METAL RECOVERY FURNACE
TSCA COMPLIANCE TEST PLAN

PREPARED FOR:

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Appendix A Quality Assurance Project Plan

List of Acronyms

acfm	actual cubic feet per minute
ASTM	American Society for Testing and Materials
Btu	British thermal unit
CEM	continuous emissions monitor
CEMS	continuous emissions monitoring system
CFR	Code of Federal Regulations
cm^2	square centimeters
DF	polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans
DRE	destruction and removal efficiency
dscf	dry standard cubic foot
dscfm	dry standard cubic feet per minute
dscm	dry standard cubic meter
dscmm	dry standard cubic meter per minute
EPA	U.S. Environmental Protection Agency
ft	foot
ft^2	square feet
ft^3	cubic feet
g	gram
g/cc	grams per cubic centimeter
GC	gas chromatography
GC/MS	gas chromatograph/mass spectrometry
gr	grain
hr	hour
HRGC/HRMS	high resolution gas chromatography/high resolution mass spectrometry
in	inch
inwc	inches water column
kg	kilogram
l	liter
lpm	liters per minute
lb or lbs	pounds
mg	milligram
ml	milliliter
MM Btu/hr	million British thermal units per hour
MS	mass spectroscopy
NDIR	non-dispersive infrared
NO_X	Oxides of Nitrogen
NO_2	Nitrogen Dioxide
ODEQ	Oklahoma Department of Environmental Quality
PCB	polychlorinated biphenyls
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
pg	picogram
ppm	parts per million
ppmv	parts per million by volume
PM	particulate matter
psig	pounds per square inch, gauge
QA	quality assurance
QC	quality control
RCl	total chlorinated organic content
scf	standard cubic feet
scfm	standard cubic feet per minute
sec	second
SO_2	sulfur dioxide
VOC	volatile organic compound

vol%	volume percent
VOST	Volatile Organic Sampling Train
w.c.	water column
wt%	weight percent
μg or ug	microgram
ηg or ng	nanogram
pg	picogram

1.0 INTRODUCTION

1.1 GENERAL

A-Line T.D.S., Inc. (A-Line) operates a transformer disposal service facility located in Tonkawa, Oklahoma. Transformers, capacitors, bushings, and other electrical equipment components contaminated with polychlorinated biphenyls (PCB) are thermally treated to remove and destroy the PCB. All items are drained of free-flowing liquid and dismantled. The PCB-bearing liquid drained from these items may be chemically treated on-site to destroy the PCB via de-chlorination or may be shipped off-site for treatment in a Toxic Substances Control Act (TSCA) permitted commercial hazardous waste incinerator. The metal, cores, and dunnage from dismantling the electrical items are thermally treated in the Metal Recovery Furnace (MRF). The MRF thermally desorbs the residual PCB contamination from the metal and non-metal solid components. The desorbed PCB are thermally destroyed in the secondary chamber. The thermally treated metal is recovered for recycling. Ash and other non-metal, non-combustible residuals (e.g., ceramic components) are containerized for off-site disposal at a TCSA permitted landfill. Drained liquids less than 3,000 mg/kg may be treated in the on-site chemical process. The MRF and chemical treatment process operate under a TSCA permit issued by the Environmental Protection Agency (EPA) Region 6 and an Air Permit issued by the Oklahoma Department of Environmental Quality (ODEQ). This Test Plan is submitted as part of the TSCA permit renewal. The Test Plan delineates the protocol and procedures to demonstrate compliance of the MRF with the TSCA requirements. Compliance testing of the chemical process is covered under a separate test plan.

1.2 FACILITY ADDRESS AND CONTACT INFORMATION

The street address of the facility is:

A-Line T.D.S., INC.
1500 NORTH MAIN STREET
Tonkawa, Oklahoma 74653.

All correspondence should be directed to the following facility contact:

Mr. Lynn Fritz
319-504-7934
lynn@alineeds.com.

1.3 SYSTEM CONFIGURATION AND GENERAL OPERATION

The MRF is a batch operated furnace that complies with the operating requirements of 40 CFR 761.72 *Scrap Metal Recovery Ovens and Smelters*. The MRF includes two chambers, each equipped with natural gas fired burners. PCB-contaminated solid components are treated in the primary chamber. The gases from the primary chamber are thermally treated in the secondary chamber to destroy the desorbed PCB.

Thermally treated gases are discharged to the atmosphere via the MRF stack; there are no additional emissions controls.

Dismantled solid electrical components for treatment are loaded in a burn tray. The secondary chamber burners are started. Once the secondary chamber has reached the TSCA Permit required minimum operating temperature of 1,100°C (2,012°F) as required by 40 CFR 761.72(a)(5), the loaded burn tray is placed in the MRF primary chamber. The primary chamber burners are then started. The MRF operates for a time and temperature cycle/protocol consistent with the current TSCA Permit. Once the MRF cycle is complete, the primary chambers burners are shut off. After a cooling period, the primary chamber is opened and the burn tray with the treated materials is removed. The metals parts are allowed to continue to cool to ambient temperature at which point they can be wipe sampled and the samples analyzed to confirm the absence of PCB. The ash and other non-recycle materials in the burn tray can then also be removed. The decontaminated metal is made available for recycling. The ash and other non-recycle materials are containerized for eventual disposal in a TSCA permitted landfill.

1.4 APPLICABLE PERFORMANCE STANDARDS

The MRF is a *"scrap metal recovery oven"* under the TSCA regulations and is subject to the following emissions standards at 40 CFR 761.72(a)(8):

- Particulate matter (PM) $\leq$0.015 grains per dry standard cubic foot (gr/dscf)
- Sulfur dioxide (SO_2) $\leq$35 parts per million volume (ppmv)
- Nitrogen oxide (NO_X) $\leq$150 ppmv
- Carbon monoxide (CO) $\leq$35 ppmv
- Hydrogen chloride (HCl) $\leq$35 ppmv.

