	mg/kg (ppm)	2	69	10-146
Chloromethane	mg/kg (ppm)	2	83	27-133
Vinyl chloride	mg/kg (ppm)	2	88	22-139
Bromomethane	mg/kg (ppm)	2	81	10-201
Chloroethane	mg/kg (ppm)	2	94	10-163
Trichlorofluoromethane	mg/kg (ppm)	2	96	10-196
Acetone	mg/kg (ppm)	10	106	52-141
1,1-Dichloroethene	mg/kg (ppm)	2	104	47-128
Hexane	mg/kg (ppm)	2	104	43-142
Methylene chloride	mg/kg (ppm)	2	92	10-184
Methyl t-butyl ether (MTBE)	mg/kg (ppm)	2	101	60-123
trans-1,2-Dichloroethene	mg/kg (ppm)	2	106	64-132
1,1-Dichloroethane	mg/kg (ppm)	2	106	64-135
2,2-Dichloropropane	mg/kg (ppm)	2	114	52-170
cis-1,2-Dichloroethene	mg/kg (ppm)	2	103	64-135
Chloroform	mg/kg (ppm)	2	100	61-139
2-Butanone (MEK)	mg/kg (ppm)	10	105	30-197
1,2-Dichloroethane (EDC)	mg/kg (ppm)	2	102	56-135
1,1,1-Trichloroethane	mg/kg (ppm)	2	102	62-131
1,1-Dichloropropene	mg/kg (ppm)	2	100	64-136
Carbon tetrachloride	mg/kg (ppm)	2	100	60-139
Benzene	mg/kg (ppm)	2	104	65-136
Trichloroethene	mg/kg (ppm)	2	100	63-139
1,2-Dichloropropane	mg/kg (ppm)	2	105	61-145
Bromodichloromethane	mg/kg (ppm)	2	102	57-126
Dibromomethane	mg/kg (ppm)	2	102	62-123
4-Methyl-2-pentanone	mg/kg (ppm)	10	107	45-145
cis-1,3-Dichloropropene	mg/kg (ppm)	2	105	65-143
Toluene	mg/kg (ppm)	2	102	66-126
trans-1,3-Dichloropropene	mg/kg (ppm)	2	102	65-131
1,1,2-Trichloroethane	mg/kg (ppm)	2	103	62-131
2-Hexanone	mg/kg (ppm)	10	96	33-152
1,3-Dichloropropane	mg/kg (ppm)	2	99	67-128
Tetrachloroethene	mg/kg (ppm)	2	107	68-128
Dibromochloromethane	mg/kg (ppm)	2	103	55-121
1,2-Dibromoethane (EDB)	mg/kg (ppm)	2	102	66-129
Chlorobenzene	mg/kg (ppm)	2	104	67-128
Ethylbenzene	mg/kg (ppm)	2	102	64-123
1,1,1,2-Tetrachloroethane	mg/kg (ppm)	2	97	64-121
m,p-Xylene	mg/kg (ppm)	4	104	68-128
o-Xylene	mg/kg (ppm)	2	106	67-129
Styrene	mg/kg (ppm)	2	105	67-129
Isopropylbenzene	mg/kg (ppm)	2	104	68-128
Bromoform	mg/kg (ppm)	2	100	56-132
n-Propylbenzene	mg/kg (ppm)	2	98	68-129
Bromobenzene	mg/kg (ppm)	2	99	69-128
1,3,5-Trimethylbenzene	mg/kg (ppm)	2	97	69-129
1,1,2,2-Tetrachloroethane	mg/kg (ppm)	2	100	56-143

1,2,3-Trichloropropane	mg/kg (ppm)	2	98	61-137
2-Chlorotoluene	mg/kg (ppm)	2	98	69-128
4-Chlorotoluene	mg/kg (ppm)	2	96	67-127
tert-Butylbenzene	mg/kg (ppm)	2	100	69-129
1,2,4-Trimethylbenzene	mg/kg (ppm)	2	99	69-128
sec-Butylbenzene	mg/kg (ppm)	2	98	69-130
p-Isopropyltoluene	mg/kg (ppm)	2	104	69-130
1,3-Dichlorobenzene	mg/kg (ppm)	2	101	69-127
1,4-Dichlorobenzene	mg/kg (ppm)	2	99	68-126
1,2-Dichlorobenzene	mg/kg (ppm)	2	101	69-127
1,2-Dibromo-3-chloropropane	mg/kg (ppm)	2	92	58-138
1,2,4-Trichlorobenzene	mg/kg (ppm)	2	100	64-135
Hexachlorobutadiene	mg/kg (ppm)	2	99	50-153
Naphthalene	mg/kg (ppm)	2	97	62-128
1,2,3-Trichlorobenzene	mg/kg (ppm)	2	95	61-126

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 403449-09 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	10	<1	89	27-164
Chloromethane	ug/L (ppb)	10	<10	96	34-141
Vinyl chloride	ug/L (ppb)	10	<0.02	94	16-176
Bromomethane	ug/L (ppb)	10	<5	130	10-193
Chloroethane	ug/L (ppb)	10	<1	108	50-150
Trichlorofluoromethane	ug/L (ppb)	10	<1	99	50-150
2-Propanol	ug/L (ppb)	0	<10	0	50-150
Acetone	ug/L (ppb)	50	<50	77	15-179
1,1-Dichloroethene	ug/L (ppb)	10	<1	95	50-150
Hexane	ug/L (ppb)	10	<5	107	49-161
Methylene chloride	ug/L (ppb)	10	<5	97	40-143
Methyl t-butyl ether (MTBE)	ug/L (ppb)	10	<1	97	50-150
trans-1,2-Dichloroethene	ug/L (ppb)	10	<1	98	50-150
1,1-Dichloroethane	ug/L (ppb)	10	<1	96	50-150
2,2-Dichloropropane	ug/L (ppb)	10	<1	139	62-152
cis-1,2-Dichloroethene	ug/L (ppb)	10	<1	98	50-150
Chloroform	ug/L (ppb)	10	<1	96	50-150
2-Butanone (MEK)	ug/L (ppb)	50	<20	92	34-168
1,2-Dichloroethane (EDC)	ug/L (ppb)	10	<0.2	98	50-150
1,1,1-Trichloroethane	ug/L (ppb)	10	<1	99	50-150
1,1-Dichloropropene	ug/L (ppb)	10	<1	96	50-150
Carbon tetrachloride	ug/L (ppb)	10	<0.5	106	50-150
Benzene	ug/L (ppb)	10	<0.35	97	50-150
Trichloroethene	ug/L (ppb)	10	<0.5	96	43-133
1,2-Dichloropropane	ug/L (ppb)	10	<1	96	50-150
Bromodichloromethane	ug/L (ppb)	10	<0.5	110	50-150
Dibromomethane	ug/L (ppb)	10	<1	99	50-150
4-Methyl-2-pentanone	ug/L (ppb)	50	<10	109	50-150
cis-1,3-Dichloropropene	ug/L (ppb)	10	<0.4	95	48-145
Toluene	ug/L (ppb)	10	<1	99	50-150
trans-1,3-Dichloropropene	ug/L (ppb)	10	<0.4	90	37-152
1,1,2-Trichloroethane	ug/L (ppb)	10	<0.5	128	50-150
2-Hexanone	ug/L (ppb)	50	<10	89	50-150
1,3-Dichloropropane	ug/L (ppb)	10	<1	94	50-150
Tetrachloroethene	ug/L (ppb)	10	<1	101	50-150
Dibromochloromethane	ug/L (ppb)	10	<0.5	90	33-164
1,2-Dibromoethane (EDB)	ug/L (ppb)	10	<0.01	102	50-150
Chlorobenzene	ug/L (ppb)	10	<1	94	50-150
Ethylbenzene	ug/L (ppb)	10	<1	103	50-150
1,1,1,2-Tetrachloroethane	ug/L (ppb)	10	<1	92	50-150
m,p-Xylene	ug/L (ppb)	20	<2	102	50-150
o-Xylene	ug/L (ppb)	10	<1	100	50-150
Styrene	ug/L (ppb)	10	<1	97	50-150
Isopropylbenzene	ug/L (ppb)	10	<1	97	50-150
Bromoform	ug/L (ppb)	10	<5	91	23-161
n-Propylbenzene	ug/L (ppb)	10	<1	100	50-150
Bromobenzene	ug/L (ppb)	10	<1	94	50-150
1,3,5-Trimethylbenzene	ug/L (ppb)	10	<1	97	50-150
1,1,2,2-Tetrachloroethane	ug/L (ppb)	10	<0.2	109	57-162
1,2,3-Trichloropropane	ug/L (ppb)	10	<1	97	33-151

2-Chlorotoluene	ug/L (ppb)	10	<1	95	50-150
4-Chlorotoluene	ug/L (ppb)	10	<1	96	50-150
tert-Butylbenzene	ug/L (ppb)	10	<1	97	50-150
1,2,4-Trimethylbenzene	ug/L (ppb)	10	<1	95	50-150
sec-Butylbenzene	ug/L (ppb)	10	<1	98	46-139
p-Isopropyltoluene	ug/L (ppb)	10	<1	99	46-140
1,3-Dichlorobenzene	ug/L (ppb)	10	<1	95	50-150
1,4-Dichlorobenzene	ug/L (ppb)	10	<1	95	50-150
1,2-Dichlorobenzene	ug/L (ppb)	10	<1	94	50-150
1,2-Dibromo-3-chloropropane	ug/L (ppb)	10	<10	86	50-150
1,2,4-Trichlorobenzene	ug/L (ppb)	10	<1	94	50-150
Hexachlorobutadiene	ug/L (ppb)	10	<0.5	95	42-150
Naphthalene	ug/L (ppb)	10	<1	101	50-150
1,2,3-Trichlorobenzene	ug/L (ppb)	10	<1	93	44-155

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	10	85	86	49-149	1
Chloromethane	ug/L (ppb)	10	92	91	34-143	1
Vinyl chloride	ug/L (ppb)	10	93	92	43-149	1
Bromomethane	ug/L (ppb)	10	131	131	28-182	0
Chloroethane	ug/L (ppb)	10	106	106	59-157	0
Trichlorofluoromethane	ug/L (ppb)	10	104	101	59-141	3
2-Propanol	ug/L (ppb)	0	0	0	70-130	
Acetone	ug/L (ppb)	50	78	74	20-139	5
1,1-Dichloroethene	ug/L (ppb)	10	92	92	67-138	0
Hexane	ug/L (ppb)	10	99	99	50-161	0
Methylene chloride	ug/L (ppb)	10	97	92	29-192	5
Methyl t-butyl ether (MTBE)	ug/L (ppb)	10	94	93	70-130	1
trans-1,2-Dichloroethene	ug/L (ppb)	10	94	94	70-130	0
1,1-Dichloroethane	ug/L (ppb)	10	93	93	70-130	0
2,2-Dichloropropane	ug/L (ppb)	10	136	115	71-148	17
cis-1,2-Dichloroethene	ug/L (ppb)	10	95	94	70-130	1
Chloroform	ug/L (ppb)	10	93	92	70-130	1
2-Butanone (MEK)	ug/L (ppb)	50	89	87	50-157	2
1,2-Dichloroethane (EDC)	ug/L (ppb)	10	94	94	70-130	0
1,1,1-Trichloroethane	ug/L (ppb)	10	96	95	70-130	1
1,1-Dichloropropene	ug/L (ppb)	10	93	91	70-130	2
Carbon tetrachloride	ug/L (ppb)	10	103	101	70-130	2
Benzene	ug/L (ppb)	10	93	92	70-130	1
Trichloroethene	ug/L (ppb)	10	93	92	70-130	1
1,2-Dichloropropane	ug/L (ppb)	10	92	90	70-130	2
Bromodichloromethane	ug/L (ppb)	10	95	95	70-130	0
Dibromomethane	ug/L (ppb)	10	96	95	70-130	1
4-Methyl-2-pentanone	ug/L (ppb)	50	99	95	70-130	4
cis-1,3-Dichloropropene	ug/L (ppb)	10	92	91	70-130	1
Toluene	ug/L (ppb)	10	102	104	70-130	2
trans-1,3-Dichloropropene	ug/L (ppb)	10	95	97	70-130	2
1,1,2-Trichloroethane	ug/L (ppb)	10	98	99	70-130	1
2-Hexanone	ug/L (ppb)	50	86	82	66-132	5
1,3-Dichloropropane	ug/L (ppb)	10	96	98	70-130	2
Tetrachloroethene	ug/L (ppb)	10	104	105	70-130	1
Dibromochloromethane	ug/L (ppb)	10	94	97	63-142	3
1,2-Dibromoethane (EDB)	ug/L (ppb)	10	102	103	70-130	1
Chlorobenzene	ug/L (ppb)	10	96	99	70-130	3
Ethylbenzene	ug/L (ppb)	10	103	105	70-130	2
1,1,1,2-Tetrachloroethane	ug/L (ppb)	10	98	99	70-130	1
m,p-Xylene	ug/L (ppb)	20	103	105	70-130	2
o-Xylene	ug/L (ppb)	10	101	103	70-130	2
Styrene	ug/L (ppb)	10	97	97	70-130	0
Isopropylbenzene	ug/L (ppb)	10	97	98	70-130	1
Bromoform	ug/L (ppb)	10	96	95	50-157	1
n-Propylbenzene	ug/L (ppb)	10	102	101	70-130	1
Bromobenzene	ug/L (ppb)	10	99	99	70-130	0
1,3,5-Trimethylbenzene	ug/L (ppb)	10	100	100	52-150	0

1,1,2,2-Tetrachloroethane	ug/L (ppb)	10	104	103	75-140	1
1,2,3-Trichloropropane	ug/L (ppb)	10	103	101	40-153	2
2-Chlorotoluene	ug/L (ppb)	10	102	100	70-130	2
4-Chlorotoluene	ug/L (ppb)	10	101	99	70-130	2
tert-Butylbenzene	ug/L (ppb)	10	100	98	70-130	2
1,2,4-Trimethylbenzene	ug/L (ppb)	10	99	96	70-130	3
sec-Butylbenzene	ug/L (ppb)	10	100	99	70-130	1
p-Isopropyltoluene	ug/L (ppb)	10	100	99	70-130	1
1,3-Dichlorobenzene	ug/L (ppb)	10	99	98	70-130	1
1,4-Dichlorobenzene	ug/L (ppb)	10	101	99	70-130	2
1,2-Dichlorobenzene	ug/L (ppb)	10	99	98	70-130	1
1,2-Dibromo-3-chloropropane	ug/L (ppb)	10	97	92	70-130	5
1,2,4-Trichlorobenzene	ug/L (ppb)	10	96	92	70-130	4
Hexachlorobutadiene	ug/L (ppb)	10	98	96	70-130	2
Naphthalene	ug/L (ppb)	10	96	92	61-133	4
1,2,3-Trichlorobenzene	ug/L (ppb)	10	94	91	69-143	3

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: 403380-04 1/5 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Phenol	mg/kg (ppm)	0.83	<0.5	83	84	50-150	1
Bis(2-chloroethyl) ether	mg/kg (ppm)	0.83	<0.05	85	85	50-150	0
2-Chlorophenol	mg/kg (ppm)	0.83	<0.5	83	84	50-150	1
1,3-Dichlorobenzene	mg/kg (ppm)	0.83	<0.05	73	77	36-107	5
1,4-Dichlorobenzene	mg/kg (ppm)	0.83	<0.05	77	79	37-106	3
1,2-Dichlorobenzene	mg/kg (ppm)	0.83	<0.05	76	78	39-106	3
Benzyl alcohol	mg/kg (ppm)	4.2	<0.5	78	79	50-150	1
2,2'-Oxybis(1-chloropropane)	mg/kg (ppm)	0.83	<0.05	84	84	50-150	0
2-Methylphenol	mg/kg (ppm)	0.83	<0.5	88	87	50-150	1
Hexachloroethane	mg/kg (ppm)	0.83	<0.05	81	82	19-129	1
N-Nitroso-di-n-propylamine	mg/kg (ppm)	0.83	<0.05	90	91	50-150	1
3-Methylphenol + 4-Methylphenol	mg/kg (ppm)	0.83	<1	89	90	50-150	1
Nitrobenzene	mg/kg (ppm)	0.83	<0.05	81	82	50-150	1
Isophorone	mg/kg (ppm)	0.83	<0.05	86	105	16-156	20
2-Nitrophenol	mg/kg (ppm)	0.83	<0.5	91	92	50-150	1
2,4-Dimethylphenol	mg/kg (ppm)	0.83	<0.5	86	86	35-117	0
Benzoic acid	mg/kg (ppm)	2.5	<2.5	50	54	10-105	8
Bis(2-chloroethoxy)methane	mg/kg (ppm)	0.83	<0.05	83	83	50-150	0
2,4-Dichlorophenol	mg/kg (ppm)	0.83	<0.5	83	83	50-150	0
1,2,4-Trichlorobenzene	mg/kg (ppm)	0.83	<0.05	84	85	50-150	1
Naphthalene	mg/kg (ppm)	0.83	<0.01	77	77	50-150	0
Hexachlorobutadiene	mg/kg (ppm)	0.83	<0.05	68	71	39-106	4
4-Chloroaniline	mg/kg (ppm)	6.8	<5	66	69	40-101	4
4-Chloro-3-methylphenol	mg/kg (ppm)	0.83	<0.5	97	95	50-150	2
2-Methylnaphthalene	mg/kg (ppm)	0.83	<0.01	76	75	50-150	1
1-Methylnaphthalene	mg/kg (ppm)	0.83	<0.01	76	75	50-150	1
Hexachlorocyclopentadiene	mg/kg (ppm)	0.83	<0.15	69	72	27-127	4
2,4,6-Trichlorophenol	mg/kg (ppm)	0.83	<0.5	93	91	35-130	2
2,4,5-Trichlorophenol	mg/kg (ppm)	0.83	<0.5	94	95	43-126	1
2-Chloronaphthalene	mg/kg (ppm)	0.83	<0.05	81	80	50-150	1
2-Nitroaniline	mg/kg (ppm)	4.2	<0.25	73	74	50-150	1
Dimethyl phthalate	mg/kg (ppm)	0.83	<0.5	88	86	50-150	2
Acenaphthylene	mg/kg (ppm)	0.83	<0.01	72	72	50-150	0
2,6-Dinitrotoluene	mg/kg (ppm)	0.83	<0.25	87	87	50-150	0
3-Nitroaniline	mg/kg (ppm)	4.2	<5	74	73	50-150	1
Acenaphthene	mg/kg (ppm)	0.83	<0.01	70	69	50-150	1
2,4-Dinitrophenol	mg/kg (ppm)	1.7	<1.5	88	92	10-146	4
Dibenzofuran	mg/kg (ppm)	0.83	<0.05	79	78	50-150	1
2,4-Dinitrotoluene	mg/kg (ppm)	0.83	<0.25	102	101	44-141	1
4-Nitrophenol	mg/kg (ppm)	1.7	<1.5	105	112	33-142	6
Diethyl phthalate	mg/kg (ppm)	0.83	<0.5	85	84	50-150	1
Fluorene	mg/kg (ppm)	0.83	<0.01	79	78	50-150	1
4-Chlorophenyl phenyl ether	mg/kg (ppm)	0.83	<0.05	89	88	50-150	1
1,2-Diphenylhydrazine	mg/kg (ppm)	0.83	<0.05	89	87	50-150	2
N-Nitrosodiphenylamine	mg/kg (ppm)	0.83	<0.05	85	84	50-150	1
4-Nitroaniline	mg/kg (ppm)	4.2	<5	82	81	50-150	1
4,6-Dinitro-2-methylphenol	mg/kg (ppm)	0.83	<1.5	112	111	33-155	1
4-Bromophenyl phenyl ether	mg/kg (ppm)	0.83	<0.05	91	89	50-150	2
Hexachlorobenzene	mg/kg (ppm)	0.83	<0.05	91	89	50-150	2
Pentachlorophenol	mg/kg (ppm)	0.83	<0.25	101	102	15-159	1
Phenanthrene	mg/kg (ppm)	0.83	<0.01	86	85	10-170	1
Anthracene	mg/kg (ppm)	0.83	<0.01	85	85	37-139	0
Carbazole	mg/kg (ppm)	0.83	<0.05	83	82	50-150	1
Di-n-butyl phthalate	mg/kg (ppm)	0.83	<0.5	90	89	50-150	1
Fluoranthene	mg/kg (ppm)	0.83	<0.01	88	88	10-203	0
Benzidine	mg/kg (ppm)	1.3	<1	44	48	10-72	9
Pyrene	mg/kg (ppm)	0.83	<0.01	89	87	10-208	2
Benzyl butyl phthalate	mg/kg (ppm)	0.83	<0.5	93	92	50-150	1
3,3'-Dichlorobenzidine	mg/kg (ppm)	1.3	<0.5	76	74	10-119	3
Benz(a)anthracene	mg/kg (ppm)	0.83	<0.01	90	89	37-146	1
Chrysene	mg/kg (ppm)	0.83	<0.01	81	79	36-144	2
Bis(2-ethylhexyl) phthalate	mg/kg (ppm)	0.83	<0.8	93	94	50-150	1
Di-n-octyl phthalate	mg/kg (ppm)	0.83	<0.5	101	101	10-243	0
Benzo(a)pyrene	mg/kg (ppm)	0.83	<0.01	87	87	40-150	0
Benzo(b)fluoranthene	mg/kg (ppm)	0.83	<0.01	90	88	45-157	2
Benzo(k)fluoranthene	mg/kg (ppm)	0.83	<0.01	86	89	50-150	3
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.83	<0.01	110	102	24-145	8
Dibenz(a,h)anthracene	mg/kg (ppm)	0.83	<0.01	109	105	31-137	4
Benzo(g,h,i)perylene	mg/kg (ppm)	0.83	<0.01	102	98	14-141	4

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample 1/5
end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Phenol	mg/kg (ppm)	0.83	85	57-113
Bis(2-chloroethyl) ether	mg/kg (ppm)	0.83	88	55-108
2-Chlorophenol	mg/kg (ppm)	0.83	88	60-104
1,3-Dichlorobenzene	mg/kg (ppm)	0.83	79	54-103
1,4-Dichlorobenzene	mg/kg (ppm)	0.83	81	54-102
1,2-Dichlorobenzene	mg/kg (ppm)	0.83	79	55-103
Benzyl alcohol	mg/kg (ppm)	4.2	80	36-147
2,2'-Oxybis(1-chloropropane)	mg/kg (ppm)	0.83	89	56-109
2-Methylphenol	mg/kg (ppm)	0.83	92	62-107
Hexachloroethane	mg/kg (ppm)	0.83	86	54-105
N-Nitroso-di-n-propylamine	mg/kg (ppm)	0.83	92	64-112
3-Methylphenol + 4-Methylphenol	mg/kg (ppm)	0.83	93	63-110
Nitrobenzene	mg/kg (ppm)	0.83	83	55-111
Isophorone	mg/kg (ppm)	0.83	89	52-127
2-Nitrophenol	mg/kg (ppm)	0.83	94	53-122
2,4-Dimethylphenol	mg/kg (ppm)	0.83	88	31-105
Benzoic acid	mg/kg (ppm)	2.5	72	38-99
Bis(2-chloroethoxy)methane	mg/kg (ppm)	0.83	86	63-112
2,4-Dichlorophenol	mg/kg (ppm)	0.83	86	62-112
1,2,4-Trichlorobenzene	mg/kg (ppm)	0.83	89	59-105
Naphthalene	mg/kg (ppm)	0.83	82	59-105
Hexachlorobutadiene	mg/kg (ppm)	0.83	72	54-108
4-Chloroaniline	mg/kg (ppm)	6.8	65	36-111
4-Chloro-3-methylphenol	mg/kg (ppm)	0.83	100	63-116
2-Methylnaphthalene	mg/kg (ppm)	0.83	80	62-108
1-Methylnaphthalene	mg/kg (ppm)	0.83	80	62-108
Hexachlorocyclopentadiene	mg/kg (ppm)	0.83	74	48-123
2,4,6-Trichlorophenol	mg/kg (ppm)	0.83	95	61-114
2,4,5-Trichlorophenol	mg/kg (ppm)	0.83	98	64-121
2-Chloronaphthalene	mg/kg (ppm)	0.83	84	62-112
2-Nitroaniline	mg/kg (ppm)	4.2	74	30-179
Dimethyl phthalate	mg/kg (ppm)	0.83	88	63-124
Acenaphthylene	mg/kg (ppm)	0.83	75	61-111
2,6-Dinitrotoluene	mg/kg (ppm)	0.83	88	63-131
3-Nitroaniline	mg/kg (ppm)	4.2	79	57-114
Acenaphthene	mg/kg (ppm)	0.83	72	61-110
2,4-Dinitrophenol	mg/kg (ppm)	1.7	99	51-143
Dibenzofuran	mg/kg (ppm)	0.83	81	65-118
2,4-Dinitrotoluene	mg/kg (ppm)	0.83	99	47-146
4-Nitrophenol	mg/kg (ppm)	1.7	99	63-127
Diethyl phthalate	mg/kg (ppm)	0.83	89	63-124
Fluorene	mg/kg (ppm)	0.83	80	62-114
4-Chlorophenyl phenyl ether	mg/kg (ppm)	0.83	93	61-116
N-Nitrosodiphenylamine	mg/kg (ppm)	0.83	86	64-116
4-Nitroaniline	mg/kg (ppm)	4.2	82	63-117
4,6-Dinitro-2-methylphenol	mg/kg (ppm)	0.83	113	59-152
4-Bromophenyl phenyl ether	mg/kg (ppm)	0.83	94	66-118
Hexachlorobenzene	mg/kg (ppm)	0.83	94	57-115
Pentachlorophenol	mg/kg (ppm)	0.83	113	56-130
Phenanthrene	mg/kg (ppm)	0.83	89	64-112
Anthracene	mg/kg (ppm)	0.83	87	63-111
Carbazole	mg/kg (ppm)	0.83	85	68-120
Di-n-butyl phthalate	mg/kg (ppm)	0.83	94	52-130
Fluoranthene	mg/kg (ppm)	0.83	91	66-115
Benzidine	mg/kg (ppm)	1.3	0	0-100
Pyrene	mg/kg (ppm)	0.83	90	65-112
Benzyl butyl phthalate	mg/kg (ppm)	0.83	92	56-131
3,3'-Dichlorobenzidine	mg/kg (ppm)	1.3	72	10-100
Benz(a)anthracene	mg/kg (ppm)	0.83	91	64-116
Chrysene	mg/kg (ppm)	0.83	81	66-119
Bis(2-ethylhexyl) phthalate	mg/kg (ppm)	0.83	90	30-165
Di-n-octyl phthalate	mg/kg (ppm)	0.83	99	44-140
Benzo(a)pyrene	mg/kg (ppm)	0.83	88	62-116
Benzo(b)fluoranthene	mg/kg (ppm)	0.83	92	61-118
Benzo(k)fluoranthene	mg/kg (ppm)	0.83	86	65-119
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.83	107	64-130
Dibenz(a,h)anthracene	mg/kg (ppm)	0.83	111	67-131
Benzo(g,h,i)perylene	mg/kg (ppm)	0.83	106	67-126

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Phenol	ug/L (ppb)	5	27	29	10-43	7
Bis(2-chloroethyl) ether	ug/L (ppb)	5	75	80	40-114	6
2-Chlorophenol	ug/L (ppb)	5	69	74	21-97	7
1,3-Dichlorobenzene	ug/L (ppb)	5	52	53	39-102	2
1,4-Dichlorobenzene	ug/L (ppb)	5	53	54	41-103	2
1,2-Dichlorobenzene	ug/L (ppb)	5	56	59	43-105	5
Benzyl alcohol	ug/L (ppb)	25	71	77	14-82	8
2,2'-Oxybis(1-chloropropane)	ug/L (ppb)	5	81	88	51-110	8
2-Methylphenol	ug/L (ppb)	5	64	71	19-77	10
Hexachloroethane	ug/L (ppb)	5	45	50	39-104	11
N-Nitroso-di-n-propylamine	ug/L (ppb)	5	84	93	58-117	10
3-Methylphenol + 4-Methylphenol	ug/L (ppb)	5	56	66	12-89	16
Nitrobenzene	ug/L (ppb)	5	78	82	52-111	5
Isophorone	ug/L (ppb)	5	90	93	62-117	3
2-Nitrophenol	ug/L (ppb)	5	69	77	41-117	11
2,4-Dimethylphenol	ug/L (ppb)	5	75	81	10-117	8
Benzoic acid	ug/L (ppb)	40	18	18	10-39	0
Bis(2-chloroethoxy)methane	ug/L (ppb)	5	80	88	56-111	10
2,4-Dichlorophenol	ug/L (ppb)	5	82	90	34-113	9
1,2,4-Trichlorobenzene	ug/L (ppb)	5	59	62	48-104	5
Naphthalene	ug/L (ppb)	5	69	74	50-104	7
Hexachlorobutadiene	ug/L (ppb)	5	46	48	40-107	4
4-Chloroaniline	ug/L (ppb)	25	93	99	34-125	6
4-Chloro-3-methylphenol	ug/L (ppb)	5	85	94	34-111	10
2-Methylnaphthalene	ug/L (ppb)	5	73	79	52-113	8
1-Methylnaphthalene	ug/L (ppb)	5	75	81	51-115	8
Hexachlorocyclopentadiene	ug/L (ppb)	5	47	48	34-126	2
2,4,6-Trichlorophenol	ug/L (ppb)	5	80	89	28-125	11
2,4,5-Trichlorophenol	ug/L (ppb)	5	88	96	39-120	9
2-Chloronaphthalene	ug/L (ppb)	5	73	79	57-130	8
2-Nitroaniline	ug/L (ppb)	25	90	97	51-146	7
Dimethyl phthalate	ug/L (ppb)	5	97	106	64-118	9
Acenaphthylene	ug/L (ppb)	5	82	88	60-114	7
2,6-Dinitrotoluene	ug/L (ppb)	5	87	92	66-121	6
3-Nitroaniline	ug/L (ppb)	25	89	92	42-134	3
Acenaphthene	ug/L (ppb)	5	79	85	57-110	7
2,4-Dinitrophenol	ug/L (ppb)	10	82	88	20-151	7
Dibenzofuran	ug/L (ppb)	5	84	90	52-116	7
2,4-Dinitrotoluene	ug/L (ppb)	5	97	103	55-127	6
4-Nitrophenol	ug/L (ppb)	10	31	32	10-58	3
Diethyl phthalate	ug/L (ppb)	5	102	108	63-118	6
Fluorene	ug/L (ppb)	5	88	94	61-115	7
4-Chlorophenyl phenyl ether	ug/L (ppb)	5	87	91	61-112	4
N-Nitrosodiphenylamine	ug/L (ppb)	5	95	97	60-123	2
4-Nitroaniline	ug/L (ppb)	25	94	99	42-150	5
4,6-Dinitro-2-methylphenol	ug/L (ppb)	5	90	99	13-152	10
4-Bromophenyl phenyl ether	ug/L (ppb)	5	86	90	63-123	5
Hexachlorobenzene	ug/L (ppb)	5	92	96	60-113	4
Pentachlorophenol	ug/L (ppb)	5	100	99	14-137	1
Phenanthrene	ug/L (ppb)	5	92	96	63-113	4
Anthracene	ug/L (ppb)	5	95	97	65-117	2
Carbazole	ug/L (ppb)	5	106	107	62-137	1
Di-n-butyl phthalate	ug/L (ppb)	5	103	108	36-137	5
Fluoranthene	ug/L (ppb)	5	104	105	68-121	1
Benzidine	ug/L (ppb)	7.5	25	25	10-103	0
Pyrene	ug/L (ppb)	5	97	99	62-133	2
Benzyl butyl phthalate	ug/L (ppb)	5	100	101	56-145	1
3,3'-Dichlorobenzidine	ug/L (ppb)	7.5	91	93	31-139	2
Benz(a)anthracene	ug/L (ppb)	5	102	103	66-131	1
Chrysene	ug/L (ppb)	5	101	104	66-129	3
Bis(2-ethylhexyl) phthalate	ug/L (ppb)	5	105	109	52-142	4
Di-n-octyl phthalate	ug/L (ppb)	5	112	114	36-151	2
Benzo(a)pyrene	ug/L (ppb)	5	106	108	66-129	2
Benzo(b)fluoranthene	ug/L (ppb)	5	103	105	55-144	2
Benzo(k)fluoranthene	ug/L (ppb)	5	106	107	58-139	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	5	107	111	62-136	4
Dibenz(a,h)anthracene	ug/L (ppb)	5	105	110	55-146	5
Benzo(g,h,i)perylene	ug/L (ppb)	5	103	107	58-137	4

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 403326-04 (Duplicate)

end

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Benzene	mg/kg (ppm)	<0.02	<0.02	nm
Toluene	mg/kg (ppm)	<0.02	<0.02	nm
Ethylbenzene	mg/kg (ppm)	<0.02	<0.02	nm
Xylenes	mg/kg (ppm)	<0.06	<0.06	nm
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/kg (ppm)	1.0	98	70-130
Toluene	mg/kg (ppm)	1.0	94	70-130
Ethylbenzene	mg/kg (ppm)	1.0	93	70-130
Xylenes	mg/kg (ppm)	3.0	93	70-130
Gasoline	mg/kg (ppm)	40	95	70-130

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 403441-01 (Duplicate)

end

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	110	70-130
Toluene	ug/L (ppb)	50	104	70-130
Ethylbenzene	ug/L (ppb)	50	106	70-130
Xylenes	ug/L (ppb)	150	93	70-130
Gasoline	ug/L (ppb)	1,000	100	70-130

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 403410-01 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	3,000	114	96	63-146	17

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	102	77-123

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	92	88	72-139	4

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD MA-APH

Laboratory Code: 403425-01 1/5.7 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
APH EC5-8 aliphatics	ug/m3	3,200	3,000	6
APH EC9-12 aliphatics	ug/m3	200	190	5
APH EC9-10 aromatics	ug/m3	<140	<140	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
APH EC5-8 aliphatics	ug/m3	67	104	70-130
APH EC9-12 aliphatics	ug/m3	67	121	70-130
APH EC9-10 aromatics	ug/m3	67	98	70-130

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: 403425-01 1/5.7 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
Propene	ug/m3	4,800	4,800	0
Dichlorodifluoromethane	ug/m3	<5.6	<5.6	nm
Chloromethane	ug/m3	<21	<21	nm
F-114	ug/m3	<12	<12	nm
Vinyl chloride	ug/m3	<1.5	<1.5	nm
1,3-Butadiene	ug/m3	230	<0.25	nm
Butane	ug/m3	1,100	1,100	0
Bromomethane	ug/m3	<22	<22	nm
Chloroethane	ug/m3	<15	<15	nm
Vinyl bromide	ug/m3	<2.5	<2.5	nm
Ethanol	ug/m3	<43	<43	nm
Acrolein	ug/m3	<0.65	<0.65	nm
Pentane	ug/m3	300	300	0
Trichlorofluoromethane	ug/m3	<13	<13	nm
Acetone	ug/m3	55	51	8
2-Propanol	ug/m3	<49	<49	nm
1,1-Dichloroethene	ug/m3	<2.3	<2.3	nm
trans-1,2-Dichloroethene	ug/m3	<2.3	<2.3	nm
Methylene chloride	ug/m3	<200	<200	nm
t-Butyl alcohol (TBA)	ug/m3	<69	<69	nm
3-Chloropropene	ug/m3	<18	<18	nm
CFC-113	ug/m3	<8.7	<8.7	nm
Carbon disulfide	ug/m3	<36	<36	nm
Methyl t-butyl ether (MTBE)	ug/m3	<41	<41	nm
Vinyl acetate	ug/m3	<40	<40	nm
1,1-Dichloroethane	ug/m3	<2.3	<2.3	nm
cis-1,2-Dichloroethene	ug/m3	<2.3	<2.3	nm
Hexane	ug/m3	69	67	3
Chloroform	ug/m3	<0.28	<0.28	nm
Ethyl acetate	ug/m3	<41	<41	nm
Tetrahydrofuran	ug/m3	<3.4	<3.4	nm
2-Butanone (MEK)	ug/m3	<34	<34	nm
1,2-Dichloroethane (EDC)	ug/m3	<0.23	<0.23	nm
1,1,1-Trichloroethane	ug/m3	<3.1	<3.1	nm
Carbon tetrachloride	ug/m3	<1.8	<1.8	nm
Benzene	ug/m3	19	19	0
Cyclohexane	ug/m3	<39	<39	nm
1,2-Dichloropropane	ug/m3	<1.3	<1.3	nm
1,4-Dioxane	ug/m3	<2.1	<2.1	nm
2,2,4-Trimethylpentane	ug/m3	<27	<27	nm
Methyl methacrylate	ug/m3	<23	<23	nm
Heptane	ug/m3	<23	<23	nm
Bromodichloromethane	ug/m3	<0.38	<0.38	nm
Trichloroethene	ug/m3	<0.61	<0.61	nm
cis-1,3-Dichloropropene	ug/m3	<5.2	<5.2	nm
4-Methyl-2-pentanone	ug/m3	<47	<47	nm
trans-1,3-Dichloropropene	ug/m3	<2.6	<2.6	nm
Toluene	ug/m3	<43	<43	nm
1,1,2-Trichloroethane	ug/m3	<0.31	<0.31	nm
2-Hexanone	ug/m3	<23	<23	nm

Tetrachloroethene	ug/m3	<39	<39	nm
Dibromochloromethane	ug/m3	<0.49	<0.49	nm
1,2-Dibromoethane (EDB)	ug/m3	<0.44	<0.44	nm
Chlorobenzene	ug/m3	<2.6	<2.6	nm
Ethylbenzene	ug/m3	5.4	5.5	2
1,1,2,2-Tetrachloroethane	ug/m3	<0.78	<0.78	nm
Nonane	ug/m3	<30	<30	nm
Isopropylbenzene	ug/m3	<56	<56	nm
2-Chlorotoluene	ug/m3	<30	<30	nm
Propylbenzene	ug/m3	<28	<28	nm
4-Ethyltoluene	ug/m3	<28	<28	nm
m,p-Xylene	ug/m3	15	15	0
o-Xylene	ug/m3	4.7	4.8	2
Styrene	ug/m3	<4.9	<4.9	nm
Bromoform	ug/m3	<12	<12	nm
Benzyl chloride	ug/m3	<0.3	<0.3	nm
1,3,5-Trimethylbenzene	ug/m3	<28	<28	nm
1,2,4-Trimethylbenzene	ug/m3	<28	<28	nm
1,3-Dichlorobenzene	ug/m3	<3.4	<3.4	nm
1,4-Dichlorobenzene	ug/m3	<1.3	<1.3	nm
1,2-Dichlorobenzene	ug/m3	<3.4	<3.4	nm
1,2,4-Trichlorobenzene	ug/m3	<4.2	<4.2	nm
Naphthalene	ug/m3	<1.5	<1.5	nm
Hexachlorobutadiene	ug/m3	<1.2	<1.2	nm

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Propene	ug/m3	23	126	70-130
Dichlorodifluoromethane	ug/m3	67	113	70-130
Chloromethane	ug/m3	28	101	70-130
F-114	ug/m3	94	112	70-130
Vinyl chloride	ug/m3	35	117	70-130
1,3-Butadiene	ug/m3	30	102	70-130
Butane	ug/m3	32	107	70-130
Bromomethane	ug/m3	52	108	70-130
Chloroethane	ug/m3	36	111	70-130
Vinyl bromide	ug/m3	59	121	70-130
Ethanol	ug/m3	25	119	70-130
Acrolein	ug/m3	31	122	70-130
Pentane	ug/m3	40	108	70-130
Trichlorofluoromethane	ug/m3	76	108	70-130
Acetone	ug/m3	32	112	70-130
2-Propanol	ug/m3	33	101	70-130
1,1-Dichloroethene	ug/m3	54	113	70-130
trans-1,2-Dichloroethene	ug/m3	54	112	70-130
Methylene chloride	ug/m3	94	106	70-130
t-Butyl alcohol (TBA)	ug/m3	41	88	70-130
3-Chloropropene	ug/m3	42	96	70-130
CFC-113	ug/m3	100	114	70-130
Carbon disulfide	ug/m3	42	98	70-130
Methyl t-butyl ether (MTBE)	ug/m3	49	98	70-130
Vinyl acetate	ug/m3	48	100	70-130
1,1-Dichloroethane	ug/m3	55	116	70-130
cis-1,2-Dichloroethene	ug/m3	54	107	70-130
Hexane	ug/m3	48	85	70-130
Chloroform	ug/m3	66	115	70-130
Ethyl acetate	ug/m3	49	86	70-130
Tetrahydrofuran	ug/m3	40	98	70-130
2-Butanone (MEK)	ug/m3	40	104	70-130
1,2-Dichloroethane (EDC)	ug/m3	55	117	70-130
1,1,1-Trichloroethane	ug/m3	74	120	70-130
Carbon tetrachloride	ug/m3	85	113	70-130
Benzene	ug/m3	43	105	70-130
Cyclohexane	ug/m3	46	96	70-130
1,2-Dichloropropane	ug/m3	62	119	70-130
1,4-Dioxane	ug/m3	49	99	70-130
2,2,4-Trimethylpentane	ug/m3	63	103	70-130
Methyl methacrylate	ug/m3	55	111	70-130
Heptane	ug/m3	55	105	70-130
Bromodichloromethane	ug/m3	90	120	70-130
Trichloroethene	ug/m3	73	118	70-130
cis-1,3-Dichloropropene	ug/m3	61	114	70-130
4-Methyl-2-pentanone	ug/m3	55	104	70-130
trans-1,3-Dichloropropene	ug/m3	61	121	70-130
Toluene	ug/m3	51	110	70-130
1,1,2-Trichloroethane	ug/m3	74	120	70-130
2-Hexanone	ug/m3	55	96	70-130

Tetrachloroethene	ug/m3	92	117	70-130
Dibromochloromethane	ug/m3	120	116	70-130
1,2-Dibromoethane (EDB)	ug/m3	100	121	70-130
Chlorobenzene	ug/m3	62	107	70-130
Ethylbenzene	ug/m3	59	103	70-130
1,1,2,2-Tetrachloroethane	ug/m3	93	118	70-130
Nonane	ug/m3	71	108	70-130
Isopropylbenzene	ug/m3	66	109	70-130
2-Chlorotoluene	ug/m3	70	105	70-130
Propylbenzene	ug/m3	66	106	70-130
4-Ethyltoluene	ug/m3	66	98	70-130
m,p-Xylene	ug/m3	120	105	70-130
o-Xylene	ug/m3	59	109	70-130
Styrene	ug/m3	58	93	70-130
Bromoform	ug/m3	140	105	70-130
Benzyl chloride	ug/m3	70	161 vo	70-130
1,3,5-Trimethylbenzene	ug/m3	66	102	70-130
1,2,4-Trimethylbenzene	ug/m3	66	93	70-130
1,3-Dichlorobenzene	ug/m3	81	110	70-130
1,4-Dichlorobenzene	ug/m3	81	107	70-130
1,2-Dichlorobenzene	ug/m3	81	108	70-130
1,2,4-Trichlorobenzene	ug/m3	100	95	70-130
Naphthalene	ug/m3	71	95	70-130
Hexachlorobutadiene	ug/m3	140	107	70-130

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-17

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Dichlorodifluoromethane	ng/tube	50	70	70-130
Vinyl chloride	ng/tube	50	82	70-130
2-Propanol	ng/tube	250	111	70-130
1,1-Dichloroethene	ng/tube	50	99	70-130
Hexane	ng/tube	50	97	70-130
t-Butyl alcohol (TBA)	ng/tube	250	106	70-130
Methyl t-butyl ether (MTBE)	ng/tube	50	102	70-130
trans-1,2-Dichloroethene	ng/tube	50	99	70-130
1,1-Dichloroethane	ng/tube	50	99	70-130
2,2-Dichloropropane	ng/tube	50	101	70-130
cis-1,2-Dichloroethene	ng/tube	50	99	70-130
Chloroform	ng/tube	50	99	70-130
2-Butanone (MEK)	ng/tube	50	91	70-130
1,2-Dichloroethane (EDC)	ng/tube	50	99	70-130
1,1,1-Trichloroethane	ng/tube	50	100	70-130
1,1-Dichloropropene	ng/tube	50	99	70-130
Carbon tetrachloride	ng/tube	50	100	70-130
Benzene	ng/tube	50	94	70-130
Trichloroethene	ng/tube	50	102	70-130
1,2-Dichloropropane	ng/tube	50	100	70-130
Bromodichloromethane	ng/tube	50	99	70-130
Dibromomethane	ng/tube	50	99	70-130
4-Methyl-2-pentanone	ng/tube	50	101	70-130
cis-1,3-Dichloropropene	ng/tube	50	102	70-130
Toluene	ng/tube	50	100	70-130
trans-1,3-Dichloropropene	ng/tube	50	104	70-130
1,1,2-Trichloroethane	ng/tube	50	105	70-130
2-Hexanone	ng/tube	50	88	70-130
1,3-Dichloropropane	ng/tube	50	103	70-130
Tetrachloroethene	ng/tube	50	106	70-130
Dibromochloromethane	ng/tube	50	103	70-130
1,2-Dibromoethane (EDB)	ng/tube	50	104	70-130
Chlorobenzene	ng/tube	50	101	70-130
Ethylbenzene	ng/tube	50	102	70-130
1,1,1,2-Tetrachloroethane	ng/tube	50	101	70-130
m,p-Xylene	ng/tube	100	102	70-130
o-Xylene	ng/tube	50	102	70-130
Styrene	ng/tube	50	103	70-130
Isopropylbenzene	ng/tube	50	102	70-130
Bromoform	ng/tube	50	101	70-130
n-Propylbenzene	ng/tube	50	102	70-130
Bromobenzene	ng/tube	50	104	70-130
1,3,5-Trimethylbenzene	ng/tube	50	101	70-130
1,1,2,2-Tetrachloroethane	ng/tube	50	101	70-130
1,2,3-Trichloropropane	ng/tube	50	101	70-130
2-Chlorotoluene	ng/tube	50	105	70-130
4-Chlorotoluene	ng/tube	50	103	70-130
tert-Butylbenzene	ng/tube	50	103	70-130
1,2,4-Trimethylbenzene	ng/tube	50	92	70-130
sec-Butylbenzene	ng/tube	50	91	70-130

p-Isopropyltoluene	ng/tube	50	92	70-130
1,3-Dichlorobenzene	ng/tube	50	90	70-130
1,4-Dichlorobenzene	ng/tube	50	90	70-130
1,2-Dichlorobenzene	ng/tube	50	89	70-130
1,2-Dibromo-3-chloropropane	ng/tube	50	93	70-130
1,2,4-Trichlorobenzene	ng/tube	50	88	70-130
Hexachlorobutadiene	ng/tube	50	87	70-130
Naphthalene	ng/tube	50	91	70-130
1,2,3-Trichlorobenzene	ng/tube	50	89	70-130
2-Methylnaphthalene	ng/tube	50	107	70-130
1-Methylnaphthalene	ng/tube	50	107	70-130
Diesel Fuel Range	ng/tube	2,500	105	70-130
APH EC9-12 aliphatics	ng/tube	1,200	82	70-130
APH EC9-10 aromatics	ng/tube	1,000	111	70-130

ANALYTE	CATEGORY	MATRIX	MDL	RL	LOW LEVEL RL	UNIT	METHOD
Helium	AIR	Air	0.15	0.6	---	ug/m3	ASTMD1946
1,4-Dioxane	VOC SIM	Water	0.12	0.4	---	ug/L	EPA8260D SIM
1,4-Dioxane	VOC SIM	Soil	0.023	0.1	---	mg/kg	EPA8260D SIM
Aroclor 1221	PCB	Soil	0.00021	0.02	0.004	mg/kg	EPA8082
Aroclor 1232	PCB	Soil	0.00021	0.02	0.004	mg/kg	EPA8082
Aroclor 1016	PCB	Soil	0.00021	0.02	0.004	mg/kg	EPA8082
Aroclor 1242	PCB	Soil	0.00021	0.02	0.004	mg/kg	EPA8082
Aroclor 1248	PCB	Soil	0.00023	0.02	0.004	mg/kg	EPA8082
Aroclor 1254	PCB	Soil	0.00023	0.02	0.004	mg/kg	EPA8082
Aroclor 1260	PCB	Soil	0.00023	0.02	0.004	mg/kg	EPA8082
Aroclor 1262	PCB	Soil	0.00023	0.02	0.004	mg/kg	EPA8082
Aroclor 1268	PCB	Soil	0.00023	0.02	0.004	mg/kg	EPA8082
Aroclor 1221	PCB	Water	0.0054	0.1	0.01	ug/L	EPA8082
Aroclor 1232	PCB	Water	0.0054	0.1	0.01	ug/L	EPA8082
Aroclor 1016	PCB	Water	0.0054	0.1	0.01	ug/L	EPA8082
Aroclor 1242	PCB	Water	0.0054	0.1	0.01	ug/L	EPA8082
Aroclor 1248	PCB	Water	0.0059	0.1	0.01	ug/L	EPA8082
Aroclor 1254	PCB	Water	0.0059	0.1	0.01	ug/L	EPA8082
Aroclor 1260	PCB	Water	0.0059	0.1	0.01	ug/L	EPA8082
Aroclor 1262	PCB	Water	0.0059	0.1	0.01	ug/L	EPA8082
Aroclor 1268	PCB	Water	0.0059	0.1	0.01	ug/L	EPA8082
Aroclor 1221	PCB	Product	0.6	1	---	mg/kg	EPA8082
Aroclor 1232	PCB	Product	0.6	1	---	mg/kg	EPA8082
Aroclor 1016	PCB	Product	0.6	1	---	mg/kg	EPA8082
Aroclor 1242	PCB	Product	0.6	1	---	mg/kg	EPA8082
Aroclor 1248	PCB	Product	0.7	1	---	mg/kg	EPA8082
Aroclor 1254	PCB	Product	0.7	1	---	mg/kg	EPA8082
Aroclor 1260	PCB	Product	0.7	1	---	mg/kg	EPA8082
Aroclor 1262	PCB	Product	0.7	1	---	mg/kg	EPA8082
Aroclor 1268	PCB	Product	0.7	1	---	mg/kg	EPA8082
Aroclor 1221	PCB	Wipe	0.62	1	---	ug/wipe	EPA8082
Aroclor 1232	PCB	Wipe	0.62	1	---	ug/wipe	EPA8082
Aroclor 1016	PCB	Wipe	0.62	1	---	ug/wipe	EPA8082
Aroclor 1242	PCB	Wipe	0.62	1	---	ug/wipe	EPA8082
Aroclor 1248	PCB	Wipe	0.56	1	---	ug/wipe	EPA8082
Aroclor 1254	PCB	Wipe	0.56	1	---	ug/wipe	EPA8082
Aroclor 1260	PCB	Wipe	0.56	1	---	ug/wipe	EPA8082
Aroclor 1262	PCB	Wipe	0.56	1	---	ug/wipe	EPA8082
Aroclor 1268	PCB	Wipe	0.56	1	---	ug/wipe	EPA8082
4,4'-DDD	PEST	Soil	0.000015	0.01	0.0001	mg/kg	EPA8081
4,4'-DDE	PEST	Soil	0.000012	0.01	0.0001	mg/kg	EPA8081
4,4'-DDT	PEST	Soil	0.000028	0.01	0.0001	mg/kg	EPA8081
Aldrin	PEST	Soil	0.00001	0.01	0.0001	mg/kg	EPA8081
alpha-BHC	PEST	Soil	0.000012	0.01	0.0001	mg/kg	EPA8081
beta-BHC	PEST	Soil	0.000021	0.01	0.0001	mg/kg	EPA8081
cis-Chlordane	PEST	Soil	0.000012	0.01	0.0001	mg/kg	EPA8081
delta-BHC	PEST	Soil	0.00002	0.01	0.0001	mg/kg	EPA8081
Dieldrin	PEST	Soil	0.000015	0.01	0.0001	mg/kg	EPA8081
Endosulfan I	PEST	Soil	0.00001	0.01	0.0001	mg/kg	EPA8081
Endosulfan II	PEST	Soil	0.000014	0.01	0.0001	mg/kg	EPA8081
Endosulfan Sulfate	PEST	Soil	0.000012	0.01	0.0001	mg/kg	EPA8081
Endrin	PEST	Soil	0.000018	0.01	0.0001	mg/kg	EPA8081
Endrin Aldehyde	PEST	Soil	0.000026	0.01	0.0001	mg/kg	EPA8081
Endrin Ketone	PEST	Soil	0.000055	0.01	0.0001	mg/kg	EPA8081
gamma-BHC (Linc	PEST	Soil	9.5E-06	0.01	0.0001	mg/kg	EPA8081
Heptachlor	PEST	Soil	0.000017	0.01	0.0001	mg/kg	EPA8081
Heptachlor Epoxid	PEST	Soil	0.00001	0.01	0.0001	mg/kg	EPA8081
Methoxychlor	PEST	Soil	0.00004	0.01	0.0001	mg/kg	EPA8081
Toxaphene	PEST	Soil	0.014	1	0.1	mg/kg	EPA8081
trans-Chlordane	PEST	Soil	0.000013	0.01	0.0001	mg/kg	EPA8081
4,4'-DDD	PEST	Water	0.0012	0.1	0.005	ug/L	EPA8081
4,4'-DDE	PEST	Water	0.00072	0.1	0.005	ug/L	EPA8081
4,4'-DDT	PEST	Water	0.001	0.1	0.005	ug/L	EPA8081
Aldrin	PEST	Water	0.00052	0.1	0.005	ug/L	EPA8081
alpha-BHC	PEST	Water	0.00064	0.1	0.005	ug/L	EPA8081
beta-BHC	PEST	Water	0.00061	0.1	0.005	ug/L	EPA8081
cis-Chlordane	PEST	Water	0.0007	0.1	0.005	ug/L	EPA8081
delta-BHC	PEST	Water	0.00053	0.1	0.005	ug/L	EPA8081
Dieldrin	PEST	Water	0.00064	0.1	0.005	ug/L	EPA8081
Endosulfan I	PEST	Water	0.00067	0.1	0.005	ug/L	EPA8081
Endosulfan II	PEST	Water	0.00094	0.1	0.005	ug/L	EPA8081
Endosulfan Sulfate	PEST	Water	0.00083	0.1	0.005	ug/L	EPA8081
Endrin	PEST	Water	0.00063	0.1	0.005	ug/L	EPA8081
Endrin Aldehyde	PEST	Water	0.0011	0.1	0.005	ug/L	EPA8081

ACRONYMS

MDL-method detection limit
RL - reporting limit
ug - microgram
mg - milligram
kg - kilogram
L - liter
m3 - cubic meter

Endrin Ketone	PEST	Water	0.0027	0.1	0.005	ug/L	EPA8081
gamma-BHC (Linc	PEST	Water	0.00076	0.1	0.005	ug/L	EPA8081
Heptachlor	PEST	Water	0.0005	0.1	0.005	ug/L	EPA8081
Heptachlor Epoxid	PEST	Water	0.0008	0.1	0.005	ug/L	EPA8081
Methoxychlor	PEST	Water	0.0013	0.1	0.005	ug/L	EPA8081
Toxaphene	PEST	Water	0.044	1	0.1	ug/L	EPA8081
trans-Chlordane	PEST	Water	0.00048	0.1	0.005	ug/L	EPA8081
1,2-Dibromoethan	8011	Water	0.0098	0.01	---	ug/L	EPA8011
diesel	TPH	Soil	25	50	---	mg/kg	NWTPH-Dx
diesel extended	TPH	Soil	32	250	---	mg/kg	NWTPH-Dx
motor oil	TPH	Soil	37	250	---	mg/kg	NWTPH-Dx
diesel	TPH	Soil	5.4	---	10	mg/kg	NWTPH-Dx
motor oil	TPH	Soil	10	---	50	mg/kg	NWTPH-Dx
diesel	TPH	Water	27	100	---	ug/L	NWTPH-Dx
diesel extended	TPH	Water	110	250	---	ug/L	NWTPH-Dx
motor oil	TPH	Water	110	250	---	ug/L	NWTPH-Dx
gasoline	TPH	Soil	0.6	5	---	mg/kg	NWTPH-Gx
Stoddard	TPH	Soil	1.3	25	---	mg/kg	NWTPH-Gx
benzene	TPH	Soil	0.003	0.02	---	mg/kg	EPA8021
toluene	TPH	Soil	0.0046	0.02	---	mg/kg	EPA8021
ethylbenzene	TPH	Soil	0.0029	0.02	---	mg/kg	EPA8021
xylenes	TPH	Soil	0.0077	0.06	---	mg/kg	EPA8021
Stoddard	TPH	Water	7	500	---	ug/L	NWTPH-Gx
gasoline	TPH	Water	26	100	---	ug/L	NWTPH-Gx
benzene	TPH	Water	0.12	1	---	ug/L	EPA8021
toluene	TPH	Water	0.12	1	---	ug/L	EPA8021
ethylbenzene	TPH	Water	0.1	1	---	ug/L	EPA8021
xylenes	TPH	Water	0.29	3	---	ug/L	EPA8021
1,1,1-Trichloroeth	TO15	Air	0.043	0.55	---	ug/m3	EPATO15
1,1,2,2-Tetrachlor	TO15	Air	0.06	0.14	---	ug/m3	EPATO15
1,1,2-Trichloroeth	TO15	Air	0.047	0.055	---	ug/m3	EPATO15
1,1-Dichloroethan	TO15	Air	0.024	0.4	---	ug/m3	EPATO15
1,1-Dichloroethen	TO15	Air	0.044	0.4	---	ug/m3	EPATO15
1,2,4-Trichloroben	TO15	Air	0.53	0.74	---	ug/m3	EPATO15
1,2,4-Trimethylber	TO15	Air	1.6	4.9	---	ug/m3	EPATO15
1,2-Dibromoethan	TO15	Air	0.058	0.077	---	ug/m3	EPATO15
1,2-Dichlorobenze	TO15	Air	0.17	0.6	---	ug/m3	EPATO15
1,2-Dichloroethan	TO15	Air	0.024	0.04	---	ug/m3	EPATO15
1,2-Dichloropropa	TO15	Air	0.086	0.23	---	ug/m3	EPATO15
1,3,5-Trimethylber	TO15	Air	0.35	4.9	---	ug/m3	EPATO15
1,3-Butadiene	TO15	Air	0.024	0.044	---	ug/m3	EPATO15
1,3-Dichlorobenze	TO15	Air	0.22	0.6	---	ug/m3	EPATO15
1,4-Dichlorobenze	TO15	Air	0.15	0.23	---	ug/m3	EPATO15
1,4-Dioxane	TO15	Air	0.061	0.36	---	ug/m3	EPATO15
2,2,4-Trimethylper	TO15	Air	0.66	4.7	---	ug/m3	EPATO15
2-Butanone (MEK)	TO15	Air	1.1	5.9	---	ug/m3	EPATO15
2-Chlorotoluene	TO15	Air	1.2	5.2	---	ug/m3	EPATO15
2-Hexanone	TO15	Air	2.3	4.1	---	ug/m3	EPATO15
2-Propanol	TO15	Air	0.71	8.6	---	ug/m3	EPATO15
3-Chloropropene	TO15	Air	0.66	3.1	---	ug/m3	EPATO15
4-Ethyltoluene	TO15	Air	1.8	4.9	---	ug/m3	EPATO15
4-Methyl-2-pentan	TO15	Air	2.2	8.2	---	ug/m3	EPATO15
Acetone	TO15	Air	1.3	4.8	---	ug/m3	EPATO15
Acrolein	TO15	Air	0.1	0.11	---	ug/m3	EPATO15
Benzene	TO15	Air	0.038	0.32	---	ug/m3	EPATO15
Benzyl chloride	TO15	Air	0.032	0.052	---	ug/m3	EPATO15
Bromodichloromet	TO15	Air	0.064	0.067	---	ug/m3	EPATO15
Bromoform	TO15	Air	0.65	2.1	---	ug/m3	EPATO15
Bromomethane	TO15	Air	1.3	3.9	---	ug/m3	EPATO15
Butane	TO15	Air	0.48	4.8	---	ug/m3	EPATO15
Carbon disulfide	TO15	Air	0.96	6.2	---	ug/m3	EPATO15
Carbon tetrachlori	TO15	Air	0.04	0.31	---	ug/m3	EPATO15
CFC-113	TO15	Air	0.28	1.5	---	ug/m3	EPATO15
Chlorobenzene	TO15	Air	0.11	0.46	---	ug/m3	EPATO15
Chloroethane	TO15	Air	0.038	2.6	---	ug/m3	EPATO15
Chloroform	TO15	Air	0.037	0.049	---	ug/m3	EPATO15
Chloromethane	TO15	Air	0.072	3.7	---	ug/m3	EPATO15
cis-1,2-Dichloroeth	TO15	Air	0.02	0.4	---	ug/m3	EPATO15
cis-1,3-Dichloropr	TO15	Air	0.15	0.91	---	ug/m3	EPATO15
Cyclohexane	TO15	Air	0.76	6.9	---	ug/m3	EPATO15
Dibromochloromet	TO15	Air	0.076	0.085	---	ug/m3	EPATO15
Dichlorodifluorom	TO15	Air	0.14	0.99	---	ug/m3	EPATO15
Ethanol	TO15	Air	1.3	7.5	---	ug/m3	EPATO15
Ethyl acetate	TO15	Air	1.3	7.2	---	ug/m3	EPATO15
Ethylbenzene	TO15	Air	0.046	0.43	---	ug/m3	EPATO15
F-114	TO15	Air	0.32	2.1	---	ug/m3	EPATO15
Heptane	TO15	Air	0.6	4.1	---	ug/m3	EPATO15

Hexachlorobutadie	TO15	Air	0.092	0.21	---	ug/m3	EPATO15
Hexane	TO15	Air	0.92	3.5	---	ug/m3	EPATO15
Isopropylbenzene	TO15	Air	2	9.8	---	ug/m3	EPATO15
m,p-Xylene	TO15	Air	0.14	0.87	---	ug/m3	EPATO15
Methyl Methacryla	TO15	Air	1.3	4.1	---	ug/m3	EPATO15
Methyl t-butyl ethe	TO15	Air	0.7	7.2	---	ug/m3	EPATO15
Methylene chloride	TO15	Air	1.3	35	---	ug/m3	EPATO15
Naphthalene	TO15	Air	0.018	0.11	0.052	ug/m3	EPATO15
Nonane	TO15	Air	0.76	5.2	---	ug/m3	EPATO15
o-Xylene	TO15	Air	0.058	0.43	---	ug/m3	EPATO15
Pentane	TO15	Air	1.1	5.9	---	ug/m3	EPATO15
Propene	TO15	Air	0.2	1.2	---	ug/m3	EPATO15
Propylbenzene	TO15	Air	0.92	4.9	---	ug/m3	EPATO15
Styrene	TO15	Air	0.28	0.85	---	ug/m3	EPATO15
t-Butyl alcohol (TB	TO15	Air	0.33	12	---	ug/m3	EPATO15
Tetrachloroethene	TO15	Air	0.18	6.8	---	ug/m3	EPATO15
Tetrahydrofuran	TO15	Air	0.15	0.59	---	ug/m3	EPATO15
Toluene	TO15	Air	0.095	7.5	---	ug/m3	EPATO15
trans-1,2-Dichloroe	TO15	Air	0.051	0.4	---	ug/m3	EPATO15
trans-1,3-Dichlorop	TO15	Air	0.1	0.45	---	ug/m3	EPATO15
Trichloroethene	TO15	Air	0.051	0.11	---	ug/m3	EPATO15
Trichlorofluoromet	TO15	Air	0.21	2.2	---	ug/m3	EPATO15
Vinyl acetate	TO15	Air	0.91	7	---	ug/m3	EPATO15
Vinyl bromide	TO15	Air	0.034	0.44	---	ug/m3	EPATO15
Vinyl chloride	TO15	Air	0.012	0.26	---	ug/m3	EPATO15
Gasoline Range C	TO15	Air	30	330	---	ug/m3	EPATO15
1,2,4-Trichloroben	SVOC	Soil	0.0039	0.05	---	mg/kg	EPA8270E
1,2-Dichlorobenze	SVOC	Soil	0.0036	0.05	---	mg/kg	EPA8270E
1,2-Diphenylhydra	SVOC	Soil	0.0044	0.05	---	mg/kg	EPA8270E
1,3-Dichlorobenze	SVOC	Soil	0.0029	0.05	---	mg/kg	EPA8270E
1,4-Dichlorobenze	SVOC	Soil	0.003	0.05	---	mg/kg	EPA8270E
1-Methylnaphthale	SVOC	Soil	0.0003	0.01	---	mg/kg	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Soil	0.0031	0.05	---	mg/kg	EPA8270E
2,4,5-Trichlorophe	SVOC	Soil	0.013	0.5	---	mg/kg	EPA8270E
2,4,6-Trichlorophe	SVOC	Soil	0.015	0.5	---	mg/kg	EPA8270E
2,4-Dichlorophenc	SVOC	Soil	0.0061	0.5	---	mg/kg	EPA8270E
2,4-Dimethylphenc	SVOC	Soil	0.014	0.5	---	mg/kg	EPA8270E
2,4-Dinitrophenol	SVOC	Soil	0.016	1.5	---	mg/kg	EPA8270E
2,4-Dinitrotoluene	SVOC	Soil	0.0081	0.25	---	mg/kg	EPA8270E
2,6-Dinitrotoluene	SVOC	Soil	0.0069	0.25	---	mg/kg	EPA8270E
2-Chloronaphthale	SVOC	Soil	0.0016	0.05	---	mg/kg	EPA8270E
2-Chlorophenol	SVOC	Soil	0.012	0.5	---	mg/kg	EPA8270E
2-Methylnaphthale	SVOC	Soil	0.00039	0.01	---	mg/kg	EPA8270E
2-Methylphenol	SVOC	Soil	0.0082	0.5	---	mg/kg	EPA8270E
2-Nitroaniline	SVOC	Soil	0.015	0.25	---	mg/kg	EPA8270E
2-Nitrophenol	SVOC	Soil	0.027	0.5	---	mg/kg	EPA8270E
3,3'-Dichlorobenzi	SVOC	Soil	0.033	0.5	---	mg/kg	EPA8270E
3-Methylphenol + 4	SVOC	Soil	0.013	1	---	mg/kg	EPA8270E
3-Nitroaniline	SVOC	Soil	0.017	5	---	mg/kg	EPA8270E
4,6-Dinitro-2-meth	SVOC	Soil	0.017	1.5	---	mg/kg	EPA8270E
4-Bromophenyl ph	SVOC	Soil	0.0023	0.05	---	mg/kg	EPA8270E
4-Chloro-3-methyl	SVOC	Soil	0.018	0.5	---	mg/kg	EPA8270E
4-Chloroaniline	SVOC	Soil	0.21	5	---	mg/kg	EPA8270E
4-Chlorophenyl ph	SVOC	Soil	0.0028	0.05	---	mg/kg	EPA8270E
4-Nitroaniline	SVOC	Soil	0.024	5	---	mg/kg	EPA8270E
4-Nitrophenol	SVOC	Soil	0.011	1.5	---	mg/kg	EPA8270E
Acenaphthene	SVOC	Soil	0.00018	0.01	---	mg/kg	EPA8270E
Acenaphthylene	SVOC	Soil	0.00016	0.01	---	mg/kg	EPA8270E
Anthracene	SVOC	Soil	0.00014	0.01	---	mg/kg	EPA8270E
Benz(a)anthracen	SVOC	Soil	0.00023	0.01	---	mg/kg	EPA8270E
Benzo(a)pyrene	SVOC	Soil	0.00028	0.01	---	mg/kg	EPA8270E
Benzo(b)fluoranth	SVOC	Soil	0.00025	0.01	---	mg/kg	EPA8270E
Benzo(g,h,i)peryle	SVOC	Soil	0.0004	0.01	---	mg/kg	EPA8270E
Benzo(k)fluoranth	SVOC	Soil	0.00032	0.01	---	mg/kg	EPA8270E
Benzoic acid	SVOC	Soil	0.1	2.5	---	mg/kg	EPA8270E
Benzyl alcohol	SVOC	Soil	0.012	0.5	---	mg/kg	EPA8270E
Benzyl butyl phtha	SVOC	Soil	0.019	0.5	---	mg/kg	EPA8270E
Bis(2-chloroethoxy	SVOC	Soil	0.0027	0.05	---	mg/kg	EPA8270E
Bis(2-chloroethyl)	SVOC	Soil	0.0035	0.05	---	mg/kg	EPA8270E
Bis(2-ethylhexyl) p	SVOC	Soil	0.035	0.8	---	mg/kg	EPA8270E
Carbazole	SVOC	Soil	0.0019	0.05	---	mg/kg	EPA8270E
Chrysene	SVOC	Soil	0.00018	0.01	---	mg/kg	EPA8270E
Dibenzo(a,h)anthr	SVOC	Soil	0.00049	0.01	---	mg/kg	EPA8270E
Dibenzofuran	SVOC	Soil	0.0034	0.05	---	mg/kg	EPA8270E
Diethyl phthalate	SVOC	Soil	0.0051	0.5	---	mg/kg	EPA8270E
Dimethyl phthalate	SVOC	Soil	0.0053	0.5	---	mg/kg	EPA8270E
Di-n-butyl phthalat	SVOC	Soil	0.019	0.5	---	mg/kg	EPA8270E

Di-n-octyl phthalat	SVOC	Soil	0.019	0.5	---	mg/kg	EPA8270E
Fluoranthene	SVOC	Soil	0.00019	0.01	---	mg/kg	EPA8270E
Fluorene	SVOC	Soil	0.00014	0.01	---	mg/kg	EPA8270E
Hexachlorobenzer	SVOC	Soil	0.002	0.05	---	mg/kg	EPA8270E
Hexachlorobutadie	SVOC	Soil	0.0029	0.05	---	mg/kg	EPA8270E
Hexachlorocyclope	SVOC	Soil	0.0061	0.15	---	mg/kg	EPA8270E
Hexachloroethane	SVOC	Soil	0.0041	0.05	---	mg/kg	EPA8270E
Indeno(1,2,3-cd)py	SVOC	Soil	0.00026	0.01	---	mg/kg	EPA8270E
Isophorone	SVOC	Soil	0.0019	0.05	---	mg/kg	EPA8270E
Naphthalene	SVOC	Soil	0.0004	0.01	---	mg/kg	EPA8270E
Nitrobenzene	SVOC	Soil	0.0047	0.05	---	mg/kg	EPA8270E
N-Nitrosodimethyla	SVOC	Soil	0.0063	0.05	---	mg/kg	EPA8270E
N-Nitroso-di-n-pro	SVOC	Soil	0.003	0.05	---	mg/kg	EPA8270E
N-Nitrosodiphenyla	SVOC	Soil	0.0033	0.05	---	mg/kg	EPA8270E
Pentachloropheno	SVOC	Soil	0.0088	0.25	---	mg/kg	EPA8270E
Phenanthrene	SVOC	Soil	0.00018	0.01	---	mg/kg	EPA8270E
Phenol	SVOC	Soil	0.013	0.5	---	mg/kg	EPA8270E
Pyrene	SVOC	Soil	0.00016	0.01	---	mg/kg	EPA8270E
1,2,4-Trichloroben	SVOC	Water	0.051	0.2	---	ug/L	EPA8270E
1,2-Dichlorobenze	SVOC	Water	0.055	0.2	---	ug/L	EPA8270E
1,2-Diphenylhydra	SVOC	Water	0.028	0.2	---	ug/L	EPA8270E
1,3-Dichlorobenze	SVOC	Water	0.067	0.2	---	ug/L	EPA8270E
1,4-Dichlorobenze	SVOC	Water	0.065	0.2	---	ug/L	EPA8270E
1-Methylnaphthale	SVOC	Water	0.005	0.2	---	ug/L	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Water	0.046	0.2	---	ug/L	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Water	0.046	2	---	ug/L	EPA8270E
2,4,5-Trichlorophe	SVOC	Water	0.17	2	---	ug/L	EPA8270E
2,4,6-Trichlorophe	SVOC	Water	0.13	2	---	ug/L	EPA8270E
2,4-Dichloropheno	SVOC	Water	0.12	2	---	ug/L	EPA8270E
2,4-Dimethylphen	SVOC	Water	0.78	6	---	ug/L	EPA8270E
2,4-Dinitrophenol	SVOC	Water	2.6	1	---	ug/L	EPA8270E
2,4-Dinitrotoluene	SVOC	Water	0.067	1	---	ug/L	EPA8270E
2,6-Dinitrotoluene	SVOC	Water	0.072	0.2	---	ug/L	EPA8270E
2-Chloronaphthale	SVOC	Water	0.034	2	---	ug/L	EPA8270E
2-Chlorophenol	SVOC	Water	0.16	0.2	---	ug/L	EPA8270E
2-Methylnaphthale	SVOC	Water	0.0059	2	---	ug/L	EPA8270E
2-Methylphenol	SVOC	Water	0.19	1	---	ug/L	EPA8270E
2-Nitroaniline	SVOC	Water	0.35	2	---	ug/L	EPA8270E
2-Nitrophenol	SVOC	Water	0.25	2	---	ug/L	EPA8270E
3,3'-Dichlorobenzi	SVOC	Water	0.81	4	---	ug/L	EPA8270E
3-Methylphenol +	SVOC	Water	0.29	20	---	ug/L	EPA8270E
3-Nitroaniline	SVOC	Water	0.34	6	---	ug/L	EPA8270E
4,6-Dinitro-2-meth	SVOC	Water	0.16	0.2	---	ug/L	EPA8270E
4-Bromophenyl ph	SVOC	Water	0.035	2	---	ug/L	EPA8270E
4-Chloro-3-methyl	SVOC	Water	0.1	20	---	ug/L	EPA8270E
4-Chloroaniline	SVOC	Water	0.61	0.2	---	ug/L	EPA8270E
4-Chlorophenyl ph	SVOC	Water	0.03	20	---	ug/L	EPA8270E
4-Nitroaniline	SVOC	Water	0.88	6	---	ug/L	EPA8270E
4-Nitrophenol	SVOC	Water	0.52	0.02	---	ug/L	EPA8270E
Acenaphthene	SVOC	Water	0.0042	0.02	---	ug/L	EPA8270E
Acenaphthylene	SVOC	Water	0.0031	0.02	---	ug/L	EPA8270E
Anthracene	SVOC	Water	0.0049	0.02	---	ug/L	EPA8270E
Benz(a)anthracen	SVOC	Water	0.006	4	---	ug/L	EPA8270E
Benzo(a)pyrene	SVOC	Water	0.0089	0.02	---	ug/L	EPA8270E
Benzo(b)fluoranth	SVOC	Water	0.0054	0.02	---	ug/L	EPA8270E
Benzo(g,h,i)peryle	SVOC	Water	0.018	0.04	---	ug/L	EPA8270E
Benzo(k)fluoranth	SVOC	Water	0.0045	0.02	---	ug/L	EPA8270E
Benzoic acid	SVOC	Water	5.2	10	---	ug/L	EPA8270E
Benzyl alcohol	SVOC	Water	0.14	2	---	ug/L	EPA8270E
Benzyl butyl phtha	SVOC	Water	0.7	2	---	ug/L	EPA8270E
Bis(2-chloroethoxy	SVOC	Water	0.062	0.2	---	ug/L	EPA8270E
Bis(2-chloroethyl)	SVOC	Water	0.042	0.2	---	ug/L	EPA8270E
Bis(2-ethylhexyl) p	SVOC	Water	0.93	3.2	---	ug/L	EPA8270E
Carbazole	SVOC	Water	0.0034	0.02	---	ug/L	EPA8270E
Chrysene	SVOC	Water	0.0045	0.02	---	ug/L	EPA8270E
Dibenzo(a,h)anthr	SVOC	Water	0.013	0.02	---	ug/L	EPA8270E
Dibenzofuran	SVOC	Water	0.0052	0.02	---	ug/L	EPA8270E
Diethyl phthalate	SVOC	Water	0.11	2	---	ug/L	EPA8270E
Dimethyl phthalate	SVOC	Water	0.062	2	---	ug/L	EPA8270E
Di-n-butyl phthalat	SVOC	Water	0.51	2	---	ug/L	EPA8270E
Di-n-octyl phthalat	SVOC	Water	0.63	2	---	ug/L	EPA8270E
Fluoranthene	SVOC	Water	0.0045	0.02	---	ug/L	EPA8270E
Fluorene	SVOC	Water	0.0032	0.02	---	ug/L	EPA8270E
Hexachlorobenzer	SVOC	Water	0.039	0.2	---	ug/L	EPA8270E
Hexachlorobutadie	SVOC	Water	0.091	0.2	---	ug/L	EPA8270E
Hexachlorocyclope	SVOC	Water	0.11	0.6	---	ug/L	EPA8270E
Hexachloroethane	SVOC	Water	0.079	0.2	---	ug/L	EPA8270E

Indeno(1,2,3-cd)p	SVOC	Water	0.014	0.02	---	ug/L	EPA8270E
Isophorone	SVOC	Water	0.02	0.2	---	ug/L	EPA8270E
Naphthalene	SVOC	Water	0.0078	0.2	---	ug/L	EPA8270E
Nitrobenzene	SVOC	Water	0.075	0.2	---	ug/L	EPA8270E
N-Nitrosodimethyl	SVOC	Water	0.03	0.2	---	ug/L	EPA8270E
N-Nitroso-di-n-pro	SVOC	Water	0.052	0.2	---	ug/L	EPA8270E
N-Nitrosodiphenyl	SVOC	Water	0.021	0.2	---	ug/L	EPA8270E
Pentachloropheno	SVOC	Water	0.44	1	---	ug/L	EPA8270E
Phenanthrene	SVOC	Water	0.005	0.02	---	ug/L	EPA8270E
Phenol	SVOC	Water	0.061	2	---	ug/L	EPA8270E
Pyrene	SVOC	Water	0.0041	0.02	---	ug/L	EPA8270E
1,2,4-Trichloroben	SVOC	Soil	0.0039	---	0.01	mg/kg	EPA8270E
1,2-Dichlorobenze	SVOC	Soil	0.0036	---	0.01	mg/kg	EPA8270E
1,2-Diphenylhydra	SVOC	Soil	0.0044	---	0.01	mg/kg	EPA8270E
1,3-Dichlorobenze	SVOC	Soil	0.0029	---	0.01	mg/kg	EPA8270E
1,4-Dichlorobenze	SVOC	Soil	0.003	---	0.01	mg/kg	EPA8270E
1-Methylnaphthale	SVOC	Soil	0.0003	---	0.002	mg/kg	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Soil	0.0031	---	0.01	mg/kg	EPA8270E
2,4,5-Trichlorophe	SVOC	Soil	0.013	---	0.1	mg/kg	EPA8270E
2,4,6-Trichlorophe	SVOC	Soil	0.015	---	0.1	mg/kg	EPA8270E
2,4-Dichloropheno	SVOC	Soil	0.0061	---	0.1	mg/kg	EPA8270E
2,4-Dimethylphen	SVOC	Soil	0.014	---	0.1	mg/kg	EPA8270E
2,4-Dinitrophenol	SVOC	Soil	0.016	---	0.3	mg/kg	EPA8270E
2,4-Dinitrotoluene	SVOC	Soil	0.0081	---	0.05	mg/kg	EPA8270E
2,6-Dinitrotoluene	SVOC	Soil	0.0069	---	0.05	mg/kg	EPA8270E
2-Chloronaphthale	SVOC	Soil	0.0016	---	0.01	mg/kg	EPA8270E
2-Chlorophenol	SVOC	Soil	0.012	---	0.1	mg/kg	EPA8270E
2-Methylnaphthale	SVOC	Soil	0.00039	---	0.002	mg/kg	EPA8270E
2-Methylphenol	SVOC	Soil	0.0082	---	0.1	mg/kg	EPA8270E
2-Nitroaniline	SVOC	Soil	0.015	---	0.05	mg/kg	EPA8270E
2-Nitrophenol	SVOC	Soil	0.027	---	0.1	mg/kg	EPA8270E
3,3'-Dichlorobenzi	SVOC	Soil	0.033	---	0.1	mg/kg	EPA8270E
3-Methylphenol +	SVOC	Soil	0.013	---	0.2	mg/kg	EPA8270E
3-Nitroaniline	SVOC	Soil	0.017	---	1	mg/kg	EPA8270E
4,6-Dinitro-2-meth	SVOC	Soil	0.017	---	0.3	mg/kg	EPA8270E
4-Bromophenyl ph	SVOC	Soil	0.0023	---	0.01	mg/kg	EPA8270E
4-Chloro-3-methyl	SVOC	Soil	0.018	---	0.1	mg/kg	EPA8270E
4-Chloroaniline	SVOC	Soil	0.21	---	1	mg/kg	EPA8270E
4-Chlorophenyl ph	SVOC	Soil	0.0028	---	0.01	mg/kg	EPA8270E
4-Nitroaniline	SVOC	Soil	0.024	---	1	mg/kg	EPA8270E
4-Nitrophenol	SVOC	Soil	0.011	---	0.3	mg/kg	EPA8270E
Acenaphthene	SVOC	Soil	0.00018	---	0.002	mg/kg	EPA8270E
Acenaphthylene	SVOC	Soil	0.00016	---	0.002	mg/kg	EPA8270E
Anthracene	SVOC	Soil	0.00014	---	0.002	mg/kg	EPA8270E
Benz(a)anthracen	SVOC	Soil	0.00023	---	0.002	mg/kg	EPA8270E
Benzo(a)pyrene	SVOC	Soil	0.00028	---	0.002	mg/kg	EPA8270E
Benzo(b)fluoranth	SVOC	Soil	0.00025	---	0.002	mg/kg	EPA8270E
Benzo(g,h,i)peryle	SVOC	Soil	0.0004	---	0.002	mg/kg	EPA8270E
Benzo(k)fluoranth	SVOC	Soil	0.00032	---	0.002	mg/kg	EPA8270E
Benzoic acid	SVOC	Soil	0.1	---	0.5	mg/kg	EPA8270E
Benzyl alcohol	SVOC	Soil	0.012	---	0.1	mg/kg	EPA8270E
Benzyl butyl phtha	SVOC	Soil	0.019	---	0.1	mg/kg	EPA8270E
Bis(2-chloroethox	SVOC	Soil	0.0027	---	0.01	mg/kg	EPA8270E
Bis(2-chloroethyl)	SVOC	Soil	0.0035	---	0.01	mg/kg	EPA8270E
Bis(2-ethylhexyl) p	SVOC	Soil	0.035	---	0.16	mg/kg	EPA8270E
Carbazole	SVOC	Soil	0.0019	---	0.01	mg/kg	EPA8270E
Chrysene	SVOC	Soil	0.00018	---	0.002	mg/kg	EPA8270E
Dibenzo(a,h)anthr	SVOC	Soil	0.00049	---	0.002	mg/kg	EPA8270E
Dibenzofuran	SVOC	Soil	0.0034	---	0.01	mg/kg	EPA8270E
Diethyl phthalate	SVOC	Soil	0.0051	---	0.1	mg/kg	EPA8270E
Dimethyl phthalate	SVOC	Soil	0.0053	---	0.1	mg/kg	EPA8270E
Di-n-butyl phthalat	SVOC	Soil	0.019	---	0.1	mg/kg	EPA8270E
Di-n-octyl phthalat	SVOC	Soil	0.019	---	0.1	mg/kg	EPA8270E
Fluoranthene	SVOC	Soil	0.00019	---	0.002	mg/kg	EPA8270E
Fluorene	SVOC	Soil	0.00014	---	0.002	mg/kg	EPA8270E
Hexachlorobenzer	SVOC	Soil	0.002	---	0.01	mg/kg	EPA8270E
Hexachlorobutadie	SVOC	Soil	0.0029	---	0.01	mg/kg	EPA8270E
Hexachlorocyclop	SVOC	Soil	0.0061	---	0.03	mg/kg	EPA8270E
Hexachloroethane	SVOC	Soil	0.0041	---	0.01	mg/kg	EPA8270E
Indeno(1,2,3-cd)p	SVOC	Soil	0.00026	---	0.002	mg/kg	EPA8270E
Isophorone	SVOC	Soil	0.0019	---	0.01	mg/kg	EPA8270E
Naphthalene	SVOC	Soil	0.0004	---	0.002	mg/kg	EPA8270E
Nitrobenzene	SVOC	Soil	0.0047	---	0.01	mg/kg	EPA8270E
N-Nitrosodimethyl	SVOC	Soil	0.0063	---	0.01	mg/kg	EPA8270E
N-Nitroso-di-n-pro	SVOC	Soil	0.003	---	0.01	mg/kg	EPA8270E
N-Nitrosodiphenyl	SVOC	Soil	0.0033	---	0.01	mg/kg	EPA8270E
Pentachloropheno	SVOC	Soil	0.0088	---	0.05	mg/kg	EPA8270E

Phenanthrene	SVOC	Soil	0.00018	---	0.002	mg/kg	EPA8270E
Phenol	SVOC	Soil	0.013	---	0.1	mg/kg	EPA8270E
Pyrene	SVOC	Soil	0.00016	---	0.002	mg/kg	EPA8270E
1,2,4-Trichloroben	SVOC	Water	0.028	---	0.2	ug/L	EPA8270E
1,2-Dichlorobenze	SVOC	Water	0.028	---	0.2	ug/L	EPA8270E
1,2-Diphenylhydra	SVOC	Water	0.014	---	0.2	ug/L	EPA8270E
1,3-Dichlorobenze	SVOC	Water	0.034	---	0.2	ug/L	EPA8270E
1,4-Dichlorobenze	SVOC	Water	0.033	---	0.2	ug/L	EPA8270E
1-Methylnaphthale	SVOC	Water	0.0025	---	0.2	ug/L	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Water	0.023	---	0.2	ug/L	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Water	0.023	---	2	ug/L	EPA8270E
2,4,5-Trichlorophe	SVOC	Water	0.085	---	2	ug/L	EPA8270E
2,4,6-Trichlorophe	SVOC	Water	0.065	---	2	ug/L	EPA8270E
2,4-Dichloropheno	SVOC	Water	0.060	---	2	ug/L	EPA8270E
2,4-Dimethylphen	SVOC	Water	0.39	---	6	ug/L	EPA8270E
2,4-Dinitrophenol	SVOC	Water	1.3	---	1	ug/L	EPA8270E
2,4-Dinitrotoluene	SVOC	Water	0.034	---	1	ug/L	EPA8270E
2,6-Dinitrotoluene	SVOC	Water	0.036	---	0.2	ug/L	EPA8270E
2-Chloronaphthale	SVOC	Water	0.017	---	2	ug/L	EPA8270E
2-Chlorophenol	SVOC	Water	0.080	---	0.2	ug/L	EPA8270E
2-Methylnaphthale	SVOC	Water	0.003	---	2	ug/L	EPA8270E
2-Methylphenol	SVOC	Water	0.095	---	1	ug/L	EPA8270E
2-Nitroaniline	SVOC	Water	0.175	---	2	ug/L	EPA8270E
2-Nitrophenol	SVOC	Water	0.125	---	2	ug/L	EPA8270E
3,3'-Dichlorobenzi	SVOC	Water	0.405	---	4	ug/L	EPA8270E
3-Methylphenol +	SVOC	Water	0.145	---	20	ug/L	EPA8270E
3-Nitroaniline	SVOC	Water	0.170	---	6	ug/L	EPA8270E
4,6-Dinitro-2-meth	SVOC	Water	0.080	---	0.2	ug/L	EPA8270E
4-Bromophenyl ph	SVOC	Water	0.0175	---	2	ug/L	EPA8270E
4-Chloro-3-methyl	SVOC	Water	0.050	---	20	ug/L	EPA8270E
4-Chloroaniline	SVOC	Water	0.305	---	0.2	ug/L	EPA8270E
4-Chlorophenyl ph	SVOC	Water	0.015	---	20	ug/L	EPA8270E
4-Nitroaniline	SVOC	Water	0.440	---	6	ug/L	EPA8270E
4-Nitrophenol	SVOC	Water	0.260	---	0.02	ug/L	EPA8270E
Acenaphthene	SVOC	Water	0.0021	---	0.02	ug/L	EPA8270E
Acenaphthylene	SVOC	Water	0.0016	---	0.02	ug/L	EPA8270E
Anthracene	SVOC	Water	0.0025	---	0.02	ug/L	EPA8270E
Benz(a)anthracen	SVOC	Water	0.0030	---	4	ug/L	EPA8270E
Benzo(a)pyrene	SVOC	Water	0.0045	---	0.02	ug/L	EPA8270E
Benzo(b)fluoranth	SVOC	Water	0.0027	---	0.02	ug/L	EPA8270E
Benzo(g,h,i)peryle	SVOC	Water	0.0090	---	0.04	ug/L	EPA8270E
Benzo(k)fluoranth	SVOC	Water	0.0023	---	0.02	ug/L	EPA8270E
Benzoic acid	SVOC	Water	2.6	---	10	ug/L	EPA8270E
Benzyl alcohol	SVOC	Water	0.070	---	2	ug/L	EPA8270E
Benzyl butyl phtha	SVOC	Water	0.350	---	2	ug/L	EPA8270E
Bis(2-chloroethoxy	SVOC	Water	0.031	---	0.2	ug/L	EPA8270E
Bis(2-chloroethyl)	SVOC	Water	0.021	---	0.2	ug/L	EPA8270E
Bis(2-ethylhexyl) p	SVOC	Water	0.465	---	3.2	ug/L	EPA8270E
Carbazole	SVOC	Water	0.0017	---	0.02	ug/L	EPA8270E
Chrysene	SVOC	Water	0.0023	---	0.02	ug/L	EPA8270E
Dibenzo(a,h)anthr	SVOC	Water	0.0065	---	0.02	ug/L	EPA8270E
Dibenzofuran	SVOC	Water	0.0026	---	0.02	ug/L	EPA8270E
Diethyl phthalate	SVOC	Water	0.055	---	2	ug/L	EPA8270E
Dimethyl phthalate	SVOC	Water	0.031	---	2	ug/L	EPA8270E
Di-n-butyl phthalat	SVOC	Water	0.255	---	2	ug/L	EPA8270E
Di-n-octyl phthalat	SVOC	Water	0.315	---	2	ug/L	EPA8270E
Fluoranthene	SVOC	Water	0.0023	---	0.02	ug/L	EPA8270E
Fluorene	SVOC	Water	0.0016	---	0.02	ug/L	EPA8270E
Hexachlorobenzer	SVOC	Water	0.0195	---	0.2	ug/L	EPA8270E
Hexachlorobutadie	SVOC	Water	0.0455	---	0.2	ug/L	EPA8270E
Hexachlorocyclope	SVOC	Water	0.0550	---	0.6	ug/L	EPA8270E
Hexachloroethane	SVOC	Water	0.0395	---	0.2	ug/L	EPA8270E
Indeno(1,2,3-cd)py	SVOC	Water	0.007	---	0.02	ug/L	EPA8270E
Isophorone	SVOC	Water	0.010	---	0.2	ug/L	EPA8270E
Naphthalene	SVOC	Water	0.0039	---	0.2	ug/L	EPA8270E
Nitrobenzene	SVOC	Water	0.0375	---	0.2	ug/L	EPA8270E
N-Nitrosodimethyla	SVOC	Water	0.015	---	0.2	ug/L	EPA8270E
N-Nitroso-di-n-pro	SVOC	Water	0.026	---	0.2	ug/L	EPA8270E
N-Nitrosodiphenyla	SVOC	Water	0.0105	---	0.2	ug/L	EPA8270E
Pentachloropheno	SVOC	Water	0.220	---	1	ug/L	EPA8270E
Phenanthrene	SVOC	Water	0.0025	---	0.02	ug/L	EPA8270E
Phenol	SVOC	Water	0.0305	---	2	ug/L	EPA8270E
Pyrene	SVOC	Water	0.0021	---	0.02	ug/L	EPA8270E
1,1,1,2-Tetrachlor	VOC	Soil	0.019	0.05	---	mg/kg	EPA8260D
1,1,1-Trichloroetha	VOC	Soil	0.0021	0.05	---	mg/kg	EPA8260D
1,1,2,2-Tetrachlor	VOC	Soil	0.016	0.05	---	mg/kg	EPA8260D
1,1,2-Trichloroetha	VOC	Soil	0.0056	0.05	---	mg/kg	EPA8260D

1,1-Dichloroethan	VOC	Soil	0.0011	0.05	---	mg/kg	EPA8260D
1,1-Dichloroethen	VOC	Soil	0.0011	0.05	---	mg/kg	EPA8260D
1,1-Dichloroprope	VOC	Soil	0.014	0.05	---	mg/kg	EPA8260D
1,2,3-Trichloroben	VOC	Soil	0.065	0.25	---	mg/kg	EPA8260D
1,2,3-Trichloropro	VOC	Soil	0.0019	0.05	---	mg/kg	EPA8260D
1,2,4-Trichloroben	VOC	Soil	0.0057	0.25	---	mg/kg	EPA8260D
1,2,4-Trimethylber	VOC	Soil	0.0053	0.05	---	mg/kg	EPA8260D
1,2-Dibromo-3-chl	VOC	Soil	0.12	0.5	---	mg/kg	EPA8260D
1,2-Dibromoethan	VOC	Soil	0.00087	0.05	---	mg/kg	EPA8260D
1,2-Dichlorobenze	VOC	Soil	0.0072	0.05	---	mg/kg	EPA8260D
1,2-Dichloroethan	VOC	Soil	0.0017	0.05	---	mg/kg	EPA8260D
1,2-Dichloropropa	VOC	Soil	0.011	0.05	---	mg/kg	EPA8260D
1,3,5-Trimethylber	VOC	Soil	0.0067	0.05	---	mg/kg	EPA8260D
1,3-Dichlorobenze	VOC	Soil	0.0045	0.05	---	mg/kg	EPA8260D
1,3-Dichloropropa	VOC	Soil	0.014	0.05	---	mg/kg	EPA8260D
1,4-Dichlorobenze	VOC	Soil	0.004	0.05	---	mg/kg	EPA8260D
2,2-Dichloropropa	VOC	Soil	0.014	0.05	---	mg/kg	EPA8260D
2-Butanone (MEK)	VOC	Soil	0.72	1	---	mg/kg	EPA8260D
2-Chlorotoluene	VOC	Soil	0.014	0.05	---	mg/kg	EPA8260D
2-Hexanone	VOC	Soil	0.43	0.5	---	mg/kg	EPA8260D
4-Chlorotoluene	VOC	Soil	0.01	0.05	---	mg/kg	EPA8260D
4-Methyl-2-pentan	VOC	Soil	0.38	1	---	mg/kg	EPA8260D
Acetone	VOC	Soil	0.87	5	---	mg/kg	EPA8260D
Benzene	VOC	Soil	0.00096	0.03	---	mg/kg	EPA8260D
Bromobenzene	VOC	Soil	0.017	0.05	---	mg/kg	EPA8260D
Bromodichloromet	VOC	Soil	0.014	0.05	---	mg/kg	EPA8260D
Bromoform	VOC	Soil	0.015	0.05	---	mg/kg	EPA8260D
Bromomethane	VOC	Soil	0.089	0.5	---	mg/kg	EPA8260D
Carbon tetrachlori	VOC	Soil	0.012	0.05	---	mg/kg	EPA8260D
Chlorobenzene	VOC	Soil	0.0063	0.05	---	mg/kg	EPA8260D
Chloroethane	VOC	Soil	0.056	0.5	---	mg/kg	EPA8260D
Chloroform	VOC	Soil	0.008	0.05	---	mg/kg	EPA8260D
Chloromethane	VOC	Soil	0.18	0.5	---	mg/kg	EPA8260D
cis-1,2-Dichloroeth	VOC	Soil	0.0013	0.05	---	mg/kg	EPA8260D
cis-1,3-Dichloropr	VOC	Soil	0.011	0.05	---	mg/kg	EPA8260D
Dibromochloromet	VOC	Soil	0.017	0.05	---	mg/kg	EPA8260D
Dibromomethane	VOC	Soil	0.024	0.05	---	mg/kg	EPA8260D
Dichlorodifluorom	VOC	Soil	0.021	0.5	---	mg/kg	EPA8260D
Ethylbenzene	VOC	Soil	0.0012	0.05	---	mg/kg	EPA8260D
Hexachlorobutadie	VOC	Soil	0.011	0.25	---	mg/kg	EPA8260D
Hexane	VOC	Soil	0.013	0.25	---	mg/kg	EPA8260D
Isopropylbenzene	VOC	Soil	0.0091	0.05	---	mg/kg	EPA8260D
m,p-Xylene	VOC	Soil	0.001	0.1	---	mg/kg	EPA8260D
Methyl t-butyl ethe	VOC	Soil	0.0011	0.05	---	mg/kg	EPA8260D
Methylene chloride	VOC	Soil	0.14	0.5	---	mg/kg	EPA8260D
Naphthalene	VOC	Soil	0.0063	0.05	---	mg/kg	EPA8260D
n-Propylbenzene	VOC	Soil	0.0045	0.05	---	mg/kg	EPA8260D
o-Xylene	VOC	Soil	0.00068	0.05	---	mg/kg	EPA8260D
p-Isopropyltoluene	VOC	Soil	0.0022	0.05	---	mg/kg	EPA8260D
sec-Butylbenzene	VOC	Soil	0.0048	0.05	---	mg/kg	EPA8260D
Styrene	VOC	Soil	0.0067	0.05	---	mg/kg	EPA8260D
tert-Butylbenzene	VOC	Soil	0.0092	0.05	---	mg/kg	EPA8260D
Tetrachloroethene	VOC	Soil	0.002	0.025	---	mg/kg	EPA8260D
Toluene	VOC	Soil	0.0011	0.05	---	mg/kg	EPA8260D
trans-1,2-Dichloro	VOC	Soil	0.0023	0.05	---	mg/kg	EPA8260D
trans-1,3-Dichloro	VOC	Soil	0.015	0.05	---	mg/kg	EPA8260D
Trichloroethene	VOC	Soil	0.0014	0.02	---	mg/kg	EPA8260D
Trichlorofluoromet	VOC	Soil	0.043	0.5	---	mg/kg	EPA8260D
Vinyl chloride	VOC	Soil	0.0019	0.05	---	mg/kg	EPA8260D
1,1,1,2-Tetrachlor	VOC	Soil	0.0095	---	0.05	mg/kg	EPA8260D
1,1,1-Trichloroeth	VOC	Soil	0.00105	---	0.002	mg/kg	EPA8260D
1,1,2,2-Tetrachlor	VOC	Soil	0.008	---	0.05	mg/kg	EPA8260D
1,1,2-Trichloroeth	VOC	Soil	0.0028	---	0.05	mg/kg	EPA8260D
1,1-Dichloroethan	VOC	Soil	0.00055	---	0.002	mg/kg	EPA8260D
1,1-Dichloroethen	VOC	Soil	0.00055	---	0.002	mg/kg	EPA8260D
1,1-Dichloroprope	VOC	Soil	0.007	---	0.05	mg/kg	EPA8260D
1,2,3-Trichloroben	VOC	Soil	0.0325	---	0.25	mg/kg	EPA8260D
1,2,3-Trichloropro	VOC	Soil	0.00095	---	0.05	mg/kg	EPA8260D
1,2,4-Trichloroben	VOC	Soil	0.00285	---	0.25	mg/kg	EPA8260D
1,2,4-Trimethylber	VOC	Soil	0.00265	---	0.05	mg/kg	EPA8260D
1,2-Dibromo-3-chl	VOC	Soil	0.06	---	0.5	mg/kg	EPA8260D
1,2-Dibromoethan	VOC	Soil	0.000435	---	0.005	mg/kg	EPA8260D
1,2-Dichlorobenze	VOC	Soil	0.0036	---	0.05	mg/kg	EPA8260D
1,2-Dichloroethan	VOC	Soil	0.00085	---	0.002	mg/kg	EPA8260D
1,2-Dichloropropa	VOC	Soil	0.0055	---	0.05	mg/kg	EPA8260D
1,3,5-Trimethylber	VOC	Soil	0.00335	---	0.05	mg/kg	EPA8260D
1,3-Dichlorobenze	VOC	Soil	0.00225	---	0.05	mg/kg	EPA8260D

1,3-Dichloropropa	VOC	Soil	0.007	---	0.05	mg/kg	EPA8260D
1,4-Dichlorobenze	VOC	Soil	0.002	---	0.05	mg/kg	EPA8260D
2,2-Dichloropropa	VOC	Soil	0.007	---	0.05	mg/kg	EPA8260D
2-Butanone (MEK)	VOC	Soil	0.36	---	1	mg/kg	EPA8260D
2-Chlorotoluene	VOC	Soil	0.007	---	0.05	mg/kg	EPA8260D
2-Hexanone	VOC	Soil	0.215	---	0.5	mg/kg	EPA8260D
4-Chlorotoluene	VOC	Soil	0.005	---	0.05	mg/kg	EPA8260D
4-Methyl-2-pentan	VOC	Soil	0.19	---	1	mg/kg	EPA8260D
Acetone	VOC	Soil	0.435	---	5	mg/kg	EPA8260D
Benzene	VOC	Soil	0.00048	---	0.001	mg/kg	EPA8260D
Bromobenzene	VOC	Soil	0.0085	---	0.05	mg/kg	EPA8260D
Bromodichloromet	VOC	Soil	0.007	---	0.05	mg/kg	EPA8260D
Bromoform	VOC	Soil	0.0075	---	0.05	mg/kg	EPA8260D
Bromomethane	VOC	Soil	0.0445	---	0.5	mg/kg	EPA8260D
Carbon tetrachlori	VOC	Soil	0.006	---	0.05	mg/kg	EPA8260D
Chlorobenzene	VOC	Soil	0.00315	---	0.05	mg/kg	EPA8260D
Chloroethane	VOC	Soil	0.028	---	0.1	mg/kg	EPA8260D
Chloroform	VOC	Soil	0.004	---	0.05	mg/kg	EPA8260D
Chloromethane	VOC	Soil	0.09	---	0.5	mg/kg	EPA8260D
cis-1,2-Dichloroeth	VOC	Soil	0.00065	---	0.002	mg/kg	EPA8260D
cis-1,3-Dichloropr	VOC	Soil	0.0055	---	0.05	mg/kg	EPA8260D
Dibromochloromet	VOC	Soil	0.0085	---	0.05	mg/kg	EPA8260D
Dibromomethane	VOC	Soil	0.012	---	0.05	mg/kg	EPA8260D
Dichlorodifluorom	VOC	Soil	0.0105	---	0.5	mg/kg	EPA8260D
Ethylbenzene	VOC	Soil	0.0006	---	0.001	mg/kg	EPA8260D
Hexachlorobutadie	VOC	Soil	0.0055	---	0.25	mg/kg	EPA8260D
Hexane	VOC	Soil	0.0065	---	0.25	mg/kg	EPA8260D
Isopropylbenzene	VOC	Soil	0.00455	---	0.05	mg/kg	EPA8260D
m,p-Xylene	VOC	Soil	0.0005	---	0.002	mg/kg	EPA8260D
Methyl t-butyl ethe	VOC	Soil	0.00055	---	0.002	mg/kg	EPA8260D
Methylene chloride	VOC	Soil	0.07	---	0.2	mg/kg	EPA8260D
Naphthalene	VOC	Soil	0.00315	---	0.01	mg/kg	EPA8260D
n-Propylbenzene	VOC	Soil	0.00225	---	0.05	mg/kg	EPA8260D
o-Xylene	VOC	Soil	0.00034	---	0.001	mg/kg	EPA8260D
p-Isopropyltoluene	VOC	Soil	0.0011	---	0.05	mg/kg	EPA8260D
sec-Butylbenzene	VOC	Soil	0.0024	---	0.05	mg/kg	EPA8260D
Styrene	VOC	Soil	0.00335	---	0.05	mg/kg	EPA8260D
tert-Butylbenzene	VOC	Soil	0.0046	---	0.05	mg/kg	EPA8260D
Tetrachloroethene	VOC	Soil	0.001	---	0.002	mg/kg	EPA8260D
Toluene	VOC	Soil	0.00055	---	0.001	mg/kg	EPA8260D
trans-1,2-Dichloro	VOC	Soil	0.00115	---	0.002	mg/kg	EPA8260D
trans-1,3-Dichloro	VOC	Soil	0.0075	---	0.05	mg/kg	EPA8260D
Trichloroethene	VOC	Soil	0.0007	---	0.002	mg/kg	EPA8260D
Trichlorofluoromet	VOC	Soil	0.0215	---	0.5	mg/kg	EPA8260D
Vinyl chloride	VOC	Soil	0.00095	---	0.002	mg/kg	EPA8260D
1,1,1,2-Tetrachlor	VOC	Water	0.16	1	---	ug/L	EPA8260D
1,1,1-Trichloroeth	VOC	Water	0.017	1	---	ug/L	EPA8260D
1,1,2,2-Tetrachlor	VOC	Water	0.17	0.2	---	ug/L	EPA8260D
1,1,2-Trichloroeth	VOC	Water	0.084	0.5	---	ug/L	EPA8260D
1,1-Dichloroethan	VOC	Water	0.017	1	---	ug/L	EPA8260D
1,1-Dichloroethen	VOC	Water	0.021	1	---	ug/L	EPA8260D
1,1-Dichloroprope	VOC	Water	0.12	1	---	ug/L	EPA8260D
1,2,3-Trichloroben	VOC	Water	0.24	1	---	ug/L	EPA8260D
1,2,3-Trichloropro	VOC	Water	0.01	1	---	ug/L	EPA8260D
1,2,4-Trichloroben	VOC	Water	0.23	1	---	ug/L	EPA8260D
1,2,4-Trimethylber	VOC	Water	0.084	1	---	ug/L	EPA8260D
1,2-Dibromo-3-chl	VOC	Water	0.8	10	---	ug/L	EPA8260D
1,2-Dibromoethan	VOC	Water	0.0049	1	---	ug/L	EPA8260D
1,2-Dichlorobenze	VOC	Water	0.12	1	---	ug/L	EPA8260D
1,2-Dichloroethan	VOC	Water	0.037	0.2	---	ug/L	EPA8260D
1,2-Dichloropropa	VOC	Water	0.24	1	---	ug/L	EPA8260D
1,3,5-Trimethylber	VOC	Water	0.083	1	---	ug/L	EPA8260D
1,3-Dichlorobenze	VOC	Water	0.11	1	---	ug/L	EPA8260D
1,3-Dichloropropa	VOC	Water	0.12	1	---	ug/L	EPA8260D
1,4-Dichlorobenze	VOC	Water	0.13	1	---	ug/L	EPA8260D
2,2-Dichloropropa	VOC	Water	0.33	1	---	ug/L	EPA8260D
2-Butanone (MEK)	VOC	Water	1.9	20	---	ug/L	EPA8260D
2-Chlorotoluene	VOC	Water	0.26	1	---	ug/L	EPA8260D
2-Hexanone	VOC	Water	3.7	10	---	ug/L	EPA8260D
4-Chlorotoluene	VOC	Water	0.098	1	---	ug/L	EPA8260D
4-Methyl-2-pentan	VOC	Water	3.4	10	---	ug/L	EPA8260D
Acetone	VOC	Water	2.9	50	---	ug/L	EPA8260D
Benzene	VOC	Water	0.019	0.35	---	ug/L	EPA8260D
Bromobenzene	VOC	Water	0.19	1	---	ug/L	EPA8260D
Bromodichloromet	VOC	Water	0.2	0.5	---	ug/L	EPA8260D
Bromoform	VOC	Water	0.17	5	---	ug/L	EPA8260D
Bromomethane	VOC	Water	2.1	5	---	ug/L	EPA8260D

Carbon tetrachlori	VOC	Water	0.16	0.5	---	ug/L	EPA8260D
Chlorobenzene	VOC	Water	0.1	1	---	ug/L	EPA8260D
Chloroethane	VOC	Water	0.05	1	---	ug/L	EPA8260D
Chloroform	VOC	Water	0.18	1	---	ug/L	EPA8260D
Chloromethane	VOC	Water	1.1	10	---	ug/L	EPA8260D
cis-1,2-Dichloroeth	VOC	Water	0.033	1	---	ug/L	EPA8260D
cis-1,3-Dichloropr	VOC	Water	0.15	0.4	---	ug/L	EPA8260D
Dibromochloromet	VOC	Water	0.21	0.5	---	ug/L	EPA8260D
Dibromomethane	VOC	Water	0.16	1	---	ug/L	EPA8260D
Dichlorodifluorom	VOC	Water	0.29	1	---	ug/L	EPA8260D
Ethylbenzene	VOC	Water	0.023	1	---	ug/L	EPA8260D
Hexachlorobutadie	VOC	Water	0.29	0.5	---	ug/L	EPA8260D
Hexane	VOC	Water	0.17	5	---	ug/L	EPA8260D
Isopropylbenzene	VOC	Water	0.057	1	---	ug/L	EPA8260D
m,p-Xylene	VOC	Water	0.044	2	---	ug/L	EPA8260D
Methyl t-butyl ethe	VOC	Water	0.014	1	---	ug/L	EPA8260D
Methylene chloride	VOC	Water	0.82	5	---	ug/L	EPA8260D
Naphthalene	VOC	Water	0.19	1	---	ug/L	EPA8260D
n-Propylbenzene	VOC	Water	0.1	1	---	ug/L	EPA8260D
o-Xylene	VOC	Water	0.023	1	---	ug/L	EPA8260D
p-Isopropyltoluene	VOC	Water	0.068	1	---	ug/L	EPA8260D
sec-Butylbenzene	VOC	Water	0.075	1	---	ug/L	EPA8260D
Styrene	VOC	Water	0.39	1	---	ug/L	EPA8260D
tert-Butylbenzene	VOC	Water	0.066	1	---	ug/L	EPA8260D
Tetrachloroethene	VOC	Water	0.043	1	---	ug/L	EPA8260D
Toluene	VOC	Water	0.062	1	---	ug/L	EPA8260D
trans-1,2-Dichloro	VOC	Water	0.046	1	---	ug/L	EPA8260D
trans-1,3-Dichloro	VOC	Water	0.12	0.4	---	ug/L	EPA8260D
Trichloroethene	VOC	Water	0.03	0.5	---	ug/L	EPA8260D
Trichlorofluoromet	VOC	Water	0.19	1	---	ug/L	EPA8260D
Vinyl chloride	VOC	Water	0.015	0.02	---	ug/L	EPA8260D
Calcium	METALS	Water	0.0087	0.05	---	mg/L	EPA200.8
Magnesium	METALS	Water	0.0097	0.05	---	mg/L	EPA200.8
Hardness (as CaC	METALS	Water	0.000062	0.35	---	mg/L	EPA200.8
Antimony	METALS	Soil	0.098	5	1	mg/kg	EPA6020/200.8
Arsenic	METALS	Soil	0.17	1	0.2	mg/kg	EPA6020/200.8
Barium	METALS	Soil	0.11	1	0.2	mg/kg	EPA6020/200.8
Beryllium	METALS	Soil	0.057	1	0.2	mg/kg	EPA6020/200.8
Cadmium	METALS	Soil	0.05	1	0.2	mg/kg	EPA6020/200.8
Chromium	METALS	Soil	0.52	5	1	mg/kg	EPA6020/200.8
Cobalt	METALS	Soil	0.028	1	0.2	mg/kg	EPA6020/200.8
Copper	METALS	Soil	0.1	5	1	mg/kg	EPA6020/200.8
Lead	METALS	Soil	0.032	1	0.2	mg/kg	EPA6020/200.8
Manganese	METALS	Soil	0.047	1	0.2	mg/kg	EPA6020/200.8
Mercury	METALS	Soil	0.033	1	0.2	mg/kg	EPA6020/200.8
Molybdenum	METALS	Soil	0.065	1	0.2	mg/kg	EPA6020/200.8
Nickel	METALS	Soil	0.093	1	0.2	mg/kg	EPA6020/200.8
Selenium	METALS	Soil	0.12	1	0.2	mg/kg	EPA6020/200.8
Silver	METALS	Soil	0.13	1	0.2	mg/kg	EPA6020/200.8
Thallium	METALS	Soil	0.031	1	0.2	mg/kg	EPA6020/200.8
Thorium	METALS	Soil	0.081	1	0.2	mg/kg	EPA6020/200.8
Uranium	METALS	Soil	0.083	1	0.2	mg/kg	EPA6020/200.8
Vanadium	METALS	Soil	0.49	5	1	mg/kg	EPA6020/200.8
Zinc	METALS	Soil	0.58	5	1	mg/kg	EPA6020/200.8
Antimony	METALS	Water	0.039	5	1	ug/L	EPA6020/200.8
Arsenic	METALS	Water	0.18	1	0.2	ug/L	EPA6020/200.8
Barium	METALS	Water	0.064	1	0.2	ug/L	EPA6020/200.8
Beryllium	METALS	Water	0.094	1	0.2	ug/L	EPA6020/200.8
Cadmium	METALS	Water	0.036	1	0.2	ug/L	EPA6020/200.8
Chromium	METALS	Water	0.079	1	0.2	ug/L	EPA6020/200.8
Cobalt	METALS	Water	0.037	1	0.2	ug/L	EPA6020/200.8
Copper	METALS	Water	0.48	5	1	ug/L	EPA6020/200.8
Iron	METALS	Water	6.3	50	---	ug/L	EPA6020/200.8
Lead	METALS	Water	0.064	1	0.2	ug/L	EPA6020/200.8
Manganese	METALS	Water	0.063	1	0.2	ug/L	EPA6020/200.8
Mercury	METALS	Water	0.037	1	0.2	ug/L	EPA6020/200.8
Molybdenum	METALS	Water	0.076	1	0.2	ug/L	EPA6020/200.8
Nickel	METALS	Water	0.11	1	0.2	ug/L	EPA6020/200.8
Selenium	METALS	Water	0.41	1	0.5	ug/L	EPA6020/200.8
Silver	METALS	Water	0.035	1	0.2	ug/L	EPA6020/200.8
Thallium	METALS	Water	0.018	1	0.2	ug/L	EPA6020/200.8
Vanadium	METALS	Water	0.058	5	1	ug/L	EPA6020/200.8
Zinc	METALS	Water	0.68	5	1	ug/L	EPA6020/200.8
Mercury (1631E)	METALS	Soil	0.0088	0.025	0.01	mg/kg	EPA1631E
Mercury (1631E)	METALS	Water	0.0008	0.01	0.0008	ug/L	EPA1631E
Total Suspended S	CONVENTIONAL	Water	1	5	1	mg/L	SM2540D
EC5-8 aliphatics	APH	Air	47	75	---	ug/m3	MA-APH

EC9-12 aliphatics	APH	Air	2.5	25	---	ug/m3	MA-APH
EC9-10 aromatics	APH	Air	2.5	25	---	ug/m3	MA-APH

Attachment B

Sampling and Analysis Plan

Sampling and Analysis Plan for Ephrata Landfill: MPE System Restart and Seasonal Operation

Prepared for
Grant County Public Works

August 2024

Parametrix

Sampling and Analysis Plan for Ephrata Landfill: MPE System Restart and Seasonal Operation

Prepared for

Grant County Public Works
124 Ephrata Street SE
Ephrata, WA 98823

Prepared by

Parametrix
719 2nd Avenue, Suite 200
Seattle, WA 98104
T. 206.394.3700 F. 1.855.542.6353
www.parametrix.com

August 2024 | 553-1860-014

Citation

Parametrix. 2024. Sampling and Analysis Plan for Ephrata Landfill: MPE System Restart and Seasonal Operation. Prepared for Grant County Public Works by Parametrix, Seattle, Washington. August2024.