As required by the current TSCA Permit, MRF operation includes continuous calculation and compliance with 99.9% combustion efficiency as measured via a continuous emissions monitoring system (CEMS):

$$[CO_2] / ([CO_2] + [CO]) * 100\% \geq 99.9\%.$$

Where: $[CO_2]$ = Stack gas concentration of carbon dioxide (CO_2)
$[CO]$ = Stack gas concentration of carbon monoxide (CO).

As part of the TSCA Permit renewal, EPA is requiring the MRF to demonstrate 99.9999% destruction and removal efficiency (DRE) of PCB normally required for an *"incinerator"* as defined at 40 CFR 761.3 of the TSCA regulations.

The MRF test program will also demonstrate compliance with the following emissions limits delineated in the ODEQ-issued Air Permit:

- Total PCDD/PCDF 7.079E10^{-8} lb/hr
- 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalents (TEQ) 7.463E10^{-9} lb/hr
- Molecular chlorine (Cl_2) 0.129 lb/hr
- Semi-volatile organic compounds (SVOC) 1.737E10^{-4} lb/hr
- Volatile organic compounds (VOC) 1.742E10^{-3} lb/hr.

These Air Permit emissions limits are based on stack tests measured at 8,400 ACFM at 2,000^{o}F.

1.5 TEST OPERATING AND SAMPLING PROTOCOLS

The test protocol consists of three (3) replicate test runs. Each test run may consist of two (2) or even three (3) complete MRF process cycles as previously described. During each process cycle, the MRF will be operated at substantially similar conditions consistent with the times and temperatures specified in the current TSCA Permit. For purposes of test organization, the sampling during each MRF cycle are identified as follows:

- Cycle 1: Sampling will be performed to measure HCl emissions. CEMS will measure CO, CO_2, and O_2 emissions.
- Cycle 2: Sampling will be performed to measure PCB DRE emissions. CEMS will measure SO_2, NO_X, CO, CO_2, and O_2 emissions.
- Cycle 3: Sampling will be performed to measure PM emissions. CEMS will measure CO, CO_2, and O_2 emissions.

The number of MRF sampling ports are limited and the approximately 1,800^{o}F stack temperature makes sampling conditions particularly difficult. As such, A-Line may elect to perform the required testing in a “campaigned” sequence as described in Section 3.0 of this test plan. Ultimately, sampling will be performed under substantially similar MRF operating conditions during each process cycle to obtain three (3) valid runs/sets of performance and emissions data for demonstrating compliance.

EPA is also requiring the following emissions to be measured during MRF testing:

- Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (DF or PCDD/PCDF)
- Semi-volatile organic compound (SVOC) total chlorinated organic content (RCl)
- Volatile organic compound (VOC) RCl, and
- Chlorine (Cl_2).

There are no specific numerical standards established in the TSCA regulations for these emissions. Compliance with the current Air Permit limits for PCDD/PCDF, SVOC, VOC, and Cl_2 will be demonstrated

for these emissions. The measurement of these additional emissions is integrated/overlayed with the HCl PCB DRE, and PM performance emissions sampling as described in Section 3.0 of this test plan.

1.6 CURRENT TSCA PERMIT OPERATING LIMITS

The current TSCA Permit operating limits based on 40 CFR 761.(a) are:

- Minimum secondary chamber operating temperature of 1,100°C (2,012°F)
- Minimum 3.0% excess oxygen (O_2)
- Minimum secondary chamber retention time of 2.0 seconds
- Minimum combustion efficiency of 99.9%
- Minimum primary combustion chamber temperature 800-1,200 °F for two (2) hours during each batch cycle, and 1,200 °F once during each batch cycle
- Heating of primary chamber shall not commence until the secondary chamber temperature has reached 1,100°C (2,012°F)
- The MRF shall operate at negative pressure. Combustion zone pressure is monitored and recorded on a continuous basis.
- Batch PCB feed may not be introduced unless the backup generator is in good working order so that the MRF will continue to operate under required conditions in the event of an electrical power failure.
- CEMS and recorders for stack gas CO_2, CO, and O_2
- Continuous temperature recording for the primary and secondary chambers
- Batch Feed Limits: The maximum stacked height of four (4) feet of drained PCB items may be disposed during each batch feed to the MRF, with a burn tray net weight not to exceed 6,300 pounds (lbs). The PCB items shall be drained of all free-flowing liquid, removed from its housing, and chopped to achieve the maximum amount of surface area exposure practicable before being placed into the burn tray. No more than one (1) 55-gallon drum, or its equivalent, of contaminated debris, and no more than one (1) contaminated wooden pallet may be disposed per batch feed. The following information will be recorded for each batch feed and kept at the facility for five (5) years from the date each charge is introduced:
  - Serial number and manufacturer of each PCB item placed on each batch burn tray
  - Date and time batch burn tray was placed into the primary chamber
  - Temperature of the secondary chamber at the time each batch burn tray was placed into the primary chamber
  - Time each batch burn tray was removed from the primary chamber, and the temperature in the primary chamber at the time the burn tray was removed, and
  - Name and signature of the operator recording the data listed above.

Testing will be conducted to demonstrate compliance with the TSCA emissions and performance standards for *"scrap metal recovery oven"* at 40 CFR 761.72(a)(8) and Air Permit emissions limits.