Approvals

Prepared by Molly Alar	Date
Checked by Shira DeGrood	Date
Approved by Jenifer Young	Date

Contents

Contents (continued)

FIGURES

TABLES

APPENDICES

Acronyms and Abbreviations

SAP	Sampling and Analysis Plan
MPE	multi-phase extraction
Site	old Ephrata Landfill
WAC	Washington Administrative Code
LTT	Liquid Treatment Train
GAC	granulated activated carbon
VTT	Vapor Treatment Train
LNAPL	light non-aqueous phase liquid
QC	quality control
COC	chain of custody
QC	quality control
ID	identification
CAS	Chemical Abstracts Service
LNAPL	light non-aqueous phase liquids
VAE	vacuum assisted extraction
SVE	soil vapor extraction
PLC	program logic controller
gpm	gallons per minute
VOCs	volatile organic compounds
VAE	vacuum assisted extraction
PPE	personal protective equipment
QA	quality assurance
MDL	Method detection limit
RL	reporting limits
DQIs	data quality indicators
LCS	laboratory control samples
MS	matrix spikes
RPD	relative percent difference

1. Introduction

Parametrix prepared this Sampling and Analysis Plan (SAP) to describe data collection, groundwater sampling, and vapor sampling procedures for restart and seasonal operation of the multi-phase extraction (MPE) system at the old Ephrata Landfill (Site). This work is required under the terms of Agreed Order No. DE 3810 Amendment No. 3 (Amendment) among between the Washington State Department of Ecology (Ecology), and Grant County. The Amendment requires the County and City (Potentially Liable Parties [PLPs]) to develop a workplan, restart, and operate the MPE system until construction of an expanded MPE system starts. This SAP was prepared in accordance with Washington Administrative Code (WAC) 173-340-820.

1.1 Project Description and Schedule

The P1 MPE system restart and seasonal operation will provide contaminant removal from the P1 zone while MPE system expansion is planned.

Liquids and vapor extracted from MPE wells will be conveyed to an onsite pretreatment facility. Liquids will be conveyed to the Liquid Treatment Train (LTT) consisting of oil water separation, air sparging, waste tanks, knockout tank, and granulated activated carbon (GAC) before being discharged to an evaporation pond. Extracted vapor will be conveyed to the Vapor Treatment Train (VTT) consisting of GAC treatment before being vented to air. Figure 1 shows a Site map of the MPE system area and Figure 2 shows a diagram of the MPE system LTT and VTT.

MPE system restart operations will involve field monitoring of depth to groundwater, total vapor and liquid extraction monitoring, and collection of extracted groundwater and vapor samples from the treatment system. For this SAP, extracted groundwater processed through the MPE system will be referred to as groundwater.

Field monitoring will be conducted three times each year. The first event will be conducted within 2 days of MPE system restart, the second event will be conducted approximately 2 weeks after MPE system restart, and the third event will be conducted during the month prior to seasonal shut down of the MPE system. A field monitoring summary is included in Table 1 and a sampling and analysis summary is included in Table 2. Figure 2 identifies sample locations within the LTT and VTT. The P1 MPE system is designed to operate without people present, although it cannot be restarted or operated remotely. Parametrix plans to train three people to restart and operate the system and who will respond to the Site within 1 week following notification of a system shutdown. Grant County Landfill personnel will check the system on regular workdays to confirm it is running and notify Parametrix of shutdowns. Grant County plans to hire an additional landfill technician, who could be trained to restart and operate the system starting as soon as 2024.

Figure 1. Site Map

Figure 2. MPE System Diagram

1.2 Project Organization

Parametrix is the project engineer and lead operator of the MPE system restart. Parametrix will coordinate system repairs and personnel training, restart the MPE system, and monitor and sample the system. Parametrix will collect vapor and groundwater samples for laboratory analysis for both MPE performance and compliance monitoring. Parametrix will be responsible for field and laboratory data management and reporting.

Parametrix plans to use Friedman & Bruya, Inc. (laboratory), located in Seattle, Washington, for liquid and gas sample analyses for the P1 MPE restart and seasonal operation.

Mott MacDonald, Ltd is the project hydrogeologist and groundwater monitoring lead. Groundwater monitoring at wells not directly involved in the P1 MPE restart and seasonal operation will be performed by Mott MacDonald under a separate workplan to be developed by Mott MacDonald.

1.3 Quality Objectives and Criteria for Measurement Data

The purpose of this SAP is to ensure that the data are of sufficient quality to support contaminant removal and emission calculations. Section 2.5 describes quality control (QC).

1.3.1 Objective

The objective of the MPE restart monitoring and sampling is to measure contaminate concentrations in extracted groundwater and vapor before and after treatment in the LTT and VTT.

1.4 Training Requirements/ Certification

Field personnel performing MPE system sampling, monitoring, and maintenance will be trained in accordance with the project health and safety plan (Parametrix 2024b).

1.5 Documents and Records

1.5.1 SAP Distribution

The Parametrix Project Manager will be responsible for preparing and distributing any SAP amendments.

1.5.2 Field Documentation and Records

Field sampling will be documented in several ways, including field and sampling forms, photographs, sample labels, and sample chain of custody (COC) forms.

1.5.2.1 Field Forms

Sampling and monitoring will be documented on the field forms included in Appendix A.

Any corrections made while recording information in the field will use single line strikethroughs and include initials and date.

Field instrument calibration will be noted.

Field forms and any photos will be retained in Parametrix's project records.

1.5.2.2 Sample Labels

Each sample will be labeled with laboratory provided labels. Each label includes the following information:

- Project name/number.
- Name of sample collector.
- Date and time of sample collection.
- Place of collection.
- Sample identification (ID) (i.e., groundwater influent, groundwater effluent, vapor pre-treatment, vapor post-treatment).
- Presence of any preservation or filtration.

1.5.2.3 Chain-of-Custody Forms and Custody Seals

COC forms and self-adhesive custody seals for individual samples and coolers will be provided by the laboratory. A blank COC form is included in Appendix B. Copies of completed COC forms will be kept in Parametrix's project records. Additional details regarding sample handling and custody are provided in Section 2.

1.5.3 Laboratory Documentation and Records

Laboratory data packages will be provided by the laboratory in electronic (PDF and .xlsx or .csv) format. These packages will include a case narrative discussing any problems with the analyses, corrective actions taken, changes to the referenced methods, and an explanation of data qualifiers. In addition to sample results, reporting limits, and method detection limits, the data packages will also report all QC results associated with the study data, including results for all blanks, surrogate compounds, and check standards included in the sample batch, as well as results for analytical duplicates. Legible copies of all COC forms and sample receiving logs associated with the samples analyzed will also be included. This information will be used to evaluate data accuracy.

In addition to the data packages, the laboratory will provide electronic data files containing sample results. The electronic files will be in unprotected .xlsx or .csv format and will include the following fields at a minimum:

- Laboratory sample ID.
- Sample ID.
- Sample type.
- Date analyzed.
- Analytical method.
- Sample filter flag.
- Chemical Abstracts Service (CAS) number.
- Parameter name.

- Units.
- Result value.
- Result qualifier.
- Dilution factor.
- Reporting limit and detection limit.

Each data file will include all laboratory results and will be consistent with the data reported in the corresponding laboratory data package.

1.5.4 Reporting

This sampling and monitoring data described in this SAP will be reported as required in the Amendment. The Amendment calls for monthly progress reports, which are to include data obtained during the preceding month. Calculations of emissions and contaminant removal during each season of operations will be included in one of the monthly reports after the system is shut down and analytical results have been evaluated each season of operation.

2. Data Generation and Acquisition

This section describes procedures for collecting field measurements and for collecting samples for laboratory analysis. It also provides quality assurance and data management protocols. Sample locations are described in the *P1 MPE System Restart and Seasonal Operation Workplan*.

2.1 Monitoring Methods

This subsection describes field monitoring methods. Monitoring will occur at locations described in Table 1.

2.1.1 Non-Aqueous Phase Liquid

Depth to water and NAPL (non-aqueous phase liquids) will be manually measured in MPE and P1 observation wells to confirm transducer measurements (for those wells instrumented with pressure transducers) and to monitor for accumulation of NAPL in these wells. Depths to water, light NAPL (LNAPL), and dense NAPL (DNAPL) will be measured in these wells using an electric interface probe by first measuring potential LNAPL and depth to water at the water surface and then lowering the probe to the bottom of the well to measure potential DNAPL.

Manual measurements of water level and NAPL depths in these wells will require temporary removal of vacuum pressures during the vacuum assisted extraction (VAE) and soil vapor extraction (SVE) portion of the test. When MPE wells are under vacuum, water levels in these wells would be abnormally high relative to conditions in which the wellhead was at atmospheric pressure (i.e., if the water pumps were not being used to depress water levels). However, operation of the pumps will depress water levels in all MPE wells regardless of wellhead pressure, and water levels will take some time to adjust to changes in wellhead pressures when collecting measurements.

The length of the non-equilibrium period will be relatively long because P1 aquifer transmissivity is low. Thus, at least two manual measurements will be collected as quickly as possible from MPE wells after removing the vacuum from the wellheads.

The following procedures will be used to measure depth to LNAPL and DNAPL in MPE wells:

- Remove vacuum from MPE wells by either unthreading the 3/4-inch wellhead port (with VAE line still open), or by first shutting off the VAE line, then unthreading the wellhead port after vacuum pressure is reduced.
- Lower interface probe into 3/4-inch access port and record date, time, depth to water, and depth to LNAPL on MPE Well Form (Appendix A). If there is no measurable LNAPL, record as "0" on form. Record observer's initials.
- Lower interface probe to the bottom of the well and record date, time, bottom of well, and depth to DNAPL on MPE Well Form. If there is no measurable DNAPL, record as "0" on form. Record observer's initials.
- Measuring point on these wells will be consistent between measurements and will be the top of the 3/4-inch access port.
- Repeat measurements and record depths on MPE Well Form.

P1 observation wells will be under less vacuum and have no pumps or VAE line. The following procedures will be used to collect measurements in P1 Observation Wells:

- Remove vacuum by unthreading the 3/4-inch wellhead sample port (Note that all P1 wells except MW-36p1 and MW-67p1 are fitted with QED well plates with 3/4-inch threaded sample ports. MW-36p1 is fitted with a temporary PVC well cap with threaded 3/4-inch sample port, and MW-67p1 is fitted with a temporary well cap plug that will have to be removed for data collection).
- Lower interface probe into 3/4-inch access port and record date, time, depth to water, and depth to LNAPL on the Observation Well Form (Appendix A). If there is no measurable LNAPL, record as "0" on form. Record observer's initials.
- Lower interface probe to the bottom of the well and record date, time, bottom of well, and depth to DNAPL on the Observation Well Form. If there is no measurable DNAPL, record as "0" on form. Record observer's initials.
- Measuring point on these wells will be consistent between measurements and will be the top of the 3/4-inch access port for those wells fitted with well plates having access ports. The measuring point for observation wells without well plates having access ports shall be the top of the PVC well casing.
- Repeat measurements and record depth on the Observation Well Form in Appendix A.

2.1.2 Groundwater Well Monitoring

Depth to water will be manually measured in the vented observations wells.

Depths to water will be collected in these wells using a water level probe as follows:

- Open monument cap and remove well cap.
- Collect depth to water using top of PVC well casing (north side) as measurement point.
- Record date, time, initials, and depth to water on Observation Well Form in Appendix A.

2.1.3 Total Vapor and Liquid Extraction

Total liquid and vapor extraction rates and volumes data will be occasionally recorded manually on the Extraction Form in Appendix A. A vapor flow meter, which records pressure differential (in H_20), and a pressure gage, which records pipe vacuum (in Hg), are in the VTT container near the intake to the VAE. Readings from these meters are used in standard air flow formulas to calculate air flow rates. Readings are transmitted to the program logic controller (PLC) but will also be manually read and recorded on the Extraction Form as backup. A liquid flow meter, which reads total cumulative volume (gallons) and instantaneous flow (gpm), is in the VTT container before influent to the oil-water separator. Readings from the liquid meter are transmitted to the PLC but will also be manually read and recorded on the Extraction Form as backup.

2.1.4 Ambient Air Monitoring

The VTT and LTT systems are designed for operation in Class 1, Division 1 areas to safely handle flammable mixtures containing methane and other volatile substances. However, it may be feasible to avoid handling flammable mixtures through system adjustments. The following thresholds for oxygen and methane have been established:

- Oxygen = over 10% volume
- Methane = over 20% LEL by volume

Although not anticipated, if the above thresholds are both exceeded at the VAE blower discharge, gas concentrations will be measured at individual wellheads to evaluate which well(s) may be contributing to elevated methane and possibly entraining landfill gas and/or atmospheric air.

Elevated methane in extracted vapor could be from a landfill gas source and/or from volatilization of dissolved methane in the P1 zone groundwater. However, volatilization of dissolved gases in the P1 zone is not likely to produce significant vapor volumes relative to the entrainment of landfill gases.

Actions to mitigate combustible gas mixtures will be discussed with the Project Manager and could include one of the following options:

1. Throttle or isolate the well producing high methane or oxygen, presuming one is identified.
2. Throttle all MPE wells and reduce the VAE blower speed.
3. Vent the MPE wells by opening sample port and reduce the VAE blower speed to minimum, essentially reverting to non-vacuum-assisted groundwater extraction.
4. Evaluate piping modifications to route rich gas to the landfill flare.
5. Evaluate well, piping, and electrical modifications to extract from a different well.
6. Evaluate adjustments to nearby LFG collection wells to offset LFG migration into the P1 zone.

As mentioned, the systems are designed to handle combustible mixtures. MPE operations may continue when the above mitigation options result in a non-flammable condition.

2.2 Sampling Methods

2.2.1 Groundwater Sampling

Groundwater (liquid) samples will be collected for laboratory analysis for both MPE performance monitoring purposes and pre-and-post-treatment performance monitoring purposes following the schedule in Table 2.

Groundwater samples will be collected at the following locations:

- Pre-treatment samples will be collected at the liquid sample port at the oil-water separator inlet.
- Post-treatment samples will be collected at the air sparge effluent sample port.

Sample locations are shown on the MPE system diagram in Figure 2.

Groundwater samples will be sampled for analytes listed in Table 3. See Table 4 for required analyses and bottles for each sample. Groundwater samples will be collected from in-line liquid sample ports (i.e. quarter-turn ball valve with PTFE tube whip) at locations summarized above using the following procedures:

- All sampling personnel will wear clean, disposable, latex gloves.
- Place a 5-gallon bucket on the ground below the sample port to collect overflow liquid during sampling. The overflow water should be contained in sealed/labeled 55-gallon drums and eventually run through the LLT.
- Connect a multiparameter water quality meter with a flow-thru cell (YSI ProDSS or equivalent) to the sample port, then open the sample port (allowing water to fill the flow-thru cell) and a small stream of discharge of about 100 to 500 millimeters per minute (ml/min) will be maintained. The following field parameters will be monitored with the water quality meter:
    - pH (standard unit).
    - Dissolved oxygen (%).
    - Electrical conductivity (µS/cm or mS/cm).
    - Temperature (degrees C).
    - Oxidation reduction potential (mV).
    - Turbidity (NTU).
- Allow water to continue moving through the flow-thru cell until parameter readings are stable for at least 30 seconds. Record field parameter values on the Groundwater Sample Form included in Appendix A. If parameter values continue to trend after 2 minutes, record values and indicate on the Groundwater Sample Form that the parameter value is trending upward or downward. Also, note visual appearance on the sample form (opaqueness, color, odor, etc.).
- Once field parameters have been collected, disconnect the sample port from the flow-thru cell and collect samples for laboratory analysis. Fill sample bottles in a manner that minimizes contact of the samples with air following individual sample container requirements, handling, and preservation. Samples for volatile organic compounds (VOCs) should contain no bubbles (headspace) after filling.

- Samples for dissolved metals analysis will be filtered in the field using a 0.45-micron in-line filter and recorded on field forms, metals sample bottle, and COC form.
- Record all sample information on the Groundwater Sample Form in Appendix A (sample ID, date, time, field parameters, analytical parameters, shipment date to the lab, and observer/comments).
- Record the information on each sample bottle label in accordance with the following subsection.

2.2.2 Vapor Sampling

Vapor samples will be collected for laboratory analysis for both MPE performance monitoring purposes and pre-and-post-treatment performance monitoring purposes following the schedule in Table 2.

Vapor samples will be collected from combined MPE vapor at the following locations in the VTT:

- Pre-treatment samples will be collected at discharge end of the VAE blower (positive pressure) in the VTT container downgradient of the heat exchanger but upgradient of the first carbon adsorber.
- Post-treatment samples will be collected at the vapor sample port at the discharge end of the first carbon adsorber.

Vapor samples will be collected using laboratory-supplied SUMMA canisters and analyzed for VOCs. See Table 5 for a list of VOCs. Vapor samples will be collected from in-line 1/4-inch sample ports at locations summarized and shown on Figure 2 using the following procedures:

- All sampling personnel will wear clean, disposable, latex gloves.
- Measure and record field measurements of gas concentrations (methane, oxygen, photo ionization detection [PID] readings) at discharge end of VAE blower using the following procedures:
    - Attach clean disposable 1/4-inch flexible tubing (silicone or polyethylene) to PID meter's air intake port (use compression fittings if needed) and turn meter on.
    - Purge ambient air vapor through open end of tubing and meter until readings are fairly stable for at least 30 seconds.
    - Record ambient air concentrations on Extraction Form (also record date, time, units of concentration, and observer's initials).
    - Turn PID meter off and attach open end of tubing to 1/4-inch vapor sample port (use compression fitting if needed).
    - Open sample port and turn on meter.
    - Purge vapor through meter until readings are fairly stable for 30 seconds.
    - Record the vapor concentrations on Extraction Form included in Appendix A (record date, time, units of concentration, and observer's initials).
    - Except for ambient air readings, repeat above steps for measuring vapor concentrations of methane and oxygen with landfill gas meter.
- Verify and record initial vacuum of canister.

- Confirm VAE sample port and canister valves are both closed.
- Attach particulate filter to canister.
- Connect canister intake to VAE sample port with lab supplied compression fittings to achieve airtight connection.
- Open VAE sample port and open canister valve (1/2 turn). Record start time—a 6-liter canister typically takes about 16 seconds to fill.
- Once full, record the end time, final vacuum pressure, and close the canister valve. (Note that maintaining a residual vacuum is not required as the lab performs a leak test both prior to shipment and upon receipt of canisters.)
- Fill out the canister label in accordance with Section 1.5.2.2.
- Record all sample information on the Vapor Sample Form included in Appendix A (sample ID, date, time, field parameters, analytical parameters, canister readings, shipment date to the lab, and observer/comments).

2.3 Field Health and Safety Procedures

Parametrix will follow the Site-specific Health and Safety Plan (Workplan Attachment A).

2.4 Field Variances

If conditions in the field vary such that modifications to the sampling procedures and protocols described in this SAP become necessary, field personnel will notify the Project Manager of the situation to obtain a verbal approval prior to implementing any changes. The approval will be recorded in the field forms.

2.5 Decontamination Procedures

The Site-specific Health and Safety Officer, as identified in the Site-specific Health and Safety Plan, is responsible for maintaining and enforcing personnel and equipment decontamination procedures. Any decontamination modifications and/or changes shall be noted in the field forms.

2.5.1 Personnel Decontamination

Personnel decontamination will include the following:

- After completion of sampling activities in the field, personnel must deposit all equipment and/or sample bottles in segregated areas on plastic sheeting. Highly contaminated equipment is to be kept separate from minimally contaminated and difficult-to-clean equipment, such as air monitoring meters.
- If field personnel personal protective equipment (PPE) comes into contact with contaminated material, all surfaces of gear, including boot soles, must be scrubbed until visible contamination is removed. PPE are to be rinsed with tap water using a brush. PPE is removed and set on plastic sheeting.
- If worn, coveralls are to be removed and disposed of in a disposal container.
- Disposable gloves are to be disposed of in a disposal container.

2.5.2 Equipment Decontamination

Disposable tools and sampling equipment will be used when possible. Decontamination of tools will include brushing with decontamination solution, such as Alconox, and rinsing with tap water, followed by rinsing with deionized water. The tools shall be segregated and placed in clean bags or containers.

Decontamination of sampling equipment will include the following:

- Clean tubs or buckets will be set up to collect wash and rinse solutions.
- Sampling tools will be scrubbed with a decontamination solution, such as Alconox, until visibly clean.
- Tool will be rinsed with tap water.
- Tool will be rinsed with deionized water. A garden prayer or squirt bottle may be used.

2.5.3 Container Decontamination

Samples will be collected directly into sample containers provided by the laboratory. No container decontamination in the field is necessary. The containers will be provided and certified clean by the laboratory according to procedures described in the laboratory's quality assurance (QA) manual included in Appendix C.

2.6 Disposal of Waste Materials

Waste that will be generated from sampling operations include soiled PPE and disposable sampling equipment, and excess purge water from the groundwater sampling ports. Waste will be collected and stored in a 55-gallon drum or watertight container and disposed of in accordance with applicable federal and state waste regulations.

2.7 Sample Handling and Custody

2.7.1 Sample Containers and Preservatives

Table 4 lists groundwater sample volume, container size and type, and preservation requirements for each parameter/parameters group to be measured. Vapor samples will be collected in Summa Canisters. Prior to each event, the Project Manager or designee will contact the laboratory to order sample containers. The laboratory will provide sampling kits containing precleaned and pre-preserved sample containers. After sample collection, samples will be placed in a cooler with ice at approximately 4 degrees C to retain cold temperature for at least 24 hours. No samples will be split in the field.

2.7.2 Sample Custody

Each sample will be listed on the COC form(s), an example of which is provided in Appendix B. The laboratory will provide COC form(s) with each sample kit. The field personnel will record all sample custody transfers on the COC form(s) and return it to the laboratory with the samples.

A sample is under a person's custody if it is:

- In that person's physical possession.
- Within that person's sight.
- Secured in a tamper-proof way by that person.
- Secured by that person in an area restricted to authorized personnel.

Field personnel are responsible for custody of the samples until they are delivered to the laboratory. The field portions of COC forms shall be completed in the field by the sampler. Each time one person relinquishes control of the samples to another person, both individuals must complete the appropriate portions of the COC form by signing the form and filling in the date and time of the custody transfer. For this reason, one field personnel individual should retain sample custody during the sampling event whenever feasible.

The laboratory's sample receipt coordinator will sign and date the COC form(s) promptly when the samples arrive. The laboratory is then responsible for the care and custody of samples. The laboratory will track sample custody through their facility using a separate sample tracking form, as discussed in the laboratory QA manual included in Appendix D. Copies of completed COC forms will be kept in the project files.

2.7.3 Sample Disposal

Following sample analysis, the laboratory will store the unused portions for 30 days after the final laboratory data package and invoice is delivered then dispose of all the samples following their standard procedures.

2.8 Analytical Methods

2.8.1 Laboratory Analysis Methods

Laboratory analysis methods for each parameter are listed in Tables 3 and 5. Sample analysis will be performed by the laboratory in accordance with Environmental Protection Agency (EPA) method specifications. The method detection limit (MDL) and reporting limit (RL) for each sample parameter method are listed in the laboratory summary table (Appendix D).

After analyzing samples from each sampling event, the laboratory will summarize the data and associated QC results in a data report and electronic data file and provide these to Parametrix within 1 month of sample receipt. Quarterly sample data report and electronic data file contents are described in Section 1.5.3.

2.9 Quality Control

2.9.1 Measurement Performance and Acceptance Criteria

This section identifies data quality indicators (DQIs) for each analytical parameter and decisions regarding how each DQI will be assessed. The DQIs include sensitivity, bias, representativeness, precision, accuracy, completeness, and comparability.

The general approach to assessing each DQI is provided below, including quantitative measurements where appropriate. Analytical methods are specified in Tables 3 and 5.

Sensitivity

Sensitivity is the MDL which a laboratory following an analytical method can detect and quantify an analyte with reasonable confidence. Laboratory MDLs and RLs are listed the summary table included in Appendix D.

Bias

Bias is the difference between the population mean and the true value of the parameter being measured. Bias in water samples will be calculated based on the analyses of field blanks, method blanks, matrix spikes, and laboratory control samples (LCS).

Field blank results that are greater than the RL will be flagged as blank contamination. Typically, associated project samples within 10 times the blank concentration will be qualified as an estimate.

Some of the parameters listed in Tables 3 and 5 require matrix spikes (MS) and MS duplicates. MS and MS duplicates will be performed for these parameters following the laboratory's standard procedure. Percent recoveries are required to be within the ranges shown in the LCS analysis included in Appendix D.

Representativeness

Representativeness is the degree to which sample data represent a characteristic environmental condition or specific site conditions. Samples will be collected at different stages of MPE system restart.

Precision

Precision is the closeness of results for a sample and duplicate sample, as defined by the relative percent difference (RPD). Required RPD ranges are shown in the LCS analysis included in Appendix D.

Accuracy

Accuracy is the measure of agreement between a measurement's result and the true or known value. LCS, MS, and MS duplicates percent recoveries are required to be within the acceptance criteria ranges in the LCS analysis included in Appendix D.

Completeness

Completeness is a percentage calculated as the ratio of measurements determined to be valid over the total number of measurements collected. The completeness goal is set in terms of the minimum number of samples meeting DQIs. To evaluate groundwater and vapor for this study, all samples must be valid. Other practices to ensure achievement of the completeness goal include using prepared sample containers and coolers from the laboratory, using trained staff, following the sampling procedures in this SAP, icing samples, packaging samples for transport to avoid breakage, and timely sample processing. Laboratory analysis can improve completeness by processing samples within their holding times. For data analysis, valid sample data may include all unflagged data and J-flagged data reviewed by the Project Manager.

2.9.2 Field Sampling QC

No field QC samples will be collected during sampling events.

2.9.3 Laboratory Analysis QC

Laboratory QA/QC procedures are described in the laboratory's QA manual included in Appendix C. Analysis for LCS and method blanks for each sample parameter method is included in Appendix D.

2.9.4 Field Monitoring Instruments/ Equipment

Installation and procedures for field sampling and monitoring equipment use are discussed in Sections 2.1 and 2.2. Field devices will be calibrated and maintained in accordance with the manufacturer's guidelines and specifications. Records of equipment calibration and maintenance will be recorded and maintained in field notes.

Documentation will include the following information, as applicable:

- Name of person maintaining or calibrating the instrument/equipment.
- Date and description of the maintenance or calibration procedure.
- Date and description of any instrument/equipment problem(s).
- Date and description of action to correct problem(s).
- List of follow-up activities after maintenance (i.e., system checks).

For leased equipment, calibration by the lessor is acceptable.

2.9.5 Laboratory Analysis Instruments/ Equipment

Inspection and maintenance of laboratory equipment is the responsibility of the laboratory and is described in the laboratory's QA manual included in Appendix C.

2.10 Data Management

Data collected by this study, as described in previous subsections, will be maintained as electronic data files. Preparation, maintenance, and storage of documents and records are described in Section 1.5.

The laboratory will provide data in electronic form via unprotected .xlsx or .csv format, with full data reports provided in Adobe PDF. The Project Manager or designee will review the results for consistency of results and qualifiers across file formats. Any discrepancies will be identified for resolution by the laboratory.

Data presented in the final report will be checked against the original sources. Any data summaries and calculations included in the final report will be checked to confirm the appropriate source data and calculation methods are used.

Data will be submitted to Ecology as required in the Amendment.

3. Oversight

This section describes oversight to confirm that field sampling and monitoring activities are conducted according to procedures outlined in this SAP.

3.1 Field and Laboratory Oversight

For this study, field oversight will include readiness reviews of the Field Sampling Team prior to initiating quarterly sampling efforts, field activity audits, and post-event review of field sampling and measurement activities.

3.1.1 Readiness Procedure

Field staff training will include review of this SAP and laboratory instructions with the field kits. Prior to each sampling and monitoring event, the field sample team will confirm the following:

- Equipment is operational and ready for field use.
- Field instruments are calibrated and in proper working order.
- Field logs are on hand.
- The sample kit includes all containers listed in the COC and this SAP for the event.
- All sample containers are intact and properly closed.

3.1.2 Post-Event Review of Field Sampling and Measurement Activities

Field data verification after each sampling and monitoring event will involve review of the field data for errors or omissions and examining the results for compliance with QC acceptance criteria outlined in this SAP. Review of field measurements will include the following:

- Evaluate field records for consistency.
- Confirm calibration procedures were followed and documented.
- Review QC information (any corrections on field forms and confirm QC of data transferred to electronic format).
- Summarize any deviations from methods specified in this SAP, determine any impact on data quality, and identify any necessary modifications to sampling activities prior to the next quarterly event.

Tables

Table 1. Field Monitoring Schedule and Summary
Ephrata Landfill, Grant County, Washington

MPE System Restart Project Phase	Field Parameters	Locations of Measurement	Location of Data Collection	Data Collection Frequency		Data Collection Form
				Automated (PLC)	Manual (Forms- record off of PLC)	
PUMPING WITH NO VACUUM	Manual Depth to Groundwater	All Extraction and Observation Wells	Wellhead Measuring Point (MP)		Once per sampling event	Observation and MPE Well Forms
	Manual Depth to LNAPL	All P1 Zone Extraction and Observation Wells	Wellhead Measuring Point (MP)		Once per sampling event	Observation and MPE Well Forms
	LT Readings	LTs in wells	PLC	Hourly	Once per sampling event	Observation and MPE Well Forms
	PIT readings	PITs at wells	PLC	Hourly	Once per sampling event	Observation and MPE Well Forms
	Pump Cycle Count and Rate	Active MPE Wells	MPE Well		Once per sampling event	MPE Well Forms
	Liquid Flow Rate and Total Volume	Meter before OWS (LTT Container)	PLC	Hourly	Once per sampling event	Extraction Form
	Vapor Extraction Rate and Volume	Meter near blower (VTT Container)	PLC	Hourly	Once per sampling event	Extraction Form
	Pump Supply Air Pressure	Regulators on air supply lines to pumps	MPE Well	Hourly	Once per sampling event	MPE Well Forms
	VAE Blower Speed	(VTT Container)	VTT Container		Once per sampling event	Operations Form
	Compressed Air Supply Rate	(VTT Container)	VTT Container		Once per sampling event	Operations Form
	Methane and Oxygen, Total Organics (PID)	VAE Sample Port (Discharge End of Heat Exchanger)	VTT Container		Once per sampling event	Extraction Form
SOIL VAPOR EXTRACTION TEST	Manual Depth to Groundwater	All Extraction and Observation Wells	Wellhead Measuring Point (MP)		Once per sampling event	Observation and MPE Well Forms
	Manual Depth to LNAPL	All P1 Zone Extraction and Observation Wells	Wellhead Measuring Point (MP)		Once per sampling event	Observation and MPE Well Forms
	Manual Vacuum Reading	MW-36p1	Wellhead		Once per sampling event	Observation Well Forms
	LT Readings	LTs in wells	PLC	Hourly	Once per sampling event	Observation and MPE Well Forms
	PIT readings	PITs at wells	PLC	Hourly	Once per sampling event	Observation and MPE Well Forms
	Pump Cycle Count and Rate	Active MPE Wells	MPE Well		Once per sampling event	MPE Well Forms
	VAE Flow Control Valves	Active MPE Wells	MPE Well		Once per sampling event	MPE Well Forms
	Liquid Flow Rate and Total Volume	Meter before OWS (LTT Container)	PLC	Hourly	Once per sampling event	Extraction Form
	Vapor Extraction Rate and Volume	Meter near blower (VTT Container)	PLC	Hourly	Once per sampling event	Extraction Form
	Pump Supply Air Pressure	Regulators on air supply lines to pumps	MPE Well	Hourly	Once per sampling event	MPE Well Forms
	VAE Blower Speed	(VTT Container)	VTT Container		Once per sampling event	Operations Form
	VAE Blower Makeup Air	(VTT Container)	VTT Container		Once per sampling event	Operations Form
	Compressed Air Supply Rate	(VTT Container)	VTT Container		Once per sampling event	Operations Form
	Methane and Oxygen, Total Organics (PID)	VAE Sample Port (Discharge End of Heat Exchanger)	VTT Container		Once per sampling event	Extraction Form

Notes:
Additional readings may be collected during seasonal startup.

LNAPL- light non-aqueous phase liquids
LT- level transducers
LTT- Liquid Treatment Train
MP- wellhead measuring point
MPE- multi-phase extraction

PIT- pressuring indicating transducers
PLC- programmable logic controller (i.e., computer)
VAE- vacuum assisted extraction
VTT- Vapor Treatment Train

Table 2. Laboratory Sampling Schedule and Summary
Ephrata Landfill, Grant County, Washington

MPE System Restart Project Phase	Estimated Duration of Each Step	Sample Location	Sampling Purpose	Media	Parameters	Sample Frequency	Total Number of Groundwater Samples per Phase	Total Number of Vapor Samples per Phase	Documentation Form
Pumping with No Vacuum	2 weeks	OWS inlet liquid sample port	MPE and pretreatment performance	Groundwater	COCs, TPH	Once during seasonal restart	1		Groundwater Sample Form
		Air sparge effluent sample port	Post-treatment performance	Groundwater	COCs, TPH	Once during seasonal restart	1		Groundwater Sample Form
Soil Vapor Extraction	Seasonal operation until	OWS inlet liquid sample port	MPE and pretreatment performance	Groundwater	COCs, TPH	Collect one sample 2 weeks after system restart and collect one sample during the month prior to system seasonal shut down	2		Groundwater Sample Form
		Air sparge effluent sample port	Post-treatment performance	Groundwater	COCs, TPH	Collect one sample 2 weeks after system restart and collect one sample during the month prior to system seasonal shut down	2		Groundwater Sample Form
		VAE blower discharge sample port	MPE and pretreatment performance	Vapor	VOCs	Collect one sample 2 weeks after system restart and collect one sample during the month prior to system seasonal shut down		2	Vapor Sample Form
		First carbon absorber discharge sample port	Post-treatment performance	Vapor	VOCs	Collect one sample 2 weeks after system restart and collect one sample during the month prior to system seasonal shut down		2	Vapor Sample Form

Notes:
COCs- contaminants of concern
MPE- multi-phase extraction
OWS- oil-water separator
TPH- total petroleum hydrocarbons
VOCs- volatile organic compounds

Table 3. Groundwater Analytical Parameters

Ephrata Landfill, Grant County, Washington

Parameters	Units	Analytical Method
Organic Parameters- VOCs		
1,4-Dioxane	ug/L	EPA 8260D SIM
1,1,1,2-Tetrachloroethane	ug/L	EPA 8260D
1,1,1-Trichloroethane	ug/L	EPA 8260D
1,1,2,2-Tetrachloroethane	ug/L	EPA 8260D
1,1,2-Trichloroethane	ug/L	EPA 8260D
1,1-Dichloroethane	ug/L	EPA 8260D
1,1-Dichloroethene	ug/L	EPA 8260D
1,1-Dichloropropene	ug/L	EPA 8260D
1,2,3-Trichlorobenzene	ug/L	EPA 8260D
1,2,3-Trichloropropane	ug/L	EPA 8260D
1,2,4-Trichlorobenzene	ug/L	EPA 8260D
1,2,4-Trimethylbenzene	ug/L	EPA 8260D
1,2-Dibromo-3-chloropropane	ug/L	EPA 8260D
1,2-Dibromoethane (EDB)	ug/L	EPA 8260D
1,2-Dichlorobenzene	ug/L	EPA 8260D
1,2-Dichloroethane (EDC)	ug/L	EPA 8260D
1,2-Dichloropropane	ug/L	EPA 8260D
1,3,5-Trimethylbenzene	ug/L	EPA 8260D
1,3-Dichlorobenzene	ug/L	EPA 8260D
1,3-Dichloropropane	ug/L	EPA 8260D
1,4-Dichlorobenzene	ug/L	EPA 8260D
2,2-Dichloropropane	ug/L	EPA 8260D
2-Butanone (MEK)	ug/L	EPA 8260D
2-Chlorotoluene	ug/L	EPA 8260D
2-Hexanone	ug/L	EPA 8260D
4-Chlorotoluene	ug/L	EPA 8260D
4-Methyl-2-pentanone	ug/L	EPA 8260D
Acetone	ug/L	EPA 8260D
Benzene	ug/L	EPA 8260D
Bromobenzene	ug/L	EPA 8260D
Bromodichloromethane	ug/L	EPA 8260D
Bromoform	ug/L	EPA 8260D
Bromomethane	ug/L	EPA 8260D
Carbon tetrachloride	ug/L	EPA 8260D
Chlorobenzene	ug/L	EPA 8260D
Chloroethane	ug/L	EPA 8260D
Chloroform	ug/L	EPA 8260D
Chloromethane	ug/L	EPA 8260D
cis-1,2-Dichloroethene	ug/L	EPA 8260D
cis-1,3-Dichloropropene	ug/L	EPA 8260D
Dibromochloromethane	ug/L	EPA 8260D
Dibromomethane	ug/L	EPA 8260D

Parameters	Units	Analytical Method
Dichlorodifluoromethane	ug/L	EPA 8260D
Ethylbenzene	ug/L	EPA 8260D
Hexachlorobutadiene	ug/L	EPA 8260D
Hexane	ug/L	EPA 8260D
Isopropylbenzene	ug/L	EPA 8260D
m,p-Xylene	ug/L	EPA 8260D
Methyl t-butyl ether (MTBE)	ug/L	EPA 8260D
Methylene chloride	ug/L	EPA 8260D
Naphthalene	ug/L	EPA 8260D
n-Propylbenzene	ug/L	EPA 8260D
o-Xylene	ug/L	EPA 8260D
p-Isopropyltoluene	ug/L	EPA 8260D
sec-Butylbenzene	ug/L	EPA 8260D
Styrene	ug/L	EPA 8260D
tert-Butylbenzene	ug/L	EPA 8260D
Tetrachloroethene	ug/L	EPA 8260D
Toluene	ug/L	EPA 8260D
trans-1,2-Dichloroethene	ug/L	EPA 8260D
trans-1,3-Dichloropropene	ug/L	EPA 8260D
Trichloroethene	ug/L	EPA 8260D
Trichlorofluoromethane	ug/L	EPA 8260D
Vinyl chloride	ug/L	EPA 8260D
Organic Parameters-SVOCs		
1,2,4-Trichlorobenzene	ug/L	EPA 8270E
1,2-Dichlorobenzene	ug/L	EPA 8270E
1,2-Diphenylhydrazine	ug/L	EPA 8270E
1,3-Dichlorobenzene	ug/L	EPA 8270E
1,4-Dichlorobenzene	ug/L	EPA 8270E
1-Methylnaphthalene	ug/L	EPA 8270E
2,2'-Oxybis(1-chloropropane)	ug/L	EPA 8270E
2,2’-Oxybis(1-chloropropane)	ug/L	EPA 8270E
2,4,5-Trichlorophenol	ug/L	EPA 8270E
2,4,6-Trichlorophenol	ug/L	EPA 8270E
2,4-Dichlorophenol	ug/L	EPA 8270E
2,4-Dimethylphenol	ug/L	EPA 8270E
2,4-Dinitrophenol	ug/L	EPA 8270E
2,4-Dinitrotoluene	ug/L	EPA 8270E
2,6-Dinitrotoluene	ug/L	EPA 8270E
2-Chloronaphthalene	ug/L	EPA 8270E
2-Chlorophenol	ug/L	EPA 8270E
2-Methylnaphthalene	ug/L	EPA 8270E
2-Methylphenol	ug/L	EPA 8270E
2-Nitroaniline	ug/L	EPA 8270E
2-Nitrophenol	ug/L	EPA 8270E
3,3'-Dichlorobenzidine	ug/L	EPA 8270E

Parameters	Units	Analytical Method
3-Methylphenol + 4-Methylphenol	ug/L	EPA 8270E
3-Nitroaniline	ug/L	EPA 8270E
4,6-Dinitro-2-methylphenol	ug/L	EPA 8270E
4-Bromophenyl phenyl ether	ug/L	EPA 8270E
4-Chloro-3-methylphenol	ug/L	EPA 8270E
4-Chloroaniline	ug/L	EPA 8270E
4-Chlorophenyl phenyl ether	ug/L	EPA 8270E
4-Nitroaniline	ug/L	EPA 8270E
4-Nitrophenol	ug/L	EPA 8270E
Acenaphthene	ug/L	EPA 8270E
Acenaphthylene	ug/L	EPA 8270E
Anthracene	ug/L	EPA 8270E
Benz(a)anthracene	ug/L	EPA 8270E
Benzo(a)pyrene	ug/L	EPA 8270E
Benzo(b)fluoranthene	ug/L	EPA 8270E
Benzo(g,h,i)perylene	ug/L	EPA 8270E
Benzo(k)fluoranthene	ug/L	EPA 8270E
Benzoic acid	ug/L	EPA 8270E
Benzyl alcohol	ug/L	EPA 8270E
Benzyl butyl phthalate	ug/L	EPA 8270E
Bis(2-chloroethoxy)methane	ug/L	EPA 8270E
Bis(2-chloroethyl) ether	ug/L	EPA 8270E
Bis(2-ethylhexyl) phthalate	ug/L	EPA 8270E
Carbazole	ug/L	EPA 8270E
Chrysene	ug/L	EPA 8270E
Dibenzo(a,h)anthracene	ug/L	EPA 8270E
Dibenzofuran	ug/L	EPA 8270E
Diethyl phthalate	ug/L	EPA 8270E
Dimethyl phthalate	ug/L	EPA 8270E
Di-n-butyl phthalate	ug/L	EPA 8270E
Di-n-octyl phthalate	ug/L	EPA 8270E
Fluoranthene	ug/L	EPA 8270E
Fluorene	ug/L	EPA 8270E
Hexachlorobenzene	ug/L	EPA 8270E
Hexachlorobutadiene	ug/L	EPA 8270E
Hexachlorocyclopentadiene	ug/L	EPA 8270E
Hexachloroethane	ug/L	EPA 8270E
Indeno(1,2,3-cd)pyrene	ug/L	EPA 8270E
Isophorone	ug/L	EPA 8270E
Naphthalene	ug/L	EPA 8270E
Nitrobenzene	ug/L	EPA 8270E
N-Nitrosodimethylamine	ug/L	EPA 8270E
N-Nitroso-di-n-propylamine	ug/L	EPA 8270E
N-Nitrosodiphenylamine	ug/L	EPA 8270E
Pentachlorophenol	ug/L	EPA 8270E

Parameters	Units	Analytical Method
Phenanthrene	ug/L	EPA 8270E
Phenol	ug/L	EPA 8270E
Pyrene	ug/L	EPA 8270E
1,2,4-Trichlorobenzene	ug/L	EPA 8270E
1,2-Dichlorobenzene	ug/L	EPA 8270E
1,2-Diphenylhydrazine	ug/L	EPA 8270E
1,3-Dichlorobenzene	ug/L	EPA 8270E
1,4-Dichlorobenzene	ug/L	EPA 8270E
1-Methylnaphthalene	ug/L	EPA 8270E
2,2'-Oxybis(1-chloropropane)	ug/L	EPA 8270E
2,2’-Oxybis(1-chloropropane)	ug/L	EPA 8270E
2,4,5-Trichlorophenol	ug/L	EPA 8270E
2,4,6-Trichlorophenol	ug/L	EPA 8270E
2,4-Dichlorophenol	ug/L	EPA 8270E
2,4-Dimethylphenol	ug/L	EPA 8270E
2,4-Dinitrophenol	ug/L	EPA 8270E
2,4-Dinitrotoluene	ug/L	EPA 8270E
2,6-Dinitrotoluene	ug/L	EPA 8270E
2-Chloronaphthalene	ug/L	EPA 8270E
2-Chlorophenol	ug/L	EPA 8270E
2-Methylnaphthalene	ug/L	EPA 8270E
2-Methylphenol	ug/L	EPA 8270E
2-Nitroaniline	ug/L	EPA 8270E
2-Nitrophenol	ug/L	EPA 8270E
3,3'-Dichlorobenzidine	ug/L	EPA 8270E
3-Methylphenol + 4-Methylphenol	ug/L	EPA 8270E
3-Nitroaniline	ug/L	EPA 8270E
4,6-Dinitro-2-methylphenol	ug/L	EPA 8270E
4-Bromophenyl phenyl ether	ug/L	EPA 8270E
4-Chloro-3-methylphenol	ug/L	EPA 8270E
4-Chloroaniline	ug/L	EPA 8270E
4-Chlorophenyl phenyl ether	ug/L	EPA 8270E
4-Nitroaniline	ug/L	EPA 8270E
4-Nitrophenol	ug/L	EPA 8270E

Parameters	Units	Analytical Method
Acenaphthene	ug/L	EPA 8270E
Acenaphthylene	ug/L	EPA 8270E
Anthracene	ug/L	EPA 8270E
Benz(a)anthracene	ug/L	EPA 8270E
Benzo(a)pyrene	ug/L	EPA 8270E
Benzo(b)fluoranthene	ug/L	EPA 8270E
Benzo(g,h,i)perylene	ug/L	EPA 8270E
Benzo(k)fluoranthene	ug/L	EPA 8270E
Benzoic acid	ug/L	EPA 8270E
Benzyl alcohol	ug/L	EPA 8270E
Benzyl butyl phthalate	ug/L	EPA 8270E
Bis(2-chloroethoxy)methane	ug/L	EPA 8270E
Bis(2-chloroethyl) ether	ug/L	EPA 8270E
Bis(2-ethylhexyl) phthalate	ug/L	EPA 8270E
Carbazole	ug/L	EPA 8270E
Chrysene	ug/L	EPA 8270E
Dibenzo(a,h)anthracene	ug/L	EPA 8270E
Dibenzofuran	ug/L	EPA 8270E
Diethyl phthalate	ug/L	EPA 8270E
Dimethyl phthalate	ug/L	EPA 8270E
Di-n-butyl phthalate	ug/L	EPA 8270E
Di-n-octyl phthalate	ug/L	EPA 8270E
Fluoranthene	ug/L	EPA 8270E
Fluorene	ug/L	EPA 8270E
Hexachlorobenzene	ug/L	EPA 8270E
Hexachlorobutadiene	ug/L	EPA 8270E
Hexachlorocyclopentadiene	ug/L	EPA 8270E
Hexachloroethane	ug/L	EPA 8270E
Indeno(1,2,3-cd)pyrene	ug/L	EPA 8270E
Isophorone	ug/L	EPA 8270E
Naphthalene	ug/L	EPA 8270E
Nitrobenzene	ug/L	EPA 8270E
N-Nitrosodimethylamine	ug/L	EPA 8270E
N-Nitroso-di-n-propylamine	ug/L	EPA 8270E
N-Nitrosodiphenylamine	ug/L	EPA 8270E
Pentachlorophenol	ug/L	EPA 8270E
Phenanthrene	ug/L	EPA 8270E
Phenol	ug/L	EPA 8270E
Pyrene	ug/L	EPA 8270E

Parameters	Units	Analytical Method
Total Petroleum Hydrocarbons		
Gasoline-range hydrocarbons	ug/L	NWTPH-Gx
Diesel-range hydrocarbons	ug/L	NWTPH-Dx
Oil-range hydrocarbons	ug/L	NWTPH-Dx
Inorganic Parameters		
Chloride	mg/L	SW-846
Sulfate	mg/L	SW-846
Nitrate as Nitrogen	mg/L	EPA 353.2
Total Suspended Solids	mg/L	SM2540D
Antimony, Total & Dissolved	ug/L	EPA 200.8
Arsenic, Total & Dissolved	ug/L	EPA 200.8
Barium, Total & Dissolved	ug/L	EPA 200.8
Beryllium, Total & Dissolved	ug/L	EPA 200.8
Cadmium,Total & Dissolved	ug/L	EPA 200.8
Chromium, Total & Dissolved	ug/L	EPA 200.8
Cobalt, Total & Dissolved	ug/L	EPA 200.8
Copper, Total & Dissolved	ug/L	EPA 200.8
Iron, Total & Dissolved	ug/L	EPA 200.8
Lead, Total & Dissolved	ug/L	EPA 200.8
Manganese, Total & Dissolved	ug/L	EPA 200.8
Mercury, Total & Dissolved	ug/L	EPA 200.8
Molybdenum, Total & Dissolved	ug/L	EPA 200.8
Nickel, Total & Dissolved	ug/L	EPA 200.8
Selenium, Total & Dissolved	ug/L	EPA 200.8
Silver, Total & Dissolved	ug/L	EPA 200.8
Thallium, Total & Dissolved	ug/L	EPA 200.8
Vanadium, Total & Dissolved	ug/L	EPA 200.8
Zinc, Total & Dissolved	ug/L	EPA 200.8

Notes:

BTEX- benzene, toluene, ethylbenzene, and xylenes

MC- methylene chloride

mg/l- milligrams per liter

SVOCs- semi-volatile organic compounds

TMB- trimethylbenzene

TPH- total petroleum hydrocarbons

ug/l- micrograms per liter

VOCs- volatile organic compounds

Table 4. Groundwater Laboratory Analyses

Ephrata Landfill, Grant County, Washington

Analysis	No. of Bottles per Analysis	Bottle	Preservative	Hold Time
Total Metals	1	500 mL HDPE	HNO3	6 Months
Dissolved Metals	1	500 mL HDPE	HNO3	6 Months
VOC-8260	3	40 mL Vials	HCL	14 Days
Semi-VOC-8270	2	500 mL Amber Glass	None	7 Days
Nitrate/Sulfate/Chloride	1	500 mL HDPE	None	48 Hours
Total Suspended Solids	1	1 L HDPE	None	7 Days
Gasoline-range hydrocarbons (NWTPH-Gx)	2	40 mL Vials	HCL	14 Days
Diesel-range and oil-range hydrocarbons (NWTPH-Dx)	2	500 mL Amber Glass	None	14 Days

Notes:

As- arsenic

COCs- contaminants of concern

Fe- iron

HCL- hydrochloric acid

HDPE- high-density polyethylene

HNO3- nitric acid

mL- milliliter

Mn- manganese

TPH- total petroleum hydrocarbons

VOCs- volatile organic compounds

Table 5. Vapor Analytical Parameters

Ephrata Landfill, Grant County, Washington

Parameters	Units	Analytical Method (Sample Collected in Summa Canister)[1]
1,1,1-Trichloroethane	ug/m3	TO-15
1,1,2,2-Tetrachloroethane	ug/m3	TO-15
1,1,2-Trichloroethane	ug/m3	TO-15
1,1-Dichloroethane	ug/m3	TO-15
1,1-Dichloroethene	ug/m3	TO-15
1,2,4-Trichlorobenzene	ug/m3	TO-15
1,2,4-Trimethylbenzene	ug/m3	TO-15
1,2-Dibromoethane (EDB)	ug/m3	TO-15
1,2-Dichlorobenzene	ug/m3	TO-15
1,2-Dichloroethane (EDC)	ug/m3	TO-15
1,2-Dichloropropane	ug/m3	TO-15
1,3,5-Trimethylbenzene	ug/m3	TO-15
1,3-Butadiene	ug/m3	TO-15
1,3-Dichlorobenzene	ug/m3	TO-15
1,4-Dichlorobenzene	ug/m3	TO-15
1,4-Dioxane	ug/m3	TO-15
2,2,4-Trimethylpentane	ug/m3	TO-15
2-Butanone (MEK)	ug/m3	TO-15
2-Chlorotoluene	ug/m3	TO-15
2-Hexanone	ug/m3	TO-15
2-Propanol	ug/m3	TO-15
3-Chloropropene	ug/m3	TO-15
4-Ethyltoluene	ug/m3	TO-15
4-Methyl-2-pentanone	ug/m3	TO-15
Acetone	ug/m3	TO-15
Acrolein	ug/m3	TO-15
Benzene	ug/m3	TO-15
Benzyl chloride	ug/m3	TO-15
Bromodichloromethane	ug/m3	TO-15
Bromoform	ug/m3	TO-15
Bromomethane	ug/m3	TO-15
Butane	ug/m3	TO-15
Carbon disulfide	ug/m3	TO-15
Carbon tetrachloride	ug/m3	TO-15
CFC-113	ug/m3	TO-15
Chlorobenzene	ug/m3	TO-15
Chloroethane	ug/m3	TO-15
Chloroform	ug/m3	TO-15
Chloromethane	ug/m3	TO-15
cis-1,2-Dichloroethene	ug/m3	TO-15
cis-1,3-Dichloropropene	ug/m3	TO-15
Cyclohexane	ug/m3	TO-15
Dibromochloromethane	ug/m3	TO-15

Parameters	Units	Analytical Method (Sample Collected in Summa Canister)[1]
Dichlorodifluoromethane	ug/m3	TO-15
Ethanol	ug/m3	TO-15
Ethyl acetate	ug/m3	TO-15
Ethylbenzene	ug/m3	TO-15
F-114	ug/m3	TO-15
Heptane	ug/m3	TO-15
Hexachlorobutadiene	ug/m3	TO-15
Hexane	ug/m3	TO-15
Isopropylbenzene	ug/m3	TO-15
m,p-Xylene	ug/m3	TO-15
Methyl Methacrylate	ug/m3	TO-15
Methyl t-butyl ether (MTBE)	ug/m3	TO-15
Methylene chloride	ug/m3	TO-15
Naphthalene	ug/m3	TO-15
Nonane	ug/m3	TO-15
o-Xylene	ug/m3	TO-15
Pentane	ug/m3	TO-15
Propene	ug/m3	TO-15
Propylbenzene	ug/m3	TO-15
Styrene	ug/m3	TO-15
t-Butyl alcohol (TBA)	ug/m3	TO-15
Tetrachloroethene	ug/m3	TO-15
Tetrahydrofuran	ug/m3	TO-15
Toluene[2]	ug/m3	TO-15
trans-1,2-Dichloroethene	ug/m3	TO-15
trans-1,3-Dichloropropene	ug/m3	TO-15
Trichloroethene	ug/m3	TO-15
Trichlorofluoromethane	ug/m3	TO-15
Vinyl acetate	ug/m3	TO-15
Vinyl bromide	ug/m3	TO-15
Vinyl chloride	ug/m3	TO-15
Gasoline Range Organics	ug/m3	TO-15

Notes:

BTEX- benzene, toluene, ethylbenzene, and xylenes

DCP- dichloropropane

MC- methylene chloride

TMB- trimethylbenzene

ug/l- micrograms per liter

[1, 2] EPA Method TO-15 is the primary analytical method. However, during the first sampling event, both EPA Methods TO-15 and TO-17 will be used to measure specifically for toluene to verify any breakthrough. Following that, If vapor concentrations exceed the upper bound qauntitatve limits of Method TO-15, then EPA Method TO-17 may be evaluated as a alternative analysis method for all VOCs.

Appendix A

Field Forms

Observation Well Form

Ephrata Landfill MPE System- Observation Well Data Form

Well _____ Sheet _____ of _____

Describe measuring point _____

Date	Time	Depth to				Pressures		Observer, Comment
		Water	LNAPL	DNAPL	Bottom	PIT	LT	
	24 hrs	x.xx ft btoc				x.xx inch water		

If found, call 206-329-0141

MPE Well Form

Ephrata Landfill MPE System - Well Data Form

Well _____ Sheet _____ of _____

Describe measuring point _____

Date	Time	Depth to				Pressures		Pump						Vapor Concentrations at Wellhead (Ambient Air or VAE Vapor, indicate under Comments)			Observer, Comment
								Pump On	Pump Off	Total Pump Cycle Count	Pump Cycle Rate		Supply Air Press.				
		Water	LNAPL	DNAPL	Bottom	PIT	LT				Number of Cycle Counts	Delta Time		CH4	O2	Total Organics	Record VAE Flow Valve Settings Here
	24 hrs	x.xx ft btoc				x.xx inch water		Date:Time	Date:Time	count	count	mm:ss	PSI	%	PPM	PPM	

If found, call 206-329-0141

Liquid and Vapor Extraction Form

Ephrata Landfill MPE System- Liquid and Vapor Extraction Form

Sheet _____ of _____

		Liquid Extraction		Vapor Extraction		Ambient Air Concentrations (Through Tubing)	Total Vapor Concentrations in VAE Line (Downgradient of Blower)			Observer/Comment
Date	Time	Volume	Rate	Pressure Differential	Vacuum Pressure	Total Organics	CH4	O2	Total Organics	
	24 hrs	x.xx gallons	x.xx gpm	x.xx in H2O	x.xx in Hg	PPM	%	PPM	PPM	

If found, call 206-329-0141

Groundwater Sample Form

Ephrata Landfill MPE System- Groundwater Sample Form

			Field Parameters								Analytical Parameters (Y/N)									
					Electrical Conductivity															
Sample ID (Well/Location)	Sample Date	Sample Time 24 hrs	pH (units)	DO (%)	EC Value	EC Units (uS/cm or mS/cm)	Temp (Degrees C)	ORP (mV	Turbidity (NTU)	Visual (color, odor, etc)	Total Metals	Dissolved Metals	Dissolved Metals Field Filtered (Y/N)	VOC-8260	VOC-8270	NO3/SO4/Cl	TDS	Lab	Shipment Date to Lab	Observer/Comment

Vapor Sample Form

Ephrata Landfill MPE System- Vapor Sample Form

Sample ID (Well/Location)	Sample Date	Sample Time 24 hrs	Field Parameters			Analytical Parameter (Y or N)	Canister Recordings				Lab	Shipment Date to Lab	Observer/Comment
			CH4 %	O2 PPM	Total Organics PPM	VOC-TO15 (Summa Canister)	Time Start	Time Stop	Canister Vacuum Start ("Hg)	Canister Vacuum Stop ("Hg)			

Appendix B

Chain-of-Custody Form

SAMPLE CHAIN OF CUSTODY

Report To_____

Company_____

Address_____

City, State, ZIP_____

Phone_____Email_____

SAMPLERS (*signature*)	
PROJECT NAME	PO #
REMARKS Project Specific RLs - Yes / No	INVOICE TO

Page # _____ of _____

TURNAROUND TIME
Standard Turnaround
RUSH_____
Rush charges authorized by:
_____

SAMPLE DISPOSAL
Dispose after 30 days
Archive Samples
Other_____

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082						Notes

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:				
Received by:				
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
5500 4th Avenue S
Seattle, WA 98108
Ph. (206) 285-8282

Appendix C

Laboratory Quality Assurance Manual

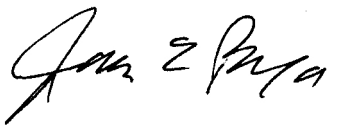
QUALITY ASSURANCE MANUAL

Friedman & Bruya, Inc.

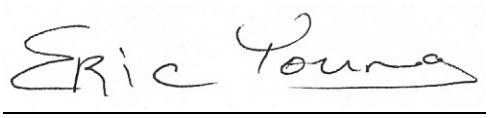
5500 4th Avenue South
Seattle, Washington 98108-2419
(206) 285-8282

Revision Number 18
December 9, 2022

Approved by

Executive Committee Representative: 

James E. Bruya

Laboratory Director: 

Eric Young

Quality Assurance Officer: 

Stephanie Pham

Document Control Number: 218

2.0 TABLE OF CONTENTS

3.0 QUALITY SYSTEM POLICY STATEMENT

Quality Assurance/Quality Control (QA/QC) is of fundamental importance to any chemical testing program. It is the goal of Friedman & Bruya, Inc. (F&BI) to provide analytical data which is scientifically sound and of known and documented quality. To achieve this objective, a quality system has been established to ensure that adequate QA/QC procedures are followed and documented, from sample receipt through to the final report provided to the client. The quality system has been established to meet the requirements of the National Environmental Laboratory Accreditation Program (NELAP). The policies and procedures established are designed to meet the quality requirements of our clients, as well as those of accrediting authorities.

F&BI laboratory management is committed to following good professional practices, and to providing the highest quality of environmental testing services to our clients. An important part of this commitment is the requirement that all F&BI personnel involved with environmental testing activities, including management, are familiar with the established quality system, and implement the policies and procedures of the system in their work.

4.0 ETHICS POLICY STATEMENT

Friedman & Bruya, Inc. (F&BI) believes the practice of chemistry requires training, care, attention to detail and personal integrity that must withstand significant pressure from interested parties. We believe we stand firmly for the chemist's right to practice his/her profession with the highest level of support. For this reason, fraud or the falsification of analytical data by an employee is grounds for immediate dismissal. Management shall review data and perform internal audits to ensure ethical conduct on the part of its employees.

Waste of our clients' time and money, as well as natural resources, is strongly discouraged. Environmental analyses can be very costly and their results exponentially more so. Friedman & Bruya, Inc. was formed to provide our clients with analytical information that met their chemical and analytical needs, while at the same time minimizing cost wherever possible.

Friedman & Bruya, Inc. is proud of its employees. Upon employment, a manual is issued to each employee that describes the policies of Friedman and Bruya, Inc. with regards to employee conduct, fraud, waste and abuse. We believe abuse or harassment is degrading to our employees and our clients. Such behavior is not condoned by Friedman & Bruya, Inc. This covers interactions amongst our employees, as well as those between us and our clients. Where abuse or harassment can be documented, a written warning is issued. If the action or behavior continues, dismissal may result.

All employees of Friedman & Bruya, Inc. are charged with the task of reporting any occurrence of fraud or data falsification to the highest authority within our organization. Management will continually look for fraud and data falsification through standard review practices such as those conducted during the course of data review and internal audits. Management will not attempt to create policies that conflict with our fraud policy. If any employee feels or believes that a management policy conflicts with our fraud policy or that any such policy encourages fraudulent practices on the part of employees, they are encouraged to bring these issues to the attention of their supervisor or to the highest authority within our organization.

5.0 LABORATORY ORGANIZATION

5.1 Ownership and Facility Description

F&BI is a privately owned corporation. No other business affiliations or external business entities exist. The F&BI laboratory is comprised of one building, with approximately 12,000 square feet, which is located at 3012 16 Ave. W., Seattle WA. This laboratory was built with safety, efficiency and quality control in mind. Separate rooms are designated for inorganic, organic and volatiles extractions. Fume hoods are located in each of these rooms as well as in standard storage and preparation rooms. Separate areas are also designated for sample storage, instruments/analysis, office space and records storage. Floor plans of the building can be furnished upon request.

5.2 Personnel Organization

The qualifications and responsibilities for key personnel are listed below. An organizational chart is provided in Figure 5-1.

Laboratory/Technical Director

Qualifications:
The Laboratory/Technical Director should be an individual who has a history of laboratory and personnel management. She/He should have a knowledge of all analyses performed by the laboratory and of QA/QC standards of performance. This person should have a bachelors degree in chemical, environmental, biological sciences, physical sciences or engineering, with at least 24 college semester credit hours in chemistry and with at least 2 years of relevant experience. (A masters or doctoral degree may be substituted for 1 year experience.)
Responsibilities:
The Laboratory/Technical Director reports directly to the Executive Committee.
He/She has overall responsibility for the technical operation of the laboratory. Specific responsibilities include the following:
Monitor standards of performance in quality control and quality assurance.
Monitor the validity of the analyses performed and data generated to assure reliable data.
Ensure sufficient numbers of qualified personnel are employed.
Provide educational direction to laboratory staff.
Assign workloads and arranges schedules of Project Leaders.
Evaluate overall effectiveness of the laboratory activity.
Propose new methods and modifications as needed. Institute new programs and procedures as directed by the Executive Committee.
Review all new work to ensure that appropriate facilities and resources are available.
Fill in for the QA Officer in her/his absence.

Quality Assurance Officer

Qualifications:
The Quality Assurance Officer should be an individual who has a history of establishing inter-laboratory and intra-laboratory quality assurance programs. She/He should be capable of evaluating analytical data to distinguish between sample variability, instrument variability and method errors. This person is expected to have a degree in chemistry plus several years practice as an environmental chemist evaluating analytical data for technical validity.
Responsibilities:
The Quality Assurance Officer reports to the Executive Committee and Laboratory/Technical Director. She/He has the responsibility of overseeing the inter-laboratory, intra-laboratory studies, non-conformance report reviews, and demonstration of capability program. She/He also works in a team with other qualified staff to complete all of the quality assurance tasks conducted at F&B. These specific responsibilities include the following:
Training and documentation of F&B staff with regards to QA policy and procedures including coordinated quarterly meetings.
Evaluate data for compliance with standard operating procedures and acceptance criteria.
Conduct internal audits on the entire technical operation annually.
Propose changes in the Quality Assurance Program to improve the quality, efficiency, and/or defensibility of the data generated.
Manage laboratory participation in inter-laboratory comparisons and proficiency programs.
Maintain or modify laboratory accreditation.
Notification of laboratory management and project managers, in writing, of any changes to accreditation.
Assist in training of analysts in analytical quality control procedures.
Maintaining the QA manual, DOCs, and SOPs.

Project Leader

Qualifications:
Project Leaders should be individuals who have a history of analyzing environmental samples. They should have knowledge of quality assurance and how it relates to the validity of analytical data. They should also have knowledge of the specific analytical testing requirements for the needs of our clients. They should be able to recognize problems which can arise when analyzing samples, and be able to discuss with the client proper analytical techniques for meeting the clients' goals. This person is expected to have a degree in chemistry or several years experience in the environmental chemistry field.
Responsibilities:
The Project Leaders report directly to the Quality Assurance Officer on all quality assurance matters. They report directly to the Technical/Laboratory Director on all other matters such as project status and projected work loads. Specific responsibilities include the following:
Support the quality assurance program within the project.

Determine effectiveness of the quality assurance program in the project.
Recommend to the Quality Assurance Officer changes in the quality assurance program.
Document for the client any quality control problems which could not be resolved.
Provide technical overview of laboratory activities.

Laboratory Analysts

Qualifications:
Laboratory Analysts should be individuals who have a history of analyzing environmental samples. They should have knowledge of quality assurance. They should recognize quality assurance results which are out of conformance and be able to determine and remedy possible causes. Laboratory Analysts are expected to have a degree in chemical, environmental, biological sciences, physical sciences or engineering and/or experience in the environmental chemistry field.
Responsibilities:
Specific responsibilities include the following:
Perform analytical procedures and data recording in accordance with accepted methods.
Consult with the Quality Assurance Officer to verify that the laboratory is meeting stated quality control goals.
Evaluate new analytical techniques, procedures, instrumentation and quality control methods, and provide recommendations to the Technical/Laboratory Director and Quality Assurance Officer.
Lead the training of new analysts in laboratory operations and analytical procedures.
Evaluate instrument performance and implement instrument calibration and preventive maintenance program.
Perform data processing and validation.
Initiate non-conformance report forms for out-of-control situations, instrument malfunction, calibration failure, or other non-conformances as appropriate.
Prepare and maintain laboratory quality control records.

General Personnel

Qualifications:
General personnel include all other staff, such as laboratory technicians, sample check-in technicians and office personnel. General personnel should be individuals that pay very close attention to detail and follow written and oral instructions precisely.

Responsibilities:
General personnel are responsible for following established procedures and reporting any quality control problems or questions.

Figure 5-1
Laboratory Organization

Executive Committee/Technical Director:
Responsibilities: Appointed by owner to oversee all operations and functions of the laboratory.

Laboratory Director:
Responsibilities: Reports directly to the Executive Committee.

Quality Assurance Officer:
Responsibilities: Reports directly to The Executive Committee and Laboratory/Technical Director.

Project Leaders:
Responsibilities: Report directly to the Quality Assurance Officer on QA/QC matters and to the Technical/Laboratory Director on all other matters.

Laboratory Analysts/Calculations Chemists:
Responsibilities: Report directly to the Quality Assurance Officer on QA/QC matters and to the Technical/Laboratory Director and/or Executive Committee on all other matters.

Laboratory Analyst/Extraction Manager:
Responsibilities: Reports directly to the Quality Assurance Officer on QA/QC matters and to the Technical/Laboratory Director and/or Executive Committee on all other matters.

Technicians:
Responsibilities: Report directly to the Extraction Manager.

Safety Officer/Committee:
Responsibilities: Reports directly to the Technical/Laboratory Director and/or Executive Committee.

General Personnel:
Responsibilities: Reports directly to the Executive Committee.

6.0 STANDARD OPERATING PROCEDURES

Standard operating procedures (SOPs) are maintained which accurately reflect current laboratory activities. These documents may include, for example, equipment manuals provided by the manufacturer, published analytical methods with any changes or specifications documented, or internally written documents. Hardcopies of all SOPs are organized in folders which are easily accessible to all personnel. (The exception is equipment manuals, which are kept with the corresponding equipment.) There are two general types of SOPs; method SOPs and administrative SOPs. A list of administrative SOPs, along with other quality system documents, is included in Appendix A.

Method SOPs

Method SOPs are generated for each accredited method performed by F&BI. They provide detailed, laboratory specific, procedures for analytical testing methods. Each method SOP references the published analytical procedure upon which it is based. When the referenced analytical procedure has stated QA/QC requirements, the SOP meets the stated requirements. Any additional, laboratory specific, QA/QC requirements are detailed in the method and/or administrative SOPs.

Administrative SOPs

Administrative SOPs provide detailed procedures for all activities of the quality system not included in specific analytical methods, such as sample receiving, personnel training, and creating client reports. Administrative SOPs may be separate documents, or may be included in this document.

6.1 Deviation from SOPs

When a client (or project) has specific requirements of the laboratory, a deviation from existing procedures may be necessary. Typical examples include addition of target analytes and project specific reporting limits. If a deviation is requested, the project manager is responsible for discussing the request with the manager in charge of the analysis and obtaining her/his approval to accept the project. The project manager is also responsible for documenting the request on the appropriate analysis extraction worksheets, and on the final report if necessary.

Deviations from SOPs are documented using the extraction worksheet, sequence tables, injection logs, and/or other documents such as the non-conformance report form as discussed in section 13.3. Frequent departure from policy is not encouraged. However, if frequent departure from a particular policy is noted, the technical/laboratory director will address the possible need for a change in the policy.

7.0 TRAINING

Our company is designed around the idea that our employees are our most valuable asset. We are committed to the professional development of our employees. Since we are a relatively small laboratory, many of our employees wear several hats, and cross training is critical.

7.1 Quality System, Data Integrity, and Safety Training

When hired, each employee receives a company policy manual, data integrity SOP, quality assurance manual, and any SOPs relevant to their responsibilities. She/he also receives a safety training form and an employee attestation form, including data integrity training, to fill out and sign. The office manager is responsible for providing each new employee with copies of the policy manual and quality assurance manual. Each new employee is also provided with safety and general training forms, and copies of the relevant SOPs. Each employee is responsible for completing the required training documents, and for complying with all QA/QC and data integrity requirements. Each employee is also responsible for maintaining the current quality system documents which are relevant to their position, in their individual document file.

7.2 Initial Demonstration of Capability

The first step in training for analytical procedures is to familiarize the trainee with the method. This is achieved through a combination of reading the method SOP and observing an experienced analyst performing the method. The trainee then performs the method under close supervision. Prior to independently performing an analysis, each analyst completes an initial demonstration of capability (DOC). The DOC is performed as follows:

Obtain a quality control sample from an outside source. If not available, the QC sample may be prepared by the laboratory using stock standards that are prepared independently from those used in instrument calibration.
Dilute/prepare enough of the QC sample to make 4 separate aliquots (samples) of the specified concentration. If the concentration is not otherwise specified, it should be approximately 10 times the MDL. Laboratory control samples or MDL study samples may be used to meet this requirement.
Extract and/or analyze each of the 4 samples either concurrently or over a period of days.
Use all of the results to calculate the mean recovery (accuracy) and the standard deviation (precision) for each parameter/analyte. Compare the mean and standard deviation to method acceptance criteria.
If all parameters/analytes meet the acceptance criteria, the DOC is complete and independent analysis of actual samples can begin. If one or more of the parameters/analytes fail at least one of the acceptance criteria, then locate and correct the source of the problem and repeat the entire test (above) for either all of the parameters/analytes or just the parameter(s)/analyte(s) that failed.

7.3 Continuing Demonstration of Capability

At least one of the following, once per year, is completed by each analyst to demonstrate continuing proficiency.

Acceptable performance of a blind sample
Another demonstration of capability
At least four consecutive laboratory control samples with acceptable levels of precision and accuracy (calculated as for DOC above).
Successful analysis of a blind performance sample on a similar test method using the same technology (e.g. GC/MS volatiles by methods 624 and 8260 are considered equivalent).
If none of the above can be performed, analysis of authentic samples with results statistically indistinguishable from those obtained by another trained analyst.

7.4 Continuing Quality System, Data Integrity, and Safety Training

Company wide training meetings are held at least once a quarter. At these meetings quality system, data integrity, and/or safety topics are discussed by the QA officer, technical/laboratory director, and/or safety officer/committee respectively. Employees are also encouraged to participate in relevant external training, such as seminars and instrument training courses.

7.5 Documentation of Training

Documentation of education, experience and training prior to employment at F&BI is kept on file with personnel records. The office manager is responsible for maintaining personnel records. All employees document on the Employee Attestation Form that they have read, understood and will follow the Policy Manual, QA Manual and each SOP distributed to him/her. The attendance at each quarterly training meeting is documented using the Quarterly Training Meeting form. These and other completed training documents, including DOC certificates, are filed. In addition a database summarizing DOC training is maintained. The QA officer is responsible for maintaining the DOC database. The office personnel are responsible for maintaining training files. Additional details of training documentation are found in the "Training" SOP.

8.0 MATERIAL PROCUREMENT AND CONTROL

The quality of reagents, solvents, gases, water, and laboratory vessels used in analyses should be known so that their effect upon analytical results can be defined and anticipated. Materials and equipment purchased by F&BI should meet the requirements stated below or as denoted in specific analytical procedures, and be controlled as stated.

The following general guidelines are used for purchasing and using materials and equipment. More specific requirements can be found in section 9 below, and in administrative and method SOPs.
Specify within the purchase requests the suitable grades of materials.
Verify upon receipt that materials meet requirements and that, as applicable, material certificates/records are provided and maintained in the laboratory record system.
Date all chemicals, standards and reagents with date of receipt, date opened and expiration date.
Store reagents and solvents in accordance with manufacturer's recommendations.
Verify that material storage is properly maintained, and remove materials from use when shelf life has expired.
Record the date put into service for equipment such as balances and analytical instruments.
Record preventive and corrective maintenance procedures performed on equipment.
Verify that equipment, including analytical balances, thermometers, volumetric glassware etc., is properly calibrated prior to use.
Clearly mark any equipment which has been taken out of service.

8.1 Requirements for Reagents, Solvents, and Gases

Chemical reagents, solvents, and gases are available in a variety of grades of purity, ranging from technical grade to ultrapure grades. The purity required varies with the type of analysis and project requirements. For many analyses analytical reagent (AR) grade is satisfactory. Other analyses, such as trace organic analyses, frequently require special ultrapure reagents, solvents, and gases.

General Inorganic Analyses
In general, AR grade reagents and solvents are adequate for inorganic analyses. Primary standard reagents should be used for standardizing all volumetric solutions. All prepared reagents should be checked for accuracy.

Trace Metals Analyses
All standards used for emission spectroscopy should be spectro-quality. It is recommended that other reagents and solvents also be spectro-quality. In many cases, AR grade may be satisfactory. Standards are prepared by the analyst, or purchased provided that purchased materials meet the requirements of the analytical method. Gases used for emission spectroscopy should be high purity.

Organic Chemical Analyses

AR grade is generally the minimum acceptable grade for materials used for organic analyses. Reference grade standards should be used as necessary. Pesticide-quality solvents are generally required for low-concentration work. AR grade solvents are adequate for analyzing industrial waste samples. However, the contents of each solvent lot should be checked to determine suitability for the analyses.

For sample cleanup procedures, the adsorbents most commonly used are florisil, silica gel, and alumina. These are pre-activated according to the analytical method requirements and checked for interfering constituents.

Water

Deionized water is used for dilution and preparation of reagent solutions. Deionized water prepared in the laboratory should be ASTM Type I or better. For trace level inorganic work, Type I Reagent grade is required. Organic-free water is required for organic analyses. Organic-free water may be verified by GC or GC/MS. However, when determining trace organics by solvent extraction and gas chromatography, specialty water such as HPLC grade water with sufficiently low background may need to be used.

8.2 Requirements for Laboratory Containers

Containers used in the laboratory can affect the quality of results. Material composition and volumetric tolerances are discussed below.

Material Composition of Laboratory Vessels

The glass recommended for general use is chemically resistant borosilicate glass, such as that manufactured under the trade names of Pyrex or Kimax. The use of plastic vessels, containers and other apparatus made of Teflon, polyethylene, polystyrene, and polypropylene is desirable for certain specified applications.

Volumetric Tolerances of Laboratory Vessels

All volumetric measurements are made using measuring devices with tolerances appropriate to the level of accuracy needed.

Glassware Cleaning Requirements

All glassware used for sample extraction and analysis is cleaned sufficiently to meet the sensitivity of the method. This is tested on an ongoing basis with method blank samples. The same types of glassware and glassware cleaning techniques are used for method blank samples and client samples. In general, the following glassware cleaning procedures are followed.

Beakers - wash with laboratory grade soap, triple rinse with water

Separatory funnels - remove stopcock, wash stopcock, cap and funnel with laboratory grade soap, triple rinse with water, triple rinse with extraction solvent

KD flasks - wash with laboratory grade soap, triple rinse with water, triple rinse with extraction solvent

Snyder columns - triple rinse with extraction solvent

Concentrator tubes - wash with laboratory grade soap, triple rinse with water, triple rinse with extraction solvent

Syringes - triple rinse with extraction solvent
If lower than normal reporting limits are required or if highly contaminated samples have been extracted, glassware may need additional cleaning such as acid rinsing.

9.0 MEASUREMENT TRACEABILITY AND CALIBRATION

All measuring operations and testing equipment having an effect on the accuracy or validity of analytical results are calibrated and/or verified prior to being put into service and on a continuing basis. Wherever possible, reference standards (such as Class 1 weights and traceable thermometers) and analytical reagent calibration standards are traceable to national standards of measurement. For accredited analyses, where traceability to national standards is not applicable, correlation of results is confirmed using proficiency testing and/or independent analysis.

All equipment and reference materials necessary for correct performance of analysis are under the permanent control of F&BI. A list of major analytical equipment is given in Appendix B.

9.1 Support Equipment Calibration

Support equipment includes devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, thermometers, ovens, refrigerators, freezers, water baths and volumetric dispensing devices such as autopipetes and syringes. In cases where quantitative results are dependent on their accuracy, these devices are calibrated as described below.

Calibration/Verification Prior to Use

When new support equipment is purchased, it is the responsibility of the extraction manager to verify its calibration and traceability prior to putting it into service. Each piece of equipment is numbered, or otherwise identified, and the date put in service is recorded. Any certificates provided by the manufacturer are marked with the equipment identification and kept on file. Specific procedures for calibration (including on-going calibration) of specific types of support equipment are detailed in the “Support Equipment Monitoring and Calibration" SOP. These procedures include:
reference standard(s) used for calibration
specific calibration technique employed
acceptable performance tolerances
calibration frequency
documentation procedures

On-Going Calibration

Requirements for on-going calibration are provided in the specific equipment SOPs. The requirements are based on the type of equipment, stability characteristics of the equipment, and required accuracy. Some equipment is calibrated each working day, some monthly and some less frequently. All support equipment is calibrated annually, using nationally traceable reference standards if possible, over the entire range of use. It is the responsibility of the extraction manager to complete all on-going calibrations.

Corrective Actions

If equipment does not meet the calibration requirements, it is taken out of service unless and until necessary repairs have been made. All such equipment is marked as "out of service" and, if possible, placed in a different location until repaired. Records of all repairs, including service calls, are kept with the equipment records. When a piece of equipment is repaired another initial calibration is performed prior to being put back into service. If equipment cannot be repaired, it is discarded as appropriate. It is the responsibility of the laboratory manager to mark out of service equipment, arrange for repairs, re-calibrate and document all such activities.

In addition, if equipment goes outside the direct control of the laboratory, it is the responsibility of the extraction manager to verify satisfactory function and calibration status before the equipment is returned to service.

If an item of equipment is found to be defective, the effect of the defect on previous calibrations or analyses is examined, and corrective actions are taken if necessary. It is the responsibility of the person who finds a defect to inform the QA officer, Technical Director, or Executive Committee.

9.2 Instrument Calibration

Initial instrument calibration and continuing instrument calibration verification of all analytical instruments is performed to ensure that the data are of known quality. Specific method SOPs describe detailed calibration requirements for each method. It is the responsibility of each analyst to follow and document established calibration procedures. The following sections describe the calibration requirements for all accredited analyses performed by F&BI.

Initial Calibration

The following are essential elements of initial instrument calibration:
Sufficient raw data records are retained to permit reconstruction of the calibration.
Sample results are quantitated against the initial calibration, and may not be quantitated from any continuing instrument calibration verification.
Initial calibrations are verified with a second source standard (a standard obtained from a second manufacturer or lot, if the lot can be demonstrated from the manufacturer as prepared independently from other lots), unless a different requirement is specified in the method.
Appropriate criteria for the acceptance of an initial calibration are established.
If the initial calibration results are outside of the established acceptance criteria corrective action is taken (see below).
Any reported sample results which fall outside of the calibration range are reported as having less certainty.
At least one calibration standard is at or below the method reporting limit.
The lowest calibration standard is above the method detection limit (MDL), with the following exception:
For instrument technology (such as ICP/MS) with validated techniques which use a zero point and a single point calibration standard, the following apply:
Prior to analysis of samples the linear range is established.

Zero point and single point calibration standard are analyzed with each analytical batch. Additional standards may also be analyzed.
A standard corresponding to the limit of quantitation is analyzed with each analytical batch.
The linearity is verified at a frequency established by the method and/or the manufacturer.

Continuing Instrument Calibration Verification

When the initial instrument calibration is not performed on the day of analysis, the validity of the initial calibration is verified prior to sample analysis by a continuing instrument calibration verification (CCV). The following items are essential elements of continuing instrument calibration verification:
A CCV is repeated at the beginning and end of each analytical batch. The concentrations of the calibration verification are varied within the established calibration range. If an internal standard is used, only one CCV is analyzed per batch.
Sufficient raw data records are retained to permit reconstruction of the CCV. These records explicitly connect the continuing verification data to the initial instrument calibration.
Criteria for the acceptance of a CCV are established.
If the CCV results are outside established acceptance criteria, corrective actions are performed (see below).

Corrective Actions

Specific corrective actions are included in method SOPs. Following are general corrective action guidelines:
If the initial calibration results are outside established acceptance criteria, corrective actions are performed. This may include preparation of new standard solutions or instrument maintenance. Data associated with an unacceptable initial instrument calibration should not be reported. However, if such data are reported (usually due to insufficient sample for reanalysis) then it is reported with appropriate qualifiers.
If a CCV falls outside of established acceptance criteria, then corrective actions are performed. This may include preparation of new standard solutions or instrument maintenance. If routine corrective action procedures fail to produce a second consecutive (immediate) CCV within acceptance criteria, then either acceptable performance is demonstrated after corrective action with two consecutive CCVs, or a new initial calibration is performed. If possible, samples associated with a failing CCV are reanalyzed. If reanalysis is not performed, then results are qualified. In the following two situations, results may be reported, even if reanalysis is possible.
a) If the CCV fails high, then associated sample results which are non-detect may be reported.
b) If the CCV fails low, then associated sample results which are above a level which provides sufficient data for client use (if known) may be reported.

9.3 Maintaining Traceability of Standards, Solvents, and Reagents

The following steps are taken to maintain traceability of standards:

All standards are logged into the Standards Logbook and given a Date Code which is written on each container and certificate (if included). Also recorded are description, supplier and manufacturer's Lot # (if provided). The sample check-in technician is responsible for logging in standards.
When opened, all original containers (as provided by the vendor) are labeled with the date opened and an expiration date (based on the date opened). The extraction analyst is responsible for labeling original containers when opened.
Documentation of standards prepared from purchased stocks or neat compounds is maintained in the Standards Prep Logbook. Information recorded includes the Date Code, the preparation date, the expiration date, the amount used, and the preparer's initials. The person preparing the standard is responsible for proper documentation.
Containers of prepared standards are labeled with a unique Standards Prep Logbook ID linking them to the above preparation documentation. They are also labeled with the preparation and expiration dates. The expiration date of a prepared standard may not exceed the expiration date of any of the primary standards used in its preparation. The person preparing the standard is responsible for labeling correctly.
Whenever a standard is used for sample extraction or analysis (e.g. calibration standard, surrogate, etc.) the Standards Prep Logbook ID is written in the sample extraction and analysis records. The extraction analyst is responsible for recording the Logbook ID.
Standards are not used past their expiration dates.

The following steps are taken to maintain traceability of solvents and reagents.

All solvents and reagents are logged into the Solvents and Reagents Logbook and assigned a Solvent Code which is written on each container and certificate (if included). Also recorded are description, supplier and manufacturer's Lot # (if provided). The sample check-in technician is responsible for logging in solvents and reagents.
When a solvent or reagent is used to prepare a standard, the Solvent Code is recorded in the Standards Prep Logbook. The person preparing the standard is responsible for proper documentation. Note: If a reagent solution is prepared, then that is documented in the Standards Prep Logbook as described above.
When a solvent or reagent is used for extraction or analysis, the Solvent Code is recorded in the sample extraction and analysis records. The extraction analyst is responsible for recording the Solvent Code.

9.4 Equipment Maintenance

Preventive maintenance is an important part of the F&BI quality system. A maintenance program has been outlined to provide an organized program of actions to maintain proper instrument performance which will ensure reliability of the measurements and prevent instrument failure during use. This equipment maintenance program is included as Appendix C. Additional information about routine

and special maintenance activities can be found in instrument manuals and troubleshooting guides, and in method SOPs.

Implementation

The implementation of the preventive maintenance program is dependent upon the specific instruments and equipment used. The extraction manager is responsible for performing and/or coordinating all support equipment maintenance. The GC, GC/MS, and inorganics supervisors are responsible for performing and/or coordinating all analytical instrument maintenance.

Documentation

Preventive maintenance is documented in maintenance log books. Each instrument has its own maintenance logbook which is updated each time any type of work is performed on the instrument.

10.0 SAMPLE HANDLING PROCEDURES

10.1 Sampling and Sample Acceptance Policy

The quality of analytical results is highly dependent upon the quality of the procedures used to collect, preserve and store samples. Factors that are taken into account to ensure accurate, reliable results include:
Type of container used
Sample preservation
Amount of sample taken
Sample storage (holding) time
Proper sample labeling/identification
Proper chain-of-custody (COC) documentation

Container, volume, preservation and holding time information for selected analyses for water and soil samples is included in Appendix D. F&BI provides sample containers, including preservative, to our clients when requested.

Each sample container should be labeled, using a durable label and indelible ink, to identify the following:
Client name
Client project name
Sampling date and time
Sample name/number
Sample preservation

A chain-of-custody (COC) form should be filled out for every client project. An example COC form is shown in Figure 10-1. The following information should be included on the COC:
Client (company) name and contact information
Client project name/number
Sampler's name
Sample ID (name/number)
Date and time sampled
Type of sample (e.g. soil, water, etc.)
Requested analysis

Sample Acceptance Policy
It is the client's responsibility to follow proper sampling and documentation protocol. If any samples are received with incomplete documentation, unclear sample labeling, incorrect or damaged sample containers, expired holding time, insufficient sample volume, incorrect sample preservation or any other circumstances that could affect data quality, the sample custodian and/or project manager will notify the client. If the problem can be resolved (e.g. documentation provided) normal analysis will be initiated. If not, data will be reported with qualifiers if necessary. The sample acceptance policy is posted at the sample receiving area, and copies are available upon request.

10.2 Sample Receipt Protocols

Chain-of-Custody
Evidence of sample collection, shipment, laboratory receipt, and laboratory custody until disposal is documented to maintain quality control. Documentation is accomplished through the COC records, shipping records and sample check-in and disposal records.

Sample Condition
Upon receipt, the condition of the samples is recorded. A copy of the sample condition receipt checklist is included in Figure 10-2. If a sample does not meet the sample receipt acceptance criteria the client is consulted for further instructions before proceeding. A record of the client's request is retained.

Sample Tracking
A permanent chronological sample receipt logbook is used to document receipt of all samples. The laboratory project number assigned is recorded on the sample condition checklist and on the COC, providing an unequivocal link to the laboratory and field ID's, the sample collection and analysis information provided on the COC, and the sample condition record.

Each sample received is assigned a unique laboratory ID that maintains an unequivocal link with the unique field ID assigned to each container. The laboratory ID is placed on the sample container as a durable label and is recorded on the COC. The laboratory ID is the link that associates the sample with subsequent laboratory activities such as sample preparation or calibration.

Sample Check-In
Upon sample receipt, the sample custodian completes the following steps (more details are found in the "Sample Receiving" SOP):
Sign and date the COC and attach the waybill (if applicable) to the COC.
Examine all samples and accompanying paperwork, using the Sample Condition Upon Receipt Checklist as a guide.
Verify that sample holding times have not been exceeded and are not close to their limit.
Notify the Project Leader if there are any samples that should be analyzed immediately because of holding time or client request.

The sample custodian then logs the samples into the Sample Check-In Logbook, which contains the following information:
Date received in laboratory
Name of client
Client project name/number
Type and condition of samples as received
Analyses requested
F&BI project number
Initials of person logging in samples

Container size(s) and cooler/sample temperature

The sample custodian then initiates sample analysis by:
Completing the COC documentation
Labeling each container with the unique laboratory ID
Placing the samples in proper laboratory storage
Notifying the project leader of sample arrival by placing copies of the COC and all other project documents in the project leader bin.

10.3 Sample Storage

Samples and sample extracts are stored according to the conditions specified by preservation protocols. The temperatures of sample storage refrigerators are monitored each working day and recorded in the refrigerator temperature logbook. Samples and sample extracts are stored away from all standards, reagents, food and other potentially contaminating sources, and are stored in such a manner to prevent cross contamination. In addition, samples and sample extracts are stored in a secured area in order to protect sample condition and integrity. Placing of samples in the proper storage environment is the responsibility of the sample custodian. Placing of extracts in the proper storage environment is the responsibility of the extraction analyst.

10.4 Sample Disposal

There are several possibilities for sample disposition:
The sample may be consumed during analysis.
Samples may be returned to the client for disposal.
Samples are incorporated into the laboratory waste streams.

The samples may be stored for 30 days after arrival. Proper environmental control and holding times are observed if reanalysis is anticipated. If reanalysis is not anticipated, environmental conditions for storage may not be observed.

The project leader and/or sample custodian determine disposition of samples if not specified on the COC. In general, F&BI will not maintain samples and extracts longer than one month beyond completion of analysis, unless otherwise requested.

After the appropriate storage time, the samples and extracts are disposed of by following approved disposal procedures. All materials known contain hazardous substances are disposed of as a separate waste streams. F&BI has identified 4 primary waste streams; solid waste, organic liquid waste, PCB (HazMat) waste, and acid waste. Disposal procedures are in compliance with all EPA, DOT, and Washington State waste disposal regulations. The extraction manager is responsible for overseeing sample and waste disposal.

Figure 10-1
Chain of Custody Form

SAMPLE CHAIN OF CUSTODY

Page # _____ of _____

Send Report To _____ SAMPLERS *(signature)*

Company _____ PROJECT NAME/NO. PO #

Address _____

City, State, ZIP _____ REMARKS

Phone # _____ Fax # _____

TURNAROUND TIME
- ☐ Standard (2 Weeks)
- ☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL
- ☐ Dispose after 30 days
- ☐ Return samples
- ☐ Will call with instructions

Sample ID	Lab ID	Date	Time	Sample Type	# of containers	ANALYSES REQUESTED: TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260	SVOCs by 8270	HFS				Notes

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:					
Received by:					
Relinquished by:					
Received by:					

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

Figure 10-2

SAMPLE CONDITION UPON RECEIPT CHECKLIST

PROJECT # _____ **CLIENT**_____ **INITIALS/ DATE:**_____

If custody seals are present on cooler, are they intact? ☐ NA ☐ YES ☐ NO

Cooler/Sample temperature _____ °C

Were samples received on ice/cold packs? ☐ YES ☐ NO

How did samples arrive?
☐ Over the Counter
☐ Picked up by F&BI
☐ FedEx/UPS/GSO

Number of days samples have been sitting prior to receipt at laboratory _____ days

Is there a Chain-of-Custody* (COC)? ☐ YES ☐ NO
*or other representative documents, letters, and/or shipping memos

Are the samples clearly identified? (explain "no" answer below) ☐ YES ☐ NO

Is the following information provided on the COC* ? (explain "no" answer below)

Sample ID's	☐ Yes	☐ No	# of Containers	☐ Yes	☐ No
Date Sampled	☐ Yes	☐ No	Relinquished	☐ Yes	☐ No
Time Sampled	☐ Yes	☐ No	Requested analysis	☐ Yes	☐ No

Were all sample containers received intact (i.e. not broken, leaking etc.)? (explain "no" answer below) ☐ YES ☐ NO

Were appropriate sample containers used? (explain "no" answer below) ☐ YES ☐ NO

If custody seals are present on samples, are they intact? ☐ NA ☐ YES ☐ NO

Are samples requiring no headspace, headspace free? ☐ NA ☐ YES ☐ NO

Explain "no" items from above (use the back if needed)

11.0 QUALITY CONTROL OBJECTIVES

F&BI follows a comprehensive internal quality control (QC) program to insure precision, accuracy, and reliability of data. QC objectives are established to determine if data generated is acceptable. These objectives are either specified by the method, or are statistically derived from historical laboratory data. Individual method SOPs include details of method QC requirements, which may supersede those given here.

11.1 Demonstration of Capability

Prior to using any test method, and at any time there is a significant change in instrument type or test method, a demonstration of capability (see section 7.2) is performed. In general, this does not test the performance of the method in real world samples, but in the applicable clean matrix.

11.2 Precision

Precision is a measure of the reproducibility of a result. Except as otherwise specified by an accredited method, the QC objective for precision is 20% as measured by Relative Percent Difference (RPD), as determined by duplicate analyses. It is recognized that for analytes at concentrations of less than five to ten times the method detection limit (MDL), it may be difficult to meet this objective.

Precision is usually expressed as Relative Percent Difference (RPD) based on duplicate analyses of a sample. The RPD is calculated as:

$$RPD = \frac{|X1 - X2|}{[(X1+X2)/2]} \times 100$$

where X1 and X2 are, respectively, the first and second values obtained for the analysis. Precision may be evaluated from duplicate sample, matrix spike and/or laboratory control sample analyses.

11.3 Accuracy

Accuracy is a measure of the closeness of a result to the true or expected value. It is generally determined using matrix spike and/or laboratory control sample recoveries. Control charts (see section 11.4) are generated to calculate laboratory specific accuracy objectives. For accredited analysis without enough QC data, or where the method specifies accuracy objectives, method prescribed limits are used. If the method does not specify control limits, then reasonable default limits are used. It is recognized that, for matrix spike samples, unless the sample is homogeneous and the spike concentration is greater than or approximately equal to the native concentration and greater than five to ten times the reporting limit, this objective may be difficult to meet, and therefore such samples will not be used to generate new QA/QC objectives/criteria. Alternatively, accuracy may be assessed through the analysis of appropriate standard reference materials or certified standards or samples, as available.

Accuracy is usually expressed as percent recovery (%R). The %R is calculated as:

$$\%R = ((Xs - Xa)/Ct) \times 100$$

where Xs is the observed concentration of the spiked sample, Xa is the observed concentration of the unspiked sample, and Ct is the concentration of the spike.

11.4 Uncertainty

Laboratory generated control limits (see below) for laboratory control samples represent an estimation of the uncertainty of measurement for a particular analysis.

Control Limits
Control limits are the acceptance criteria used for evaluating the accuracy and precision of results. F&BI has established control limits for precision of 0% to 30% for all accredited analyses, unless method specified limits are more stringent. Initial control limits for accuracy are taken from the method or regulatory requirements. If no method or regulatory criteria exist, control limits are assigned default values. These default values are assigned using the following guidelines.

For laboratory control samples default control limits are 70% to 130%, and default warning limits are 80% to 120%.
For matrix spike samples and surrogate compounds default control limits are 50% to 150%, and default warning limits are 65% to 135%.
Established control limits for a similar method/matrix may be used instead of default limits.

When sufficient data has been generated, the laboratory specific acceptance limits for accuracy are usually used. After a minimum of 20 samples have been analyzed for a particular matrix/method, the mean and standard deviation of the results are calculated. Warning limits are set at 2 standard deviations from the mean, and control (action) limits are set at 3 standard deviations from the mean. Control limits are generally reviewed at least monthly, or when sufficient data has been generated to warrant review, and updated annually.

Control Charts
Control charts are prepared for accredited analytical methods to document the trends in percent recoveries (accuracy) for laboratory control samples, matrix spike samples and surrogates. Results are monitored routinely by the analyst. If 10 consecutive results fall outside of warning or control limits (either all 10 above, or all 10 below), the cause is investigated and necessary corrective actions are taken.

11.5 Completeness

Completeness is determined as the percentage of the sample data for which the associated QC data are found to be acceptable. The QC goal for completeness, as determined by the percentage of valid data generated, is 100%. Precision and accuracy

determinations, if outside the QA objectives due to sample-related causes, may be regarded as qualifying, rather than invalidating, the associated data.

11.6 Representativeness

Representativeness is the degree to which the field sample represents the overall sample site or material. F&BI will make every reasonable effort to assure that the samples are adequately homogenized prior to taking aliquots for analysis, so that the reported results are representative of the sample received. However, F&BI does not represent that the samples submitted for analysis are representative of the conditions in the field. Of particular importance is that mixing may substantially lower the measured levels of volatile components. (For this reason, mixing is avoided as much as possible for samples being analyzed for those compounds.)

11.7 Comparability

Comparability is an expression of the confidence with which one data set can be compared to another. To ensure comparability, standard operating procedures as defined in the quality system are used for handling and analysis of all samples.

11.8 Method Detection Limits and Reporting Limits

Method Detection Limits

The method detection limit (MDL) is the minimum concentration that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. For each applicable test method and matrix, MDLs are determined for the compounds of interest by spiking the analyte(s) at a level approximately 5 times the expected MDL into a clean matrix and processing as a sample. A minimum of seven replicates are processed and the mean result is multiplied by the applicable students' value to obtain the MDL. MDLs are determined for each new test method (prior to sample analysis), annually, and each time there is a change in the test method that affects how the test is performed, or when a change in instrumentation occurs that affects the reliability of the analysis.

Reporting Limits

Reporting limits (RL), or practical quantitation limits (PQL), are the routinely reported lower limits of quantitation. RLs are calculated from the MDL and are typically 2 to 10 times the MDL, or equal to or greater than the concentration of the lowest calibration standard. The RLs take into account the day-to-day fluctuations in instrument reliability and other factors. These RLs are the levels to which F&BI routinely reports results. If a result below the RL is reported, typically due to client request, it is qualified as an estimated value.

12.0 ANALYSIS AND EVALUATION OF QUALITY CONTROL SAMPLES

Quality control samples are routinely analyzed with each analytical batch (see below) of field samples to demonstrate that the laboratory is operating within the QC objectives. QC samples are evaluated on an on-going basis, and QC acceptance criteria are defined and used to determine the validity of the data. Specific types of QC samples are described below. Individual method SOPs include details of method QC requirements. A summary of frequency and acceptance limit requirements for QC elements described in this and previous sections is given in Table 12-1. If method requirements are different than those given here, the method requirements will be followed.

12.1 Preparation Batch

The preparation batch is the basic unit for quality control. To ensure that QC results for accredited analyses are representative, all of the samples in a batch, both field and QC samples, are extracted, analyzed and calculated in the same way. In the absence of specific program or method requirements, the requirements for a preparation batch are as follows:

A maximum of 20 (field) samples are in a batch.
All samples in a batch are the same matrix.
QC samples (see below) processed with a batch are; 1 method blank, 1 LCS, 1 MS (if suitable), and either 1 MSD or 1 matrix duplicate (if suitable, if not, then 1 LCSD).
The same reagent lot(s) are used to process the batch.
The same analyst(s) process the entire batch.
The maximum time between the start of processing of the first and last sample in a batch is 24 hours.
QC samples are prepared and analyzed with the associated field samples. However, if field samples in the batch are reanalyzed for a reason not affecting the QC samples (e.g. dilution, surrogate recovery etc.), the QC samples do not require analysis each time a field sample from the preparation batch is analyzed.
Each batch is assigned a unique ID which links it to the associated field samples.

12.2 Method Blank Samples

Purpose
The method blank is used to assess the preparation batch for possible contamination during the preparation and processing steps. It is processed along with and under the same conditions as the associated samples.

Frequency
One method blank is analyzed with each preparation batch.

Composition
The method blank consists of a matrix that is similar to the associated samples and is free of the analytes of interest.

Evaluation Criteria and Corrective Action
The goal is to have no detectable contaminants. If contamination is detected in the method blank sample, the nature of the interference and the effect on the analysis of each sample in the batch is evaluated. The source of contamination is investigated and measures taken to minimize or eliminate the problem. Affected samples are reprocessed, or data are appropriately qualified if:
The concentration of a targeted analyte in the blank is at or above the reporting limit AND is greater than 1/10 of the amount measured in the sample.
The blank contamination otherwise affects the sample results as per the test method requirements or the individual project data quality objectives.
Results of method blank analyses are maintained with the corresponding analytical data set and reported with project results.

12.3 Laboratory Control Sample (LCS)

Purpose
The LCS is used to evaluate the performance of the total analytical system, including all preparation and analysis steps.

Frequency
One LCS is analyzed with each preparation batch. Exceptions are for analytes for which no spiking solutions are available such as total suspended solids, pH or turbidity.

Composition
The LCS is a controlled matrix, free of the analytes of interest, spiked with known and verified concentrations of analytes. Alternatively the LCS may consist of a media containing known and verified concentrations of analytes or as Certified Reference Material (CRM). All analyte concentrations are within the calibration range of the methods. The components spiked are specified in individual method SOPs.

Evaluation Criteria and Corrective Action
LCS results are calculated in percent recovery (see section 11.3). Results are compared to established acceptance criteria. A LCS that is determined to be within the criteria effectively establishes that the analytical system is in control and validates system performance for the samples in the associated batch. If a LCS result is found to be outside the criteria, this indicates that the analytical system is "out of control". Any affected samples associated with an out of control LCS are reprocessed and re-analyzed (if possible), or the results reported with appropriate data qualifying codes. LCS results are reported on the quality control data summary forms.

12.4 Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Samples

Purpose
Matrix specific QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from

these controls is sample/matrix specific and is not normally used to determine the validity of the entire batch.

Frequency
One MS sample is analyzed with each preparation batch, if a sufficient amount of sample is provided.

Composition
MS/MSD analysis is performed on aliquots of actual samples. The composition is not usually known. Samples are spiked with known and verified concentrations of analytes. All analyte spiking concentrations are within the calibration range of the methods. The components spiked are specified in individual method SOPs.

Evaluation and Corrective Action
The results from MS/MSD analyses are primarily designed to assess the precision and accuracy of analytical results in a given matrix and are expressed as percent recovery (%R) and relative percent difference (RPD) (see section 11). Results are compared to the established acceptance criteria. If results are outside the criteria, the cause is investigated and corrective actions are taken if necessary, or the MS/MSD data are reported with appropriate qualifiers. MS/MSD results are reported on the quality control data summary forms.

12.5 Matrix Duplicate Samples

Purpose
Matrix duplicates are replicate aliquots of the same sample taken through the entire analytical procedure. The results from this analysis indicate the precision of the results for the specific sample using the selected method.

Frequency
One duplicate sample is analyzed with each preparation batch. If sufficient sample is provided, this will be either a MSD or a matrix duplicate. If not, a laboratory control sample duplicate (LCSD) is analyzed.