1.7 TEST PLAN ORGANIZATION

This Test Plan is prepared in a chapter format. The major sections of the Test Plan are as follows:

- Section 1.0 - Introduction
- Section 2.0 - Engineering Description and System Operation
- Section 3.0 - Test Design and Protocol
- Section 4.0 - Test Schedule
- Section 5.0 - Test Report and Operational Limits

1.8 DEVELOPMENT OF TSCA PERMIT LIMITS

The test results will be used to confirm the adequacy of the current TSCA Permit MRF operating limits and operating protocol to assure ongoing compliance with the TSCA emissions limits and operating standards. The test is not designed to establish new operating limits or changes in the operating protocol. However, Section 5.0 proposes methodology for establishing new TSCA Permit operating limits from this test program.

1.9 REFERENCE DOCUMENTS

Reference documents that have been used in developing this Test Plan include the following:

- American Society for Testing and Materials, "Annual Book of ASTM Standards", latest annual edition.
- EPA, "New Source Performance Standards, Test Methods and Procedures," Appendix A, 40 CFR 60.
- EPA, "Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (SW-846)", Third Edition, 1986 and updates (December 1997).
- EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5 EPA/240/B-01/003), March 2001
- Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80)
- Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, EPA/625/6-89/023, January 1990.

2.0 ENGINEERING DESCRIPTION AND SYSTEM OPERATION

2.1 GENERAL

Figure 2-1 provides a schematic of the MRF system. The MRF is a batch treatment system consisting of primary and secondary chambers. The MRF is used to thermally treat disassembled transformer metal and non-metal solid components to desorb and destroy the PCB contaminants. The treated metal is sorted and made available for recycling. Any ash and non-combustible, non-recyclable residues are containerized for disposal in a TSCA-permitted landfill. The MRF configuration and operation are described in the following sections.

2.2 MANUFACTURER'S NAME AND MODEL NUMBER

The MRF was originally custom designed and manufactured by Blair-Alexander Engineering Co., Inc. of Denver, Colorado circa 1996/1997. The MRF is a two-chamber design with commercial natural gas used as auxiliary fuel. The MRF has been maintained since its original construction via repairs, upgrades, and in-kind replacement parts to assure and improve compliant operability.

The primary chamber, secondary chamber, and system stack are constructed of carbon steel and lined with nominal 8-inch insulating brick. The inner brick dimensions of the rectangular primary chamber 7-feet-10 inches tall, 6-feet-3 inches wide, and 14-feet-2 inches long. The primary chamber is equipped with four (4) 2-inch Maxon Kinemaz Medium Velocity Burner, Size 2C burners each having a rated heat input of 1.0 MMBtu/hr.

The inner brick dimensions of the cylindrical secondary chamber are 9-feet-4 inches diameter and 16-feet tall. The secondary chamber is equipped with two (2) 6-inch Maxon burners each rated at a maximum of 8.0 MMBtu/hr.

The inner brick dimensions of the system stack extending from the secondary chamber are 11-feet tall and 2-feet-6-inches diameter. The furnace is specifically manufactured for the purpose of reclaiming metals such as copper and aluminum from industrial power transformers and similar electrical items that have been discarded by the electrical power industry.

2.3 MRF OPERATION

The MRF consists of two enclosed, negative draft (no fugitive emissions) interconnected chambers as required by 40 CFR 761.72(a)(1). The startup sequence for the MRF is designed to prevent fugitive emissions of uncombusted PCB. To do this, the secondary chamber natural-gas fired burners are electronically ignited and the temperature allowed to stabilize at the required minimum temperature of 1,100^{o}C. A burn tray containing electrical equipment components, with all free-flowing liquid removed and dismantled, is then loaded into the primary chamber. A forklift is used to handle and move the burn trays. The furnace loading process consists of a forklift placing the burn tray on the furnace transfer

car mounted on rails. The forklift forks are then used to push (roll) the furnace transfer car into the furnace. The primary chamber door is closed and the primary chamber burners with excess air supply are electronically ignited. The system draft provided by the secondary chamber burner firing is designed to prevent fugitive emissions of uncombusted PCB when the primary chamber door is opened. Once the operating cycle is complete, the burners in the primary chamber are shut down while the airflow and the secondary chamber continue normal operation. In this configuration, the material in the primary chamber is allowed to cool to approximately 250-482°F. At this point, the primary chamber door can be opened and the processed material removed. The material is removed by using the forklift forks to pull (roll) the furnace transfer car out of the furnace. Once out, the forklift can then lift the burn tray off the furnace transfer car and place it on a metal stand where it is allowed to continue to cool to ambient temperature.

The following are the specific steps of MRF cycle operation:

1. Verify that the CEMS passed the automatic daily calibration. If the system indicates that it did not pass, make the necessary repairs to the system until the system passes the calibration test.

2. Verify that the backup generator has been tested for automatic operation within the last 30 days. If it has not been tested within the last 30 days, test the automatic operation of the generator.

3. Bring the secondary chamber to the minimum operating temperature of 1,100^{o}C (2,012^{o}F).

4. Prepare a burn tray with PCB materials drained of all free liquid. The maximum stacked height of PCB materials in the burn tray is four (4) feet with a maximum net charge weight of 6,300 pounds (lbs). Materials can include one 55-gallon drum, or its equivalent, of contaminated debris, and up to one (1) contaminated wooden pallet may be disposed per MRF cycle. PCB-free salt water removed from the Clean Oil Storage Tank of the PCB liquid de-chlorination process or process water may be added to the burn tray as well. The water is added to the burn tray to preclude warping during thermal processing. (NOTE 1: For the MRF testing, four to six (4-6) inches of salt water or process water shall be included in each burn tray processed.) (NOTE 2: For the MRF testing, three (3) wipe samples of the three (3) distinctly different feed items will be collected from each burn tray to confirm the presence of PCB. The following batch information shall be recorded and retained for a minimum of 5 years:
   - Serial number and manufacture of each PCB item in the burn tray
   - Date and time the burn tray was placed in the primary chamber.
   - The temperature of the secondary chamber when that burn tray was placed in the primary chamber.
   - The time the primary chamber reached 1,200^{o}F.
   - The time and temperature of the burn tray was removed from the primary chamber.
   - Name and signature of the operator recording the data list above.