Composition
Matrix duplicates are performed on replicate aliquots of actual samples. The composition is not usually known.

Evaluation and Corrective Action
The results from matrix duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as RPD. Results are compared to established acceptance criteria. If results are outside the criteria, the cause is investigated and corrective actions are taken if necessary, or the matrix duplicate data are reported with appropriate qualifiers. Duplicate analysis results are summarized on the quality control data summary forms.

12.6 Surrogate Standard Analyses

Purpose
Surrogates are used most often in organic chromatography test methods and are chosen to reflect the chemistries of the targeted components of the method. Added prior to sample preparation/extraction, they provide a measure of recovery for every sample matrix.

Frequency
Except where the matrix precludes its use or when not available, surrogate compounds are added to all samples, standards, and blanks for all appropriate test methods.

Composition
Surrogate compounds are chosen to represent the various chemistries of the target analytes in the method. Individual method SOPs specify the surrogate compound(s) used.

Evaluation Criteria and Corrective Action
Surrogate results are calculated in percent recovery (see section 11.3). Results are compared to established acceptance criteria. Surrogates outside the acceptance criteria are evaluated for the effect indicated for the individual sample results. Corrective actions are taken if necessary, or affected results are reported with appropriate qualifiers. Surrogate results are reported with associated sample results.

12.7 Proficiency Testing (PT) Samples

Purpose
PT samples are blind samples purchased from a certified provider. They are used to evaluate the performance of the total analytical system, including all preparation and analysis steps. They are processed under the same conditions and in the same manner as client samples.

Frequency
F&BI participates in certified proficiency testing programs at a frequency required by accrediting agencies. PT samples are analyzed twice a year for each analyte, method and matrix, when available, for which F&BI is accredited.

Composition
PT samples are either prepared in a clean matrix by the provider, or are prepared in a clean matrix at the laboratory according to the provider's instructions. The specific analyte spiking levels are unknown to the laboratory.

Evaluation Criteria and Corrective Action
PT results are evaluated by the provider and reported directly to the regulatory agency as well as to the laboratory. Any PT results which are reported as not acceptable are reviewed and corrective actions implemented as needed. Reports received from PT sample providers and corrective action documentation are kept on file.

F&BI does not send any PT sample, or portion of a PT sample, to another laboratory for any analysis. Also, F&BI does not knowingly receive any PT sample, or portion of a

PT sample, from another laboratory, or communicate with another laboratory concerning PT samples.

Table 12-1
QC Frequency and Acceptance Limits Summary
(For Accredited Analysis, Method requirements may supersede these.)

Quality Control Element	Frequency	Acceptance Limits
Method Detection Limit (MDL)	Initially, quarterly, and with substantial change to method or instrument.	40CFR Part 136, Appendix B calculations.
Demonstration of Capability (DOC)	Annually for each analyst.	Average of replicates within method established control limits of true value, and not >20% RSD for each analyte.
Initial Calibration	Initially and if ICV or CCV fail.	Per method specific requirements.
Initial Calibration Verification (ICV/Second Source)	Following every initial calibration, prior to sample analysis.	Per method specific requirements.
Continuing Calibration Verification (CCV)	When an initial calibration has not been performed: i) At the beginning and end of analysis of 20 samples (max). Concentrations vary. ii) At the beginning of 12 hour shift if internal calibration used.	Per method specific requirements.
Method Blank (MB)	1 per preparation batch of 20 (or fewer) samples.	Concentration for each analyte below RL or method specific.
Laboratory Control Sample (LCS)	1 per preparation batch of 20 (or fewer) samples.	Per laboratory established control limits (or default limits.)
Matrix Spike (MS)	1 per preparation batch of 20 (or fewer) samples.	Per laboratory established control limits (or default limits.) Does not control batch.
Duplicate Analysis (Sample Duplicate (Dup), MSD or LCSD)	1 per preparation batch of 20 (or fewer) samples. i) Dup or MSD if sufficient sample. ii) LCSD if not.	Percent recovery per laboratory established control limits (or default limits.) RPD 0% to 30%. Dup and MSD do not control batch.
Surrogate	Each field and QC sample for accredited organic analyses.	Per laboratory established control limits (or default limits.)
Proficiency Testing (PT)	Twice per year per accredited	Per PT provider.

Samples	method/analyte/matrix.	

13.0 CORRECTIVE ACTIONS

Corrective actions may be implemented as a result of failure of quality control results to meet established criteria, failure of reported results to meet client's needs, or deviation from established policies and procedures in the SOPs and this QA manual. These are documented with the non-conformance report form which includes an investigation of the root cause, identification of possible corrective actions, and a description of the corrective action taken.

The QA officer reviews each non-conformance report form. This documentation is kept on file with each affected client report, and a copy is kept by the QA officer. During the annual internal audit (see section 16), the QA officer or other qualified F&B staff reviews all non-conformance report forms to look for chronic systematic problems that need more in-depth investigation and alternative corrective action consideration.

In addition, corrective actions may be implemented as a result of internal or external audit findings, or management review (see section 16). These are documented with the internal audit corrective action form, external audit correspondence, and the management review corrective action form respectively.

If corrective action procedures do not resolve or identify the problem, personnel will notify management for direction to take. The findings and actions taken are documented and sent to the QA officer or Technical Director for follow-up during an internal audit.

13.1 QC Analysis Failure

If any quality control results fail to meet established criteria, corrective action procedures are immediately implemented if possible. Corrective actions are identified by the individual responsible for a particular analytical method or instrument. In addition, the analyst performing data calculation or review may initiate corrective actions if needed. Corrective actions may include a review of calculations, a check of instrument maintenance, a review of analytical techniques, and reanalysis of affected samples. Table 13-1 has a general summary of QC analyses and corrective actions. Individual method SOPs detail method specific corrective actions. Corrective actions are documented by the analyst in the analysis records.

If, following corrective actions, quality control results still fail, then affected results are reported with appropriate qualifying flags and the analyst may use a non-conformance report form to further document the causes of the qualified data. In some cases it may not be possible to follow standard QC procedures and/or corrective actions. For example, if insufficient sample is provided, duplicate sample analysis, matrix spike analysis and/or sample re-extraction may not be possible. In these cases, all possible QC procedures are followed, reported data are qualified if needed, and the analyst uses the extraction worksheet, sequence tables, injection logs, and/or non-conformance report form to document.

If the quality control failure may require that analysis is halted for a particular method and/or instrument, it is the responsibility of the analyst to notify his/her supervisor. The supervisor then determines the required action and notifies the laboratory/technical director if analysis should be halted. The analysis can then be resumed only after approval from the laboratory/technical director.

13.2 Client Complaints

Any client complaints are resolved promptly. The project manager has primary responsibility for handing client complaints. Complaints which are not able to be resolved by the project manager may be referred to the laboratory/technical director or executive committee. Complaints are documented by the project manager using the non-conformance report form, client communication form, project notes macro, or a printed record of an e-mail correspondence.

13.3 Deviation from SOPs or QA Manual

Deviations from established policies and procedures as written in laboratory SOPs and this QA manual are documented using the extraction worksheet, sequence tables, injection logs, and/or other documents such as the non-conformance report form. A deviation may occur due to a specific client request, or due to laboratory circumstances.

13.4 Audit Findings

Corrective actions needed as a result of audit findings (internal or external) are initiated by the quality assurance manager or the laboratory/technical director. Audit related corrective actions may include providing additional staff training, updating SOPs or establishing new procedures. Internal audit corrective action documentation is kept on file with internal audit findings. External audit corrective actions are documented through correspondence with the auditor(s).

13.5 Record-Keeping Errors

Entries in records are not obliterated by methods such as erasures, overwritten files or markings. Corrections to record-keeping errors are made by one line marked through the error. The individual making the correction initials and dates the correction, and writes a brief explanation as needed. These criteria are also followed for electronically maintained records as applicable.

13.6 Corrective Actions Which Affect Reported Results

If audits or further data review indicate a substantial error in any data which has already been issued in a final report, the client is notified within 30 days and an amended report is issued if necessary.

Table 13-1
QC Corrective Actions
(For Accredited Analysis, Method requirements may supersede these.)

Quality Control Element	Corrective Action(s)	Documentation
Method Detection Limit (MDL)	Determine source of problem, correct, reanalyze (re-extract if necessary).	Instrument raw data.
Demonstration of Capability (DOC)	Determine source of problem, correct, reanalyze (re-extract if necessary).	Instrument raw data. DOC Certificate
Initial Calibration	Determine source of problem and recalibrate. Reanalyze any affected samples.	Instrument raw data. Flag sample results if not corrected. Non-Conformance Form if not corrected.
Initial Calibration Verification (ICV/Second Source)	Re-inject ICV. If ICV fails a second time, a new initial calibration is required. Reanalyze any affected samples.	Instrument raw data. Flag sample results if not corrected. Non-Conformance Form if not corrected.
Continuing Calibration Verification (CCV)	Determine source of problem and re-inject CCV. If second CCV fails, either correct problem and pass two consecutive CCVs, or a new initial calibration is required. Reanalyze any affected samples unless: i) CCV is high and sample is ND. ii) CCV is low and sample result is above regulatory/action limit.	Instrument raw data. Flag sample results if not corrected. Non-Conformance Form if not corrected.
Method Blank (MB)	Reduce background contamination. Re-extract and reanalyze MB and all affected samples in batch. Sample result can be reported if MB is <1/10 of sample result, or if sample is ND.	Instrument raw data. Flag MB and sample results if not corrected. Non-Conformance Form if not corrected.
Laboratory Control Sample (LCS/LCSD)	Determine source of problem. Correct and: i) If instrument related, reanalyze LCS and all affected samples in batch. ii) If spike related, re-extract and reanalyze LCS. iii) If other, re-extract and reanalyze LCS and all affected samples in batch.	Instrument raw data. Flag LCS and sample results if not corrected. Non-Conformance Form if not corrected.

Note: Verify calculations prior to other corrective actions.

Table 13-1
QC Corrective Actions (continued)
(For Accredited Analysis, Method requirements may supersede these.)

Quality Control Element	Corrective Action(s)	Documentation
Matrix Spike (MS)	Determine source of problem. i) If instrument related, reanalyze MS and all affected samples in batch. ii) If spike related, re-extract and reanalyze MS. iii) If LCS passes, flag failing MS result as matrix effect.	Instrument raw data. Flag MS result if not corrected. Non-Conformance Form if not corrected.
Duplicate Analysis (Sample Duplicate (Dup), or MSD)	Determine source of problem. i) If instrument related, reanalyze duplicate and all affected samples in batch. ii) If other, re-extract and reanalyze sample and duplicate (or MS and MSD). iii) If LCS passes, flag failing result as matrix effect.	Instrument raw data. Flag duplicate result if not corrected. Non-Conformance Form if not corrected.
Surrogate	Determine source of problem. i) If instrument related, reanalyze sample. ii) If spike related, re-extract and reanalyze sample. iii) If matrix related, flag failing result as matrix effect.	Instrument raw data. Flag surrogate result if not corrected. Non-Conformance Form if not corrected.
Proficiency Testing (PT) Samples	Determine and correct source of problem. Pass minimum of 2 of last 3 for each accredited method/analyte/matrix.	PT provider report. Corrective action letters to regulatory agency.

Note: Verify calculations prior to other corrective actions.

14.0 DATA PROCESSING, VALIDATION, AND REPORTING

All analytical data reported by F&BI to a client in a final report is calculated, reviewed and validated, following established quality system procedures. Individual method SOPs describe specific calculation procedures. The following describes our general data reduction, validation and reporting procedures.

14.1 Data Processing and Review

Analytical results are generated from raw data by the analyst, using procedures specific to the analytical methods, and described in the appropriate method SOP. Results for most analyses are generated by computer. However, analysts usually enter data, such as sample volume/weight, to complete the calculations. Summary pages containing these entries are printed for review. Data generated is electronically transferred into the proper electronic form(s) for reporting. These forms are also printed for review.

For analyses which do not have computer generated data, results are hand entered into the computer for reporting. These results are printed and a 100% review of calculations and data entry is completed. If a particular result, which would normally be computer generated, is manually calculated (usually due to a manual integration) then the entire calculation is documented clearly so that the review analyst can perform a complete review.

Manual Integrations

Integration settings are adjusted to minimize the need for manual integrations. However, a manual integration is necessary if the automatic integration of the peak or integration area (for TPH analyses) is clearly affected (e.g. does not extend from baseline to baseline, peak is split, integration is inconsistent between full strength and diluted peak).

If manual integration is performed, this is clearly documented. The raw data affected by the re-integration is printed and included in the instrument data package along with the original integration, and any manual calculations which are done as a result, are documented. The analyst records his/her initials and the date the manual integrations were made. In addition, all manual integrations are reviewed carefully to check for bias.

Quality Control Results

The analyst also calculates and evaluates all quality control results. Analytical data for quality control samples (e.g. method blank, LCS, MS) are calculated and reviewed in the same manner as for all other samples. Results are evaluated using established acceptance criteria, and corrective actions are taken prior to releasing, as final, any associated sample results. After all calculations and QC evaluations are complete, the analyst signs the worksheet(s) and gives it to the calculation review analyst.

Calculation Review

An analyst, independent from the person performing the analysis, is responsible for a 100% review of all raw data, calculations, transcriptions (if needed) and results. Each worksheet reviewed is initialed. Corrections are reviewed by the calculations analyst, and any disagreements are resolved by the QA officer or Technical Director. Upon completion of review, worksheets are given to the project manager to generate a final report.

14.2 Analytical Data Reports

Analytical data and quality control data are summarized in standard report formats, either designed by F&BI or supplied by the client. The project manager combines the electronic files of reviewed analytical results to generate a final report. Prior to release of the report to the client, the project manager reviews and approves the entire report for completeness, and to ensure that any client-specified objectives were successfully achieved. The project manager then authorizes and electronically releases the final report file to office personnel to generate a hardcopy report. Specific procedures for generating a final analytical report are provided in the "Creating Reports" SOP. The following information is included in each final analytical data report issued by F&BI.
The F&BI name, address and phone number, and project manager's name and electronic signature.
The client's project number/name, the F&BI project number, and date of issue (all on each page).
The sample identification provided by the client and the sample identification number assigned by F&BI
Chemical parameters analyzed, reported values, and units of measurement
Reporting limit of the analytical procedure
The dates the samples were received and analyzed
A summary of quality control sample results
Footnotes referenced to specific data if required to explain/qualify reported values

Explanatory text or the cover letter may also include:
Person(s) receiving and transmitting the data
Documentation of samples which did not meet acceptance criteria when received
Brief discussion of samples analyzed and the analytical program
Discussion of any apparent data anomalies
Reference to specific accreditation requirements

<u>Reports for Additional Results</u>
If additional analysis is requested after a final report for a specific laboratory project has been issued, then those additional results are issued in a separate report. A statement that these are additional results for the project is included in the cover letter.

<u>Reports Including Subcontracted Analysis</u>
If any analysis is subcontracted to another laboratory, a statement is included in the cover letter and/or case narrative indicating the subcontracting laboratory and the analysis they performed. The original copy of the subcontracting laboratory's report is

provided to the client and a copy is kept with the F&BI project file. No subcontracted work is ever reported as being F&BI data.

Report Review

After the hardcopy data report is prepared, the report is subject to a complete review by another reviewer. Entries such as dates, sample IDs, names and addresses are reviewed. The reviewer completes a report review checklist and attaches it to the report. If any errors are found, they are noted and the report is given back to the project leader to correct.

The final draft is reviewed by the executive committee or its designee to assure that all of the steps listed to this point have been followed. He/She then initials the draft which is filed. After approval, a final report bearing the appropriate signatures is issued to the client.

Amending Issued Final Reports

After issuance of a final report, the laboratory report remains unchanged. If a report which has already been issued as final to the client is amended, the amended report is issued separately. A cover letter is included, which states that amended results are being provided. If needed, further explanation of the amendment is included in the cover letter. All amended reports receive final approval before being released to the client.

15.0 DOCUMENT CONTROL AND RECORDS MANAGEMENT

15.1 Document Control

Internally generated documents which are used to define and implement the quality system are controlled. This includes the Quality Assurance Manual, all SOPs and laboratory logbooks. Documents are controlled in two ways. Each document clearly indicates the effective date of the document, the revision number, and the signature(s) of the approving authority (revision number and signature may not be applicable for logbooks). In addition, a record is kept of who received a signed copy of each document.

Preparation of Controlled Documents

Quality system documents are written by the personnel most familiar with the procedures described. The author of the document is responsible for including the correct revision number and date. The documents are reviewed and released by the QA officer, laboratory/technical director and/or executive committee representative as applicable. They are implemented on the revision date indicated on the document. More specific procedures for writing and organizing quality system documents are described in the "Quality System Document Organization" SOP.

Office personnel are responsible for controlling logbooks. Laboratory logbooks are sequentially assigned a number, which is clearly written on the logbook. The name/use and starting date of the logbook are also written on the logbook and are recorded in the Master Log of Laboratory Logbooks. Completed logbooks are filed with office records, or with the associated instrument, if applicable.

Revision of Controlled Documents

Currently existing quality system documents are reviewed annually during the internal laboratory audit (see section 16). Documents may be revised due to changes initiated by an internal or external audit; or due to changes such as new instrumentation, updated instrument parameters, updated concentrations used for chemical standards etc. A new quality system document is generated if a new quality system procedure is implemented.

To ensure that the beginning and ending effective dates for a document are clearly documented, revision numbers are always whole numbers (starting with revision 1) which are increased by one whole number for each document revision. Therefore the beginning date of a particular revision is the ending date for the immediately previous revision.

Documentation of Controlled Documents

Office personnel are responsible for keeping a record of who received each signed controlled document. The Controlled Document Record includes the document name, a sequentially assigned number which is written on the document before releasing, the person (or company) the document was released to, and the date released. Unsigned copies of documents are not considered controlled.

15.2 Records Management

The purpose of the Records Management system is to standardize the organization, storage and retrieval of all data and documents pertinent to quality and the analytical process. Also, in many cases, F&BI project files must be legally defensible, that is, admissible by the courts and believed as fact. To fulfill these documentation requirements, F&BI maintains a Records Management System which meets the following criteria:

Data and documents are indexed and easily retrievable.
Files are secure.
A formal document inventory can be produced if required by the contract/project.
Laboratory operation/QC documents are cross referenced to applicable projects.
The system is documented in the Quality Assurance Manual and Standard Operating Procedures.
Specific regulatory or contractual requirements can be accommodated.

Analysis Records

Data generated using instruments driven by computers is stored on computer disks coded by the instrument number and date the samples were analyzed. Hard copies of all of the electronic data are also kept. For each instrument, a list of all samples analyzed for each date is kept for easy sample searching. For instruments not controlled by a computer, data are recorded in individual instrument logbooks.

Worksheets are documents filled out by extraction analysts as a sample is processed. These sheets contain measurements such as the weight of the sub-sample, identification and volume of solvent used for any extraction, and documentation of any dilutions or concentrations made. These worksheets are kept with our file copy of any report that is sent to a client.

Laboratory Files

Laboratory records/documents are of two types:
1) Project/Client Files - Documents which are specific to a project/client. All records pertaining to a specific project contain a reference to the laboratory project number which is assigned during sample check-in.
2) Laboratory Files - Documents which pertain to the overall functioning of the laboratory

Project/Client files contain the following:
Chain-of-Custody documents for the project
Extraction worksheets for the project
Electronic file of data generated by Analyst for each sample delivery group and analysis
Electronic file of compiled data for the results of analyses for each sample delivery group generated by Project Manager
Non-conformance report forms for the project
Contract files pertinent to a client
Communication records between project management and the client

Final reports submitted to the client

Laboratory files contain the following:
Sample Check-in Logbook
Raw instrument data, including calibration data
Instrument maintenance records
Internal and external audit records
Training records
QA Manual and SOPs
Any other QA/QC documents pertaining to the overall functioning of the laboratory
General office/business records

15.3 Archived Records

All files are stored at F&BI, in a safe and secure area, for a minimum of 5 years. Access to archived information is documented with an access log. After 5 years, records are purged only with approval from the executive committee representative.

15.4 Change of Ownership

If there is a change of ownership, records will be retained, and details of record availability will be specified in the transaction.

16.0 QUALITY SYSTEM AUDITS

Quality audits are an essential part of F&BI's quality system program. Two types of audits are used: system audits which qualitatively evaluate the operational details of the quality system program, and performance audits which quantitatively evaluate the outputs of the various measurement systems.

16.1 System Audits

Internal Audits

The QA officer arranges for annual internal audits to verify that laboratory operations continue to comply with the requirements of the quality system. These audits are carried out by trained and qualified personnel who are, wherever possible, independent of the activity to be audited. An internal audit of all or part of the system may also be performed at any time due to any circumstance which raises concern regarding compliance with established policies or procedures, or with the data quality.

Target dates for completion of any corrective action investigations resulting from an internal audit are set within a reasonable time frame so that, if necessary, laboratory practice can be changed and/or clients can be contacted. Where the audit findings indicate a substantial error in calibrations or test results, immediate corrective action is taken and any client whose work was involved is notified within 30 days in writing.

Audit findings and any corrective actions that arise from them are documented using the Internal Audit forms, which are included in Appendix E.

External Audits

F&BI is audited on a regular basis by state and independent auditors, as required for accreditation and by client contracts. External audits are documented through correspondence with the auditors.

Managerial Review

The laboratory/technical director conducts an annual review of the quality system and testing and calibration activities to ensure their continuing suitability and effectiveness, and to introduce any necessary changes or improvements in the quality system and laboratory operations.

The review takes account of reports from managerial and supervisory personnel, the outcome of recent internal and external audits, the results of interlaboratory comparisons or proficiency tests, any changes in the volume and type of work undertaken, feedback from clients, corrective actions, and other relevant factors. In addition, pro-active suggestions for preventive actions are included. These include either technical or quality system improvements which will reduce the likelihood of potential non-conformances.

Review findings and any corrective actions that arise from them are documented using the Managerial Review forms, which are included in Appendix E.

16.2 Performance Audits

In addition to periodic system audits, the quality of results is ensured through ongoing checks which monitor the quality of the laboratory's analytical activities. Examples of such checks are:
Internal quality control procedures, as described in section 12 above
Participation in proficiency testing programs, as described in section 12 above
Use of second source standards and/or certified reference materials
Replicate analysis using the same or different test methods
Re-testing of retained samples
Correlation of results for different but related analysis of a sample
Review of historical data from the same sample

17.0 CLIENT COMMUNICATION

17.1 Client Confidentiality

Strict client confidentiality is maintained at all times. No records or results are discussed with, or provided to, anyone other than the client unless the client has given specific permission. Clients are notified by the project manager or office personnel whenever any other party requests information about their records.

In addition, when clients require transmission of test results by facsimile, email or other electronic or electromagnetic means, care is taken to ensure that client confidentiality is maintained. To avoid accidental transmission to a different party, commonly used email addresses are included in an email address book, and commonly used fax numbers are pre-programmed. Also, in case of accidental transmission to the wrong party, email messages and facsimile cover sheets contain a message which states that the information is privileged, confidential, and intended only for the addressee named. Office personnel are responsible for maintaining email addresses and pre-programmed fax numbers.

17.2 Review of Requests, Tenders, and Contracts

Before agreeing to a written or oral contract to provide a client with environmental testing services, a review is conducted to ensure that F&BI has the capability and resources necessary to meet the client's requirements. For routine and other simple tasks, the project leader can provide an oral agreement. For more complex tasks, the laboratory/technical director conducts a review. This may include items such as review of previous proficiency testing results, and running trial testing to determine detection limits or other essential quality control requirements. The laboratory's current accreditation status, and any subcontracted work are also reviewed. The client is informed if, at any time before and during the agreement, F&BI is unable to fulfill the requirements of the contract. Records of written contracts, and other communication regarding the contract, are documented in the Client Report Template, and/or kept in the project/client files.

17.3 Specific Project Communication

After samples have been received, the F&BI project manager communicates with the client, when necessary, regarding sample receipt conditions, specific analysis needs, laboratory capability, and integrity of reported results. Communication is documented in the Project Notes macro, and/or with the Client Communication Record form, which is kept in the project/client files. In addition, any fax or email communication is also kept in the project/client files.

18.0 SUBCONTRACTING ANALYTICAL SAMPLES

It is the policy of F&BI not to subcontract work which we are normally able to perform. For requested analyses which we do not normally perform, the project manager informs the client of the need to subcontract. Work may also be subcontracted if we are temporarily unable to perform one of our normal analyses due to instrument malfunction, or if the client requires certification which we do not have. In these cases the same procedures are followed.

In those cases where we subcontract work, the results reported by the outside laboratory appear under the letterhead of the laboratory reporting the data. Data generated by another laboratory is never reported under our company letterhead. The original report from the contracted laboratory is provided to the client, and a copy is kept with the F&BI project file.

END OF DOCUMENT

APPENDIX A

LIST OF ADMINISTRATIVE SOPS AND QUALITY SYSTEM DOCUMENTS

LIST OF ADMINISTRATIVE SOPS AND QUALITY SYSTEM DOCUMENTS

ADMINISTRATIVE STANDARD OPERATING PROCEDURES	
Title	**Location**
Creating Reports	sops\admin\Reports
Data Integrity	Sops\admin\Data Integrity
Project Manager Procedure (includes Client Communication Record form)	sops\admin\Project Manager
Qualifiers	Sops\admin\Qualifier
Quality System Document Organization	sops\admin\Document Organization
Sample, Extract, and Waste Disposal	sops\admin\Disposal
Sample Receiving	sops\admin\Sample Receiving
Support Equipment Monitoring and Calibration	sops\admin\Support Equipment
Training Records (includes training forms)	sops\admin\Training
ADDITIONAL QUALITY SYSTEM DOCUMENTS	
Archive Access Log	forms\office\archive
Controlled Document Record	sops\Controlled Document Record
DOC Training Summary Database	fbi\nelap\doc_sum
F&BI Certifications/Accreditations	office records
Final Report Checklist	forms\chklist
Internal Audit/Managerial Review Forms	QAM Appendix E
Laboratory Organization/Personnel Qualifications	fbi\nelap\Lab Organization Chart – Personnel Qualifications
Master Log of Laboratory Logbooks	forms\logbooks\ Master Log
Non-Conformance Report Form	forms\nonconformance
Policy and Health & Safety Manual	sops\Policy and Health & Safety Manual
Quality Assurance Manual	sops\QAM
Sample Condition Upon Receipt Checklist Form	forms\checkin\ SampleCondition
Signature List	office records

APPENDIX B

MAJOR ANALYTICAL EQUIPMENT

MAJOR ANALYTICAL EQUIPMENT

Make/Model	Type	Identifier	Software
Agilent 5890	GC/FID	GC 1	ChemStation
Agilent 5890 with Varian Archon and OI 4560	GC/FID/PID Autosampler Purge & Trap	GC 2	 ChemStation
Agilent 5890 with Varian Archon and OI 4560	GC/FID/PID Autosampler Purge & Trap	GC 3	 ChemStation
Agilent 5890	GC/FID	GC 4	ChemStation
Agilent 5890	GC/TCD	GC 5	ChemStation
Agilent 5890	GC/FID	GC 6	ChemStation
Agilent 6890	GC/ECD/ECD	GC 7	EnviroQuant
Agilent 5890 with Tekmar 7000	GC/FID Headspace Autosampler	GC 8	ChemStation
Agilent 6890	GC/ECD/ECD	GC 9	EnviroQuant
Agilent 6890 with Agilent 5973	GC MSD	GC/MS 3	 EnviroQuant
Agilent 6890N with Agilent 5973N and OI 7361 and OI 4660	GC MSD Autosampler Purge & Trap	GC/MS 4	 EnviroQuant
Agilent 6890 with Agilent 5973	GC MSD	GC/MS 6	 EnviroQuant
Agilent 7890A with Agilent 5975C Entech Model #7200 CTS and Entech Model #7016D and Entech Model #3100D and Entech Model #31-350ER and Entech Model #39-FP-01 and Entech DDS Model #PG7-50.00-PSIA	GC MSD Preconcentrator Autosampler/ Vacuum Cleaning System Oven/Vacuum Flow Professor Digital Dilution System (DDS)	GC/MS 7	 EnviroQuant Maveric Entech Entech Entech 3100D Entech Flow Professor

MAJOR ANALYTICAL EQUIPMENT
(Continued)

Make/Model	Type	Identifier	Software
Agilent 6890N with Agilent 7975C Entech Model #7200 CTS and Entech Model #7016D and Entech Model #3100D and Entech Model #31-350ER and Entech Model #39-FP-01 and Entech DDS Model #PG7-50.00-PSIA	GC MSD Preconcentrator Autosampler/ Vacuum Cleaning System Oven/Vacuum Flow Professor Digital Dilution System (DDS)	GC/MS 8	 EnviroQuant Maveric Entech Entech Entech 3100D Entech 3100D Entech Flow Professor
Agilent 7890 with Agilent 5975C	GC MSD	GC/MS 9	 EnviroQuant
Agilent 7890B with Agilent 5977A and Markes Model # TD- 100	GC MSD Autosampler/ Concentrator	GC/MS 10	EnviroQuant Maveric
Agilent 7890B with Agilent 5977B and OI 4100 and OI 4760	GC MSD Autosampler Purge & Trap	GC/MS 11	 EnviroQuant
Agilent 7890B with Agilent 5977B	GC MSD	GC/MS 12	EnviroQuant
Agilent 7890B with Agilent 5977B and OI 4100 and OI 4760	GC MSD Autosampler Purge & Trap	GC/MS 13	 EnviroQuant
Agilent 8890	GC	GC10, GC13, GC14	EnviroQuant
Agilent 8890 with OI 4100	GC Autosampler	GC11	

and OI 4760	Purge & Trap		EnviroQuant
PerkinElmer NexION 300D	ICP/MS	ICP/MS	PerkinElmer Syngistix
PerkinElmer S10 Autosampler	ICP/MS Autosampler	ICP/MS	PerkinElmer S10 Utility
PerkinElmer SC4DX Autosampler	ICP/MS Autosampler	ICP/MS	ESI SC
Tekran 2600	CVAFS	CVAFS	Tekran
Hach TL2300	Turbidimeter	Turbidimeter	N/A
Mettle-Toledo Seven Compact	pH Meter	pH Meter	N/A
Rae Systems, Model# PGM-30 (2)	Hand Held PID	Hand Held PID	N/A
Buck Scientific, Model# HC-404 (1)	IR analyzer	IR analyzer	N/A
Beckman Model TJ-6 (2)	Centrifuge	Centrifuge	N/A
Vortex Genie 2, Model G-560 (3)	Vortex Mixer	Vortex Mixer	N/A
Buchi Syncore	Concentrator	Concentrator No.1	N/A
Buchi Syncore	Concentrator	Concentrator No.2	N/A
Buchi Syncore	Concentrator	Concentrator No.3	N/A
Thermo Scientific Precision Water Bath, Model #2849	Water Bath	Water Bath	N/A
Organomation Associates, Inc. Model #120 (1)	Water Bath	Water Bath	N/A
Sonics VibraCell	Sonicator	Sonicator No.1	N/A

MAJOR ANALYTICAL EQUIPMENT
(Continued)

Make/Model	Type	Identifier	Software
Branson Ultrasonics Corporation, Sonifier Model# 450	Sonicator	Sonicator No.2	N/A
Branson Ultrasonics Corporation, Sonifier Model# 450	Sonicator	Sonicator No.3	N/A
Sonics VibraCell	Sonicator	Sonicator No.4	N/A
Marathon Electric, Model 0523-N191Q-G588 (1)	Sonicator	Sonicator	N/A
Sonics and Material, Inc. Model# VC600 (1)	Sonicator	Sonicator	N/A
Brenson Ultrasonic Bath, Model #M3800	Cavitator	Cavitator No.1	N/A
Brenson Ultrasonic Bath, Model #M3800	Cavitator	Cavitator No.2	N/A
Torbal, Fulcrum Inc., Model #AGCN 100	Analytical Balance	Analytical Balance	N/A
AND Model #HA-120M (1) (white)	Analytical Balance	Analytical Balance	N/A
AND Model #EK-1200A (1)	Analytical Balance	Analytical Balance	N/A
Mettler Toledo, Model #ML1502E/03 (2)	Analytical Balance	Analytical Balance	N/A
Denver Instrument Model #XP-1500 (1)	Analytical Balance	Analytical Balance	N/A
AEAdams CoreBalance	Analytical Balance	Analytical Balance	N/A
US Electrical Motors, Model #E438 (1)	Tumbler	Tumbler	N/A
Emerson Electric Co. (2)	Vacuum Pump	Vacuum Pump	N/A
ThermoScientific Isotemp 100L Oven FA 120V	Oven	Oven	N/A
Stabil-Therm Gravity Oven Model# OV-484A (1)	Oven	Oven	N/A
Thermolyne Corporation, Model # F6000 (1)	Muffle Furnace	Muffle Furnace	N/A

MAJOR ANALYTICAL EQUIPMENT
(Continued)

Make/Model	Type	Identifier	Software
Barnstead/Thermolyne Model#1415M (1)	Muffle Furnace	Muffle Furnace	N/A
Thermolyne Corporation, Model # HPA2245M (2)	Hot Plate	Hot Plate	N/A
Corning Laboratory, Model#PC-300 (1)	Hot Plate	Hot Plate	N/A
Corning Laboratory Model #PC-420 (1)	Hot Plate/Stirrer	Hot Plate/Stirrer	N/A
CPI-MOD Block (70 mL) Digest Heater Block with Controller (2)	Digester/Heater Block	Digester/Heater Block	N/A
Julabo Labortachnik, Model#FC600 or equivalent (2)	Chilling Unit	Chilling Unit	N/A
PolyScience 6000 Series Chiller Model #0772046	Chilling Unit	Chilling Unit	N/A

APPENDIX C
EQUIPMENT MAINTENANCE PROGRAM
(GENERAL GUIDANCE)

EQUIPMENT MAINTENANCE PROGRAM
(GENERAL GUIDANCE)

Instrument	Activity	Approximate Frequency
GC 1, GC 4, and GC 6 *(Semivolatile TPH)* Agilent 5890 Series II	Clean FID	Weekly or as needed
	Check Gases	Replace at 200 PSI
	Change Liner	Every 200 injections or as needed due to response change
	Change Septum	Every 200 injections
	Replace Syringe	As needed if clogged or broken
	Clip Column	As needed to improve chromatography
	Replace Column	As needed
	Change Gold Seal	As needed
GC 2 and GC 3 *(Volatile TPH and BTEX by 8021B)* Agilent 5890 Series II	Clean FID	Weekly or as needed
	Check Gases	Replace at 200 PSI
	Clean PID	As needed
	Replace PID Lamp	As needed to improve sensitivity
	Replace Column	As needed
OI 4560/4660 Concentrator (GC 2, GC 3, GC/MS 4, GC/MS 9, and GC/MS 7)	Check Purge Flow	Monthly
	Replace Trap	As needed
	Clean Sparge Cell	As needed
	Clean Sparge Filter	As needed if clogged
4552/4551 Autosampler (GC 2, GC 3, GC/MS 4, GC/MS 9, and GC/MS 7)	Tighten Syringe Nut	Once a week
	Autocalibrate	As needed
GC 7 *(PCBs, Organic Lead, Canadian Pulp, EDB)* Agilent 5890 Series II	Check Gases	Replace at 200 PSI
	Change Liner	Every 200 injections or as needed due to response change
	Change Septum	Every 200 injections
	Replace Syringe	As needed if clogged or broken
	Clip Column	As needed to improve chromatography
	Replace Column	As needed
	Change Gold Seal	As needed
	Clean ECD	As needed to improve chromatography

EQUIPMENT MAINTENANCE PROGRAM
(GENERAL GUIDANCE)

Instrument	Activity	Approximate Frequency
GC 5 *(Helium Analyzer)* Agilent 5890 Series II	Clean TCD	As needed
	Check Gases	As needed
	Change Liner	As needed
	Change Septum	As needed
	Replace Syringe	As needed
	Clip Column	As needed
	Replace Column	As needed
GC/MS 3, GC/MS 6, GC/MS 8, and GC/MS 10 *(Semivolatiles and Methamphetamine)*	Check Gases	Replace at 200 PSI
	Change Liner	Every 200 injections or if tune fails due to degradation of DDT > 20
	Change Septum	Every 200 injections
	Replace Syringe	As needed if clogged or broken
	Clip Column	As needed to improve chromatography
	Replace Column	As needed
	Change Gold Seal	As needed
	Change Pump Oil	Every 6 months
	Clean Source	As needed
GC/MS 4, GC/MS 9, and GC/MS 7 *(Volatiles)*	Check Gases	Replace at 200 PSI
	Replace Column	As needed
	Change Pump Oil	Every 6 months
	Clean Source	As needed
CVAFS *(Mercury)*	Clean Liquid Gas Separator	Before each run
	Clean Cuvette	As needed
	Replace Lamp	As needed
	Change Tubing	As needed
ICP/MS *(Metals)*	Change Torch	As needed
	Change Tubing	As needed
	Change Coolant	As needed
	Clean Cones	As needed

APPENDIX D

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Parameter	Method	Matrix	Minimum Sample Volume	Container	Preservation	Maximum Holding Time
Organic Analysis						
Diesel Range Organics (Extractable TPH)	8015M NWTPH-Dx	Water	500 mL	500 mL glass	*Cool, ≤6°C	*7 days to extract, 40 days after extr.
	AK 102	Water	1 L	1 L glass		
	8015M NWTPH-Dx AK102/103	Soil	50 grams	4 oz glass	Cool, ≤6°C	14 days to extract, 40 days after extr.
Gasoline Range Organics (Purgable TPH)	8015M NWTPH-Gx AK101	Water	40 mL	40 mL VOA	Cool, ≤6°C, HCl to pH<2, no headspace	14 days
	8015M NWTPH-Gx	Soil	20 grams	3 x 5035 kit or MeOH pres. vial	Cool, ≤6°C/Freeze <-7°C	14 days
	AK101	Soil	app. 50 g	4 oz glass septum top	Methanol	28 days
HCID	NWTPH-HCID	Water	500 mL	500 mL glass	Cool, ≤6°C	7 days to extract, 40 days after extr.
		Soil	50 grams	4 oz glass	Cool, ≤6°C	14 days
HEM (O&G), SGT-HEM	1664	Water	1 Liter	1 L glass	Cool, ≤6°C, H_2SO_4 to pH<2	28 days
PCBs	8082A	Water	1 Liter	1 L glass	Cool, ≤6°C	none
	8082A	Soil	50 grams	4 oz glass	Cool, ≤6°C	none
PNAs (PAHs)	8270D or 8270D SIM	Water	500 mL	500 mL glass	Cool, ≤6°C	7 days to extract, 40 days after extr.
	8270D or 8270D SIM	Soil	50 grams	4 oz glass	Cool, ≤6°C	14 days to extract, 40 days after extr.
Purgable Aromatic Hydrocarbons (BTEX, MTBE)	8021B or AK101	Water	40 mL	40 mL VOA	Cool, ≤6°C, HCl to pH<2, no headspace	14 days
	8021B	Soil	20 grams	3 x 5035 kit or MeOH pres. vial	Cool, ≤6°C/Freeze <-7°C	14 days
	AK101	Soil	app. 50 g	4 oz glass septum top	Methanol	28 days
Semivolatile Organic Compounds (SVOCs, BNAs)	8270D	Water	1 Liter	1 L glass	Cool, ≤6°C	7 days to extract, 40 days after extr.
	8270D	Soil	50 grams	4 oz glass	Cool, ≤6 °C	14 days to extract, 40 days after extr.

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Parameter	Method	Matrix	Minimum Sample Volume	Container	Preservation	Maximum Holding Time
Organic Analysis (Continued)						
Volatile Organic Compounds (VOCs)	8260C	Water	40 mL	40 mL VOA	Cool, ≤6°C, HCl to pH<2, no headspace	14 days
	8260C	Soil	10 grams	40 mL VOA	Freeze within 48 hrs., ≤0°C	14 days

* For NWTPH-Dx and AK102 methods, if preserved with HCl or H_2SO_4 to pH<2, holding time is 14 days to extract.

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Parameter	Method	Matrix	Minimum Sample Volume	Container	Preservation	Maximum Holding Time
Inorganic Analysis						
Alkalinity	SM2320B	Water	100 mL	500 mL poly	Cool, ≤6°C	14 days
BOD	405.1	Water	1 Liter	1 L glass	Cool, ≤6°C	48 hours
Chloride	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
COD	410.4	Water	100 mL	500 mL poly	H_2SO_4 to pH<2	28 days
Conductivity	120.1	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
Cyanide, total	335.2	Water	1 Liter	1 L glass	NaOH to pH 12	14 days
Fluoride	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
Hardness	SM2340B	Water	100 mL	500 mL poly	HNO_3 to pH,<2	6 months
Nitrate	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	48 hours
Nitrite	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	48 hours
Nitrate-Nitrite	353.2	Water	100 mL	500 mL poly	Cool, ≤6°C, H_2SO_4 to pH<2	28 days
pH	9040/150.1	Water	20 mL	500 mL poly	None	As soon as possible
	9045	Soil	20 grams	4 oz glass	None	28 days
Phosphorus, total	365.2	Water	100 mL	500 mL poly	Cool, ≤6°C, H_2SO_4 to pH<2	28 days
Sulfate	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
Sulfide	376.2	Water	500 mL	500 mL poly	Cool, ≤6°C ZnAcetate plus NaOH to pH>9	7 days
Sulfite	377.1	Water	100 mL	500 mL poly	None	24 hours
Total Dissolved Solids (TDS)	SM2540C/ 160.1	Water	500 mL	500 mL poly	Cool, ≤6°C	7 days
Total Organic Carbon (TOC)	415.1/ 9060M	Water	100 mL	500 mL poly	H_2SO_4 to pH<2	28 days
Total Suspended Solids (TSS)	SM2540D	Water	250 mL	500 mL poly	Cool, ≤6°C	7 days
Turbidity	SM2130B	Water	20 mL	500 mL poly	Cool, ≤6°C	48 hours
Metals Analysis						
Metals (except Cr VI and Mercury)	200.8/6020 or 6010	Water	200 mL	500 mL poly or glass	HNO_3 to pH<2 at least 24 hours prior to analysis	6 months
	200.8/6020 or 6010	Soil	20 grams	4 oz glass	Cool, ≤6°C	6 months
Chromium VI	SM3500Cr	Water	100 mL	500 mL poly	Cool, ≤6°C	24 hours
	7196A	Soil	50 grams	4 oz glass	Cool, ≤6°C	30 days
Mercury	1631/200.8/ 6020/7040	Water	125 mL	250 mL poly, fluoropolymer, or glass	HNO_3 to pH<2	28 days (48 hours if not preserved)
	1631/200.8/ 6020/7041	Soil	50 grams	4 oz glass	Cool, ≤6°C	28 days

APPENDIX E

INTERNAL AUDIT/MANAGERIAL REVIEW FORMS

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Summary

Areas audited

1. Quality System:

Quality Assurance Manual and SOPs reviewed ☐
(attach "List of Current SOPs" with reviewed documents marked)

2. Support Equipment ☐

3. Non-Conformance reports (review) ☐

4. Project Management/Reports ☐

5. Sample receiving, storage, disposal ☐

6. Document Control/Training ☐

7. Extractions:

Organic		Inorganic		Volatiles	
3510	☐	200.8	☐	5030	☐
3550	☐	1631	☐	5035	☐
3580	☐	3005	☐	3580	☐
3630	☐	3050	☐		

8. Analysis/Calculations:

8260	☐	RSK-175	☐	TPHD	☐	200.8	☐
8270	☐	1664	☐	TSS	☐	6020	☐
8082	☐	Methamphetamine	☐	pH	☐	1631	☐
524.2	☐	Hardness	☐	Spec. Grav.	☐	TO-15	☐
8011	☐	TPHG/BTEX	☐	Turbidity	☐	TO-17	☐
8081	☐	Other	☐				

Total number of corrective actions_____

Comments:_____

Does any non-conformance/corrective action require further notification?

Yes ☐ No ☐ (If yes, explain)

_____

Attach all internal audit checksheets and corrective action forms and file in the internal QA/QC audit folder.

QA Officer's Signature_____

Date Audit Review Completed_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Sample receiving, storage, disposal

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO
Is the Master Sample Log-In book in order?	_____	_____
Are COCs filled out correctly during sample check-in?	_____	_____
Are all samples/projects traceable, i.e. labeled?	_____	_____
Are samples stored in the correct refrigerators?	_____	_____
Are refrigerator temperatures recorded daily?	_____	_____
Are standards/solvents logged in?	_____	_____
Are sample disposal records kept?	_____	_____
Disposal Area:		
Does each drum have an up to date contents list?	_____	_____
Are drums properly labeled?	_____	_____
Are waste materials contained properly in each drum?	_____	_____
Are waste disposal records kept?	_____	_____
Are all prior external and internal findings addressed?	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Extractions

Organic ☐ Inorganic ☐ Volatiles ☐

Method(s): _____ _____ _____

_____ _____ _____

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO	N/A
Are waste containers properly labeled and stored?	_____	_____	_____
Was any new equipment properly validated prior to use?	_____	_____	_____
Are manufacturer's certificates which verify calibration/accuracy available?	_____	_____	_____
Are analytical balances checked daily?	_____	_____	_____
Are autopipets calibrated at least monthly?	_____	_____	_____
Are bottle top dispensers calibrated at least monthly?	_____	_____	_____
Is the oven temperature recorded daily?	_____	_____	_____
Is the water bath temperature recorded daily?	_____	_____	_____
Is the hot block temperature recorded daily?	_____	_____	_____
Is equipment which falls out of calibration repaired or taken out of service?	_____	_____	_____
Are all prior external and internal findings addressed?	_____	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Analysis/Calculations Method:_____

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO
Are standards traceable to a certified source?	_____	_____
Are standards labeled with an expiration date?	_____	_____
Are standards taken out of use after the expiration date?	_____	_____
Do initial calibrations meet the method requirements?	_____	_____
Are initial calibrations verified with a second source standard?	_____	_____
Are initial calibrations verified with continuing calibration verification standards?	_____	_____
Do QC sample results (method blanks, LCS, MS) meet the method requirements?	_____	_____
Are corrective actions taken for any result which falls outside of acceptance criteria?	_____	_____
Is the SOP up to date?	_____	_____
Are instrument maintenance logs up to date?	_____	_____
Are MDLs up to date?	_____	_____
Are reporting limits based on MDLs?	_____	_____
Are data calculations based on the initial calibration?	_____	_____
Is data flagged with qualifiers if necessary?	_____	_____
Are all prior external and internal findings addressed?	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Project Management/Reports

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO
Are extraction worksheets filled out completely and clearly?	_____	_____
Are capability issues communicated to the client and clearly documented?	_____	_____
Are any changes to the COC initialed/dated with the name of the person requesting the change clearly indicated?	_____	_____
Are the subcontracted samples documented to client?	_____	_____
Is the Non-Conformance form used to document client complaints?	_____	_____
Are subcontract lab reports forwarded without change to the client, and clearly identified in our final report?	_____	_____
Are amended reports clearly identified?	_____	_____
Are additional reports clearly identified?	_____	_____
Are draft results/reports clearly identified?	_____	_____
Are flags from analysts left as is?	_____	_____
Is data flagged in an unambiguous manner?	_____	_____
Is there a case narrative when the validity of the data is in question?	_____	_____
Are all prior external and internal findings addressed?	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Document Control/Training

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO
Is the employeed signature list up to date?	_____	_____
Are all logbooks numbered and listed in the Master Log of Laboratory Logbooks?	_____	_____
Is the Controlled Document Record used to track distribution of controlled documents?	_____	_____
Is the Archive Access Log used?	_____	_____
Is the List of Current SOPs up to date?	_____	_____
Are the Current SOP binders up to date?	_____	_____
Do Employee Attestation forms list current SOPs and revision numbers?	_____	_____
Have employees initialed Attestation forms for the current revision of all applicable SOPs?	_____	_____
Are DOCs complete and clearly identified?	_____	_____
Is the DOC training summary database up to date?	_____	_____
Are Laboratory Organization and Personnel Qualifications summaries up to date?	_____	_____
Is current accreditation summary up to date?	_____	_____
Are all prior external and internal findings addressed?	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

QUALITY ASSURANCE/QUALITY CONTROL
INTERNAL AUDIT

Area: Support Equipment

Date:_____ Auditor:_____ Person(s) Audited:_____

	YES	NO
Are primary reference weights and thermometers clearly labeled?	_____	_____
Are standards NIST traceable?	_____	_____
Are daily standards referenced in logbooks?	_____	_____
Are logbooks (refrigerator, water bath, hot block, oven, balance autopipete, etc.) completed as required?	_____	_____
Are logbooks (refrigerator, water bath, hot block, oven, balance autopipete, etc.) bound or in a 3 ring binder?	_____	_____
Is all calibrated support equipment (thermometers, autopipetes, bottle top dispensers, hot blocks, etc.) clearly labeled?	_____	_____
If any equipment is out of specifications, is it taken out of service and clearly labeled as such?	_____	_____
Are all prior external and internal findings addressed?	_____	_____

Fill out a corrective action form for any "no" answers and for anything else as needed.

Number of corrective actions given:_____ COMMENTS_____

_____

_____

INTERNAL QA/QC AUDIT CORRECTIVE ACTION

Area/Analysis_____

Corrective action given to (name):_____

Given by (name):_____
(Keep a copy of this form for tracking)

Date given:_____ Target response date:_____
(set based on potential need to notify clients and on work load)

Description of non-compliance:_____

_____

_____

Description of root cause and required corrective action:_____
_____

_____

_____

_____

Specific documentation required: (Return this form to the auditor with the required documentation attached.)

_____

_____

_____

Corrective action reviewed and approved:

QC Officer (or designee):_____ Date:_____

(Return this form to QC officer along with attached documentation)

QUALITY SYSTEM
MANAGERIAL REVIEW

Date:_____ Auditor:_____

Review of Calendar Year 20___

Write comments, as needed, in a separate file and attach.

1. Review of most recent internal audit (Date(s)_____)

All areas audited Yes ☐ No ☐

Corrective actions implemented and documented Yes ☐ No ☐

2. Review of non-conformance reports

Corrective actions implemented and documented Yes ☐ No ☐

3. Review of proficiency testing (PT) samples

Analysis completed two times per year per analyte per matrix (for NELAP accredited analyses) Yes ☐ No ☐

Corrective actions implemented and documented Yes ☐ No ☐

4. Review of current accreditation status.

5. Review of recent audits/assessments by external bodies.

External audit(s) by: State/Company_____ Date_____

Corrective actions implemented and documented. Yes ☐ No ☐

6. If audits or data review resulted in changes to previously reported data, were affected clients notified within 30 days? Yes ☐ No ☐ n/a ☐

7. Changes in volume and/or type of work undertaken which may affect quality.

8. Feedback from clients regarding quality. (Include review of any client complaints.)

9. Other relevant factor(s) which may affect quality.

10. Pro-active preventive actions to avoid potential non-conformances.

MANAGERIAL REVIEW CORRECTIVE ACTION

Area/Analysis_____

Corrective action given to (name):_____

Given by (name):_____
(Keep a copy for tracking)

Date given:_____ Target Response Date:_____
(set based on potential need to notify clients and on work load)

Description of non-compliance:_____

_____

_____

Root Cause:_____

_____

Description of required corrective action:_____

_____

Specific documentation required: (Return this sheet to the auditor with the required documentation attached.)

_____

_____

Corrective action reviewed and approved:

Name:_____ Date:_____
(Technical/Laboratory Director or designee)

File along with attached documentation in the management review folder.

APPENDIX F

DEFINITIONS

DEFINITIONS

Acceptance Criteria: specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: the process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one. (NELAC)

Accrediting Authority: the Territorial, State, or federal agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation. (NELAC)

Accuracy: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Analyst: the designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (NELAC)

Audit: a systematic evaluation to determine the conformance to quantitative *and qualitative* specifications of some operational function or activity. (EPA-QAD)

Batch: environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. (NELAC Quality Systems Committee)

Blank: a sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. Blanks include:
Equipment Blank: a sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)
Field Blank: blank prepared in the field by filling a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)

Instrument Blank: a clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)
Method Blank: a sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. (NELAC)
Reagent Blank: (method reagent blank): a sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Blind Sample: a sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process. (NELAC)

Calibration: to determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration Curve: the graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (NELAC)

Calibration Standard: a substance or reference material used to calibrate an instrument. (QAMS)

Certified Reference Material (CRM): a reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO Guide 30 - 2.2)

Chain of Custody Form: record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; collector; time of collection; preservation; and requested analyses. (NELAC)

Confirmation: verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: Second column confirmation, Alternate wavelength, Derivatization, Mass spectral interpretation, Alternative detectors or, Additional cleanup procedures. (NELAC)

Conformance: an affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

Corrective Action: the action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Audit: a qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality (i.e., that they meet specified acceptance criteria). (NELAC)

Data Reduction: the process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (EPA-QAD)

Demonstration of Capability: a procedure to establish the ability of the analyst to generate acceptable accuracy. (NELAC)

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

Holding Times (Maximum Allowable Holding Times): the maximum times that samples may be held prior to analysis and still be considered valid or not compromised. (40 CFR Part 136)

Internal Standard: a known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method. (NELAC)

Laboratory: a body that calibrates and/or tests. (ISO 25)

Laboratory Control Sample (LCS): a sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. (NELAC)

Laboratory Control Sample Duplicate (LCSD): a second replicate LCS prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte. (QAMS)

Matrix: the substrate of a test sample.

Laboratory Duplicate: aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently. (NELAC)

Matrix Spike (MS): a sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency. (QAMS)

Matrix Spike Duplicate (MSD): a second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte. (QAMS)

Method: see Test Method

Method Detection Limit: the minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136, Appendix B)

National Institute of Standards and Technology (NIST): an agency of the US Department of Commerce's Technology Administration that is working with EPA, States, NELAC, and other public and commercial entities to establish a system under which private sector companies and interested States can be accredited by NIST to provide NIST-traceable proficiency testing (PT) to those laboratories testing drinking water and wastewater. (NIST)

National Environmental Laboratory Accreditation Conference (NELAC): a voluntary organization of State and Federal environmental officials and interest groups purposed primarily to establish mutually acceptable standards for accrediting environmental laboratories. A subset of NELAP. (NELAC)

National Environmental Laboratory Accreditation Program (NELAP): the overall National Environmental Laboratory Accreditation Program of which NELAC is a part. (NELAC)

National Voluntary Laboratory Accreditation Program (NVLAP): a program administered by NIST that is used by providers of proficiency testing to gain accreditation for all compounds/matrices for which NVLAP accreditation is available, and for which the provider intends to provide NELAP PT samples. (NELAC)

Performance Audit: the routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory. (NELAC)

Performance Based Measurement System (PBMS): a set of processes wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting measurement processes which will meet those needs in a cost-effective manner. (NELAC)

Precision: the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (NELAC)

Preservation: refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample. (NELAC)

Proficiency Testing: a means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (NELAC)

Proficiency Testing Study Provider: any person, private party, or government entity that meets stringent criteria to produce and distribute NELAC PT samples, evaluate study results against published performance criteria and report the results to the laboratories, primary accrediting authorities, PTOB/PTPA, and NELAP. (NELAC)

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

Protocol: a detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) which must be strictly followed. (EPA-QAD)

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

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

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

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

Quality Manual: a document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (NELAC)

Quality System: a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC. (ANSI/ASQC E-41994)

Quantitation Limits: levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported at a specified degree of confidence. (NELAC)

Range: the difference between the minimum and the maximum of a set of values. (EPA-QAD)

Raw Data: any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments. If exact copies of raw data have been prepared (e.g., tapes which have been transcribed verbatim, data and verified accurate by signature), the exact copy or exact transcript may be submitted. (EPA-QAD)

Reference Material: a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (ISO Guide 30-2.1)

Reference Method: a method of known and documented accuracy and precision issued by an organization recognized as competent to do so. (NELAC*)*

Reference Standard: a standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived. (VIM-6.08)

Replicate Analyses: the measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval. (NELAC)

Reporting Limits: routinely reported lower limits of quantitation, typically 2 to 10 times the MDL.

Sample Tracking: procedures employed to record the possession of the samples from the time of sampling until analysis, reporting, and archiving. These procedures include the use of a Chain of Custody Form that documents the collection, transport, and receipt of compliance samples to the laboratory. In addition, access to the laboratory is limited and controlled to protect the integrity of the samples. (NELAC)

Selectivity: the capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. (EPA-QAD)

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

Spike: a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes. (NELAC)

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

Standardized Reference Material (SRM): a certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method. (EPA-QAD)

Supervisor (however named): the individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses. (NELAC)

Surrogate: a substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes. (QAMS)

Technical Director: individual(s) who has overall responsibility for the technical operation of the environmental testing laboratory. (NELAC)

Test: a technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate. (ISO/IEC Guide 2-12.1, amended)

Test Method: an adoption of a scientific technique for a specific measurement problem, as documented in a laboratory SOP or published by a recognized authority. (NELAC)

Testing Laboratory: a laboratory that performs tests (ISO/IEC Guide 2-12.4)

The NELAC Institute (TNI): A non-profit organization whose mission is to foster the generation of environmental data of known and documented quality through an open, inclusive and transparent process that is responsive to the needs of the community. (TNI)

Traceability: the property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons. (VIM-6.12)

United States Environmental Protection Agency (EPA): the federal governmental agency with responsibility for protecting public health and safeguarding and improving the natural environment (i.e., the air, water, and land) upon which human life depends. (US-EPA)

Validation: the process of substantiating specified performance criteria. (EPA-QAD)

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

Sources:
40CFR Part 136

American Society for Quality Control (ASQC), Definitions of Environmental Quality Assurance Terms

American National Standards Institute (ANSI), Style Manual for Preparation of Proposed American National Standards, Eighth Edition, March 1991

ANSI/ASQC E4, 1994

International Standards Organization (ISO) Guides 2, 30, 8402

International Vocabulary of Basic and General Terms in Metrology (VIM): 1984. Issued by BIPM, IEC, ISO and OIML

National Institute of Standards and Technology (NIST)

National Environmental Laboratory Accreditation Conference (NELAC), July 1998 Standards

The NELAC Institute (TNI), Web site, January 2009.

US EPA Quality Assurance Management Section (QAMS), Glossary of Terms of Quality Assurance Terms, 8/31/92 and 12/6/95

US EPA Quality Assurance Division (QAD)

Appendix D

Laboratory Sample Quality Control and Detection Limits

Analysis For Total Metals By EPA Method 6020/200.8

Client ID:	Method Blank	Client:	Friedman & Bruya
Date Received:	NA	Project:	Study SM-137, UST-112
Date Extracted:	04/13/23	Lab ID:	I3-288 mb
Date Analyzed:	04/13/23	Data File:	I3-288 mb.128
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Antimony	<1
Arsenic	<1
Barium	<1
Beryllium	<1
Cadmium	<1
Chromium	<5
Cobalt	<1
Copper	<5
Lead	<1
Manganese	<1
Mercury	<1
Molybdenum	<1
Nickel	<2
Selenium	<1
Silver	<1
Thallium	<1
Vanadium	<1
Zinc	<5

Analysis For Total Metals By EPA Method 6020/200.8

Client ID:	Method Blank	Client:	
Date Received:	NA	Project:	
Date Extracted:	05/05/23	Lab ID:	I3-349 mb2
Date Analyzed:	05/05/23	Data File:	I3-349 mb2.038
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Antimony	<1
Arsenic	<1
Barium	<1
Beryllium	<1
Cadmium	<1
Chromium	<1
Cobalt	<1
Copper	<5
Iron	<50
Lead	<1
Manganese	<1
Mercury	<1
Molybdenum	<1
Nickel	<1
Selenium	<1
Silver	<1
Thallium	<1
Vanadium	<1
Zinc	<5

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	02/21/24	Lab ID:	04-374 mb 1/30
Date Analyzed:	02/21/24	Data File:	022107.D
Matrix:	Soil	Instrument:	GC9
Units:	mg/kg (ppm) Dry Weight	Operator:	AL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	67	20	157
Decachlorobiphenyl	96	28	158

Compounds:	Concentration mg/kg (ppm) Dry Weight
alpha-BHC	<0.01
gamma-BHC (Lindane)	<0.01
beta-BHC	<0.01
delta-BHC	<0.01
Heptachlor	<0.01
Aldrin	<0.01
Heptachlor Epoxide	<0.01
trans-Chlordane	<0.01
cis-Chlordane	<0.01
4,4'-DDE	<0.01
Endosulfan I	<0.01
Dieldrin	<0.01
Endrin	<0.01
4,4'-DDD	<0.01
Endosulfan II	<0.01
4,4'-DDT	<0.01
Endrin Aldehyde	<0.01
Methoxychlor	<0.01
Endosulfan Sulfate	<0.01
Endrin Ketone	<0.01
Toxaphene	<1

Analysis For Organochlorine Pesticides By EPA Method 8081B

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	04/01/24	Lab ID:	04-755 mb
Date Analyzed:	04/01/24	Data File:	040116.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	60	20	121
Decachlorobiphenyl	46	11	159

Compounds:	Concentration ug/L
alpha-BHC	<0.005
gamma-BHC (Lindane)	<0.005
beta-BHC	<0.005
delta-BHC	<0.005
Heptachlor	<0.005
Aldrin	<0.005
Heptachlor Epoxide	<0.005
trans-Chlordane	<0.005
cis-Chlordane	<0.005
4,4'-DDE	<0.005
Endosulfan I	<0.005
Dieldrin	<0.005
Endrin	<0.005
4,4'-DDD	<0.005
Endosulfan II	<0.005
4,4'-DDT	<0.005
Endrin Aldehyde	<0.005
Methoxychlor	<0.005
Endosulfan Sulfate	<0.005
Endrin Ketone	<0.005
Toxaphene	<0.05

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	04/02/24	Lab ID:	04-758 mb 1/30
Date Analyzed:	04/02/24	Data File:	040222.D
Matrix:	Soil	Instrument:	GC7
Units:	mg/kg (ppm) Dry Weight	Operator:	AL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Tetrachlorometaxylene	102	11	162
Decachlorobiphenyl	105	11	152

Compounds:	Concentration mg/kg (ppm) Dry Weight
Aroclor 1221	<0.02
Aroclor 1232	<0.02
Aroclor 1016	<0.02
Aroclor 1242	<0.02
Aroclor 1248	<0.02
Aroclor 1254	<0.02
Aroclor 1260	<0.02
Aroclor 1262	<0.02
Aroclor 1268	<0.02

Analysis For Volatile Compounds By EPA Method 8260D

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	04/04/24 06:00	Lab ID:	04-0767 mb
Date Analyzed:	04/04/24 11:25	Data File:	040412.D
Matrix:	Soil	Instrument:	GCMS4
Units:	mg/kg (ppm) Dry Weight	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	86	114
Toluene-d8	102	86	115
4-Bromofluorobenzene	96	83	116

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
Ethanol	<50	trans-1,3-Dichloropropene	<0.05
Dichlorodifluoromethane	<0.5	1,1,2-Trichloroethane	<0.05
Chloromethane	<0.5	2-Hexanone	<0.5
Vinyl chloride	<0.05	1,3-Dichloropropane	<0.05
Bromomethane	<0.5	Tetrachloroethene	<0.025
Chloroethane	<0.5	Dibromochloromethane	<0.05
Trichlorofluoromethane	<0.5	1,2-Dibromoethane (EDB)	<0.05
2-Propanol	<0.5	Chlorobenzene	<0.05
Acetone	<5	Ethylbenzene	<0.05
1,1-Dichloroethene	<0.05	1,1,1,2-Tetrachloroethane	<0.05
Hexane	<0.25	m,p-Xylene	<0.1
Methylene chloride	<0.5	o-Xylene	<0.05
t-Butyl alcohol (TBA)	<2.5	Styrene	<0.05
Methyl t-butyl ether (MTBE)	<0.05	Isopropylbenzene	<0.05
trans-1,2-Dichloroethene	<0.05	Bromoform	<0.05
Diisopropyl ether (DIPE)	<0.05	n-Propylbenzene	<0.05
1,1-Dichloroethane	<0.05	Bromobenzene	<0.05
Ethyl t-butyl ether (ETBE)	<0.05	1,3,5-Trimethylbenzene	<0.05
2,2-Dichloropropane	<0.05	1,1,2,2-Tetrachloroethane	<0.05
cis-1,2-Dichloroethene	<0.05	1,2,3-Trichloropropane	<0.05
Chloroform	<0.05	2-Chlorotoluene	<0.05
2-Butanone (MEK)	<1	4-Chlorotoluene	<0.05
t-Amyl methyl ether (TAME)	<0.05	tert-Butylbenzene	<0.05
1,2-Dichloroethane (EDC)	<0.05	1,2,4-Trimethylbenzene	<0.05
1,1,1-Trichloroethane	<0.05	sec-Butylbenzene	<0.05
1,1-Dichloropropene	<0.05	p-Isopropyltoluene	<0.05
Carbon tetrachloride	<0.05	1,3-Dichlorobenzene	<0.05
Benzene	<0.03	1,4-Dichlorobenzene	<0.05
Trichloroethene	<0.02	1,2-Dichlorobenzene	<0.05
1,2-Dichloropropane	<0.05	1,2-Dibromo-3-chloropropane	<0.5
Bromodichloromethane	<0.05	1,2,4-Trichlorobenzene	<0.25
Dibromomethane	<0.05	Hexachlorobutadiene	<0.25
4-Methyl-2-pentanone	<1	Naphthalene	<0.05
cis-1,3-Dichloropropene	<0.05	1,2,3-Trichlorobenzene	<0.25
Toluene	<0.05		

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	03/28/24 05:46	Lab ID:	04-0685 mb
Date Analyzed:	03/28/24 10:51	Data File:	032809.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	IJL

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	93	71	132
Toluene-d8	94	68	139
4-Bromofluorobenzene	103	62	136

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
Ethanol	<1,000	trans-1,3-Dichloropropene	<0.4
Dichlorodifluoromethane	<1	1,1,2-Trichloroethane	<0.5
Chloromethane	<10	2-Hexanone	<10
Vinyl chloride	<0.02	1,3-Dichloropropane	<1
Bromomethane	<5	Tetrachloroethene	<1
Chloroethane	<1	Dibromochloromethane	<0.5
Trichlorofluoromethane	<1	1,2-Dibromoethane (EDB)	<0.01
2-Propanol	<10	Chlorobenzene	<1
Acetone	<50	Ethylbenzene	<1
1,1-Dichloroethene	<1	1,1,1,2-Tetrachloroethane	<1
Hexane	<5	m,p-Xylene	<2
Methylene chloride	<5	o-Xylene	<1
t-Butyl alcohol (TBA)	<50	Styrene	<1
Methyl t-butyl ether (MTBE)	<1	Isopropylbenzene	<1
trans-1,2-Dichloroethene	<1	Bromoform	<5
Diisopropyl ether (DIPE)	<1	n-Propylbenzene	<1
1,1-Dichloroethane	<1	Bromobenzene	<1
Ethyl t-butyl ether (ETBE)	<1	1,3,5-Trimethylbenzene	<1
2,2-Dichloropropane	<1	1,1,2,2-Tetrachloroethane	<0.2
cis-1,2-Dichloroethene	<1	1,2,3-Trichloropropane	<1
Chloroform	<1	2-Chlorotoluene	<1
2-Butanone (MEK)	<20	4-Chlorotoluene	<1
t-Amyl methyl ether (TAME)	<1	tert-Butylbenzene	<1
1,2-Dichloroethane (EDC)	<0.2	1,2,4-Trimethylbenzene	<1
1,1,1-Trichloroethane	<1	sec-Butylbenzene	<1
1,1-Dichloropropene	<1	p-Isopropyltoluene	<1
Carbon tetrachloride	<0.5	1,3-Dichlorobenzene	<1
Benzene	<0.35	1,4-Dichlorobenzene	<1
Trichloroethene	<0.5	1,2-Dichlorobenzene	<1
1,2-Dichloropropane	<1	1,2-Dibromo-3-chloropropane	<10
Bromodichloromethane	<0.5	1,2,4-Trichlorobenzene	<1
Dibromomethane	<1	Hexachlorobutadiene	<0.5
4-Methyl-2-pentanone	<10	Naphthalene	<1
cis-1,3-Dichloropropene	<0.4	1,2,3-Trichlorobenzene	<1
Toluene	<1		

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	04/01/24	Lab ID:	04-0751 mb 1/5
Date Analyzed:	04/02/24	Data File:	040135.D
Matrix:	Soil	Instrument:	GCMS12
Units:	mg/kg (ppm) Dry Weight	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	85	14	115
Phenol-d6	97	29	121
Nitrobenzene-d5	106	16	137
2-Fluorobiphenyl	106	46	122
2,4,6-Tribromophenol	104	17	154
Terphenyl-d14	115	31	167

Compounds:	Concentration mg/kg (ppm)	Compounds:	Concentration mg/kg (ppm)
N-Nitrosodimethylamine	<0.05	3-Nitroaniline	<5
Phenol	<0.5	Acenaphthene	<0.01
Bis(2-chloroethyl) ether	<0.05	2,4-Dinitrophenol	<1.5
2-Chlorophenol	<0.5	Dibenzofuran	<0.05
1,3-Dichlorobenzene	<0.05	2,4-Dinitrotoluene	<0.25
1,4-Dichlorobenzene	<0.05	4-Nitrophenol	<1.5
1,2-Dichlorobenzene	<0.05	Diethyl phthalate	<0.5
Benzyl alcohol	<0.5	Fluorene	<0.01
2,2'-Oxybis(1-chloropr...	<0.05	4-Chlorophenyl phenyl ...	<0.05
2-Methylphenol	<0.5	1,2-Diphenylhydrazine	<0.05
Hexachloroethane	<0.05	N-Nitrosodiphenylamine	<0.05
N-Nitroso-di-n-propyla...	<0.05	4-Nitroaniline	<5
3-Methylphenol + 4-Met...	<1	4,6-Dinitro-2-methylph...	<1.5
Nitrobenzene	<0.05	4-Bromophenyl phenyl e...	<0.05
Isophorone	<0.05	Hexachlorobenzene	<0.05
2-Nitrophenol	<0.5	Pentachlorophenol	<0.25
2,4-Dimethylphenol	<0.5	Phenanthrene	<0.01
Benzoic acid	<2.5	Anthracene	<0.01
Bis(2-chloroethoxy)met...	<0.05	Carbazole	<0.05
2,4-Dichlorophenol	<0.5	Di-n-butyl phthalate	<0.5
1,2,4-Trichlorobenzene	<0.05	Fluoranthene	<0.01
Naphthalene	<0.01	Benzidine	<1
Hexachlorobutadiene	<0.05	Pyrene	<0.01
4-Chloroaniline	<5	Benzyl butyl phthalate	<0.5
4-Chloro-3-methylphenol	<0.5	3,3'-Dichlorobenzidine	<0.5
2-Methylnaphthalene	<0.01	Benz(a)anthracene	<0.01
1-Methylnaphthalene	<0.01	Chrysene	<0.01
Hexachlorocyclopentadiene	<0.15	Bis(2-ethylhexyl) phth...	<0.8
2,4,6-Trichlorophenol	<0.5	Di-n-octyl phthalate	<0.5
2,4,5-Trichlorophenol	<0.5	Benzo(a)pyrene	<0.01
2-Chloronaphthalene	<0.05	Benzo(b)fluoranthene	<0.01
2-Nitroaniline	<0.25	Benzo(k)fluoranthene	<0.01
Dimethyl phthalate	<0.5	Indeno(1,2,3-cd)pyrene	<0.01
Acenaphthylene	<0.01	Dibenz(a,h)anthracene	<0.01

2,6-Dinitrotoluene	<0.25	Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Extracted:	04/01/24	Lab ID:	04-750 mb
Date Analyzed:	04/01/24	Data File:	040114.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	35	10	60
Phenol-d6	25	10	49
Nitrobenzene-d5	82	15	144
2-Fluorobiphenyl	83	25	128
2,4,6-Tribromophenol	78	10	142
Terphenyl-d14	108	41	138

Compounds:	Concentration ug/L (ppb)	Compounds:	Concentration ug/L (ppb)
N-Nitrosodimethylamine	<0.2	3-Nitroaniline	<20
Phenol	<2	Acenaphthene	<0.02
Bis(2-chloroethyl) ether	<0.2	2,4-Dinitrophenol	<6
2-Chlorophenol	<2	Dibenzofuran	<0.02
1,3-Dichlorobenzene	<0.2	2,4-Dinitrotoluene	<1
1,4-Dichlorobenzene	<0.2	4-Nitrophenol	<6
1,2-Dichlorobenzene	<0.2	Diethyl phthalate	<2
Benzyl alcohol	<2	Fluorene	<0.02
2,2'-Oxybis(1-chloropr...	<0.2	4-Chlorophenyl phenyl ...	<0.2
2-Methylphenol	<2	1,2-Diphenylhydrazine	<0.2
Hexachloroethane	<0.2	N-Nitrosodiphenylamine	<0.2
N-Nitroso-di-n-propyla...	<0.2	4-Nitroaniline	<20
3-Methylphenol + 4-Met...	<4	4,6-Dinitro-2-methylph...	<6
Nitrobenzene	<0.2	4-Bromophenyl phenyl e...	<0.2
Isophorone	<0.2	Hexachlorobenzene	<0.2
2-Nitrophenol	<2	Pentachlorophenol	<1
2,4-Dimethylphenol	<2	Phenanthrene	<0.02
Benzoic acid	<20	Anthracene	<0.02
Bis(2-chloroethoxy)met...	<0.2	Carbazole	<0.02
2,4-Dichlorophenol	<2	Di-n-butyl phthalate	<2
1,2,4-Trichlorobenzene	<0.2	Fluoranthene	<0.02
Naphthalene	<0.2	Benzidine	<4
Hexachlorobutadiene	<0.2	Pyrene	<0.02
4-Chloroaniline	<20	Benzyl butyl phthalate	<2
4-Chloro-3-methylphenol	<2	3,3'-Dichlorobenzidine	<2
2-Methylnaphthalene	<0.2	Benz(a)anthracene	<0.02
1-Methylnaphthalene	<0.2	Chrysene	<0.02
Hexachlorocyclopentadiene	<0.6	Bis(2-ethylhexyl) phth...	<3.2
2,4,6-Trichlorophenol	<2	Di-n-octyl phthalate	<2
2,4,5-Trichlorophenol	<2	Benzo(a)pyrene	<0.02
2-Chloronaphthalene	<0.2	Benzo(b)fluoranthene	<0.02
2-Nitroaniline	<1	Benzo(k)fluoranthene	<0.02
Dimethyl phthalate	<2	Indeno(1,2,3-cd)pyrene	<0.02
Acenaphthylene	<0.02	Dibenz(a,h)anthracene	<0.02

2,6-Dinitrotoluene	<1	Benzo(g,h,i)perylene	<0.04

Analysis For Volatile Compounds By Method MA-APH

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Collected:	04/03/24	Lab ID:	04-0689 mb
Date Analyzed:	04/03/24	Data File:	040311.D
Matrix:	Air	Instrument:	GCMS8
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	94	70	130

Compounds:	Concentration ug/m3
APH EC5-8 aliphatics	<75
APH EC9-12 aliphatics	<25
APH EC9-10 aromatics	<25

Date Extracted: 03/25/24
Date Analyzed: 03/26/24

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
Method Blank 04-618 MB	<0.02	<0.02	<0.02	<0.06	<5	81

Date Extracted: 03/28/24
Date Analyzed: 03/29/24

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
Method Blank 04-627 MB	<1	<1	<1	<3	<100	104

Date Extracted: 03/27/24
Date Analyzed: 03/27/24

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES
FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL
USING METHOD NWTPH-Dx
Extended to Include Motor Oil Range Compounds
Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Diesel Extended (C_{10}-C_{36})	Surrogate (% Recovery) (Limit 50-150)
Method Blank 04-734 MB	<50	104

Date Extracted: 03/28/24
Date Analyzed: 03/28/24

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND RESIDUAL RANGE USING METHOD NWTPH-Dx

Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Residual Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 50-150)
Method Blank 04-734 MB2	<50	<250	87

Date Extracted: 03/29/24
Date Analyzed: 03/29/24

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND RESIDUAL RANGE USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Residual Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
Method Blank 04-745 MB	<100	<250	121

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	ClientID
Date Received:	Not Applicable	Project:	ProjectID
Date Collected:	04/03/24	Lab ID:	04-0689 mb
Date Analyzed:	04/03/24	Data File:	040311.D
Matrix:	Air	Instrument:	GCMS8
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	94	70	130

Compounds:	Concentration ug/m3	Concentration ppbv	Compounds:	ug/m3	ppbv
Propene	<1.2	<0.7	1,2-Dichloropropane	<0.23	<0.05
Dichlorodifluoromethane	<0.99	<0.2	1,4-Dioxane	<0.36	<0.1
Chloromethane	<3.7	<1.8	2,2,4-Trimethylpentane	<4.7	<1
F-114	<2.1	<0.3	Methyl methacrylate	<4.1	<1
Vinyl chloride	<0.26	<0.1	Heptane	<4.1	<1
1,3-Butadiene	<0.044	<0.02	Bromodichloromethane	<0.067	<0.01
Butane	<4.8	<2	Trichloroethene	<0.11	<0.02
Bromomethane	<3.9	<1	cis-1,3-Dichloropropene	<0.91	<0.2
Chloroethane	<2.6	<1	4-Methyl-2-pentanone	<8.2	<2
Vinyl bromide	<0.44	<0.1	trans-1,3-Dichloropropene	<0.45	<0.1
Ethanol	<7.5	<4	Toluene	<7.5	<2
Acrolein	<0.11	<0.05	1,1,2-Trichloroethane	<0.055	<0.01
Pentane	<5.9	<2	2-Hexanone	<4.1	<1
Trichlorofluoromethane	<2.2	<0.4	Tetrachloroethene	<6.8	<1
Acetone	<4.8	<2	Dibromochloromethane	<0.085	<0.01
2-Propanol	<8.6	<3.5	1,2-Dibromoethane (EDB)	<0.077	<0.01
1,1-Dichloroethene	<0.4	<0.1	Chlorobenzene	<0.46	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1	Ethylbenzene	<0.43	<0.1
Methylene chloride	<35	<10	1,1,2,2-Tetrachloroethane	<0.14	<0.02
t-Butyl alcohol (TBA)	<12	<4	Nonane	<5.2	<1
3-Chloropropene	<3.1	<1	Isopropylbenzene	<9.8	<2
CFC-113	<1.5	<0.2	2-Chlorotoluene	<5.2	<1
Carbon disulfide	<6.2	<2	Propylbenzene	<4.9	<1
Methyl t-butyl ether (MTBE)	<7.2	<2	4-Ethyltoluene	<4.9	<1
Vinyl acetate	<7	<2	m,p-Xylene	<0.87	<0.2
1,1-Dichloroethane	<0.4	<0.1	o-Xylene	<0.43	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1	Styrene	<0.85	<0.2
Hexane	<3.5	<1	Bromoform	<2.1	<0.2
Chloroform	<0.049	<0.01	Benzyl chloride	<0.052	<0.01
Ethyl acetate	<7.2	<2	1,3,5-Trimethylbenzene	<4.9	<1
Tetrahydrofuran	<0.59	<0.2	1,2,4-Trimethylbenzene	<4.9	<1
2-Butanone (MEK)	<5.9	<2	1,3-Dichlorobenzene	<0.6	<0.1
1,2-Dichloroethane (EDC)	<0.04	<0.01	1,4-Dichlorobenzene	<0.23	<0.038
1,1,1-Trichloroethane	<0.55	<0.1	1,2-Dichlorobenzene	<0.6	<0.1
Carbon tetrachloride	<0.31	<0.05	1,2,4-Trichlorobenzene	<0.74	<0.1
Benzene	<0.32	<0.1	Naphthalene	<0.26	<0.05
Cyclohexane	<6.9	<2	Hexachlorobutadiene	<0.21	<0.02

Calculation Data	040311.D04-0689 mb ve15	Air	1	1
15	11	**STANDARD**		

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES
FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	85	87	85-115	2
Arsenic	mg/kg (ppm)	10	96	97	85-115	1
Barium	mg/kg (ppm)	50	92	93	85-115	1
Beryllium	mg/kg (ppm)	5	104	104	85-115	0
Cadmium	mg/kg (ppm)	10	97	98	85-115	1
Chromium	mg/kg (ppm)	50	100	99	85-115	1
Cobalt	mg/kg (ppm)	20	102	103	85-115	1
Copper	mg/kg (ppm)	50	101	101	85-115	0
Lead	mg/kg (ppm)	50	101	101	85-115	0
Manganese	mg/kg (ppm)	20	98	98	85-115	0
Mercury	mg/kg (ppm)	5	110	111	85-115	1
Molybdenum	mg/kg (ppm)	20	95	94	85-115	1
Nickel	mg/kg (ppm)	25	96	97	85-115	1
Selenium	mg/kg (ppm)	5	91	89	85-115	2
Silver	mg/kg (ppm)	10	96	96	85-115	0
Thallium	mg/kg (ppm)	5	101	102	85-115	1
Vanadium	mg/kg (ppm)	30	113	112	85-115	1
Zinc	mg/kg (ppm)	50	100	101	85-115	1

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES
FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 402378-01 rr (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	ug/L (ppb)	20	1.05	97	96	70-130	1
Arsenic	ug/L (ppb)	10	<1	93	92	70-130	1
Barium	ug/L (ppb)	50	9.10	96	96	70-130	0
Beryllium	ug/L (ppb)	5	<1	92	91	70-130	1
Cadmium	ug/L (ppb)	5	<1	96	94	70-130	2
Chromium	ug/L (ppb)	20	<1	94	93	70-130	1
Cobalt	ug/L (ppb)	20	<1	93	92	70-130	1
Copper	ug/L (ppb)	20	<5	93	91	70-130	2
Iron	ug/L (ppb)	100	156	88 b	85 b	70-130	3 b
Lead	ug/L (ppb)	10	<1	89	88	70-130	1
Manganese	ug/L (ppb)	20	8.99	90 b	90 b	70-130	0 b
Mercury	ug/L (ppb)	5	<1	84	83	70-130	1
Molybdenum	ug/L (ppb)	10	<1	94	93	70-130	1
Nickel	ug/L (ppb)	20	<1	94	93	70-130	1
Selenium	ug/L (ppb)	5	<1	96	91	70-130	5
Silver	ug/L (ppb)	5	<1	88	87	70-130	1
Thallium	ug/L (ppb)	5	<1	90	88	70-130	2
Vanadium	ug/L (ppb)	20	<1	93	93	70-130	0
Zinc	ug/L (ppb)	50	32.9	91 b	90 b	70-130	1 b

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	ug/L (ppb)	20	94	85-115
Arsenic	ug/L (ppb)	10	92	85-115
Barium	ug/L (ppb)	50	96	85-115
Beryllium	ug/L (ppb)	5	95	85-115
Cadmium	ug/L (ppb)	5	93	85-115
Chromium	ug/L (ppb)	20	96	85-115
Cobalt	ug/L (ppb)	20	97	85-115
Copper	ug/L (ppb)	20	95	85-115
Iron	ug/L (ppb)	100	97	85-115
Lead	ug/L (ppb)	10	94	85-115
Manganese	ug/L (ppb)	20	95	85-115
Mercury	ug/L (ppb)	5	87	85-115
Molybdenum	ug/L (ppb)	10	93	85-115
Nickel	ug/L (ppb)	20	96	85-115
Selenium	ug/L (ppb)	5	97	85-115
Silver	ug/L (ppb)	5	91	85-115
Thallium	ug/L (ppb)	5	94	85-115
Vanadium	ug/L (ppb)	20	97	85-115
Zinc	ug/L (ppb)	50	96	85-115

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 403229-01 x10 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	mg/kg (ppm)	5	<0.025	134	152	71-125	13

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Mercury	mg/kg (ppm)	5	123	68-143

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES FOR
TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 403411-01 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	<0.1	78	94	71-125	18

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Mercury	ug/L (ppb)	0.01	99	66-126

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES
FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 403297-01 x5 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/kg (ppm)	20	<5	92	104	75-125	12
Arsenic	mg/kg (ppm)	10	6.39	76 b	108 b	75-125	35 b
Barium	mg/kg (ppm)	50	68.1	67 b	90 b	75-125	29 b
Beryllium	mg/kg (ppm)	5	<5	98	98	75-125	0
Cadmium	mg/kg (ppm)	10	<5	97	96	75-125	1
Chromium	mg/kg (ppm)	50	13.5	93 b	98 b	75-125	5 b
Cobalt	mg/kg (ppm)	20	<5	96	98	75-125	2
Copper	mg/kg (ppm)	50	<25	87	94	75-125	8
Lead	mg/kg (ppm)	50	36.1	97 b	187 b	75-125	63 b
Manganese	mg/kg (ppm	20	387	<1.00	25	75-125	
Mercury	mg/kg (ppm	5	<5	98	100	75-125	2
Molybdenum	mg/kg (ppm)	20	<5	93	96	75-125	3
Nickel	mg/kg (ppm)	25	21.1	77 b	99 b	75-125	25 b
Selenium	mg/kg (ppm)	5	<5	86	91	75-125	6
Silver	mg/kg (ppm)	10	<5	90	92	75-125	2
Thallium	mg/kg (ppm)	5	<5	84	82	75-125	2
Vanadium	mg/kg (ppm)	30	31.4	69 b	235 b	75-125	109 b
Zinc	mg/kg (ppm)	50	142	49 b	83 b	75-125	52 b

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/kg (ppm)	20	104	80-120
Arsenic	mg/kg (ppm)	10	87	80-120
Barium	mg/kg (ppm)	50	98	80-120
Beryllium	mg/kg (ppm)	5	111	80-120
Cadmium	mg/kg (ppm)	10	103	80-120
Chromium	mg/kg (ppm)	50	116	80-120
Cobalt	mg/kg (ppm)	20	109	80-120
Copper	mg/kg (ppm)	50	102	80-120
Lead	mg/kg (ppm)	50	100	80-120
Manganese	mg/kg (ppm)	20	97	80-120
Mercury	mg/kg (ppm)	5	90	80-120
Molybdenum	mg/kg (ppm)	20	91	80-120
Nickel	mg/kg (ppm)	25	105	80-120
Selenium	mg/kg (ppm)	5	97	80-120
Silver	mg/kg (ppm)	10	99	80-120
Thallium	mg/kg (ppm)	5	99	80-120
Vanadium	mg/kg (ppm)	30	110	80-120
Zinc	mg/kg (ppm)	50	103	80-120

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL/SOLID SAMPLES
FOR TCLP METALS USING
EPA METHODS 6020B AND 1311

Laboratory Code: 403454-01 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	mg/L (ppm)	2.0	<1	110	110	75-125	0
Arsenic	mg/L (ppm)	1.0	<1	99	99	75-125	0
Barium	mg/L (ppm)	5.0	3.5	101 b	103 b	75-125	2 b
Beryllium	mg/L (ppm)	0.5	<1	96	96	75-125	0
Cadmium	mg/L (ppm)	0.5	<1	99	100	75-125	1
Chromium	mg/L (ppm)	2.0	<1	86	88	75-125	2
Cobalt	mg/L (ppm)	2.0	<1	86	88	75-125	2
Copper	mg/L (ppm)	2.0	<5	87	88	75-125	1
Iron	mg/L (ppm)	10	<50	85	89	75-125	5
Lead	mg/L (ppm)	1.0	<1	97	98	75-125	1
Manganese	mg/L (ppm)	2.0	5.0	72 b	81 b	75-125	12 b
Molybdenum	mg/L (ppm)	1.0	<1	101	103	75-125	2
Nickel	mg/L (ppm)	2.0	<1	88	89	75-125	1
Selenium	mg/L (ppm)	0.5	<1	107	105	75-125	2
Silver	mg/L (ppm)	0.5	<1	86	87	75-125	1
Thallium	mg/L (ppm)	0.5	<1	88	88	75-125	0
Vanadium	mg/L (ppm)	2.0	<1	89	91	75-125	2
Zinc	mg/L (ppm)	5.0	<5	88	89	75-125	1

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	mg/L (ppm)	2.0	103	80-120
Arsenic	mg/L (ppm)	1.0	91	80-120
Barium	mg/L (ppm)	5.0	95	80-120
Beryllium	mg/L (ppm)	0.5	94	80-120
Cadmium	mg/L (ppm)	0.5	94	80-120
Chromium	mg/L (ppm)	2.0	83	80-120
Cobalt	mg/L (ppm)	2.0	83	80-120
Copper	mg/L (ppm)	2.0	84	80-120
Iron	mg/L (ppm)	10	85	80-120
Lead	mg/L (ppm)	1.0	98	80-120
Manganese	mg/L (ppm)	2.0	80	80-120
Molybdenum	mg/L (ppm)	1.0	94	80-120
Nickel	mg/L (ppm)	2.0	85	80-120
Selenium	mg/L (ppm)	0.5	98	80-120
Silver	mg/L (ppm)	0.5	86	80-120
Thallium	mg/L (ppm)	0.5	86	80-120
Vanadium	mg/L (ppm)	2.0	84	80-120
Zinc	mg/L (ppm)	5.0	86	80-120

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES
FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 404039-06 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Antimony	ug/L (ppb)	20	<1	99	101	75-125	2
Arsenic	ug/L (ppb)	10	1.20	103	105	75-125	2
Barium	ug/L (ppb)	50	25.6	99 b	102 b	75-125	3 b
Beryllium	ug/L (ppb)	5	<1	98	100	75-125	2
Cadmium	ug/L (ppb)	5	<1	98	99	75-125	1
Chromium	ug/L (ppb)	20	<1	88	91	75-125	3
Cobalt	ug/L (ppb)	20	<1	87	89	75-125	2
Copper	ug/L (ppb)	20	<5	83	83	75-125	0
Iron	ug/L (ppb)	100	3,600	143 b	233 b	75-125	48 b
Lead	ug/L (ppb)	10	<1	85	86	75-125	1
Manganese	ug/L (ppb)	20	1,190	283 b	406 b	75-125	36 b
Mercury	ug/L (ppb)	5	<1	92	94	75-125	2
Molybdenum	ug/L (ppb)	10	<1	107	109	75-125	2
Nickel	ug/L (ppb)	20	1.75	84	86	75-125	2
Selenium	ug/L (ppb)	5	<1	103	102	75-125	1
Silver	ug/L (ppb)	5	<1	93	95	75-125	2
Thallium	ug/L (ppb)	5	<1	85	87	75-125	2
Vanadium	ug/L (ppb)	20	<1	92	93	75-125	1
Zinc	ug/L (ppb)	50	<5	86	87	75-125	1

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Antimony	ug/L (ppb)	20	103	80-120
Arsenic	ug/L (ppb)	10	90	80-120
Barium	ug/L (ppb)	50	104	80-120
Beryllium	ug/L (ppb)	5	89	80-120
Cadmium	ug/L (ppb)	5	102	80-120
Chromium	ug/L (ppb)	20	88	80-120
Cobalt	ug/L (ppb)	20	91	80-120
Copper	ug/L (ppb)	20	96	80-120
Iron	ug/L (ppb)	100	89	80-120
Lead	ug/L (ppb)	10	93	80-120
Manganese	ug/L (ppb)	20	88	80-120
Mercury	ug/L (ppb)	5	94	80-120
Molybdenum	ug/L (ppb)	10	87	80-120
Nickel	ug/L (ppb)	20	94	80-120
Selenium	ug/L (ppb)	5	94	80-120
Silver	ug/L (ppb)	5	90	80-120
Thallium	ug/L (ppb)	5	86	80-120
Vanadium	ug/L (ppb)	20	89	80-120
Zinc	ug/L (ppb)	50	97	80-120

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
ORGANOCHLORINE PESTICIDES
BY EPA METHOD 8081B

Laboratory Code: 402374-01 1/30 (Matrix Spike) 1/30

end

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
alpha-BHC	mg/kg (ppm)	0.1	<0.01	76	76	17-122	0
gamma-BHC (Lindane)	mg/kg (ppm)	0.1	<0.01	77	77	18-128	0
beta-BHC	mg/kg (ppm)	0.1	<0.01	74	79	17-130	7
delta-BHC	mg/kg (ppm)	0.1	<0.01	76	82	20-124	8
Heptachlor	mg/kg (ppm)	0.1	<0.01	84	84	15-133	0
Aldrin	mg/kg (ppm)	0.1	<0.01	81	81	26-125	0
Heptachlor Epoxide	mg/kg (ppm)	0.1	<0.01	75	80	19-132	6
trans-Chlordane	mg/kg (ppm)	0.1	<0.01	81	84	15-157	4
cis-Chlordane	mg/kg (ppm)	0.1	<0.01	79	82	17-133	4
4,4'-DDE	mg/kg (ppm)	0.1	<0.01	81	83	17-139	2
Endosulfan I	mg/kg (ppm)	0.1	<0.01	71	76	19-130	7
Dieldrin	mg/kg (ppm)	0.1	<0.01	79	83	17-140	5
Endrin	mg/kg (ppm)	0.1	<0.01	88	89	20-143	1
4,4'-DDD	mg/kg (ppm)	0.1	<0.01	84	83	20-143	1
Endosulfan II	mg/kg (ppm)	0.1	<0.01	80	80	21-133	0
4,4'-DDT	mg/kg (ppm)	0.1	<0.01	85	83	10-385	2
Endrin Aldehyde	mg/kg (ppm)	0.1	<0.01	65	74	12-123	13
Methoxychlor	mg/kg (ppm)	0.1	<0.01	87	86	10-226	1
Endosulfan Sulfate	mg/kg (ppm)	0.1	<0.01	80	79	17-134	1
Endrin Ketone	mg/kg (ppm)	0.1	<0.01	80	79	10-153	1
Toxaphene	mg/kg (ppm)	4	<0.1	39	42	12-123	7

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
ORGANOCHLORINE PESTICIDES
BY EPA METHOD 8081B

Laboratory Code: Laboratory Control Sample 1/30

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
alpha-BHC	mg/kg (ppm)	0.1	90	57-116
gamma-BHC (Lindane)	mg/kg (ppm)	0.1	91	59-118
beta-BHC	mg/kg (ppm)	0.1	92	63-113
delta-BHC	mg/kg (ppm)	0.1	98	58-124
Heptachlor	mg/kg (ppm)	0.1	100	60-117
Aldrin	mg/kg (ppm)	0.1	98	63-113
Heptachlor Epoxide	mg/kg (ppm)	0.1	96	70-130
trans-Chlordane	mg/kg (ppm)	0.1	98	70-130
cis-Chlordane	mg/kg (ppm)	0.1	99	70-130
4,4'-DDE	mg/kg (ppm)	0.1	101	69-121
Endosulfan I	mg/kg (ppm)	0.1	95	70-130
Dieldrin	mg/kg (ppm)	0.1	98	70-130
Endrin	mg/kg (ppm)	0.1	105	65-140
4,4'-DDD	mg/kg (ppm)	0.1	98	70-130
Endosulfan II	mg/kg (ppm)	0.1	95	70-130
4,4'-DDT	mg/kg (ppm)	0.1	99	57-135
Endrin Aldehyde	mg/kg (ppm)	0.1	88	25-133
Methoxychlor	mg/kg (ppm)	0.1	101	57-147
Endosulfan Sulfate	mg/kg (ppm)	0.1	92	70-130
Endrin Ketone	mg/kg (ppm)	0.1	93	70-130
Toxaphene	mg/kg (ppm)	4	88	53-143

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES FOR
ORGANOCHLORINE PESTICIDES
BY EPA METHOD 8081B

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
alpha-BHC	ug/L (ppb)	0.25	65	61	41-101	6
gamma-BHC (Lindane)	ug/L (ppb)	0.25	66	63	43-105	5
beta-BHC	ug/L (ppb)	0.25	56	64	49-104	13
delta-BHC	ug/L (ppb)	0.25	69	68	45-108	1
Heptachlor	ug/L (ppb)	0.25	60	56	39-104	7
Aldrin	ug/L (ppb)	0.25	62	58	43-98	7
Heptachlor Epoxide	ug/L (ppb)	0.25	69	64	52-110	8
trans-Chlordane	ug/L (ppb)	0.25	73	64	39-119	13
cis-Chlordane	ug/L (ppb)	0.25	70	63	47-106	11
4,4'-DDE	ug/L (ppb)	0.25	71	65	48-114	9
Endosulfan I	ug/L (ppb)	0.25	70	65	10-140	7
Dieldrin	ug/L (ppb)	0.25	69	64	54-115	8
Endrin	ug/L (ppb)	0.25	74	69	39-136	7
4,4'-DDD	ug/L (ppb)	0.25	75	70	31-161	7
Endosulfan II	ug/L (ppb)	0.25	74	68	10-144	8
4,4'-DDT	ug/L (ppb)	0.25	74	68	50-121	8
Endrin Aldehyde	ug/L (ppb)	0.25	55	57	47-113	4
Methoxychlor	ug/L (ppb)	0.25	74	69	51-126	7
Endosulfan Sulfate	ug/L (ppb)	0.25	73	69	58-110	6
Endrin Ketone	ug/L (ppb)	0.25	70	66	57-120	6
Toxaphene	ug/L (ppb)	4	100	100	56-123	0

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF SOIL SAMPLES FOR
POLYCHLORINATED BIPHENYLS AS
AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: 404010-01 1/30 (Matrix Spike) 1/30

end

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Control Limits	RPD (Limit 20)
Aroclor 1016	mg/kg (ppm)	0.25	<0.02	95	94	29-125	1
Aroclor 1260	mg/kg (ppm)	0.25	<0.02	92	105	12-177	13

Laboratory Code: Laboratory Control Sample 1/30

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Aroclor 1016	mg/kg (ppm)	0.25	107	55-137
Aroclor 1260	mg/kg (ppm)	0.25	104	51-150

QUALITY ASSURANCE RESULTS
FOR THE ANALYSIS OF WATER SAMPLES FOR
POLYCHLORINATED BIPHENYLS AS
AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Aroclor 1016	ug/L (ppb)	0.25	59	66	20-94	11
Aroclor 1260	ug/L (ppb)	0.25	59	72	23-123	20

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 404057-03 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	mg/kg (ppm)	2	<0.5	42	41	10-142	2
Chloromethane	mg/kg (ppm)	2	<0.5	65	62	10-126	5
Vinyl chloride	mg/kg (ppm)	2	<0.05	69	66	10-138	4
Bromomethane	mg/kg (ppm)	2	<0.5	66	61	10-163	8
Chloroethane	mg/kg (ppm)	2	<0.5	77	70	10-176	10
Trichlorofluoromethane	mg/kg (ppm)	2	<0.5	81	79	10-176	2
Acetone	mg/kg (ppm)	10	<5	79	71	10-163	11
1,1-Dichloroethene	mg/kg (ppm)	2	<0.05	90	85	10-160	6
Hexane	mg/kg (ppm)	2	<0.25	87	82	10-137	6
Methylene chloride	mg/kg (ppm)	2	<0.5	86	84	10-156	2
Methyl t-butyl ether (MTBE)	mg/kg (ppm)	2	<0.05	87	83	21-145	5
trans-1,2-Dichloroethene	mg/kg (ppm)	2	<0.05	94	85	14-137	10
1,1-Dichloroethane	mg/kg (ppm)	2	<0.05	93	87	19-140	7
2,2-Dichloropropane	mg/kg (ppm)	2	<0.05	102	96	10-158	6
cis-1,2-Dichloroethene	mg/kg (ppm)	2	<0.05	89	86	25-135	3
Chloroform	mg/kg (ppm)	2	<0.05	88	84	21-145	5
2-Butanone (MEK)	mg/kg (ppm)	10	<1	80	74	19-147	8
1,2-Dichloroethane (EDC)	mg/kg (ppm)	2	<0.05	89	84	12-160	6
1,1,1-Trichloroethane	mg/kg (ppm)	2	<0.05	89	84	10-156	6
1,1-Dichloropropene	mg/kg (ppm)	2	<0.05	89	86	17-140	3
Carbon tetrachloride	mg/kg (ppm)	2	<0.05	90	86	9-164	5
Benzene	mg/kg (ppm)	2	<0.03	90	86	29-129	5
Trichloroethene	mg/kg (ppm)	2	<0.02	87	80	21-139	8
1,2-Dichloropropane	mg/kg (ppm)	2	<0.05	92	86	30-135	7
Bromodichloromethane	mg/kg (ppm)	2	<0.05	90	83	23-155	8
Dibromomethane	mg/kg (ppm)	2	<0.05	89	83	23-145	7
4-Methyl-2-pentanone	mg/kg (ppm)	10	<1	96	87	24-155	10
cis-1,3-Dichloropropene	mg/kg (ppm)	2	<0.05	93	85	28-144	9
Toluene	mg/kg (ppm)	2	<0.05	85	82	35-130	4
trans-1,3-Dichloropropene	mg/kg (ppm)	2	<0.05	87	83	26-149	5
1,1,2-Trichloroethane	mg/kg (ppm)	2	<0.05	86	81	10-205	6
2-Hexanone	mg/kg (ppm)	10	<0.5	80	79	15-166	1
1,3-Dichloropropane	mg/kg (ppm)	2	<0.05	84	80	31-137	5
Tetrachloroethene	mg/kg (ppm)	2	<0.025	89	89	20-133	0
Dibromochloromethane	mg/kg (ppm)	2	<0.05	86	79	28-150	8
1,2-Dibromoethane (EDB)	mg/kg (ppm)	2	<0.05	85	83	28-142	2
Chlorobenzene	mg/kg (ppm)	2	<0.05	91	83	32-129	9
Ethylbenzene	mg/kg (ppm)	2	<0.05	86	82	32-137	5
1,1,1,2-Tetrachloroethane	mg/kg (ppm)	2	<0.05	85	84	31-143	1
m,p-Xylene	mg/kg (ppm)	4	<0.1	88	85	34-136	3
o-Xylene	mg/kg (ppm)	2	<0.05	88	84	33-134	5
Styrene	mg/kg (ppm)	2	<0.05	87	85	35-137	2
Isopropylbenzene	mg/kg (ppm)	2	<0.05	88	86	31-142	2
Bromoform	mg/kg (ppm)	2	<0.05	83	82	21-156	1
n-Propylbenzene	mg/kg (ppm)	2	<0.05	87	82	23-146	6
Bromobenzene	mg/kg (ppm)	2	<0.05	87	82	34-130	6
1,3,5-Trimethylbenzene	mg/kg (ppm)	2	<0.05	85	82	18-149	4
1,1,2,2-Tetrachloroethane	mg/kg (ppm)	2	<0.05	90	83	28-140	8
1,2,3-Trichloropropane	mg/kg (ppm)	2	<0.05	82	78	25-144	5
2-Chlorotoluene	mg/kg (ppm)	2	<0.05	86	81	31-134	6

4-Chlorotoluene	mg/kg (ppm)	2	<0.05	84	79	31-136	6
tert-Butylbenzene	mg/kg (ppm)	2	<0.05	86	82	30-137	5
1,2,4-Trimethylbenzene	mg/kg (ppm)	2	<0.05	85	80	10-182	6
sec-Butylbenzene	mg/kg (ppm)	2	<0.05	87	82	23-145	6
p-Isopropyltoluene	mg/kg (ppm)	2	<0.05	89	84	21-149	6
1,3-Dichlorobenzene	mg/kg (ppm)	2	<0.05	87	85	30-131	2
1,4-Dichlorobenzene	mg/kg (ppm)	2	<0.05	85	82	29-129	4
1,2-Dichlorobenzene	mg/kg (ppm)	2	<0.05	87	82	31-132	6
1,2-Dibromo-3-chloropropane	mg/kg (ppm)	2	<0.5	76	69	11-161	10
1,2,4-Trichlorobenzene	mg/kg (ppm)	2	<0.25	87	81	22-142	7
Hexachlorobutadiene	mg/kg (ppm)	2	<0.25	83	76	10-142	9
Naphthalene	mg/kg (ppm)	2	<0.05	83	78	14-157	6
1,2,3-Trichlorobenzene	mg/kg (ppm)	2	<0.25	83	77	20-144	7

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Dichlorodifluoromethane	mg/kg (ppm)	2	69	10-146
Chloromethane	mg/kg (ppm)	2	83	27-133
Vinyl chloride	mg/kg (ppm)	2	88	22-139
Bromomethane	mg/kg (ppm)	2	81	10-201
Chloroethane	mg/kg (ppm)	2	94	10-163
Trichlorofluoromethane	mg/kg (ppm)	2	96	10-196
Acetone	mg/kg (ppm)	10	106	52-141
1,1-Dichloroethene	mg/kg (ppm)	2	104	47-128
Hexane	mg/kg (ppm)	2	104	43-142
Methylene chloride	mg/kg (ppm)	2	92	10-184
Methyl t-butyl ether (MTBE)	mg/kg (ppm)	2	101	60-123
trans-1,2-Dichloroethene	mg/kg (ppm)	2	106	64-132
1,1-Dichloroethane	mg/kg (ppm)	2	106	64-135
2,2-Dichloropropane	mg/kg (ppm)	2	114	52-170
cis-1,2-Dichloroethene	mg/kg (ppm)	2	103	64-135
Chloroform	mg/kg (ppm)	2	100	61-139
2-Butanone (MEK)	mg/kg (ppm)	10	105	30-197
1,2-Dichloroethane (EDC)	mg/kg (ppm)	2	102	56-135
1,1,1-Trichloroethane	mg/kg (ppm)	2	102	62-131
1,1-Dichloropropene	mg/kg (ppm)	2	100	64-136
Carbon tetrachloride	mg/kg (ppm)	2	100	60-139
Benzene	mg/kg (ppm)	2	104	65-136
Trichloroethene	mg/kg (ppm)	2	100	63-139
1,2-Dichloropropane	mg/kg (ppm)	2	105	61-145
Bromodichloromethane	mg/kg (ppm)	2	102	57-126
Dibromomethane	mg/kg (ppm)	2	102	62-123
4-Methyl-2-pentanone	mg/kg (ppm)	10	107	45-145
cis-1,3-Dichloropropene	mg/kg (ppm)	2	105	65-143
Toluene	mg/kg (ppm)	2	102	66-126
trans-1,3-Dichloropropene	mg/kg (ppm)	2	102	65-131
1,1,2-Trichloroethane	mg/kg (ppm)	2	103	62-131
2-Hexanone	mg/kg (ppm)	10	96	33-152
1,3-Dichloropropane	mg/kg (ppm)	2	99	67-128
Tetrachloroethene	mg/kg (ppm)	2	107	68-128
Dibromochloromethane	mg/kg (ppm)	2	103	55-121
1,2-Dibromoethane (EDB)	mg/kg (ppm)	2	102	66-129
Chlorobenzene	mg/kg (ppm)	2	104	67-128
Ethylbenzene	mg/kg (ppm)	2	102	64-123
1,1,1,2-Tetrachloroethane	mg/kg (ppm)	2	97	64-121
m,p-Xylene	mg/kg (ppm)	4	104	68-128
o-Xylene	mg/kg (ppm)	2	106	67-129
Styrene	mg/kg (ppm)	2	105	67-129
Isopropylbenzene	mg/kg (ppm)	2	104	68-128
Bromoform	mg/kg (ppm)	2	100	56-132
n-Propylbenzene	mg/kg (ppm)	2	98	68-129
Bromobenzene	mg/kg (ppm)	2	99	69-128
1,3,5-Trimethylbenzene	mg/kg (ppm)	2	97	69-129
1,1,2,2-Tetrachloroethane	mg/kg (ppm)	2	100	56-143

1,2,3-Trichloropropane	mg/kg (ppm)	2	98	61-137
2-Chlorotoluene	mg/kg (ppm)	2	98	69-128
4-Chlorotoluene	mg/kg (ppm)	2	96	67-127
tert-Butylbenzene	mg/kg (ppm)	2	100	69-129
1,2,4-Trimethylbenzene	mg/kg (ppm)	2	99	69-128
sec-Butylbenzene	mg/kg (ppm)	2	98	69-130
p-Isopropyltoluene	mg/kg (ppm)	2	104	69-130
1,3-Dichlorobenzene	mg/kg (ppm)	2	101	69-127
1,4-Dichlorobenzene	mg/kg (ppm)	2	99	68-126
1,2-Dichlorobenzene	mg/kg (ppm)	2	101	69-127
1,2-Dibromo-3-chloropropane	mg/kg (ppm)	2	92	58-138
1,2,4-Trichlorobenzene	mg/kg (ppm)	2	100	64-135
Hexachlorobutadiene	mg/kg (ppm)	2	99	50-153
Naphthalene	mg/kg (ppm)	2	97	62-128
1,2,3-Trichlorobenzene	mg/kg (ppm)	2	95	61-126