5. Open the door to the primary chamber, place a loaded burn tray in the primary chamber, close the door to the primary chamber.

6. Bring the primary chamber to a minimum of 800^{o}F for a minimum of 2.5 hours. During the initial 2.5 hour cycle the primary chamber must reach 1,200^{o}F at least once. After the 2.5-

hour cycle has been completed, if the temperature in the primary chamber has not started to drop continue the burn cycle until the temperature begins to drop.

7. When the burn cycle has been completed and the primary chamber drops to 482°F, the primary chamber door may be partially open to visually determine if smoke is visible. If smoke is visible the door will be closed. When the temperature drops in the primary chamber to 360°F, the primary chamber door may be partially open to visually determine if smoke is visible. If smoke is visible the door will be closed. When the temperature drops to 250°F or no smoke is visible when the primary chamber door is opened, the burn tray is removed and placed in the holding area until the burn tray reaches ambient temperature. NOTE: The secondary chamber is maintained at or above required minimum temperature and the MRF is under negative draft conditions when materials are present in the primary chamber. These operating conditions preclude any personnel or the environment being exposed to PCB fugitive emissions when the primary chamber door is opened.

8. The typical time to complete a burn cycle (from cold starting of the secondary chamber burners) to withdraw of the burn tray from the primary chamber ranges from 4 to 7 hours depending on the PCB material being processed. (Note: With the secondary chamber burners remaining on and maintaining the required minimum temperature, subsequent MRF cycles may be 4 hours or less.)

9. Once the burn tray reaches ambient temperature, any ash, ceramic, or non-recyclable material will be removed from the burn tray and placed in a roll off for disposal at a TSCA landfill.

10. For the decontamination demonstration, after cooling to ambient temperature three (3) wipe samples of the three (3) distinctly different treated items will be collected from each burn tray to verify that PCB are no longer present on the recyclable metal materials. The materials will be separated by type, copper, aluminum, brass, etc. and placed in storage until the PCB test results are completed. If the sample results are <10 micrograms (ug) per 100 centimeters squared (cm^2), the metal may be sent for recycling in a normal shipment. If the results are $\geq$ 10 ug per 100 cm^2, the metal will be held for additional treatment (re-processing in the MRF) or disposed of at a TSCA-permitted landfill.

The following compares the MRF TSCA Permit required operating protocol with the requirements of 40 CFR 761.72(a)(3)-(6) of the TSCA Rule:

Operating Requirement	TSCA Permit	TSCA Rule
Loading and Heating of the Primary Chamber	When Secondary Chamber reaches 1,100°C (2,012°F)	When Secondary Chamber reaches 1,100±100°C (2,012±180°F)
Primary Chamber Temperature Operation	500-1,200°F for a minimum of 2.0 hours and reach a minimum temperature of 1,200°F once during each cycle	537-650°C (999-1,202°F) for a minimum of 2.5 hours
Secondary Chamber (Afterburner) Operation	1,200°C (2,192°F), at least 3% excess oxygen, 2.0 seconds residence time and 99.9% combustion efficiency $[CO_2] / ([CO_2] + [CO]) * 100\%$	1,200°C (2,192°F), at least 3% excess oxygen, 2.0 seconds residence time and 99.9% combustion efficiency $[CO_2] / ([CO_2] + [CO]) * 100\%$
Continuous emissions monitors (CEMs) and recorders	CO_2, CO, and O_2	CO_2, CO, and O_2

The MRF is a batch operation; there is no continuous "feed system" and consequently no "automatic waste feed cutoff" (AWFCO) system; once a tray is loaded into the furnace, it remains there unit the treatment cycle is completed. The burn trays are loaded manually by operators dressed in Tyvek suit, rubber boots, chemical resistant gloves, hard hat, and safety glasses. The burn tray is loaded within the weight and stack height limits in the current TSCA permit. The tray is placed in the into and removed from the MRF using a forklift. The forklift operator wears general PPE as that person is not touching the material: hard hat, safety glasses, cut resistant gloves, and steel toed boots. All material handling is performed within a building with secondary containment. The MRF is operated at induced (negative) draft to preclude fugitive emissions from thermal treatment.

2.4 RETENTION TIME DETERMINATION

The internal volume of the secondary chamber is approximately 1,094 cubic feet (ft^3):

$$\Pi * (9.33 \text{ feet diameter} / 2)^2 * 16 \text{ feet tall} = 1{,}094 \text{ } ft^3$$

Based on the 1997 test stack flow of 10,122 acfm at 1,853°F, the secondary gas retention time at 2,012°F (1,100°C) is:

$$10{,}122 \text{ acfm} * (2{,}012 + 460^oR)/(1{,}853 + 460^oR) = 10{,}925 \text{ acfm through the secondary chamber}$$

$$1{,}094 \text{ } ft^3 / 10{,}925 \text{ acfm} * 60 \text{ sec/min} = 6.0 \text{ seconds.}$$

Secondary chamber residence (dwell) time calculations will be performed as part of testing and included in the final test report.

2.5 CONTINUOUS PROCESS MONITORING SYSTEM

Table 2-1 lists the MRF major process and CEMS instruments. Figure 2-1 shows the general monitoring locations for temperature, pressure, and CEMS measurements. One-minute values for process measurements are recorded and electronically retrievable for regulatory inspection for any operating period.

2.6 FIRE SUPRESSION SYSTEM

The areas adjacent to the MRF include a standard industrial fire suppression system. The system is continuously pressured with water. The fire suppression sprinkler system is mechanically activated when the linkage is melted by fire heat. The design activation temperature is 286°F. There is no sprinkler system in the room with the MRF. The local fire marshal specifically forbids installation of a sprinkler system in this room. The reason is spraying water on the hot exterior of the MRF could result in a catastrophic failure of the metal shell and/or refractory.

Table 2-1. MRF Process Instrumentation

Parameter	Location	Figure 2-1 Location	Units	Scale	Accuracy	Instrument Type
Primary Chamber Temperature	Exit of Chamber	T1	°F	-326 to 2200	±4°F	Type K thermocouple
Secondary Chamber Temperature	Exit of Chamber	T2	°F	-326 to 2200	±4°F	Type K thermocouple
MRF Pressure	Duct from Primary Chamber to Secondary Chamber	P1	inwc	-9 to 9	±2% of scale	Pressure Transmitter
Natural Gas Usage	Natural Gas Line to MRF	Not Pictured	scf	NA; totalizer	±0.1%	Rotary Gas Meter
Stack Gas CO Concentration	Stack	A1	ppmv, dry	0 to 200	±2% of scale	Non-dispersive Infrared (NDIR)
Stack Gas CO_2 Concentration	Stack	A2	%vol, dry	0 to 20	±2% of scale	NDIR
Stack Gas O_2 Concentration	Stack	A3	%vol, dry	0 to 25	±2% of scale	Paramagnetic

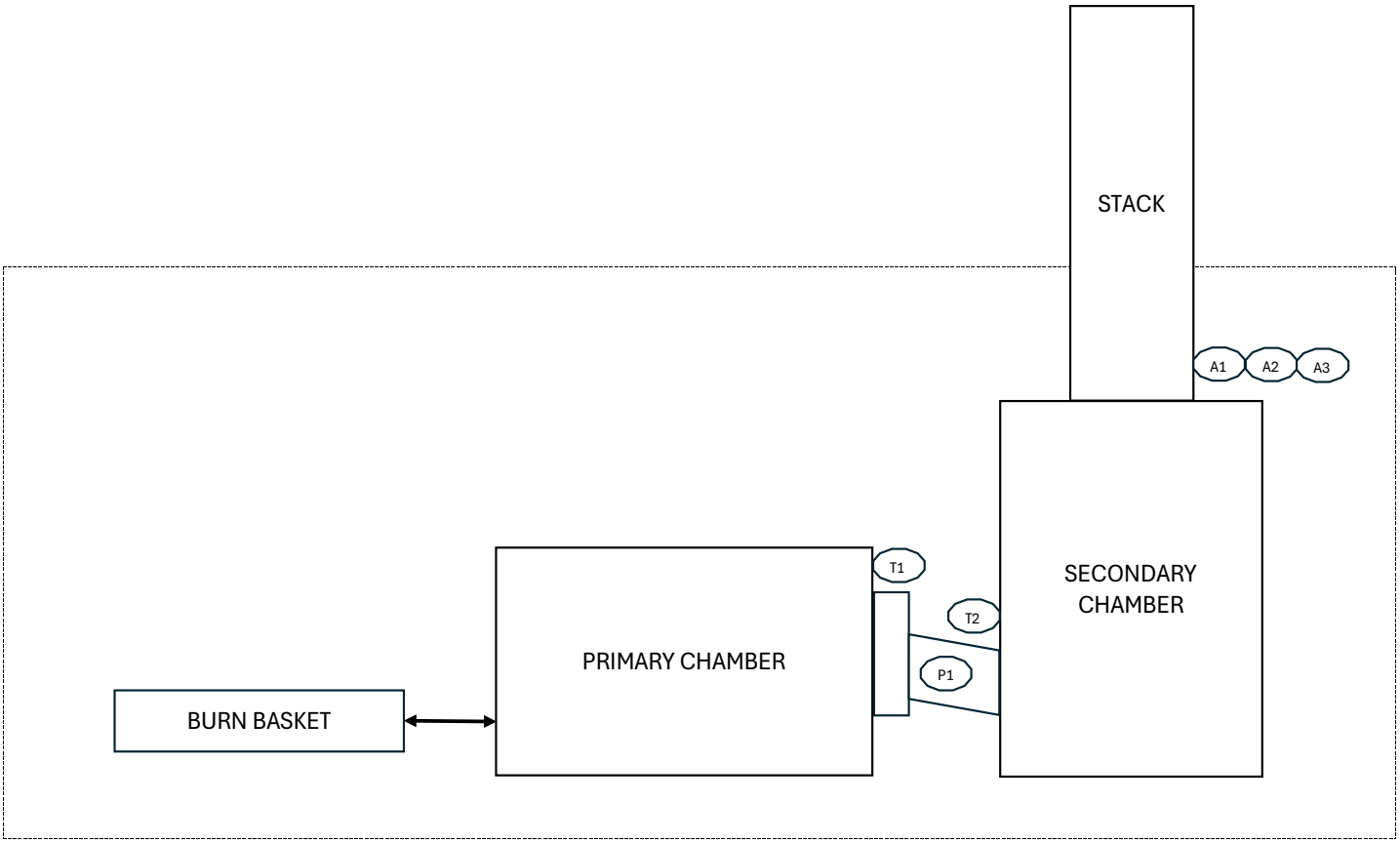


Figure 2-1. MRF Process Flow Schematic

3.0 TEST DESIGN AND PROTOCOL

3.1 TEST OBJECTIVES

The MRF test will demonstrate compliance with following appliable emissions standards for "*scrap metal recovery ovens"* at 40 CFR 761.72(a)(8):

- Particulate matter (PM) $\leq$0.015 grains per dry standard cubic foot (gr/dscf)
- Sulfur dioxide (SO_2) $\leq$35 parts per million volume (ppmv)
- Nitrogen oxide (NO_X) $\leq$150 ppmv
- Carbon monoxide (CO) $\leq$35 ppmv
- Hydrogen chloride (HCl) $\leq$35 ppmv.