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 403449-09 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Dichlorodifluoromethane	ug/L (ppb)	10	<1	89	27-164
Chloromethane	ug/L (ppb)	10	<10	96	34-141
Vinyl chloride	ug/L (ppb)	10	<0.02	94	16-176
Bromomethane	ug/L (ppb)	10	<5	130	10-193
Chloroethane	ug/L (ppb)	10	<1	108	50-150
Trichlorofluoromethane	ug/L (ppb)	10	<1	99	50-150
2-Propanol	ug/L (ppb)	0	<10	0	50-150
Acetone	ug/L (ppb)	50	<50	77	15-179
1,1-Dichloroethene	ug/L (ppb)	10	<1	95	50-150
Hexane	ug/L (ppb)	10	<5	107	49-161
Methylene chloride	ug/L (ppb)	10	<5	97	40-143
Methyl t-butyl ether (MTBE)	ug/L (ppb)	10	<1	97	50-150
trans-1,2-Dichloroethene	ug/L (ppb)	10	<1	98	50-150
1,1-Dichloroethane	ug/L (ppb)	10	<1	96	50-150
2,2-Dichloropropane	ug/L (ppb)	10	<1	139	62-152
cis-1,2-Dichloroethene	ug/L (ppb)	10	<1	98	50-150
Chloroform	ug/L (ppb)	10	<1	96	50-150
2-Butanone (MEK)	ug/L (ppb)	50	<20	92	34-168
1,2-Dichloroethane (EDC)	ug/L (ppb)	10	<0.2	98	50-150
1,1,1-Trichloroethane	ug/L (ppb)	10	<1	99	50-150
1,1-Dichloropropene	ug/L (ppb)	10	<1	96	50-150
Carbon tetrachloride	ug/L (ppb)	10	<0.5	106	50-150
Benzene	ug/L (ppb)	10	<0.35	97	50-150
Trichloroethene	ug/L (ppb)	10	<0.5	96	43-133
1,2-Dichloropropane	ug/L (ppb)	10	<1	96	50-150
Bromodichloromethane	ug/L (ppb)	10	<0.5	110	50-150
Dibromomethane	ug/L (ppb)	10	<1	99	50-150
4-Methyl-2-pentanone	ug/L (ppb)	50	<10	109	50-150
cis-1,3-Dichloropropene	ug/L (ppb)	10	<0.4	95	48-145
Toluene	ug/L (ppb)	10	<1	99	50-150
trans-1,3-Dichloropropene	ug/L (ppb)	10	<0.4	90	37-152
1,1,2-Trichloroethane	ug/L (ppb)	10	<0.5	128	50-150
2-Hexanone	ug/L (ppb)	50	<10	89	50-150
1,3-Dichloropropane	ug/L (ppb)	10	<1	94	50-150
Tetrachloroethene	ug/L (ppb)	10	<1	101	50-150
Dibromochloromethane	ug/L (ppb)	10	<0.5	90	33-164
1,2-Dibromoethane (EDB)	ug/L (ppb)	10	<0.01	102	50-150
Chlorobenzene	ug/L (ppb)	10	<1	94	50-150
Ethylbenzene	ug/L (ppb)	10	<1	103	50-150
1,1,1,2-Tetrachloroethane	ug/L (ppb)	10	<1	92	50-150
m,p-Xylene	ug/L (ppb)	20	<2	102	50-150
o-Xylene	ug/L (ppb)	10	<1	100	50-150
Styrene	ug/L (ppb)	10	<1	97	50-150
Isopropylbenzene	ug/L (ppb)	10	<1	97	50-150
Bromoform	ug/L (ppb)	10	<5	91	23-161
n-Propylbenzene	ug/L (ppb)	10	<1	100	50-150
Bromobenzene	ug/L (ppb)	10	<1	94	50-150
1,3,5-Trimethylbenzene	ug/L (ppb)	10	<1	97	50-150
1,1,2,2-Tetrachloroethane	ug/L (ppb)	10	<0.2	109	57-162
1,2,3-Trichloropropane	ug/L (ppb)	10	<1	97	33-151

2-Chlorotoluene	ug/L (ppb)	10	<1	95	50-150
4-Chlorotoluene	ug/L (ppb)	10	<1	96	50-150
tert-Butylbenzene	ug/L (ppb)	10	<1	97	50-150
1,2,4-Trimethylbenzene	ug/L (ppb)	10	<1	95	50-150
sec-Butylbenzene	ug/L (ppb)	10	<1	98	46-139
p-Isopropyltoluene	ug/L (ppb)	10	<1	99	46-140
1,3-Dichlorobenzene	ug/L (ppb)	10	<1	95	50-150
1,4-Dichlorobenzene	ug/L (ppb)	10	<1	95	50-150
1,2-Dichlorobenzene	ug/L (ppb)	10	<1	94	50-150
1,2-Dibromo-3-chloropropane	ug/L (ppb)	10	<10	86	50-150
1,2,4-Trichlorobenzene	ug/L (ppb)	10	<1	94	50-150
Hexachlorobutadiene	ug/L (ppb)	10	<0.5	95	42-150
Naphthalene	ug/L (ppb)	10	<1	101	50-150
1,2,3-Trichlorobenzene	ug/L (ppb)	10	<1	93	44-155

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Dichlorodifluoromethane	ug/L (ppb)	10	85	86	49-149	1
Chloromethane	ug/L (ppb)	10	92	91	34-143	1
Vinyl chloride	ug/L (ppb)	10	93	92	43-149	1
Bromomethane	ug/L (ppb)	10	131	131	28-182	0
Chloroethane	ug/L (ppb)	10	106	106	59-157	0
Trichlorofluoromethane	ug/L (ppb)	10	104	101	59-141	3
2-Propanol	ug/L (ppb)	0	0	0	70-130	
Acetone	ug/L (ppb)	50	78	74	20-139	5
1,1-Dichloroethene	ug/L (ppb)	10	92	92	67-138	0
Hexane	ug/L (ppb)	10	99	99	50-161	0
Methylene chloride	ug/L (ppb)	10	97	92	29-192	5
Methyl t-butyl ether (MTBE)	ug/L (ppb)	10	94	93	70-130	1
trans-1,2-Dichloroethene	ug/L (ppb)	10	94	94	70-130	0
1,1-Dichloroethane	ug/L (ppb)	10	93	93	70-130	0
2,2-Dichloropropane	ug/L (ppb)	10	136	115	71-148	17
cis-1,2-Dichloroethene	ug/L (ppb)	10	95	94	70-130	1
Chloroform	ug/L (ppb)	10	93	92	70-130	1
2-Butanone (MEK)	ug/L (ppb)	50	89	87	50-157	2
1,2-Dichloroethane (EDC)	ug/L (ppb)	10	94	94	70-130	0
1,1,1-Trichloroethane	ug/L (ppb)	10	96	95	70-130	1
1,1-Dichloropropene	ug/L (ppb)	10	93	91	70-130	2
Carbon tetrachloride	ug/L (ppb)	10	103	101	70-130	2
Benzene	ug/L (ppb)	10	93	92	70-130	1
Trichloroethene	ug/L (ppb)	10	93	92	70-130	1
1,2-Dichloropropane	ug/L (ppb)	10	92	90	70-130	2
Bromodichloromethane	ug/L (ppb)	10	95	95	70-130	0
Dibromomethane	ug/L (ppb)	10	96	95	70-130	1
4-Methyl-2-pentanone	ug/L (ppb)	50	99	95	70-130	4
cis-1,3-Dichloropropene	ug/L (ppb)	10	92	91	70-130	1
Toluene	ug/L (ppb)	10	102	104	70-130	2
trans-1,3-Dichloropropene	ug/L (ppb)	10	95	97	70-130	2
1,1,2-Trichloroethane	ug/L (ppb)	10	98	99	70-130	1
2-Hexanone	ug/L (ppb)	50	86	82	66-132	5
1,3-Dichloropropane	ug/L (ppb)	10	96	98	70-130	2
Tetrachloroethene	ug/L (ppb)	10	104	105	70-130	1
Dibromochloromethane	ug/L (ppb)	10	94	97	63-142	3
1,2-Dibromoethane (EDB)	ug/L (ppb)	10	102	103	70-130	1
Chlorobenzene	ug/L (ppb)	10	96	99	70-130	3
Ethylbenzene	ug/L (ppb)	10	103	105	70-130	2
1,1,1,2-Tetrachloroethane	ug/L (ppb)	10	98	99	70-130	1
m,p-Xylene	ug/L (ppb)	20	103	105	70-130	2
o-Xylene	ug/L (ppb)	10	101	103	70-130	2
Styrene	ug/L (ppb)	10	97	97	70-130	0
Isopropylbenzene	ug/L (ppb)	10	97	98	70-130	1
Bromoform	ug/L (ppb)	10	96	95	50-157	1
n-Propylbenzene	ug/L (ppb)	10	102	101	70-130	1
Bromobenzene	ug/L (ppb)	10	99	99	70-130	0
1,3,5-Trimethylbenzene	ug/L (ppb)	10	100	100	52-150	0

1,1,2,2-Tetrachloroethane	ug/L (ppb)	10	104	103	75-140	1
1,2,3-Trichloropropane	ug/L (ppb)	10	103	101	40-153	2
2-Chlorotoluene	ug/L (ppb)	10	102	100	70-130	2
4-Chlorotoluene	ug/L (ppb)	10	101	99	70-130	2
tert-Butylbenzene	ug/L (ppb)	10	100	98	70-130	2
1,2,4-Trimethylbenzene	ug/L (ppb)	10	99	96	70-130	3
sec-Butylbenzene	ug/L (ppb)	10	100	99	70-130	1
p-Isopropyltoluene	ug/L (ppb)	10	100	99	70-130	1
1,3-Dichlorobenzene	ug/L (ppb)	10	99	98	70-130	1
1,4-Dichlorobenzene	ug/L (ppb)	10	101	99	70-130	2
1,2-Dichlorobenzene	ug/L (ppb)	10	99	98	70-130	1
1,2-Dibromo-3-chloropropane	ug/L (ppb)	10	97	92	70-130	5
1,2,4-Trichlorobenzene	ug/L (ppb)	10	96	92	70-130	4
Hexachlorobutadiene	ug/L (ppb)	10	98	96	70-130	2
Naphthalene	ug/L (ppb)	10	96	92	61-133	4
1,2,3-Trichlorobenzene	ug/L (ppb)	10	94	91	69-143	3

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: 403380-04 1/5 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Phenol	mg/kg (ppm)	0.83	<0.5	83	84	50-150	1
Bis(2-chloroethyl) ether	mg/kg (ppm)	0.83	<0.05	85	85	50-150	0
2-Chlorophenol	mg/kg (ppm)	0.83	<0.5	83	84	50-150	1
1,3-Dichlorobenzene	mg/kg (ppm)	0.83	<0.05	73	77	36-107	5
1,4-Dichlorobenzene	mg/kg (ppm)	0.83	<0.05	77	79	37-106	3
1,2-Dichlorobenzene	mg/kg (ppm)	0.83	<0.05	76	78	39-106	3
Benzyl alcohol	mg/kg (ppm)	4.2	<0.5	78	79	50-150	1
2,2'-Oxybis(1-chloropropane)	mg/kg (ppm)	0.83	<0.05	84	84	50-150	0
2-Methylphenol	mg/kg (ppm)	0.83	<0.5	88	87	50-150	1
Hexachloroethane	mg/kg (ppm)	0.83	<0.05	81	82	19-129	1
N-Nitroso-di-n-propylamine	mg/kg (ppm)	0.83	<0.05	90	91	50-150	1
3-Methylphenol + 4-Methylphenol	mg/kg (ppm)	0.83	<1	89	90	50-150	1
Nitrobenzene	mg/kg (ppm)	0.83	<0.05	81	82	50-150	1
Isophorone	mg/kg (ppm)	0.83	<0.05	86	105	16-156	20
2-Nitrophenol	mg/kg (ppm)	0.83	<0.5	91	92	50-150	1
2,4-Dimethylphenol	mg/kg (ppm)	0.83	<0.5	86	86	35-117	0
Benzoic acid	mg/kg (ppm)	2.5	<2.5	50	54	10-105	8
Bis(2-chloroethoxy)methane	mg/kg (ppm)	0.83	<0.05	83	83	50-150	0
2,4-Dichlorophenol	mg/kg (ppm)	0.83	<0.5	83	83	50-150	0
1,2,4-Trichlorobenzene	mg/kg (ppm)	0.83	<0.05	84	85	50-150	1
Naphthalene	mg/kg (ppm)	0.83	<0.01	77	77	50-150	0
Hexachlorobutadiene	mg/kg (ppm)	0.83	<0.05	68	71	39-106	4
4-Chloroaniline	mg/kg (ppm)	6.8	<5	66	69	40-101	4
4-Chloro-3-methylphenol	mg/kg (ppm)	0.83	<0.5	97	95	50-150	2
2-Methylnaphthalene	mg/kg (ppm)	0.83	<0.01	76	75	50-150	1
1-Methylnaphthalene	mg/kg (ppm)	0.83	<0.01	76	75	50-150	1
Hexachlorocyclopentadiene	mg/kg (ppm)	0.83	<0.15	69	72	27-127	4
2,4,6-Trichlorophenol	mg/kg (ppm)	0.83	<0.5	93	91	35-130	2
2,4,5-Trichlorophenol	mg/kg (ppm)	0.83	<0.5	94	95	43-126	1
2-Chloronaphthalene	mg/kg (ppm)	0.83	<0.05	81	80	50-150	1
2-Nitroaniline	mg/kg (ppm)	4.2	<0.25	73	74	50-150	1
Dimethyl phthalate	mg/kg (ppm)	0.83	<0.5	88	86	50-150	2
Acenaphthylene	mg/kg (ppm)	0.83	<0.01	72	72	50-150	0
2,6-Dinitrotoluene	mg/kg (ppm)	0.83	<0.25	87	87	50-150	0
3-Nitroaniline	mg/kg (ppm)	4.2	<5	74	73	50-150	1
Acenaphthene	mg/kg (ppm)	0.83	<0.01	70	69	50-150	1
2,4-Dinitrophenol	mg/kg (ppm)	1.7	<1.5	88	92	10-146	4
Dibenzofuran	mg/kg (ppm)	0.83	<0.05	79	78	50-150	1
2,4-Dinitrotoluene	mg/kg (ppm)	0.83	<0.25	102	101	44-141	1
4-Nitrophenol	mg/kg (ppm)	1.7	<1.5	105	112	33-142	6
Diethyl phthalate	mg/kg (ppm)	0.83	<0.5	85	84	50-150	1
Fluorene	mg/kg (ppm)	0.83	<0.01	79	78	50-150	1
4-Chlorophenyl phenyl ether	mg/kg (ppm)	0.83	<0.05	89	88	50-150	1
1,2-Diphenylhydrazine	mg/kg (ppm)	0.83	<0.05	89	87	50-150	2
N-Nitrosodiphenylamine	mg/kg (ppm)	0.83	<0.05	85	84	50-150	1
4-Nitroaniline	mg/kg (ppm)	4.2	<5	82	81	50-150	1
4,6-Dinitro-2-methylphenol	mg/kg (ppm)	0.83	<1.5	112	111	33-155	1
4-Bromophenyl phenyl ether	mg/kg (ppm)	0.83	<0.05	91	89	50-150	2
Hexachlorobenzene	mg/kg (ppm)	0.83	<0.05	91	89	50-150	2
Pentachlorophenol	mg/kg (ppm)	0.83	<0.25	101	102	15-159	1
Phenanthrene	mg/kg (ppm)	0.83	<0.01	86	85	10-170	1
Anthracene	mg/kg (ppm)	0.83	<0.01	85	85	37-139	0
Carbazole	mg/kg (ppm)	0.83	<0.05	83	82	50-150	1
Di-n-butyl phthalate	mg/kg (ppm)	0.83	<0.5	90	89	50-150	1
Fluoranthene	mg/kg (ppm)	0.83	<0.01	88	88	10-203	0
Benzidine	mg/kg (ppm)	1.3	<1	44	48	10-72	9
Pyrene	mg/kg (ppm)	0.83	<0.01	89	87	10-208	2
Benzyl butyl phthalate	mg/kg (ppm)	0.83	<0.5	93	92	50-150	1
3,3'-Dichlorobenzidine	mg/kg (ppm)	1.3	<0.5	76	74	10-119	3
Benz(a)anthracene	mg/kg (ppm)	0.83	<0.01	90	89	37-146	1
Chrysene	mg/kg (ppm)	0.83	<0.01	81	79	36-144	2
Bis(2-ethylhexyl) phthalate	mg/kg (ppm)	0.83	<0.8	93	94	50-150	1
Di-n-octyl phthalate	mg/kg (ppm)	0.83	<0.5	101	101	10-243	0
Benzo(a)pyrene	mg/kg (ppm)	0.83	<0.01	87	87	40-150	0
Benzo(b)fluoranthene	mg/kg (ppm)	0.83	<0.01	90	88	45-157	2
Benzo(k)fluoranthene	mg/kg (ppm)	0.83	<0.01	86	89	50-150	3
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.83	<0.01	110	102	24-145	8
Dibenz(a,h)anthracene	mg/kg (ppm)	0.83	<0.01	109	105	31-137	4
Benzo(g,h,i)perylene	mg/kg (ppm)	0.83	<0.01	102	98	14-141	4

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample 1/5
end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Phenol	mg/kg (ppm)	0.83	85	57-113
Bis(2-chloroethyl) ether	mg/kg (ppm)	0.83	88	55-108
2-Chlorophenol	mg/kg (ppm)	0.83	88	60-104
1,3-Dichlorobenzene	mg/kg (ppm)	0.83	79	54-103
1,4-Dichlorobenzene	mg/kg (ppm)	0.83	81	54-102
1,2-Dichlorobenzene	mg/kg (ppm)	0.83	79	55-103
Benzyl alcohol	mg/kg (ppm)	4.2	80	36-147
2,2'-Oxybis(1-chloropropane)	mg/kg (ppm)	0.83	89	56-109
2-Methylphenol	mg/kg (ppm)	0.83	92	62-107
Hexachloroethane	mg/kg (ppm)	0.83	86	54-105
N-Nitroso-di-n-propylamine	mg/kg (ppm)	0.83	92	64-112
3-Methylphenol + 4-Methylphenol	mg/kg (ppm)	0.83	93	63-110
Nitrobenzene	mg/kg (ppm)	0.83	83	55-111
Isophorone	mg/kg (ppm)	0.83	89	52-127
2-Nitrophenol	mg/kg (ppm)	0.83	94	53-122
2,4-Dimethylphenol	mg/kg (ppm)	0.83	88	31-105
Benzoic acid	mg/kg (ppm)	2.5	72	38-99
Bis(2-chloroethoxy)methane	mg/kg (ppm)	0.83	86	63-112
2,4-Dichlorophenol	mg/kg (ppm)	0.83	86	62-112
1,2,4-Trichlorobenzene	mg/kg (ppm)	0.83	89	59-105
Naphthalene	mg/kg (ppm)	0.83	82	59-105
Hexachlorobutadiene	mg/kg (ppm)	0.83	72	54-108
4-Chloroaniline	mg/kg (ppm)	6.8	65	36-111
4-Chloro-3-methylphenol	mg/kg (ppm)	0.83	100	63-116
2-Methylnaphthalene	mg/kg (ppm)	0.83	80	62-108
1-Methylnaphthalene	mg/kg (ppm)	0.83	80	62-108
Hexachlorocyclopentadiene	mg/kg (ppm)	0.83	74	48-123
2,4,6-Trichlorophenol	mg/kg (ppm)	0.83	95	61-114
2,4,5-Trichlorophenol	mg/kg (ppm)	0.83	98	64-121
2-Chloronaphthalene	mg/kg (ppm)	0.83	84	62-112
2-Nitroaniline	mg/kg (ppm)	4.2	74	30-179
Dimethyl phthalate	mg/kg (ppm)	0.83	88	63-124
Acenaphthylene	mg/kg (ppm)	0.83	75	61-111
2,6-Dinitrotoluene	mg/kg (ppm)	0.83	88	63-131
3-Nitroaniline	mg/kg (ppm)	4.2	79	57-114
Acenaphthene	mg/kg (ppm)	0.83	72	61-110
2,4-Dinitrophenol	mg/kg (ppm)	1.7	99	51-143
Dibenzofuran	mg/kg (ppm)	0.83	81	65-118
2,4-Dinitrotoluene	mg/kg (ppm)	0.83	99	47-146
4-Nitrophenol	mg/kg (ppm)	1.7	99	63-127
Diethyl phthalate	mg/kg (ppm)	0.83	89	63-124
Fluorene	mg/kg (ppm)	0.83	80	62-114
4-Chlorophenyl phenyl ether	mg/kg (ppm)	0.83	93	61-116
N-Nitrosodiphenylamine	mg/kg (ppm)	0.83	86	64-116
4-Nitroaniline	mg/kg (ppm)	4.2	82	63-117
4,6-Dinitro-2-methylphenol	mg/kg (ppm)	0.83	113	59-152
4-Bromophenyl phenyl ether	mg/kg (ppm)	0.83	94	66-118
Hexachlorobenzene	mg/kg (ppm)	0.83	94	57-115
Pentachlorophenol	mg/kg (ppm)	0.83	113	56-130
Phenanthrene	mg/kg (ppm)	0.83	89	64-112
Anthracene	mg/kg (ppm)	0.83	87	63-111
Carbazole	mg/kg (ppm)	0.83	85	68-120
Di-n-butyl phthalate	mg/kg (ppm)	0.83	94	52-130
Fluoranthene	mg/kg (ppm)	0.83	91	66-115
Benzidine	mg/kg (ppm)	1.3	0	0-100
Pyrene	mg/kg (ppm)	0.83	90	65-112
Benzyl butyl phthalate	mg/kg (ppm)	0.83	92	56-131
3,3'-Dichlorobenzidine	mg/kg (ppm)	1.3	72	10-100
Benz(a)anthracene	mg/kg (ppm)	0.83	91	64-116
Chrysene	mg/kg (ppm)	0.83	81	66-119
Bis(2-ethylhexyl) phthalate	mg/kg (ppm)	0.83	90	30-165
Di-n-octyl phthalate	mg/kg (ppm)	0.83	99	44-140
Benzo(a)pyrene	mg/kg (ppm)	0.83	88	62-116
Benzo(b)fluoranthene	mg/kg (ppm)	0.83	92	61-118
Benzo(k)fluoranthene	mg/kg (ppm)	0.83	86	65-119
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.83	107	64-130
Dibenz(a,h)anthracene	mg/kg (ppm)	0.83	111	67-131
Benzo(g,h,i)perylene	mg/kg (ppm)	0.83	106	67-126

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Phenol	ug/L (ppb)	5	27	29	10-43	7
Bis(2-chloroethyl) ether	ug/L (ppb)	5	75	80	40-114	6
2-Chlorophenol	ug/L (ppb)	5	69	74	21-97	7
1,3-Dichlorobenzene	ug/L (ppb)	5	52	53	39-102	2
1,4-Dichlorobenzene	ug/L (ppb)	5	53	54	41-103	2
1,2-Dichlorobenzene	ug/L (ppb)	5	56	59	43-105	5
Benzyl alcohol	ug/L (ppb)	25	71	77	14-82	8
2,2'-Oxybis(1-chloropropane)	ug/L (ppb)	5	81	88	51-110	8
2-Methylphenol	ug/L (ppb)	5	64	71	19-77	10
Hexachloroethane	ug/L (ppb)	5	45	50	39-104	11
N-Nitroso-di-n-propylamine	ug/L (ppb)	5	84	93	58-117	10
3-Methylphenol + 4-Methylphenol	ug/L (ppb)	5	56	66	12-89	16
Nitrobenzene	ug/L (ppb)	5	78	82	52-111	5
Isophorone	ug/L (ppb)	5	90	93	62-117	3
2-Nitrophenol	ug/L (ppb)	5	69	77	41-117	11
2,4-Dimethylphenol	ug/L (ppb)	5	75	81	10-117	8
Benzoic acid	ug/L (ppb)	40	18	18	10-39	0
Bis(2-chloroethoxy)methane	ug/L (ppb)	5	80	88	56-111	10
2,4-Dichlorophenol	ug/L (ppb)	5	82	90	34-113	9
1,2,4-Trichlorobenzene	ug/L (ppb)	5	59	62	48-104	5
Naphthalene	ug/L (ppb)	5	69	74	50-104	7
Hexachlorobutadiene	ug/L (ppb)	5	46	48	40-107	4
4-Chloroaniline	ug/L (ppb)	25	93	99	34-125	6
4-Chloro-3-methylphenol	ug/L (ppb)	5	85	94	34-111	10
2-Methylnaphthalene	ug/L (ppb)	5	73	79	52-113	8
1-Methylnaphthalene	ug/L (ppb)	5	75	81	51-115	8
Hexachlorocyclopentadiene	ug/L (ppb)	5	47	48	34-126	2
2,4,6-Trichlorophenol	ug/L (ppb)	5	80	89	28-125	11
2,4,5-Trichlorophenol	ug/L (ppb)	5	88	96	39-120	9
2-Chloronaphthalene	ug/L (ppb)	5	73	79	57-130	8
2-Nitroaniline	ug/L (ppb)	25	90	97	51-146	7
Dimethyl phthalate	ug/L (ppb)	5	97	106	64-118	9
Acenaphthylene	ug/L (ppb)	5	82	88	60-114	7
2,6-Dinitrotoluene	ug/L (ppb)	5	87	92	66-121	6
3-Nitroaniline	ug/L (ppb)	25	89	92	42-134	3
Acenaphthene	ug/L (ppb)	5	79	85	57-110	7
2,4-Dinitrophenol	ug/L (ppb)	10	82	88	20-151	7
Dibenzofuran	ug/L (ppb)	5	84	90	52-116	7
2,4-Dinitrotoluene	ug/L (ppb)	5	97	103	55-127	6
4-Nitrophenol	ug/L (ppb)	10	31	32	10-58	3
Diethyl phthalate	ug/L (ppb)	5	102	108	63-118	6
Fluorene	ug/L (ppb)	5	88	94	61-115	7
4-Chlorophenyl phenyl ether	ug/L (ppb)	5	87	91	61-112	4
N-Nitrosodiphenylamine	ug/L (ppb)	5	95	97	60-123	2
4-Nitroaniline	ug/L (ppb)	25	94	99	42-150	5
4,6-Dinitro-2-methylphenol	ug/L (ppb)	5	90	99	13-152	10
4-Bromophenyl phenyl ether	ug/L (ppb)	5	86	90	63-123	5
Hexachlorobenzene	ug/L (ppb)	5	92	96	60-113	4
Pentachlorophenol	ug/L (ppb)	5	100	99	14-137	1
Phenanthrene	ug/L (ppb)	5	92	96	63-113	4
Anthracene	ug/L (ppb)	5	95	97	65-117	2
Carbazole	ug/L (ppb)	5	106	107	62-137	1
Di-n-butyl phthalate	ug/L (ppb)	5	103	108	36-137	5
Fluoranthene	ug/L (ppb)	5	104	105	68-121	1
Benzidine	ug/L (ppb)	7.5	25	25	10-103	0
Pyrene	ug/L (ppb)	5	97	99	62-133	2
Benzyl butyl phthalate	ug/L (ppb)	5	100	101	56-145	1
3,3'-Dichlorobenzidine	ug/L (ppb)	7.5	91	93	31-139	2
Benz(a)anthracene	ug/L (ppb)	5	102	103	66-131	1
Chrysene	ug/L (ppb)	5	101	104	66-129	3
Bis(2-ethylhexyl) phthalate	ug/L (ppb)	5	105	109	52-142	4
Di-n-octyl phthalate	ug/L (ppb)	5	112	114	36-151	2
Benzo(a)pyrene	ug/L (ppb)	5	106	108	66-129	2
Benzo(b)fluoranthene	ug/L (ppb)	5	103	105	55-144	2
Benzo(k)fluoranthene	ug/L (ppb)	5	106	107	58-139	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	5	107	111	62-136	4
Dibenz(a,h)anthracene	ug/L (ppb)	5	105	110	55-146	5
Benzo(g,h,i)perylene	ug/L (ppb)	5	103	107	58-137	4

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 403326-04 (Duplicate)

end

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Benzene	mg/kg (ppm)	<0.02	<0.02	nm
Toluene	mg/kg (ppm)	<0.02	<0.02	nm
Ethylbenzene	mg/kg (ppm)	<0.02	<0.02	nm
Xylenes	mg/kg (ppm)	<0.06	<0.06	nm
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/kg (ppm)	1.0	98	70-130
Toluene	mg/kg (ppm)	1.0	94	70-130
Ethylbenzene	mg/kg (ppm)	1.0	93	70-130
Xylenes	mg/kg (ppm)	3.0	93	70-130
Gasoline	mg/kg (ppm)	40	95	70-130

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 403441-01 (Duplicate)

end

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	110	70-130
Toluene	ug/L (ppb)	50	104	70-130
Ethylbenzene	ug/L (ppb)	50	106	70-130
Xylenes	ug/L (ppb)	150	93	70-130
Gasoline	ug/L (ppb)	1,000	100	70-130

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 403410-01 (Matrix Spike)

end

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	3,000	114	96	63-146	17

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	102	77-123

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

end

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	92	88	72-139	4

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD MA-APH

Laboratory Code: 403425-01 1/5.7 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
APH EC5-8 aliphatics	ug/m3	3,200	3,000	6
APH EC9-12 aliphatics	ug/m3	200	190	5
APH EC9-10 aromatics	ug/m3	<140	<140	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
APH EC5-8 aliphatics	ug/m3	67	104	70-130
APH EC9-12 aliphatics	ug/m3	67	121	70-130
APH EC9-10 aromatics	ug/m3	67	98	70-130

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: 403425-01 1/5.7 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
Propene	ug/m3	4,800	4,800	0
Dichlorodifluoromethane	ug/m3	<5.6	<5.6	nm
Chloromethane	ug/m3	<21	<21	nm
F-114	ug/m3	<12	<12	nm
Vinyl chloride	ug/m3	<1.5	<1.5	nm
1,3-Butadiene	ug/m3	230	<0.25	nm
Butane	ug/m3	1,100	1,100	0
Bromomethane	ug/m3	<22	<22	nm
Chloroethane	ug/m3	<15	<15	nm
Vinyl bromide	ug/m3	<2.5	<2.5	nm
Ethanol	ug/m3	<43	<43	nm
Acrolein	ug/m3	<0.65	<0.65	nm
Pentane	ug/m3	300	300	0
Trichlorofluoromethane	ug/m3	<13	<13	nm
Acetone	ug/m3	55	51	8
2-Propanol	ug/m3	<49	<49	nm
1,1-Dichloroethene	ug/m3	<2.3	<2.3	nm
trans-1,2-Dichloroethene	ug/m3	<2.3	<2.3	nm
Methylene chloride	ug/m3	<200	<200	nm
t-Butyl alcohol (TBA)	ug/m3	<69	<69	nm
3-Chloropropene	ug/m3	<18	<18	nm
CFC-113	ug/m3	<8.7	<8.7	nm
Carbon disulfide	ug/m3	<36	<36	nm
Methyl t-butyl ether (MTBE)	ug/m3	<41	<41	nm
Vinyl acetate	ug/m3	<40	<40	nm
1,1-Dichloroethane	ug/m3	<2.3	<2.3	nm
cis-1,2-Dichloroethene	ug/m3	<2.3	<2.3	nm
Hexane	ug/m3	69	67	3
Chloroform	ug/m3	<0.28	<0.28	nm
Ethyl acetate	ug/m3	<41	<41	nm
Tetrahydrofuran	ug/m3	<3.4	<3.4	nm
2-Butanone (MEK)	ug/m3	<34	<34	nm
1,2-Dichloroethane (EDC)	ug/m3	<0.23	<0.23	nm
1,1,1-Trichloroethane	ug/m3	<3.1	<3.1	nm
Carbon tetrachloride	ug/m3	<1.8	<1.8	nm
Benzene	ug/m3	19	19	0
Cyclohexane	ug/m3	<39	<39	nm
1,2-Dichloropropane	ug/m3	<1.3	<1.3	nm
1,4-Dioxane	ug/m3	<2.1	<2.1	nm
2,2,4-Trimethylpentane	ug/m3	<27	<27	nm
Methyl methacrylate	ug/m3	<23	<23	nm
Heptane	ug/m3	<23	<23	nm
Bromodichloromethane	ug/m3	<0.38	<0.38	nm
Trichloroethene	ug/m3	<0.61	<0.61	nm
cis-1,3-Dichloropropene	ug/m3	<5.2	<5.2	nm
4-Methyl-2-pentanone	ug/m3	<47	<47	nm
trans-1,3-Dichloropropene	ug/m3	<2.6	<2.6	nm
Toluene	ug/m3	<43	<43	nm
1,1,2-Trichloroethane	ug/m3	<0.31	<0.31	nm
2-Hexanone	ug/m3	<23	<23	nm

Tetrachloroethene	ug/m3	<39	<39	nm
Dibromochloromethane	ug/m3	<0.49	<0.49	nm
1,2-Dibromoethane (EDB)	ug/m3	<0.44	<0.44	nm
Chlorobenzene	ug/m3	<2.6	<2.6	nm
Ethylbenzene	ug/m3	5.4	5.5	2
1,1,2,2-Tetrachloroethane	ug/m3	<0.78	<0.78	nm
Nonane	ug/m3	<30	<30	nm
Isopropylbenzene	ug/m3	<56	<56	nm
2-Chlorotoluene	ug/m3	<30	<30	nm
Propylbenzene	ug/m3	<28	<28	nm
4-Ethyltoluene	ug/m3	<28	<28	nm
m,p-Xylene	ug/m3	15	15	0
o-Xylene	ug/m3	4.7	4.8	2
Styrene	ug/m3	<4.9	<4.9	nm
Bromoform	ug/m3	<12	<12	nm
Benzyl chloride	ug/m3	<0.3	<0.3	nm
1,3,5-Trimethylbenzene	ug/m3	<28	<28	nm
1,2,4-Trimethylbenzene	ug/m3	<28	<28	nm
1,3-Dichlorobenzene	ug/m3	<3.4	<3.4	nm
1,4-Dichlorobenzene	ug/m3	<1.3	<1.3	nm
1,2-Dichlorobenzene	ug/m3	<3.4	<3.4	nm
1,2,4-Trichlorobenzene	ug/m3	<4.2	<4.2	nm
Naphthalene	ug/m3	<1.5	<1.5	nm
Hexachlorobutadiene	ug/m3	<1.2	<1.2	nm

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Propene	ug/m3	23	126	70-130
Dichlorodifluoromethane	ug/m3	67	113	70-130
Chloromethane	ug/m3	28	101	70-130
F-114	ug/m3	94	112	70-130
Vinyl chloride	ug/m3	35	117	70-130
1,3-Butadiene	ug/m3	30	102	70-130
Butane	ug/m3	32	107	70-130
Bromomethane	ug/m3	52	108	70-130
Chloroethane	ug/m3	36	111	70-130
Vinyl bromide	ug/m3	59	121	70-130
Ethanol	ug/m3	25	119	70-130
Acrolein	ug/m3	31	122	70-130
Pentane	ug/m3	40	108	70-130
Trichlorofluoromethane	ug/m3	76	108	70-130
Acetone	ug/m3	32	112	70-130
2-Propanol	ug/m3	33	101	70-130
1,1-Dichloroethene	ug/m3	54	113	70-130
trans-1,2-Dichloroethene	ug/m3	54	112	70-130
Methylene chloride	ug/m3	94	106	70-130
t-Butyl alcohol (TBA)	ug/m3	41	88	70-130
3-Chloropropene	ug/m3	42	96	70-130
CFC-113	ug/m3	100	114	70-130
Carbon disulfide	ug/m3	42	98	70-130
Methyl t-butyl ether (MTBE)	ug/m3	49	98	70-130
Vinyl acetate	ug/m3	48	100	70-130
1,1-Dichloroethane	ug/m3	55	116	70-130
cis-1,2-Dichloroethene	ug/m3	54	107	70-130
Hexane	ug/m3	48	85	70-130
Chloroform	ug/m3	66	115	70-130
Ethyl acetate	ug/m3	49	86	70-130
Tetrahydrofuran	ug/m3	40	98	70-130
2-Butanone (MEK)	ug/m3	40	104	70-130
1,2-Dichloroethane (EDC)	ug/m3	55	117	70-130
1,1,1-Trichloroethane	ug/m3	74	120	70-130
Carbon tetrachloride	ug/m3	85	113	70-130
Benzene	ug/m3	43	105	70-130
Cyclohexane	ug/m3	46	96	70-130
1,2-Dichloropropane	ug/m3	62	119	70-130
1,4-Dioxane	ug/m3	49	99	70-130
2,2,4-Trimethylpentane	ug/m3	63	103	70-130
Methyl methacrylate	ug/m3	55	111	70-130
Heptane	ug/m3	55	105	70-130
Bromodichloromethane	ug/m3	90	120	70-130
Trichloroethene	ug/m3	73	118	70-130
cis-1,3-Dichloropropene	ug/m3	61	114	70-130
4-Methyl-2-pentanone	ug/m3	55	104	70-130
trans-1,3-Dichloropropene	ug/m3	61	121	70-130
Toluene	ug/m3	51	110	70-130
1,1,2-Trichloroethane	ug/m3	74	120	70-130
2-Hexanone	ug/m3	55	96	70-130

Tetrachloroethene	ug/m3	92	117	70-130
Dibromochloromethane	ug/m3	120	116	70-130
1,2-Dibromoethane (EDB)	ug/m3	100	121	70-130
Chlorobenzene	ug/m3	62	107	70-130
Ethylbenzene	ug/m3	59	103	70-130
1,1,2,2-Tetrachloroethane	ug/m3	93	118	70-130
Nonane	ug/m3	71	108	70-130
Isopropylbenzene	ug/m3	66	109	70-130
2-Chlorotoluene	ug/m3	70	105	70-130
Propylbenzene	ug/m3	66	106	70-130
4-Ethyltoluene	ug/m3	66	98	70-130
m,p-Xylene	ug/m3	120	105	70-130
o-Xylene	ug/m3	59	109	70-130
Styrene	ug/m3	58	93	70-130
Bromoform	ug/m3	140	105	70-130
Benzyl chloride	ug/m3	70	161 vo	70-130
1,3,5-Trimethylbenzene	ug/m3	66	102	70-130
1,2,4-Trimethylbenzene	ug/m3	66	93	70-130
1,3-Dichlorobenzene	ug/m3	81	110	70-130
1,4-Dichlorobenzene	ug/m3	81	107	70-130
1,2-Dichlorobenzene	ug/m3	81	108	70-130
1,2,4-Trichlorobenzene	ug/m3	100	95	70-130
Naphthalene	ug/m3	71	95	70-130
Hexachlorobutadiene	ug/m3	140	107	70-130

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-17

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Dichlorodifluoromethane	ng/tube	50	70	70-130
Vinyl chloride	ng/tube	50	82	70-130
2-Propanol	ng/tube	250	111	70-130
1,1-Dichloroethene	ng/tube	50	99	70-130
Hexane	ng/tube	50	97	70-130
t-Butyl alcohol (TBA)	ng/tube	250	106	70-130
Methyl t-butyl ether (MTBE)	ng/tube	50	102	70-130
trans-1,2-Dichloroethene	ng/tube	50	99	70-130
1,1-Dichloroethane	ng/tube	50	99	70-130
2,2-Dichloropropane	ng/tube	50	101	70-130
cis-1,2-Dichloroethene	ng/tube	50	99	70-130
Chloroform	ng/tube	50	99	70-130
2-Butanone (MEK)	ng/tube	50	91	70-130
1,2-Dichloroethane (EDC)	ng/tube	50	99	70-130
1,1,1-Trichloroethane	ng/tube	50	100	70-130
1,1-Dichloropropene	ng/tube	50	99	70-130
Carbon tetrachloride	ng/tube	50	100	70-130
Benzene	ng/tube	50	94	70-130
Trichloroethene	ng/tube	50	102	70-130
1,2-Dichloropropane	ng/tube	50	100	70-130
Bromodichloromethane	ng/tube	50	99	70-130
Dibromomethane	ng/tube	50	99	70-130
4-Methyl-2-pentanone	ng/tube	50	101	70-130
cis-1,3-Dichloropropene	ng/tube	50	102	70-130
Toluene	ng/tube	50	100	70-130
trans-1,3-Dichloropropene	ng/tube	50	104	70-130
1,1,2-Trichloroethane	ng/tube	50	105	70-130
2-Hexanone	ng/tube	50	88	70-130
1,3-Dichloropropane	ng/tube	50	103	70-130
Tetrachloroethene	ng/tube	50	106	70-130
Dibromochloromethane	ng/tube	50	103	70-130
1,2-Dibromoethane (EDB)	ng/tube	50	104	70-130
Chlorobenzene	ng/tube	50	101	70-130
Ethylbenzene	ng/tube	50	102	70-130
1,1,1,2-Tetrachloroethane	ng/tube	50	101	70-130
m,p-Xylene	ng/tube	100	102	70-130
o-Xylene	ng/tube	50	102	70-130
Styrene	ng/tube	50	103	70-130
Isopropylbenzene	ng/tube	50	102	70-130
Bromoform	ng/tube	50	101	70-130
n-Propylbenzene	ng/tube	50	102	70-130
Bromobenzene	ng/tube	50	104	70-130
1,3,5-Trimethylbenzene	ng/tube	50	101	70-130
1,1,2,2-Tetrachloroethane	ng/tube	50	101	70-130
1,2,3-Trichloropropane	ng/tube	50	101	70-130
2-Chlorotoluene	ng/tube	50	105	70-130
4-Chlorotoluene	ng/tube	50	103	70-130
tert-Butylbenzene	ng/tube	50	103	70-130
1,2,4-Trimethylbenzene	ng/tube	50	92	70-130
sec-Butylbenzene	ng/tube	50	91	70-130

p-Isopropyltoluene	ng/tube	50	92	70-130
1,3-Dichlorobenzene	ng/tube	50	90	70-130
1,4-Dichlorobenzene	ng/tube	50	90	70-130
1,2-Dichlorobenzene	ng/tube	50	89	70-130
1,2-Dibromo-3-chloropropane	ng/tube	50	93	70-130
1,2,4-Trichlorobenzene	ng/tube	50	88	70-130
Hexachlorobutadiene	ng/tube	50	87	70-130
Naphthalene	ng/tube	50	91	70-130
1,2,3-Trichlorobenzene	ng/tube	50	89	70-130
2-Methylnaphthalene	ng/tube	50	107	70-130
1-Methylnaphthalene	ng/tube	50	107	70-130
Diesel Fuel Range	ng/tube	2,500	105	70-130
APH EC9-12 aliphatics	ng/tube	1,200	82	70-130
APH EC9-10 aromatics	ng/tube	1,000	111	70-130

ANALYTE	CATEGORY	MATRIX	MDL	RL	LOW LEVEL RL	UNIT	METHOD
Helium	AIR	Air	0.15	0.6	---	ug/m3	ASTMD1946
1,4-Dioxane	VOC SIM	Water	0.12	0.4	---	ug/L	EPA8260D SIM
1,4-Dioxane	VOC SIM	Soil	0.023	0.1	---	mg/kg	EPA8260D SIM
Aroclor 1221	PCB	Soil	0.00021	0.02	0.004	mg/kg	EPA8082
Aroclor 1232	PCB	Soil	0.00021	0.02	0.004	mg/kg	EPA8082
Aroclor 1016	PCB	Soil	0.00021	0.02	0.004	mg/kg	EPA8082
Aroclor 1242	PCB	Soil	0.00021	0.02	0.004	mg/kg	EPA8082
Aroclor 1248	PCB	Soil	0.00023	0.02	0.004	mg/kg	EPA8082
Aroclor 1254	PCB	Soil	0.00023	0.02	0.004	mg/kg	EPA8082
Aroclor 1260	PCB	Soil	0.00023	0.02	0.004	mg/kg	EPA8082
Aroclor 1262	PCB	Soil	0.00023	0.02	0.004	mg/kg	EPA8082
Aroclor 1268	PCB	Soil	0.00023	0.02	0.004	mg/kg	EPA8082
Aroclor 1221	PCB	Water	0.0054	0.1	0.01	ug/L	EPA8082
Aroclor 1232	PCB	Water	0.0054	0.1	0.01	ug/L	EPA8082
Aroclor 1016	PCB	Water	0.0054	0.1	0.01	ug/L	EPA8082
Aroclor 1242	PCB	Water	0.0054	0.1	0.01	ug/L	EPA8082
Aroclor 1248	PCB	Water	0.0059	0.1	0.01	ug/L	EPA8082
Aroclor 1254	PCB	Water	0.0059	0.1	0.01	ug/L	EPA8082
Aroclor 1260	PCB	Water	0.0059	0.1	0.01	ug/L	EPA8082
Aroclor 1262	PCB	Water	0.0059	0.1	0.01	ug/L	EPA8082
Aroclor 1268	PCB	Water	0.0059	0.1	0.01	ug/L	EPA8082
Aroclor 1221	PCB	Product	0.6	1	---	mg/kg	EPA8082
Aroclor 1232	PCB	Product	0.6	1	---	mg/kg	EPA8082
Aroclor 1016	PCB	Product	0.6	1	---	mg/kg	EPA8082
Aroclor 1242	PCB	Product	0.6	1	---	mg/kg	EPA8082
Aroclor 1248	PCB	Product	0.7	1	---	mg/kg	EPA8082
Aroclor 1254	PCB	Product	0.7	1	---	mg/kg	EPA8082
Aroclor 1260	PCB	Product	0.7	1	---	mg/kg	EPA8082
Aroclor 1262	PCB	Product	0.7	1	---	mg/kg	EPA8082
Aroclor 1268	PCB	Product	0.7	1	---	mg/kg	EPA8082
Aroclor 1221	PCB	Wipe	0.62	1	---	ug/wipe	EPA8082
Aroclor 1232	PCB	Wipe	0.62	1	---	ug/wipe	EPA8082
Aroclor 1016	PCB	Wipe	0.62	1	---	ug/wipe	EPA8082
Aroclor 1242	PCB	Wipe	0.62	1	---	ug/wipe	EPA8082
Aroclor 1248	PCB	Wipe	0.56	1	---	ug/wipe	EPA8082
Aroclor 1254	PCB	Wipe	0.56	1	---	ug/wipe	EPA8082
Aroclor 1260	PCB	Wipe	0.56	1	---	ug/wipe	EPA8082
Aroclor 1262	PCB	Wipe	0.56	1	---	ug/wipe	EPA8082
Aroclor 1268	PCB	Wipe	0.56	1	---	ug/wipe	EPA8082
4,4'-DDD	PEST	Soil	0.000015	0.01	0.0001	mg/kg	EPA8081
4,4'-DDE	PEST	Soil	0.000012	0.01	0.0001	mg/kg	EPA8081
4,4'-DDT	PEST	Soil	0.000028	0.01	0.0001	mg/kg	EPA8081
Aldrin	PEST	Soil	0.00001	0.01	0.0001	mg/kg	EPA8081
alpha-BHC	PEST	Soil	0.000012	0.01	0.0001	mg/kg	EPA8081
beta-BHC	PEST	Soil	0.000021	0.01	0.0001	mg/kg	EPA8081
cis-Chlordane	PEST	Soil	0.000012	0.01	0.0001	mg/kg	EPA8081
delta-BHC	PEST	Soil	0.00002	0.01	0.0001	mg/kg	EPA8081
Dieldrin	PEST	Soil	0.000015	0.01	0.0001	mg/kg	EPA8081
Endosulfan I	PEST	Soil	0.00001	0.01	0.0001	mg/kg	EPA8081
Endosulfan II	PEST	Soil	0.000014	0.01	0.0001	mg/kg	EPA8081
Endosulfan Sulfate	PEST	Soil	0.000012	0.01	0.0001	mg/kg	EPA8081
Endrin	PEST	Soil	0.000018	0.01	0.0001	mg/kg	EPA8081
Endrin Aldehyde	PEST	Soil	0.000026	0.01	0.0001	mg/kg	EPA8081
Endrin Ketone	PEST	Soil	0.000055	0.01	0.0001	mg/kg	EPA8081
gamma-BHC (Linc	PEST	Soil	9.5E-06	0.01	0.0001	mg/kg	EPA8081
Heptachlor	PEST	Soil	0.000017	0.01	0.0001	mg/kg	EPA8081
Heptachlor Epoxid	PEST	Soil	0.00001	0.01	0.0001	mg/kg	EPA8081
Methoxychlor	PEST	Soil	0.00004	0.01	0.0001	mg/kg	EPA8081
Toxaphene	PEST	Soil	0.014	1	0.1	mg/kg	EPA8081
trans-Chlordane	PEST	Soil	0.000013	0.01	0.0001	mg/kg	EPA8081
4,4'-DDD	PEST	Water	0.0012	0.1	0.005	ug/L	EPA8081
4,4'-DDE	PEST	Water	0.00072	0.1	0.005	ug/L	EPA8081
4,4'-DDT	PEST	Water	0.001	0.1	0.005	ug/L	EPA8081
Aldrin	PEST	Water	0.00052	0.1	0.005	ug/L	EPA8081
alpha-BHC	PEST	Water	0.00064	0.1	0.005	ug/L	EPA8081
beta-BHC	PEST	Water	0.00061	0.1	0.005	ug/L	EPA8081
cis-Chlordane	PEST	Water	0.0007	0.1	0.005	ug/L	EPA8081
delta-BHC	PEST	Water	0.00053	0.1	0.005	ug/L	EPA8081
Dieldrin	PEST	Water	0.00064	0.1	0.005	ug/L	EPA8081
Endosulfan I	PEST	Water	0.00067	0.1	0.005	ug/L	EPA8081
Endosulfan II	PEST	Water	0.00094	0.1	0.005	ug/L	EPA8081
Endosulfan Sulfate	PEST	Water	0.00083	0.1	0.005	ug/L	EPA8081
Endrin	PEST	Water	0.00063	0.1	0.005	ug/L	EPA8081
Endrin Aldehyde	PEST	Water	0.0011	0.1	0.005	ug/L	EPA8081

ACRONYMS

MDL-method detection limit
RL - reporting limit
ug - microgram
mg - milligram
kg - kilogram
L - liter
m3 - cubic meter

Endrin Ketone	PEST	Water	0.0027	0.1	0.005	ug/L	EPA8081
gamma-BHC (Linc	PEST	Water	0.00076	0.1	0.005	ug/L	EPA8081
Heptachlor	PEST	Water	0.0005	0.1	0.005	ug/L	EPA8081
Heptachlor Epoxid	PEST	Water	0.0008	0.1	0.005	ug/L	EPA8081
Methoxychlor	PEST	Water	0.0013	0.1	0.005	ug/L	EPA8081
Toxaphene	PEST	Water	0.044	1	0.1	ug/L	EPA8081
trans-Chlordane	PEST	Water	0.00048	0.1	0.005	ug/L	EPA8081
1,2-Dibromoethan	8011	Water	0.0098	0.01	---	ug/L	EPA8011
diesel	TPH	Soil	25	50	---	mg/kg	NWTPH-Dx
diesel extended	TPH	Soil	32	250	---	mg/kg	NWTPH-Dx
motor oil	TPH	Soil	37	250	---	mg/kg	NWTPH-Dx
diesel	TPH	Soil	5.4	---	10	mg/kg	NWTPH-Dx
motor oil	TPH	Soil	10	---	50	mg/kg	NWTPH-Dx
diesel	TPH	Water	27	100	---	ug/L	NWTPH-Dx
diesel extended	TPH	Water	110	250	---	ug/L	NWTPH-Dx
motor oil	TPH	Water	110	250	---	ug/L	NWTPH-Dx
gasoline	TPH	Soil	0.6	5	---	mg/kg	NWTPH-Gx
Stoddard	TPH	Soil	1.3	25	---	mg/kg	NWTPH-Gx
benzene	TPH	Soil	0.003	0.02	---	mg/kg	EPA8021
toluene	TPH	Soil	0.0046	0.02	---	mg/kg	EPA8021
ethylbenzene	TPH	Soil	0.0029	0.02	---	mg/kg	EPA8021
xylenes	TPH	Soil	0.0077	0.06	---	mg/kg	EPA8021
Stoddard	TPH	Water	7	500	---	ug/L	NWTPH-Gx
gasoline	TPH	Water	26	100	---	ug/L	NWTPH-Gx
benzene	TPH	Water	0.12	1	---	ug/L	EPA8021
toluene	TPH	Water	0.12	1	---	ug/L	EPA8021
ethylbenzene	TPH	Water	0.1	1	---	ug/L	EPA8021
xylenes	TPH	Water	0.29	3	---	ug/L	EPA8021
1,1,1-Trichloroeth	TO15	Air	0.043	0.55	---	ug/m3	EPATO15
1,1,2,2-Tetrachlor	TO15	Air	0.06	0.14	---	ug/m3	EPATO15
1,1,2-Trichloroeth	TO15	Air	0.047	0.055	---	ug/m3	EPATO15
1,1-Dichloroethan	TO15	Air	0.024	0.4	---	ug/m3	EPATO15
1,1-Dichloroethen	TO15	Air	0.044	0.4	---	ug/m3	EPATO15
1,2,4-Trichloroben	TO15	Air	0.53	0.74	---	ug/m3	EPATO15
1,2,4-Trimethylber	TO15	Air	1.6	4.9	---	ug/m3	EPATO15
1,2-Dibromoethan	TO15	Air	0.058	0.077	---	ug/m3	EPATO15
1,2-Dichlorobenze	TO15	Air	0.17	0.6	---	ug/m3	EPATO15
1,2-Dichloroethan	TO15	Air	0.024	0.04	---	ug/m3	EPATO15
1,2-Dichloropropa	TO15	Air	0.086	0.23	---	ug/m3	EPATO15
1,3,5-Trimethylber	TO15	Air	0.35	4.9	---	ug/m3	EPATO15
1,3-Butadiene	TO15	Air	0.024	0.044	---	ug/m3	EPATO15
1,3-Dichlorobenze	TO15	Air	0.22	0.6	---	ug/m3	EPATO15
1,4-Dichlorobenze	TO15	Air	0.15	0.23	---	ug/m3	EPATO15
1,4-Dioxane	TO15	Air	0.061	0.36	---	ug/m3	EPATO15
2,2,4-Trimethylper	TO15	Air	0.66	4.7	---	ug/m3	EPATO15
2-Butanone (MEK)	TO15	Air	1.1	5.9	---	ug/m3	EPATO15
2-Chlorotoluene	TO15	Air	1.2	5.2	---	ug/m3	EPATO15
2-Hexanone	TO15	Air	2.3	4.1	---	ug/m3	EPATO15
2-Propanol	TO15	Air	0.71	8.6	---	ug/m3	EPATO15
3-Chloropropene	TO15	Air	0.66	3.1	---	ug/m3	EPATO15
4-Ethyltoluene	TO15	Air	1.8	4.9	---	ug/m3	EPATO15
4-Methyl-2-pentan	TO15	Air	2.2	8.2	---	ug/m3	EPATO15
Acetone	TO15	Air	1.3	4.8	---	ug/m3	EPATO15
Acrolein	TO15	Air	0.1	0.11	---	ug/m3	EPATO15
Benzene	TO15	Air	0.038	0.32	---	ug/m3	EPATO15
Benzyl chloride	TO15	Air	0.032	0.052	---	ug/m3	EPATO15
Bromodichloromet	TO15	Air	0.064	0.067	---	ug/m3	EPATO15
Bromoform	TO15	Air	0.65	2.1	---	ug/m3	EPATO15
Bromomethane	TO15	Air	1.3	3.9	---	ug/m3	EPATO15
Butane	TO15	Air	0.48	4.8	---	ug/m3	EPATO15
Carbon disulfide	TO15	Air	0.96	6.2	---	ug/m3	EPATO15
Carbon tetrachlori	TO15	Air	0.04	0.31	---	ug/m3	EPATO15
CFC-113	TO15	Air	0.28	1.5	---	ug/m3	EPATO15
Chlorobenzene	TO15	Air	0.11	0.46	---	ug/m3	EPATO15
Chloroethane	TO15	Air	0.038	2.6	---	ug/m3	EPATO15
Chloroform	TO15	Air	0.037	0.049	---	ug/m3	EPATO15
Chloromethane	TO15	Air	0.072	3.7	---	ug/m3	EPATO15
cis-1,2-Dichloroeth	TO15	Air	0.02	0.4	---	ug/m3	EPATO15
cis-1,3-Dichloropr	TO15	Air	0.15	0.91	---	ug/m3	EPATO15
Cyclohexane	TO15	Air	0.76	6.9	---	ug/m3	EPATO15
Dibromochloromet	TO15	Air	0.076	0.085	---	ug/m3	EPATO15
Dichlorodifluorom	TO15	Air	0.14	0.99	---	ug/m3	EPATO15
Ethanol	TO15	Air	1.3	7.5	---	ug/m3	EPATO15
Ethyl acetate	TO15	Air	1.3	7.2	---	ug/m3	EPATO15
Ethylbenzene	TO15	Air	0.046	0.43	---	ug/m3	EPATO15
F-114	TO15	Air	0.32	2.1	---	ug/m3	EPATO15
Heptane	TO15	Air	0.6	4.1	---	ug/m3	EPATO15