As required by the current TSCA Permit, MRF operation includes continuous calculation and compliance with 99.9% combustion efficiency as measured via CEMS:

$$[CO_2] / ([CO_2] + [CO]) * 100\% \geq 99.9\%.$$

Where: $[CO_2]$ = Stack gas concentration of carbon dioxide (CO_2)

$[CO]$ = Stack gas concentration of carbon monoxide (CO).

As part of the TSCA Permit renewal, EPA is requiring the MRF to demonstrate 99.9999% destruction and removal efficiency (DRE) of PCB normally required for an *"incinerator"* as defined at 40 CFR 761.3 of the TSCA regulations.

EPA is also requiring the following emissions to be measured during MRF testing:

- Polychlorinated dibenzodioxins and dibenzofurans (DF or PCDD/PCDF)
- Semi-volatile organic compound (SVOC) total chlorinated organic content (RCl)
- Volatile organic compound (VOC) RCl, and
- Molecular chlorine (Cl_2).

There are no specific numerical standards established in the TSCA regulations for these emissions. Compliance with the following current Air Permit limits for PCDD/PCDF, SVOC, VOC, and Cl_2 will be demonstrated for these emissions:

- Total PCDD/PCDF $7.079E10^{-8}$ lb/hr
- 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalents (TEQ) $7.463E10^{-9}$ lb/hr
- Cl_2 0.129 lb/hr
- Semi-volatile organic compounds (SVOC) $1.737E10^{-4}$ lb/hr

- Volatile organic compounds (VOC) 1.742E10^{-3} lb/hr.

3.2 TEST PROTOCOL

The test protocol includes demonstrating compliance with the TSCA regulation and Air Permit emissions and performance limits via a single operating condition. There are limited number of sampling ports on the stack: one set of two 4-inch ports configured for isokinetic sampling, and two additional 2-inch ports for non-isokinetic or temporary CEMS sampling. To complete the sampling and obtain representative emissions, two (2) or three (3) MRF processing cycles may be necessary per test run, with a total of nine (9) possible MRF cycles performed to complete the test program. For pruposes of test organization, the expected performance and emissions sampling is defined in cycles as follows:

- Cycle 1: Sampling will be performed to measure HCl/Cl_2. HCl/Cl_2 emissions will be measured using an EPA Method 26A sampling train. The PCB liquid spike will be sampled to determine the chlorine content and feed rate. Installed CEMS will measure CO, CO_2, and O_2 emissions.
- Cycle 2: Sampling will be performed to measure PCB DRE emissions. PCB, DF, and SVOC RCI emissions will be sampled concurrently using a single EPA Method 23 sampling train. VOC RCI emissions will be measured concurrently using a SW-846 Method 0030 sampling train. The PCB liquid spike will be sampled to determine the PCB content and feed rate. Temporary CEMS will measure SO_2 (EPA Method 6C) and NO_X (EPA Method 7E). Installed CEMS will measure CO, CO_2, and O_2 emissions.
- Cycle 3: Sampling will be performed to measure PM emissions. Filterable and condensable PM emissions will be measured using an EPA Method 5/202 sampling train. PCB spiking will not be performed during PM emissions sampling. Installed CEMS will measure CO, CO_2, and O_2 emissions.

The number of MRF sampling ports are limited and the approximately 1,800^{o}F stack temperature makes sampling conditions particularly difficult, e.g., requires the use of water-cooled sampling probes. As such, A-Line may elect to perform the required testing in a “campaigned” sequence, e.g., three (3) consecutive processing cycles of HCl (Cycle 1) sampling, followed by three (3) consecutive processing cycles of PCB DRE (Cycle 2) sampling, and lastly three (3) consecutive processing cycles of PM (Cycle 3) sampling. Alternatively, A-Line may elect to perform one (1) run of Cycle 1 followed by one (1) run Cycle 2 on the same test day, repeating this same MRF cycle/sampling sequence for three (3) consecutive days, and then run three (3) consecutive runs of Cycle 3. Where or if possible, A-Line may elect to perform Cycle 1 and Cycle 2 sampling concurrently. Ultimately, the sampling during each MRF processing cycle as described above will be performed under substantially similar MRF operating conditions to obtain three (3) valid replicate runs/sets of the respective required performance and emissions data.

3.3 MATERIALS TREATED DURING TESTING

For each MRF cycle, burn trays will be prepared with transformer and other electrical components per the current TSCA permit operating conditions previously described. To the extent possible, each burn tray will

i be prepared using a similar mix of materials that could include pieces of capacitors, bushings, transformers, and other contaminated electrical equipment. The burn tray may also include some packaging debris (e.g., wooden pallet pieces) and salt water removed from the PCB liquid de-chlorination process (approximately 4-6 inches in the burn tray). A-Line will attempt to prepare each burn tray as similar as practicable for each test cycle.

The MRF operates as a batch process. However, the EPA sampling methods are generally designed around sampling continuous processes. Therefore, to accurately measure DRE and emissions from thermal destruction of PCB, A-Line plans to meter PCB liquid continuously to the secondary chamber during the MRF PCB DRE and HCl test sampling periods. A-Line does not plan to meter PCB liquid during the PM sampling periods as PCB feed rate does not contribute to PM emissions.

Dismantled electrical components constitute a multitude of geometries and surfaces, that often include narrowly-spaced laminated metal sheets with hairline spacing between each sheet and some porous surfaces. Therefore, it is not possible to accurately measure the net amount of PCB on or in the solid materials charged to the primary chamber in the burn tray. Previous testing (1998) did include pre-test wipe samples of burn tray items which provides a general measure of surface contamination. The wipe samples were apparently used to develop estimates of PCB mass with the burn tray items. These wipe sample measurements simply confirmed the presence of PCB and were at best only rough estimates of actual PCB mass. A-Line does not believe such characterization of burn tray materials serves as an accurate measure of PCB in the MRF charges. As requested by EPA, A-Line will perform pre-test and post-test PCB wipe sampling and analysis of the materials loaded into the burn tray. However, no credit for PCB mass with burn tray charges will be used or considered in the DRE calculation. PCB DRE will be based solely on the PCB feed rate to the secondary chamber and measured emissions.

A-Line does not currently feed PCB liquid to the MRF as is allowed by Section III.B.4 of the current TSCA Permit. In fact, the piping to do so has long since been removed. However, for PCB DRE demonstration purposes, the location where PCB liquids was previously injected to the secondary chamber will be used to meter PCB liquid during MRF testing. For testing purposes, PCB liquid available will be transferred to 55-gal drums (or similar containment) and reserved for the test. A-Line does not intend to seek burning of PCB liquid as part of the TSCA Permit renewal; the PCB liquid spiking injection point will be re-capped after testing is completed.

A metering pump and scale or mass flow meter system will be used to meter (spike) PCB liquid to the secondary chamber at a controlled rate. Compressed air may be used at the injection point to atomize the PCB liquid. Supporting calculations for the PCB feed rate and DRE are presented Section 3.6 of this Test Plan.

PCB liquid injection will begin just prior to loading the burn tray into the primary chamber. PCB liquid injection will be discontinued when emissions sampling for the cycle is completed.

3.4 SAMPLING AND ANALYSIS PROTOCOL

The sampling and analytical protocols are summarized in Table 3-1.

3.5 SAMPLING LOCATIONS AND PROCEDURES

The emissions sample collection points are shown in Figures 3-1 through 3-3. The following sections discuss the planned sampling and analyses.

3.5.1 Stack Gas Method 23 (PCB/DF/SVOC RCI)

The stack gas will be sampled isokinetically for PCB, DF, and SVOC RCI using a single EPA Method 23 sampling train. Sampling will be performed for 240 minutes (24 traverse points with 10 minutes of sampling per traverse point) per run to sample a target volume of 4.0 dry standard cubic meters of stack gas. The sampling train XAD-2 resins will be prepared with isotopically labeled sampling surrogate spikes for all three target compound groups. The laboratory will extract and split the extracts for the respective analyses. The Quality Assurance Project Plan (QAPP) delineates the sampling train recovery scheme, and the sample extraction scheme and associated QA/QC. The PCB will be analyzed for all 209 congeners using EPA Method 1668C. The PCDD/PCDF will be analyzed using SW-846 Method 8290A. The SVOC RCI will be analyzed using SW-846 Method 8270E. The target PCB, PCDD/PCDF, and SVOC RCI compounds and expected detection limits are noted in Tables 9-1, 9-2, and 9-3 of the QAPP, respectively.

3.5.2 Stack Gas Method 5/202 (Particulate Matter)

The stack gas will be sampled isokinetically for filterable and condensable PM according to EPA Methods 5 and 202. Sampling will be performed for 120 minutes (24 traverse points with 5 minutes of sampling per traverse point) per run. The expected detection limits for PM are noted in Table 9-4 of the QAPP. Filterable PM data will be used to demonstrate compliance with the appliable PM emissions limit. Condensable PM emission data is collected for EPA use; no emissions standard is established for condensable PM.

3.5.3 Stack Gas Method 26A (Hydrogen Chloride and Chlorine)

Isokinetic sampling for HCl and Cl_2 is not required due to the absence of water droplets in the stack gas. However, the stack gas will be sampled isokinetically for HCl and Cl_2 according to EPA Method 26A. Sampling will be performed for 72 minutes (24 traverse points with 3 minutes of sampling per traverse point) per run. The expected detection limits for HCl and Cl_2 are noted in Table 9-5 of the QAPP.

3.5.4 Stack Gas Method 0030 (VOST)

To determine the VOC RCI emissions, the stack gas will be sampled using the SW-846 Method 0030, Volatile Organic Sampling Train (VOST). VOST is a non-isokinetic sampling method. VOST sampling will be performed using one of the 2-inch ports. Sampling will be performed at a nominal rate of 1.0 liters per minute (lpm) for 20 minutes per tube set. Four (4) pairs of VOST tubes representing nominally 80 liters of

stack gas will be collected during each sampling run, but only three will be analyzed. The fourth tube pair will serve as an archive set in the case of breakage during shipment or laboratory handling. VOST analyses will be performed using SW-846 Method 5041A/8260D. The target volatile organic compounds and expected detection limits are noted in Table 9-6 of the QAPP. Stack gas flow rate, moisture, and stack gas molecular weight (Methods 2, 3A, and 4) data from the concurrently operated Method 23 train will be used to calculate VOC RCl emission rates.

3.5.5 Stack Gas CEMS

During the test, the stack gas concentrations of CO, CO_2, and O_2 will be monitored using the installed CEMS. Temporary CEMS, set up and calibrated by the sampling company, will be used to measure the stack gas concentrations of SO_2 and NO_X. The probe for the temporary CEMS will be placed in one of the 2-inch ports. The CO, NO_X, and SO_2 data will be used to demonstrate compliance with the applicable TSCA emissions standards. The CO, CO_2, and O_2 data will be used to demonstrate compliance with the TSCA combustion efficiency standard of 99.9%. Additionally, the stack concentrations of CO_2 and O_2 will be measured by the sampling company using EPA Method 3A for purposes of calculating the stack gas molecular weight.