Hexachlorobutadie	TO15	Air	0.092	0.21	---	ug/m3	EPATO15
Hexane	TO15	Air	0.92	3.5	---	ug/m3	EPATO15
Isopropylbenzene	TO15	Air	2	9.8	---	ug/m3	EPATO15
m,p-Xylene	TO15	Air	0.14	0.87	---	ug/m3	EPATO15
Methyl Methacryla	TO15	Air	1.3	4.1	---	ug/m3	EPATO15
Methyl t-butyl ethe	TO15	Air	0.7	7.2	---	ug/m3	EPATO15
Methylene chloride	TO15	Air	1.3	35	---	ug/m3	EPATO15
Naphthalene	TO15	Air	0.018	0.11	0.052	ug/m3	EPATO15
Nonane	TO15	Air	0.76	5.2	---	ug/m3	EPATO15
o-Xylene	TO15	Air	0.058	0.43	---	ug/m3	EPATO15
Pentane	TO15	Air	1.1	5.9	---	ug/m3	EPATO15
Propene	TO15	Air	0.2	1.2	---	ug/m3	EPATO15
Propylbenzene	TO15	Air	0.92	4.9	---	ug/m3	EPATO15
Styrene	TO15	Air	0.28	0.85	---	ug/m3	EPATO15
t-Butyl alcohol (TB	TO15	Air	0.33	12	---	ug/m3	EPATO15
Tetrachloroethene	TO15	Air	0.18	6.8	---	ug/m3	EPATO15
Tetrahydrofuran	TO15	Air	0.15	0.59	---	ug/m3	EPATO15
Toluene	TO15	Air	0.095	7.5	---	ug/m3	EPATO15
trans-1,2-Dichloroe	TO15	Air	0.051	0.4	---	ug/m3	EPATO15
trans-1,3-Dichlorop	TO15	Air	0.1	0.45	---	ug/m3	EPATO15
Trichloroethene	TO15	Air	0.051	0.11	---	ug/m3	EPATO15
Trichlorofluoromet	TO15	Air	0.21	2.2	---	ug/m3	EPATO15
Vinyl acetate	TO15	Air	0.91	7	---	ug/m3	EPATO15
Vinyl bromide	TO15	Air	0.034	0.44	---	ug/m3	EPATO15
Vinyl chloride	TO15	Air	0.012	0.26	---	ug/m3	EPATO15
Gasoline Range C	TO15	Air	30	330	---	ug/m3	EPATO15
1,2,4-Trichloroben	SVOC	Soil	0.0039	0.05	---	mg/kg	EPA8270E
1,2-Dichlorobenze	SVOC	Soil	0.0036	0.05	---	mg/kg	EPA8270E
1,2-Diphenylhydra	SVOC	Soil	0.0044	0.05	---	mg/kg	EPA8270E
1,3-Dichlorobenze	SVOC	Soil	0.0029	0.05	---	mg/kg	EPA8270E
1,4-Dichlorobenze	SVOC	Soil	0.003	0.05	---	mg/kg	EPA8270E
1-Methylnaphthale	SVOC	Soil	0.0003	0.01	---	mg/kg	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Soil	0.0031	0.05	---	mg/kg	EPA8270E
2,4,5-Trichlorophe	SVOC	Soil	0.013	0.5	---	mg/kg	EPA8270E
2,4,6-Trichlorophe	SVOC	Soil	0.015	0.5	---	mg/kg	EPA8270E
2,4-Dichlorophenc	SVOC	Soil	0.0061	0.5	---	mg/kg	EPA8270E
2,4-Dimethylphenc	SVOC	Soil	0.014	0.5	---	mg/kg	EPA8270E
2,4-Dinitrophenol	SVOC	Soil	0.016	1.5	---	mg/kg	EPA8270E
2,4-Dinitrotoluene	SVOC	Soil	0.0081	0.25	---	mg/kg	EPA8270E
2,6-Dinitrotoluene	SVOC	Soil	0.0069	0.25	---	mg/kg	EPA8270E
2-Chloronaphthale	SVOC	Soil	0.0016	0.05	---	mg/kg	EPA8270E
2-Chlorophenol	SVOC	Soil	0.012	0.5	---	mg/kg	EPA8270E
2-Methylnaphthale	SVOC	Soil	0.00039	0.01	---	mg/kg	EPA8270E
2-Methylphenol	SVOC	Soil	0.0082	0.5	---	mg/kg	EPA8270E
2-Nitroaniline	SVOC	Soil	0.015	0.25	---	mg/kg	EPA8270E
2-Nitrophenol	SVOC	Soil	0.027	0.5	---	mg/kg	EPA8270E
3,3'-Dichlorobenzi	SVOC	Soil	0.033	0.5	---	mg/kg	EPA8270E
3-Methylphenol + 4	SVOC	Soil	0.013	1	---	mg/kg	EPA8270E
3-Nitroaniline	SVOC	Soil	0.017	5	---	mg/kg	EPA8270E
4,6-Dinitro-2-meth	SVOC	Soil	0.017	1.5	---	mg/kg	EPA8270E
4-Bromophenyl ph	SVOC	Soil	0.0023	0.05	---	mg/kg	EPA8270E
4-Chloro-3-methyl	SVOC	Soil	0.018	0.5	---	mg/kg	EPA8270E
4-Chloroaniline	SVOC	Soil	0.21	5	---	mg/kg	EPA8270E
4-Chlorophenyl ph	SVOC	Soil	0.0028	0.05	---	mg/kg	EPA8270E
4-Nitroaniline	SVOC	Soil	0.024	5	---	mg/kg	EPA8270E
4-Nitrophenol	SVOC	Soil	0.011	1.5	---	mg/kg	EPA8270E
Acenaphthene	SVOC	Soil	0.00018	0.01	---	mg/kg	EPA8270E
Acenaphthylene	SVOC	Soil	0.00016	0.01	---	mg/kg	EPA8270E
Anthracene	SVOC	Soil	0.00014	0.01	---	mg/kg	EPA8270E
Benz(a)anthracen	SVOC	Soil	0.00023	0.01	---	mg/kg	EPA8270E
Benzo(a)pyrene	SVOC	Soil	0.00028	0.01	---	mg/kg	EPA8270E
Benzo(b)fluoranth	SVOC	Soil	0.00025	0.01	---	mg/kg	EPA8270E
Benzo(g,h,i)peryle	SVOC	Soil	0.0004	0.01	---	mg/kg	EPA8270E
Benzo(k)fluoranth	SVOC	Soil	0.00032	0.01	---	mg/kg	EPA8270E
Benzoic acid	SVOC	Soil	0.1	2.5	---	mg/kg	EPA8270E
Benzyl alcohol	SVOC	Soil	0.012	0.5	---	mg/kg	EPA8270E
Benzyl butyl phtha	SVOC	Soil	0.019	0.5	---	mg/kg	EPA8270E
Bis(2-chloroethoxy	SVOC	Soil	0.0027	0.05	---	mg/kg	EPA8270E
Bis(2-chloroethyl)	SVOC	Soil	0.0035	0.05	---	mg/kg	EPA8270E
Bis(2-ethylhexyl) p	SVOC	Soil	0.035	0.8	---	mg/kg	EPA8270E
Carbazole	SVOC	Soil	0.0019	0.05	---	mg/kg	EPA8270E
Chrysene	SVOC	Soil	0.00018	0.01	---	mg/kg	EPA8270E
Dibenzo(a,h)anthr	SVOC	Soil	0.00049	0.01	---	mg/kg	EPA8270E
Dibenzofuran	SVOC	Soil	0.0034	0.05	---	mg/kg	EPA8270E
Diethyl phthalate	SVOC	Soil	0.0051	0.5	---	mg/kg	EPA8270E
Dimethyl phthalate	SVOC	Soil	0.0053	0.5	---	mg/kg	EPA8270E
Di-n-butyl phthalat	SVOC	Soil	0.019	0.5	---	mg/kg	EPA8270E

Di-n-octyl phthalat	SVOC	Soil	0.019	0.5	---	mg/kg	EPA8270E
Fluoranthene	SVOC	Soil	0.00019	0.01	---	mg/kg	EPA8270E
Fluorene	SVOC	Soil	0.00014	0.01	---	mg/kg	EPA8270E
Hexachlorobenzer	SVOC	Soil	0.002	0.05	---	mg/kg	EPA8270E
Hexachlorobutadie	SVOC	Soil	0.0029	0.05	---	mg/kg	EPA8270E
Hexachlorocyclope	SVOC	Soil	0.0061	0.15	---	mg/kg	EPA8270E
Hexachloroethane	SVOC	Soil	0.0041	0.05	---	mg/kg	EPA8270E
Indeno(1,2,3-cd)py	SVOC	Soil	0.00026	0.01	---	mg/kg	EPA8270E
Isophorone	SVOC	Soil	0.0019	0.05	---	mg/kg	EPA8270E
Naphthalene	SVOC	Soil	0.0004	0.01	---	mg/kg	EPA8270E
Nitrobenzene	SVOC	Soil	0.0047	0.05	---	mg/kg	EPA8270E
N-Nitrosodimethyla	SVOC	Soil	0.0063	0.05	---	mg/kg	EPA8270E
N-Nitroso-di-n-pro	SVOC	Soil	0.003	0.05	---	mg/kg	EPA8270E
N-Nitrosodiphenyla	SVOC	Soil	0.0033	0.05	---	mg/kg	EPA8270E
Pentachloropheno	SVOC	Soil	0.0088	0.25	---	mg/kg	EPA8270E
Phenanthrene	SVOC	Soil	0.00018	0.01	---	mg/kg	EPA8270E
Phenol	SVOC	Soil	0.013	0.5	---	mg/kg	EPA8270E
Pyrene	SVOC	Soil	0.00016	0.01	---	mg/kg	EPA8270E
1,2,4-Trichloroben	SVOC	Water	0.051	0.2	---	ug/L	EPA8270E
1,2-Dichlorobenze	SVOC	Water	0.055	0.2	---	ug/L	EPA8270E
1,2-Diphenylhydra	SVOC	Water	0.028	0.2	---	ug/L	EPA8270E
1,3-Dichlorobenze	SVOC	Water	0.067	0.2	---	ug/L	EPA8270E
1,4-Dichlorobenze	SVOC	Water	0.065	0.2	---	ug/L	EPA8270E
1-Methylnaphthale	SVOC	Water	0.005	0.2	---	ug/L	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Water	0.046	0.2	---	ug/L	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Water	0.046	2	---	ug/L	EPA8270E
2,4,5-Trichlorophe	SVOC	Water	0.17	2	---	ug/L	EPA8270E
2,4,6-Trichlorophe	SVOC	Water	0.13	2	---	ug/L	EPA8270E
2,4-Dichloropheno	SVOC	Water	0.12	2	---	ug/L	EPA8270E
2,4-Dimethylphen	SVOC	Water	0.78	6	---	ug/L	EPA8270E
2,4-Dinitrophenol	SVOC	Water	2.6	1	---	ug/L	EPA8270E
2,4-Dinitrotoluene	SVOC	Water	0.067	1	---	ug/L	EPA8270E
2,6-Dinitrotoluene	SVOC	Water	0.072	0.2	---	ug/L	EPA8270E
2-Chloronaphthale	SVOC	Water	0.034	2	---	ug/L	EPA8270E
2-Chlorophenol	SVOC	Water	0.16	0.2	---	ug/L	EPA8270E
2-Methylnaphthale	SVOC	Water	0.0059	2	---	ug/L	EPA8270E
2-Methylphenol	SVOC	Water	0.19	1	---	ug/L	EPA8270E
2-Nitroaniline	SVOC	Water	0.35	2	---	ug/L	EPA8270E
2-Nitrophenol	SVOC	Water	0.25	2	---	ug/L	EPA8270E
3,3'-Dichlorobenzi	SVOC	Water	0.81	4	---	ug/L	EPA8270E
3-Methylphenol +	SVOC	Water	0.29	20	---	ug/L	EPA8270E
3-Nitroaniline	SVOC	Water	0.34	6	---	ug/L	EPA8270E
4,6-Dinitro-2-meth	SVOC	Water	0.16	0.2	---	ug/L	EPA8270E
4-Bromophenyl ph	SVOC	Water	0.035	2	---	ug/L	EPA8270E
4-Chloro-3-methyl	SVOC	Water	0.1	20	---	ug/L	EPA8270E
4-Chloroaniline	SVOC	Water	0.61	0.2	---	ug/L	EPA8270E
4-Chlorophenyl ph	SVOC	Water	0.03	20	---	ug/L	EPA8270E
4-Nitroaniline	SVOC	Water	0.88	6	---	ug/L	EPA8270E
4-Nitrophenol	SVOC	Water	0.52	0.02	---	ug/L	EPA8270E
Acenaphthene	SVOC	Water	0.0042	0.02	---	ug/L	EPA8270E
Acenaphthylene	SVOC	Water	0.0031	0.02	---	ug/L	EPA8270E
Anthracene	SVOC	Water	0.0049	0.02	---	ug/L	EPA8270E
Benz(a)anthracen	SVOC	Water	0.006	4	---	ug/L	EPA8270E
Benzo(a)pyrene	SVOC	Water	0.0089	0.02	---	ug/L	EPA8270E
Benzo(b)fluoranth	SVOC	Water	0.0054	0.02	---	ug/L	EPA8270E
Benzo(g,h,i)peryle	SVOC	Water	0.018	0.04	---	ug/L	EPA8270E
Benzo(k)fluoranth	SVOC	Water	0.0045	0.02	---	ug/L	EPA8270E
Benzoic acid	SVOC	Water	5.2	10	---	ug/L	EPA8270E
Benzyl alcohol	SVOC	Water	0.14	2	---	ug/L	EPA8270E
Benzyl butyl phtha	SVOC	Water	0.7	2	---	ug/L	EPA8270E
Bis(2-chloroethoxy	SVOC	Water	0.062	0.2	---	ug/L	EPA8270E
Bis(2-chloroethyl)	SVOC	Water	0.042	0.2	---	ug/L	EPA8270E
Bis(2-ethylhexyl) p	SVOC	Water	0.93	3.2	---	ug/L	EPA8270E
Carbazole	SVOC	Water	0.0034	0.02	---	ug/L	EPA8270E
Chrysene	SVOC	Water	0.0045	0.02	---	ug/L	EPA8270E
Dibenzo(a,h)anthr	SVOC	Water	0.013	0.02	---	ug/L	EPA8270E
Dibenzofuran	SVOC	Water	0.0052	0.02	---	ug/L	EPA8270E
Diethyl phthalate	SVOC	Water	0.11	2	---	ug/L	EPA8270E
Dimethyl phthalate	SVOC	Water	0.062	2	---	ug/L	EPA8270E
Di-n-butyl phthalat	SVOC	Water	0.51	2	---	ug/L	EPA8270E
Di-n-octyl phthalat	SVOC	Water	0.63	2	---	ug/L	EPA8270E
Fluoranthene	SVOC	Water	0.0045	0.02	---	ug/L	EPA8270E
Fluorene	SVOC	Water	0.0032	0.02	---	ug/L	EPA8270E
Hexachlorobenzer	SVOC	Water	0.039	0.2	---	ug/L	EPA8270E
Hexachlorobutadie	SVOC	Water	0.091	0.2	---	ug/L	EPA8270E
Hexachlorocyclope	SVOC	Water	0.11	0.6	---	ug/L	EPA8270E
Hexachloroethane	SVOC	Water	0.079	0.2	---	ug/L	EPA8270E

Indeno(1,2,3-cd)p	SVOC	Water	0.014	0.02	---	ug/L	EPA8270E
Isophorone	SVOC	Water	0.02	0.2	---	ug/L	EPA8270E
Naphthalene	SVOC	Water	0.0078	0.2	---	ug/L	EPA8270E
Nitrobenzene	SVOC	Water	0.075	0.2	---	ug/L	EPA8270E
N-Nitrosodimethyl	SVOC	Water	0.03	0.2	---	ug/L	EPA8270E
N-Nitroso-di-n-pro	SVOC	Water	0.052	0.2	---	ug/L	EPA8270E
N-Nitrosodiphenyl	SVOC	Water	0.021	0.2	---	ug/L	EPA8270E
Pentachloropheno	SVOC	Water	0.44	1	---	ug/L	EPA8270E
Phenanthrene	SVOC	Water	0.005	0.02	---	ug/L	EPA8270E
Phenol	SVOC	Water	0.061	2	---	ug/L	EPA8270E
Pyrene	SVOC	Water	0.0041	0.02	---	ug/L	EPA8270E
1,2,4-Trichloroben	SVOC	Soil	0.0039	---	0.01	mg/kg	EPA8270E
1,2-Dichlorobenze	SVOC	Soil	0.0036	---	0.01	mg/kg	EPA8270E
1,2-Diphenylhydra	SVOC	Soil	0.0044	---	0.01	mg/kg	EPA8270E
1,3-Dichlorobenze	SVOC	Soil	0.0029	---	0.01	mg/kg	EPA8270E
1,4-Dichlorobenze	SVOC	Soil	0.003	---	0.01	mg/kg	EPA8270E
1-Methylnaphthale	SVOC	Soil	0.0003	---	0.002	mg/kg	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Soil	0.0031	---	0.01	mg/kg	EPA8270E
2,4,5-Trichlorophe	SVOC	Soil	0.013	---	0.1	mg/kg	EPA8270E
2,4,6-Trichlorophe	SVOC	Soil	0.015	---	0.1	mg/kg	EPA8270E
2,4-Dichloropheno	SVOC	Soil	0.0061	---	0.1	mg/kg	EPA8270E
2,4-Dimethylphen	SVOC	Soil	0.014	---	0.1	mg/kg	EPA8270E
2,4-Dinitrophenol	SVOC	Soil	0.016	---	0.3	mg/kg	EPA8270E
2,4-Dinitrotoluene	SVOC	Soil	0.0081	---	0.05	mg/kg	EPA8270E
2,6-Dinitrotoluene	SVOC	Soil	0.0069	---	0.05	mg/kg	EPA8270E
2-Chloronaphthale	SVOC	Soil	0.0016	---	0.01	mg/kg	EPA8270E
2-Chlorophenol	SVOC	Soil	0.012	---	0.1	mg/kg	EPA8270E
2-Methylnaphthale	SVOC	Soil	0.00039	---	0.002	mg/kg	EPA8270E
2-Methylphenol	SVOC	Soil	0.0082	---	0.1	mg/kg	EPA8270E
2-Nitroaniline	SVOC	Soil	0.015	---	0.05	mg/kg	EPA8270E
2-Nitrophenol	SVOC	Soil	0.027	---	0.1	mg/kg	EPA8270E
3,3'-Dichlorobenzi	SVOC	Soil	0.033	---	0.1	mg/kg	EPA8270E
3-Methylphenol +	SVOC	Soil	0.013	---	0.2	mg/kg	EPA8270E
3-Nitroaniline	SVOC	Soil	0.017	---	1	mg/kg	EPA8270E
4,6-Dinitro-2-meth	SVOC	Soil	0.017	---	0.3	mg/kg	EPA8270E
4-Bromophenyl ph	SVOC	Soil	0.0023	---	0.01	mg/kg	EPA8270E
4-Chloro-3-methyl	SVOC	Soil	0.018	---	0.1	mg/kg	EPA8270E
4-Chloroaniline	SVOC	Soil	0.21	---	1	mg/kg	EPA8270E
4-Chlorophenyl ph	SVOC	Soil	0.0028	---	0.01	mg/kg	EPA8270E
4-Nitroaniline	SVOC	Soil	0.024	---	1	mg/kg	EPA8270E
4-Nitrophenol	SVOC	Soil	0.011	---	0.3	mg/kg	EPA8270E
Acenaphthene	SVOC	Soil	0.00018	---	0.002	mg/kg	EPA8270E
Acenaphthylene	SVOC	Soil	0.00016	---	0.002	mg/kg	EPA8270E
Anthracene	SVOC	Soil	0.00014	---	0.002	mg/kg	EPA8270E
Benz(a)anthracen	SVOC	Soil	0.00023	---	0.002	mg/kg	EPA8270E
Benzo(a)pyrene	SVOC	Soil	0.00028	---	0.002	mg/kg	EPA8270E
Benzo(b)fluoranth	SVOC	Soil	0.00025	---	0.002	mg/kg	EPA8270E
Benzo(g,h,i)peryle	SVOC	Soil	0.0004	---	0.002	mg/kg	EPA8270E
Benzo(k)fluoranth	SVOC	Soil	0.00032	---	0.002	mg/kg	EPA8270E
Benzoic acid	SVOC	Soil	0.1	---	0.5	mg/kg	EPA8270E
Benzyl alcohol	SVOC	Soil	0.012	---	0.1	mg/kg	EPA8270E
Benzyl butyl phtha	SVOC	Soil	0.019	---	0.1	mg/kg	EPA8270E
Bis(2-chloroethox	SVOC	Soil	0.0027	---	0.01	mg/kg	EPA8270E
Bis(2-chloroethyl)	SVOC	Soil	0.0035	---	0.01	mg/kg	EPA8270E
Bis(2-ethylhexyl) p	SVOC	Soil	0.035	---	0.16	mg/kg	EPA8270E
Carbazole	SVOC	Soil	0.0019	---	0.01	mg/kg	EPA8270E
Chrysene	SVOC	Soil	0.00018	---	0.002	mg/kg	EPA8270E
Dibenzo(a,h)anthr	SVOC	Soil	0.00049	---	0.002	mg/kg	EPA8270E
Dibenzofuran	SVOC	Soil	0.0034	---	0.01	mg/kg	EPA8270E
Diethyl phthalate	SVOC	Soil	0.0051	---	0.1	mg/kg	EPA8270E
Dimethyl phthalate	SVOC	Soil	0.0053	---	0.1	mg/kg	EPA8270E
Di-n-butyl phthalat	SVOC	Soil	0.019	---	0.1	mg/kg	EPA8270E
Di-n-octyl phthalat	SVOC	Soil	0.019	---	0.1	mg/kg	EPA8270E
Fluoranthene	SVOC	Soil	0.00019	---	0.002	mg/kg	EPA8270E
Fluorene	SVOC	Soil	0.00014	---	0.002	mg/kg	EPA8270E
Hexachlorobenzer	SVOC	Soil	0.002	---	0.01	mg/kg	EPA8270E
Hexachlorobutadie	SVOC	Soil	0.0029	---	0.01	mg/kg	EPA8270E
Hexachlorocyclop	SVOC	Soil	0.0061	---	0.03	mg/kg	EPA8270E
Hexachloroethane	SVOC	Soil	0.0041	---	0.01	mg/kg	EPA8270E
Indeno(1,2,3-cd)p	SVOC	Soil	0.00026	---	0.002	mg/kg	EPA8270E
Isophorone	SVOC	Soil	0.0019	---	0.01	mg/kg	EPA8270E
Naphthalene	SVOC	Soil	0.0004	---	0.002	mg/kg	EPA8270E
Nitrobenzene	SVOC	Soil	0.0047	---	0.01	mg/kg	EPA8270E
N-Nitrosodimethyl	SVOC	Soil	0.0063	---	0.01	mg/kg	EPA8270E
N-Nitroso-di-n-pro	SVOC	Soil	0.003	---	0.01	mg/kg	EPA8270E
N-Nitrosodiphenyl	SVOC	Soil	0.0033	---	0.01	mg/kg	EPA8270E
Pentachloropheno	SVOC	Soil	0.0088	---	0.05	mg/kg	EPA8270E

Phenanthrene	SVOC	Soil	0.00018	---	0.002	mg/kg	EPA8270E
Phenol	SVOC	Soil	0.013	---	0.1	mg/kg	EPA8270E
Pyrene	SVOC	Soil	0.00016	---	0.002	mg/kg	EPA8270E
1,2,4-Trichloroben	SVOC	Water	0.028	---	0.2	ug/L	EPA8270E
1,2-Dichlorobenze	SVOC	Water	0.028	---	0.2	ug/L	EPA8270E
1,2-Diphenylhydra	SVOC	Water	0.014	---	0.2	ug/L	EPA8270E
1,3-Dichlorobenze	SVOC	Water	0.034	---	0.2	ug/L	EPA8270E
1,4-Dichlorobenze	SVOC	Water	0.033	---	0.2	ug/L	EPA8270E
1-Methylnaphthale	SVOC	Water	0.0025	---	0.2	ug/L	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Water	0.023	---	0.2	ug/L	EPA8270E
2,2'-Oxybis(1-chlo	SVOC	Water	0.023	---	2	ug/L	EPA8270E
2,4,5-Trichlorophe	SVOC	Water	0.085	---	2	ug/L	EPA8270E
2,4,6-Trichlorophe	SVOC	Water	0.065	---	2	ug/L	EPA8270E
2,4-Dichloropheno	SVOC	Water	0.060	---	2	ug/L	EPA8270E
2,4-Dimethylphen	SVOC	Water	0.39	---	6	ug/L	EPA8270E
2,4-Dinitrophenol	SVOC	Water	1.3	---	1	ug/L	EPA8270E
2,4-Dinitrotoluene	SVOC	Water	0.034	---	1	ug/L	EPA8270E
2,6-Dinitrotoluene	SVOC	Water	0.036	---	0.2	ug/L	EPA8270E
2-Chloronaphthale	SVOC	Water	0.017	---	2	ug/L	EPA8270E
2-Chlorophenol	SVOC	Water	0.080	---	0.2	ug/L	EPA8270E
2-Methylnaphthale	SVOC	Water	0.003	---	2	ug/L	EPA8270E
2-Methylphenol	SVOC	Water	0.095	---	1	ug/L	EPA8270E
2-Nitroaniline	SVOC	Water	0.175	---	2	ug/L	EPA8270E
2-Nitrophenol	SVOC	Water	0.125	---	2	ug/L	EPA8270E
3,3'-Dichlorobenzi	SVOC	Water	0.405	---	4	ug/L	EPA8270E
3-Methylphenol +	SVOC	Water	0.145	---	20	ug/L	EPA8270E
3-Nitroaniline	SVOC	Water	0.170	---	6	ug/L	EPA8270E
4,6-Dinitro-2-meth	SVOC	Water	0.080	---	0.2	ug/L	EPA8270E
4-Bromophenyl ph	SVOC	Water	0.0175	---	2	ug/L	EPA8270E
4-Chloro-3-methyl	SVOC	Water	0.050	---	20	ug/L	EPA8270E
4-Chloroaniline	SVOC	Water	0.305	---	0.2	ug/L	EPA8270E
4-Chlorophenyl ph	SVOC	Water	0.015	---	20	ug/L	EPA8270E
4-Nitroaniline	SVOC	Water	0.440	---	6	ug/L	EPA8270E
4-Nitrophenol	SVOC	Water	0.260	---	0.02	ug/L	EPA8270E
Acenaphthene	SVOC	Water	0.0021	---	0.02	ug/L	EPA8270E
Acenaphthylene	SVOC	Water	0.0016	---	0.02	ug/L	EPA8270E
Anthracene	SVOC	Water	0.0025	---	0.02	ug/L	EPA8270E
Benz(a)anthracen	SVOC	Water	0.0030	---	4	ug/L	EPA8270E
Benzo(a)pyrene	SVOC	Water	0.0045	---	0.02	ug/L	EPA8270E
Benzo(b)fluoranth	SVOC	Water	0.0027	---	0.02	ug/L	EPA8270E
Benzo(g,h,i)peryle	SVOC	Water	0.0090	---	0.04	ug/L	EPA8270E
Benzo(k)fluoranth	SVOC	Water	0.0023	---	0.02	ug/L	EPA8270E
Benzoic acid	SVOC	Water	2.6	---	10	ug/L	EPA8270E
Benzyl alcohol	SVOC	Water	0.070	---	2	ug/L	EPA8270E
Benzyl butyl phtha	SVOC	Water	0.350	---	2	ug/L	EPA8270E
Bis(2-chloroethoxy	SVOC	Water	0.031	---	0.2	ug/L	EPA8270E
Bis(2-chloroethyl)	SVOC	Water	0.021	---	0.2	ug/L	EPA8270E
Bis(2-ethylhexyl) p	SVOC	Water	0.465	---	3.2	ug/L	EPA8270E
Carbazole	SVOC	Water	0.0017	---	0.02	ug/L	EPA8270E
Chrysene	SVOC	Water	0.0023	---	0.02	ug/L	EPA8270E
Dibenzo(a,h)anthr	SVOC	Water	0.0065	---	0.02	ug/L	EPA8270E
Dibenzofuran	SVOC	Water	0.0026	---	0.02	ug/L	EPA8270E
Diethyl phthalate	SVOC	Water	0.055	---	2	ug/L	EPA8270E
Dimethyl phthalate	SVOC	Water	0.031	---	2	ug/L	EPA8270E
Di-n-butyl phthalat	SVOC	Water	0.255	---	2	ug/L	EPA8270E
Di-n-octyl phthalat	SVOC	Water	0.315	---	2	ug/L	EPA8270E
Fluoranthene	SVOC	Water	0.0023	---	0.02	ug/L	EPA8270E
Fluorene	SVOC	Water	0.0016	---	0.02	ug/L	EPA8270E
Hexachlorobenzer	SVOC	Water	0.0195	---	0.2	ug/L	EPA8270E
Hexachlorobutadie	SVOC	Water	0.0455	---	0.2	ug/L	EPA8270E
Hexachlorocyclope	SVOC	Water	0.0550	---	0.6	ug/L	EPA8270E
Hexachloroethane	SVOC	Water	0.0395	---	0.2	ug/L	EPA8270E
Indeno(1,2,3-cd)py	SVOC	Water	0.007	---	0.02	ug/L	EPA8270E
Isophorone	SVOC	Water	0.010	---	0.2	ug/L	EPA8270E
Naphthalene	SVOC	Water	0.0039	---	0.2	ug/L	EPA8270E
Nitrobenzene	SVOC	Water	0.0375	---	0.2	ug/L	EPA8270E
N-Nitrosodimethyla	SVOC	Water	0.015	---	0.2	ug/L	EPA8270E
N-Nitroso-di-n-pro	SVOC	Water	0.026	---	0.2	ug/L	EPA8270E
N-Nitrosodiphenyla	SVOC	Water	0.0105	---	0.2	ug/L	EPA8270E
Pentachloropheno	SVOC	Water	0.220	---	1	ug/L	EPA8270E
Phenanthrene	SVOC	Water	0.0025	---	0.02	ug/L	EPA8270E
Phenol	SVOC	Water	0.0305	---	2	ug/L	EPA8270E
Pyrene	SVOC	Water	0.0021	---	0.02	ug/L	EPA8270E
1,1,1,2-Tetrachlor	VOC	Soil	0.019	0.05	---	mg/kg	EPA8260D
1,1,1-Trichloroetha	VOC	Soil	0.0021	0.05	---	mg/kg	EPA8260D
1,1,2,2-Tetrachlor	VOC	Soil	0.016	0.05	---	mg/kg	EPA8260D
1,1,2-Trichloroetha	VOC	Soil	0.0056	0.05	---	mg/kg	EPA8260D

1,1-Dichloroethan	VOC	Soil	0.0011	0.05	---	mg/kg	EPA8260D
1,1-Dichloroethen	VOC	Soil	0.0011	0.05	---	mg/kg	EPA8260D
1,1-Dichloroprope	VOC	Soil	0.014	0.05	---	mg/kg	EPA8260D
1,2,3-Trichloroben	VOC	Soil	0.065	0.25	---	mg/kg	EPA8260D
1,2,3-Trichloropro	VOC	Soil	0.0019	0.05	---	mg/kg	EPA8260D
1,2,4-Trichloroben	VOC	Soil	0.0057	0.25	---	mg/kg	EPA8260D
1,2,4-Trimethylber	VOC	Soil	0.0053	0.05	---	mg/kg	EPA8260D
1,2-Dibromo-3-chl	VOC	Soil	0.12	0.5	---	mg/kg	EPA8260D
1,2-Dibromoethan	VOC	Soil	0.00087	0.05	---	mg/kg	EPA8260D
1,2-Dichlorobenze	VOC	Soil	0.0072	0.05	---	mg/kg	EPA8260D
1,2-Dichloroethan	VOC	Soil	0.0017	0.05	---	mg/kg	EPA8260D
1,2-Dichloropropa	VOC	Soil	0.011	0.05	---	mg/kg	EPA8260D
1,3,5-Trimethylber	VOC	Soil	0.0067	0.05	---	mg/kg	EPA8260D
1,3-Dichlorobenze	VOC	Soil	0.0045	0.05	---	mg/kg	EPA8260D
1,3-Dichloropropa	VOC	Soil	0.014	0.05	---	mg/kg	EPA8260D
1,4-Dichlorobenze	VOC	Soil	0.004	0.05	---	mg/kg	EPA8260D
2,2-Dichloropropa	VOC	Soil	0.014	0.05	---	mg/kg	EPA8260D
2-Butanone (MEK)	VOC	Soil	0.72	1	---	mg/kg	EPA8260D
2-Chlorotoluene	VOC	Soil	0.014	0.05	---	mg/kg	EPA8260D
2-Hexanone	VOC	Soil	0.43	0.5	---	mg/kg	EPA8260D
4-Chlorotoluene	VOC	Soil	0.01	0.05	---	mg/kg	EPA8260D
4-Methyl-2-pentan	VOC	Soil	0.38	1	---	mg/kg	EPA8260D
Acetone	VOC	Soil	0.87	5	---	mg/kg	EPA8260D
Benzene	VOC	Soil	0.00096	0.03	---	mg/kg	EPA8260D
Bromobenzene	VOC	Soil	0.017	0.05	---	mg/kg	EPA8260D
Bromodichloromet	VOC	Soil	0.014	0.05	---	mg/kg	EPA8260D
Bromoform	VOC	Soil	0.015	0.05	---	mg/kg	EPA8260D
Bromomethane	VOC	Soil	0.089	0.5	---	mg/kg	EPA8260D
Carbon tetrachlori	VOC	Soil	0.012	0.05	---	mg/kg	EPA8260D
Chlorobenzene	VOC	Soil	0.0063	0.05	---	mg/kg	EPA8260D
Chloroethane	VOC	Soil	0.056	0.5	---	mg/kg	EPA8260D
Chloroform	VOC	Soil	0.008	0.05	---	mg/kg	EPA8260D
Chloromethane	VOC	Soil	0.18	0.5	---	mg/kg	EPA8260D
cis-1,2-Dichloroeth	VOC	Soil	0.0013	0.05	---	mg/kg	EPA8260D
cis-1,3-Dichloropr	VOC	Soil	0.011	0.05	---	mg/kg	EPA8260D
Dibromochloromet	VOC	Soil	0.017	0.05	---	mg/kg	EPA8260D
Dibromomethane	VOC	Soil	0.024	0.05	---	mg/kg	EPA8260D
Dichlorodifluorom	VOC	Soil	0.021	0.5	---	mg/kg	EPA8260D
Ethylbenzene	VOC	Soil	0.0012	0.05	---	mg/kg	EPA8260D
Hexachlorobutadie	VOC	Soil	0.011	0.25	---	mg/kg	EPA8260D
Hexane	VOC	Soil	0.013	0.25	---	mg/kg	EPA8260D
Isopropylbenzene	VOC	Soil	0.0091	0.05	---	mg/kg	EPA8260D
m,p-Xylene	VOC	Soil	0.001	0.1	---	mg/kg	EPA8260D
Methyl t-butyl ethe	VOC	Soil	0.0011	0.05	---	mg/kg	EPA8260D
Methylene chloride	VOC	Soil	0.14	0.5	---	mg/kg	EPA8260D
Naphthalene	VOC	Soil	0.0063	0.05	---	mg/kg	EPA8260D
n-Propylbenzene	VOC	Soil	0.0045	0.05	---	mg/kg	EPA8260D
o-Xylene	VOC	Soil	0.00068	0.05	---	mg/kg	EPA8260D
p-Isopropyltoluene	VOC	Soil	0.0022	0.05	---	mg/kg	EPA8260D
sec-Butylbenzene	VOC	Soil	0.0048	0.05	---	mg/kg	EPA8260D
Styrene	VOC	Soil	0.0067	0.05	---	mg/kg	EPA8260D
tert-Butylbenzene	VOC	Soil	0.0092	0.05	---	mg/kg	EPA8260D
Tetrachloroethene	VOC	Soil	0.002	0.025	---	mg/kg	EPA8260D
Toluene	VOC	Soil	0.0011	0.05	---	mg/kg	EPA8260D
trans-1,2-Dichloro	VOC	Soil	0.0023	0.05	---	mg/kg	EPA8260D
trans-1,3-Dichloro	VOC	Soil	0.015	0.05	---	mg/kg	EPA8260D
Trichloroethene	VOC	Soil	0.0014	0.02	---	mg/kg	EPA8260D
Trichlorofluoromet	VOC	Soil	0.043	0.5	---	mg/kg	EPA8260D
Vinyl chloride	VOC	Soil	0.0019	0.05	---	mg/kg	EPA8260D
1,1,1,2-Tetrachlor	VOC	Soil	0.0095	---	0.05	mg/kg	EPA8260D
1,1,1-Trichloroeth	VOC	Soil	0.00105	---	0.002	mg/kg	EPA8260D
1,1,2,2-Tetrachlor	VOC	Soil	0.008	---	0.05	mg/kg	EPA8260D
1,1,2-Trichloroeth	VOC	Soil	0.0028	---	0.05	mg/kg	EPA8260D
1,1-Dichloroethan	VOC	Soil	0.00055	---	0.002	mg/kg	EPA8260D
1,1-Dichloroethen	VOC	Soil	0.00055	---	0.002	mg/kg	EPA8260D
1,1-Dichloroprope	VOC	Soil	0.007	---	0.05	mg/kg	EPA8260D
1,2,3-Trichloroben	VOC	Soil	0.0325	---	0.25	mg/kg	EPA8260D
1,2,3-Trichloropro	VOC	Soil	0.00095	---	0.05	mg/kg	EPA8260D
1,2,4-Trichloroben	VOC	Soil	0.00285	---	0.25	mg/kg	EPA8260D
1,2,4-Trimethylber	VOC	Soil	0.00265	---	0.05	mg/kg	EPA8260D
1,2-Dibromo-3-chl	VOC	Soil	0.06	---	0.5	mg/kg	EPA8260D
1,2-Dibromoethan	VOC	Soil	0.000435	---	0.005	mg/kg	EPA8260D
1,2-Dichlorobenze	VOC	Soil	0.0036	---	0.05	mg/kg	EPA8260D
1,2-Dichloroethan	VOC	Soil	0.00085	---	0.002	mg/kg	EPA8260D
1,2-Dichloropropa	VOC	Soil	0.0055	---	0.05	mg/kg	EPA8260D
1,3,5-Trimethylber	VOC	Soil	0.00335	---	0.05	mg/kg	EPA8260D
1,3-Dichlorobenze	VOC	Soil	0.00225	---	0.05	mg/kg	EPA8260D

1,3-Dichloropropa	VOC	Soil	0.007	---	0.05	mg/kg	EPA8260D
1,4-Dichlorobenze	VOC	Soil	0.002	---	0.05	mg/kg	EPA8260D
2,2-Dichloropropa	VOC	Soil	0.007	---	0.05	mg/kg	EPA8260D
2-Butanone (MEK)	VOC	Soil	0.36	---	1	mg/kg	EPA8260D
2-Chlorotoluene	VOC	Soil	0.007	---	0.05	mg/kg	EPA8260D
2-Hexanone	VOC	Soil	0.215	---	0.5	mg/kg	EPA8260D
4-Chlorotoluene	VOC	Soil	0.005	---	0.05	mg/kg	EPA8260D
4-Methyl-2-pentan	VOC	Soil	0.19	---	1	mg/kg	EPA8260D
Acetone	VOC	Soil	0.435	---	5	mg/kg	EPA8260D
Benzene	VOC	Soil	0.00048	---	0.001	mg/kg	EPA8260D
Bromobenzene	VOC	Soil	0.0085	---	0.05	mg/kg	EPA8260D
Bromodichloromet	VOC	Soil	0.007	---	0.05	mg/kg	EPA8260D
Bromoform	VOC	Soil	0.0075	---	0.05	mg/kg	EPA8260D
Bromomethane	VOC	Soil	0.0445	---	0.5	mg/kg	EPA8260D
Carbon tetrachlori	VOC	Soil	0.006	---	0.05	mg/kg	EPA8260D
Chlorobenzene	VOC	Soil	0.00315	---	0.05	mg/kg	EPA8260D
Chloroethane	VOC	Soil	0.028	---	0.1	mg/kg	EPA8260D
Chloroform	VOC	Soil	0.004	---	0.05	mg/kg	EPA8260D
Chloromethane	VOC	Soil	0.09	---	0.5	mg/kg	EPA8260D
cis-1,2-Dichloroeth	VOC	Soil	0.00065	---	0.002	mg/kg	EPA8260D
cis-1,3-Dichloropr	VOC	Soil	0.0055	---	0.05	mg/kg	EPA8260D
Dibromochloromet	VOC	Soil	0.0085	---	0.05	mg/kg	EPA8260D
Dibromomethane	VOC	Soil	0.012	---	0.05	mg/kg	EPA8260D
Dichlorodifluorom	VOC	Soil	0.0105	---	0.5	mg/kg	EPA8260D
Ethylbenzene	VOC	Soil	0.0006	---	0.001	mg/kg	EPA8260D
Hexachlorobutadie	VOC	Soil	0.0055	---	0.25	mg/kg	EPA8260D
Hexane	VOC	Soil	0.0065	---	0.25	mg/kg	EPA8260D
Isopropylbenzene	VOC	Soil	0.00455	---	0.05	mg/kg	EPA8260D
m,p-Xylene	VOC	Soil	0.0005	---	0.002	mg/kg	EPA8260D
Methyl t-butyl ethe	VOC	Soil	0.00055	---	0.002	mg/kg	EPA8260D
Methylene chloride	VOC	Soil	0.07	---	0.2	mg/kg	EPA8260D
Naphthalene	VOC	Soil	0.00315	---	0.01	mg/kg	EPA8260D
n-Propylbenzene	VOC	Soil	0.00225	---	0.05	mg/kg	EPA8260D
o-Xylene	VOC	Soil	0.00034	---	0.001	mg/kg	EPA8260D
p-Isopropyltoluene	VOC	Soil	0.0011	---	0.05	mg/kg	EPA8260D
sec-Butylbenzene	VOC	Soil	0.0024	---	0.05	mg/kg	EPA8260D
Styrene	VOC	Soil	0.00335	---	0.05	mg/kg	EPA8260D
tert-Butylbenzene	VOC	Soil	0.0046	---	0.05	mg/kg	EPA8260D
Tetrachloroethene	VOC	Soil	0.001	---	0.002	mg/kg	EPA8260D
Toluene	VOC	Soil	0.00055	---	0.001	mg/kg	EPA8260D
trans-1,2-Dichloro	VOC	Soil	0.00115	---	0.002	mg/kg	EPA8260D
trans-1,3-Dichloro	VOC	Soil	0.0075	---	0.05	mg/kg	EPA8260D
Trichloroethene	VOC	Soil	0.0007	---	0.002	mg/kg	EPA8260D
Trichlorofluoromet	VOC	Soil	0.0215	---	0.5	mg/kg	EPA8260D
Vinyl chloride	VOC	Soil	0.00095	---	0.002	mg/kg	EPA8260D
1,1,1,2-Tetrachlor	VOC	Water	0.16	1	---	ug/L	EPA8260D
1,1,1-Trichloroeth	VOC	Water	0.017	1	---	ug/L	EPA8260D
1,1,2,2-Tetrachlor	VOC	Water	0.17	0.2	---	ug/L	EPA8260D
1,1,2-Trichloroeth	VOC	Water	0.084	0.5	---	ug/L	EPA8260D
1,1-Dichloroethan	VOC	Water	0.017	1	---	ug/L	EPA8260D
1,1-Dichloroethen	VOC	Water	0.021	1	---	ug/L	EPA8260D
1,1-Dichloroprope	VOC	Water	0.12	1	---	ug/L	EPA8260D
1,2,3-Trichloroben	VOC	Water	0.24	1	---	ug/L	EPA8260D
1,2,3-Trichloropro	VOC	Water	0.01	1	---	ug/L	EPA8260D
1,2,4-Trichloroben	VOC	Water	0.23	1	---	ug/L	EPA8260D
1,2,4-Trimethylber	VOC	Water	0.084	1	---	ug/L	EPA8260D
1,2-Dibromo-3-chl	VOC	Water	0.8	10	---	ug/L	EPA8260D
1,2-Dibromoethan	VOC	Water	0.0049	1	---	ug/L	EPA8260D
1,2-Dichlorobenze	VOC	Water	0.12	1	---	ug/L	EPA8260D
1,2-Dichloroethan	VOC	Water	0.037	0.2	---	ug/L	EPA8260D
1,2-Dichloropropa	VOC	Water	0.24	1	---	ug/L	EPA8260D
1,3,5-Trimethylber	VOC	Water	0.083	1	---	ug/L	EPA8260D
1,3-Dichlorobenze	VOC	Water	0.11	1	---	ug/L	EPA8260D
1,3-Dichloropropa	VOC	Water	0.12	1	---	ug/L	EPA8260D
1,4-Dichlorobenze	VOC	Water	0.13	1	---	ug/L	EPA8260D
2,2-Dichloropropa	VOC	Water	0.33	1	---	ug/L	EPA8260D
2-Butanone (MEK)	VOC	Water	1.9	20	---	ug/L	EPA8260D
2-Chlorotoluene	VOC	Water	0.26	1	---	ug/L	EPA8260D
2-Hexanone	VOC	Water	3.7	10	---	ug/L	EPA8260D
4-Chlorotoluene	VOC	Water	0.098	1	---	ug/L	EPA8260D
4-Methyl-2-pentan	VOC	Water	3.4	10	---	ug/L	EPA8260D
Acetone	VOC	Water	2.9	50	---	ug/L	EPA8260D
Benzene	VOC	Water	0.019	0.35	---	ug/L	EPA8260D
Bromobenzene	VOC	Water	0.19	1	---	ug/L	EPA8260D
Bromodichloromet	VOC	Water	0.2	0.5	---	ug/L	EPA8260D
Bromoform	VOC	Water	0.17	5	---	ug/L	EPA8260D
Bromomethane	VOC	Water	2.1	5	---	ug/L	EPA8260D

Carbon tetrachlori	VOC	Water	0.16	0.5	---	ug/L	EPA8260D
Chlorobenzene	VOC	Water	0.1	1	---	ug/L	EPA8260D
Chloroethane	VOC	Water	0.05	1	---	ug/L	EPA8260D
Chloroform	VOC	Water	0.18	1	---	ug/L	EPA8260D
Chloromethane	VOC	Water	1.1	10	---	ug/L	EPA8260D
cis-1,2-Dichloroeth	VOC	Water	0.033	1	---	ug/L	EPA8260D
cis-1,3-Dichloropr	VOC	Water	0.15	0.4	---	ug/L	EPA8260D
Dibromochloromet	VOC	Water	0.21	0.5	---	ug/L	EPA8260D
Dibromomethane	VOC	Water	0.16	1	---	ug/L	EPA8260D
Dichlorodifluorom	VOC	Water	0.29	1	---	ug/L	EPA8260D
Ethylbenzene	VOC	Water	0.023	1	---	ug/L	EPA8260D
Hexachlorobutadie	VOC	Water	0.29	0.5	---	ug/L	EPA8260D
Hexane	VOC	Water	0.17	5	---	ug/L	EPA8260D
Isopropylbenzene	VOC	Water	0.057	1	---	ug/L	EPA8260D
m,p-Xylene	VOC	Water	0.044	2	---	ug/L	EPA8260D
Methyl t-butyl ethe	VOC	Water	0.014	1	---	ug/L	EPA8260D
Methylene chloride	VOC	Water	0.82	5	---	ug/L	EPA8260D
Naphthalene	VOC	Water	0.19	1	---	ug/L	EPA8260D
n-Propylbenzene	VOC	Water	0.1	1	---	ug/L	EPA8260D
o-Xylene	VOC	Water	0.023	1	---	ug/L	EPA8260D
p-Isopropyltoluene	VOC	Water	0.068	1	---	ug/L	EPA8260D
sec-Butylbenzene	VOC	Water	0.075	1	---	ug/L	EPA8260D
Styrene	VOC	Water	0.39	1	---	ug/L	EPA8260D
tert-Butylbenzene	VOC	Water	0.066	1	---	ug/L	EPA8260D
Tetrachloroethene	VOC	Water	0.043	1	---	ug/L	EPA8260D
Toluene	VOC	Water	0.062	1	---	ug/L	EPA8260D
trans-1,2-Dichloro	VOC	Water	0.046	1	---	ug/L	EPA8260D
trans-1,3-Dichloro	VOC	Water	0.12	0.4	---	ug/L	EPA8260D
Trichloroethene	VOC	Water	0.03	0.5	---	ug/L	EPA8260D
Trichlorofluoromet	VOC	Water	0.19	1	---	ug/L	EPA8260D
Vinyl chloride	VOC	Water	0.015	0.02	---	ug/L	EPA8260D
Calcium	METALS	Water	0.0087	0.05	---	mg/L	EPA200.8
Magnesium	METALS	Water	0.0097	0.05	---	mg/L	EPA200.8
Hardness (as CaC	METALS	Water	0.000062	0.35	---	mg/L	EPA200.8
Antimony	METALS	Soil	0.098	5	1	mg/kg	EPA6020/200.8
Arsenic	METALS	Soil	0.17	1	0.2	mg/kg	EPA6020/200.8
Barium	METALS	Soil	0.11	1	0.2	mg/kg	EPA6020/200.8
Beryllium	METALS	Soil	0.057	1	0.2	mg/kg	EPA6020/200.8
Cadmium	METALS	Soil	0.05	1	0.2	mg/kg	EPA6020/200.8
Chromium	METALS	Soil	0.52	5	1	mg/kg	EPA6020/200.8
Cobalt	METALS	Soil	0.028	1	0.2	mg/kg	EPA6020/200.8
Copper	METALS	Soil	0.1	5	1	mg/kg	EPA6020/200.8
Lead	METALS	Soil	0.032	1	0.2	mg/kg	EPA6020/200.8
Manganese	METALS	Soil	0.047	1	0.2	mg/kg	EPA6020/200.8
Mercury	METALS	Soil	0.033	1	0.2	mg/kg	EPA6020/200.8
Molybdenum	METALS	Soil	0.065	1	0.2	mg/kg	EPA6020/200.8
Nickel	METALS	Soil	0.093	1	0.2	mg/kg	EPA6020/200.8
Selenium	METALS	Soil	0.12	1	0.2	mg/kg	EPA6020/200.8
Silver	METALS	Soil	0.13	1	0.2	mg/kg	EPA6020/200.8
Thallium	METALS	Soil	0.031	1	0.2	mg/kg	EPA6020/200.8
Thorium	METALS	Soil	0.081	1	0.2	mg/kg	EPA6020/200.8
Uranium	METALS	Soil	0.083	1	0.2	mg/kg	EPA6020/200.8
Vanadium	METALS	Soil	0.49	5	1	mg/kg	EPA6020/200.8
Zinc	METALS	Soil	0.58	5	1	mg/kg	EPA6020/200.8
Antimony	METALS	Water	0.039	5	1	ug/L	EPA6020/200.8
Arsenic	METALS	Water	0.18	1	0.2	ug/L	EPA6020/200.8
Barium	METALS	Water	0.064	1	0.2	ug/L	EPA6020/200.8
Beryllium	METALS	Water	0.094	1	0.2	ug/L	EPA6020/200.8
Cadmium	METALS	Water	0.036	1	0.2	ug/L	EPA6020/200.8
Chromium	METALS	Water	0.079	1	0.2	ug/L	EPA6020/200.8
Cobalt	METALS	Water	0.037	1	0.2	ug/L	EPA6020/200.8
Copper	METALS	Water	0.48	5	1	ug/L	EPA6020/200.8
Iron	METALS	Water	6.3	50	---	ug/L	EPA6020/200.8
Lead	METALS	Water	0.064	1	0.2	ug/L	EPA6020/200.8
Manganese	METALS	Water	0.063	1	0.2	ug/L	EPA6020/200.8
Mercury	METALS	Water	0.037	1	0.2	ug/L	EPA6020/200.8
Molybdenum	METALS	Water	0.076	1	0.2	ug/L	EPA6020/200.8
Nickel	METALS	Water	0.11	1	0.2	ug/L	EPA6020/200.8
Selenium	METALS	Water	0.41	1	0.5	ug/L	EPA6020/200.8
Silver	METALS	Water	0.035	1	0.2	ug/L	EPA6020/200.8
Thallium	METALS	Water	0.018	1	0.2	ug/L	EPA6020/200.8
Vanadium	METALS	Water	0.058	5	1	ug/L	EPA6020/200.8
Zinc	METALS	Water	0.68	5	1	ug/L	EPA6020/200.8
Mercury (1631E)	METALS	Soil	0.0088	0.025	0.01	mg/kg	EPA1631E
Mercury (1631E)	METALS	Water	0.0008	0.01	0.0008	ug/L	EPA1631E
Total Suspended S	CONVENTIONAL	Water	1	5	1	mg/L	SM2540D
EC5-8 aliphatics	APH	Air	47	75	---	ug/m3	MA-APH

EC9-12 aliphatics	APH	Air	2.5	25	---	ug/m3	MA-APH
EC9-10 aromatics	APH	Air	2.5	25	---	ug/m3	MA-APH