3.5.6 Analytical Procedures

Analytical methods for the emissions samples are summarized in Table 3-1.

3.5.7 Pre- and Post-Treatment Wipe Samples

As noted in Section 3.2, with each MRF operational cycle wipe samples of three (3) distinctly different feed items will be collected before the tray is loaded into the furnace. Similarly, wipe samples of three (3) distinctly different treated items will be collected after the tray is removed from the furnace and the items have cooled to ambient temperature. These samples will be analyzed internally by A-Line's on-site laboratory and the results included in the MRF test report. These wipes samples are not included in Table 3-1 or the QAPP sample lists or counts. With two (2) burn or three (3) process cycles per test run and six (6) wipe samples per cycle, and three (3) test runs, a total of 36-54 wipe samples will be collected and analyzed. Wipe sampling will include collection one (1) unused wipe each test day as a proof blank sample.

3.6 PCB DRE AND FEED RATE ANALYSIS

Samples of the reserved PCB liquid discussed in Section 3.1 will be taken prior to the test date and analyzed using EPA Method 1668C. This analytical method will provide speciation of all 209 congeners. This pre-test analysis will identify the total concentration of PCB. This information can then be used to estimate the PCB liquid feed rate necessary to demonstrate 99.9999% DRE. The DRE will be calculated based on the total PCB feed and total PCB emission rates

Table 9-1 of the QAPP summarizes the expected in-stack detection limit for each of the 209 PCB congeners. The in-stack PCB detection limit for each congener is based on the expected stack gas sampled volume of four (4) dry standard cubic meters (dscm) and the analytical detection limit for single analysis of the combined Method 23 fractions. To allow for operational and analytical variability, the PCB liquid feed rate will be based on demonstrating between 99.99995% to 99.99999% DRE, a 5X to 10X DRE target window.

Table 3-2 provides an example calculation of the potential PCB liquid feed rates necessary to effectively demonstrate 99.9999% DRE. A grab sample of the PCB liquid spike will be collected once during each test run for PCB concentration analysis by Method 1668C. This analysis method will provide the total PCB content based on full speciation of all 209 congeners. The DRE will be calculated based on the total as-fed PCB liquid sample analysis, PCB liquid feed rate, and total PCB emission rate.

3.7 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

Appendix A contains the QAPP that has been prepared according to EPA Guidance. The QAPP delineates the QA/QC procedures for the test sampling and analyses.

Table 3-1. MRF Test Sampling and Analysis

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [1]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [1]
MRF Run Cycle 1						
Stack Gas	Isokinetic Port	Method 26A	EPA Method 26A	72 minutes [2,3]	HCl/Cl_2	EPA Method 26A
PCB Liquid Spike	Tap on Spiking Line	250 mL Sample Bottle	ASTM D-4057, E-300-03	Single grab sample once per run	Total Chlorine	SW-846 5050/9056A (Cl)
MRF Run Cycle 2						
Stack Gas	Isokinetic Port	EPA Method 23 Sampling Train	EPA 23	240 minutes and target volume 4.0 dry standard cubic meters [2,3]	PCDD/PDCF PCB SVOC RCI	EPA Method 23 & SW-846-8290A & (PCDD/PDCF) EPA Method 1668C (PCB) SW-846-8270E (SVOC RCI)
Stack Gas	Non-Isokinetic Port	VOST	SW-846 0030 (VOST)	20 L sample per tube set at 1.0 L/min; four tube sets, 80 L total sampled per run	VOC RCI	SW-846 5041A/8260D
PCB Liquid Spike	Tap on Spiking Line	250 mL Sample Bottle	ASTM D-4057, E-300-03	Single grab sample once per run	PCB	SW-846 1668C (PCB)
Stack Gas	CEMS Port	Temporary SO_2 CEMS	EPA Method 6C	Continuous	SO_2	40 CFR 60, Appendix A Method 6C
Stack Gas	CEMS Port	Temporary NO_X CEMS	EPA Method 7E	Continuous	NO_X	40 CFR 60, Appendix A Method 7E
MRF Run Cycle 3						
Stack Gas	Isokinetic Port	Method 5/202	EPA Method 5/202	120 minutes [2,3]	Filterable and Condensable PM	EPA Method 5/202
MRF Run Cycle 1, Cycle 2, and Cycle 3						
Stack Gas	CEMS Port	Installed CO, CO_2, and O_2 CEMS	40 CFR 60, Appendix F	Continuous	CO, CO_2, and O_2	40 CFR 60, Appendix F

Table 3-1. MRF Test Sampling and Analysis (cont'd)

Notes:

[1] Reference Method Sources:

"SW-846" refers to Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.

"EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.

"EPA Method 1668C" refers to Method 1668C, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-820-R-10-005, April 2010.

[2] The exact volume of gas sampled will depend on the isokinetic sampling rate.

[3] Isokinetic sampling trains include:

- Using CEMS for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3A)
- Performing stack gas velocity, pressure and temperature profile measurement for each sampling location (EPA Method 2)
- Determining the moisture content of the stack gas for each sampling train sample (EPA Method 4).

Table 3-2. Example PCB DRE Analysis

PCB Component	Expected In-stack Conc.	Emission Rate @ In-Stack Conc.	Emission Rate @ In-Stack Conc.	Feed Rate @ 99.9999% DRE	Feed Rate @ 99.99995% DRE	Feed Rate @ 99.99999% DRE
Congener	**ng/dscm**	**ng/hr**	**lb/hr**	**lb/hr**	**lb/hr**	**lb/hr**
Total RL, All 209 Congeners	26.2 (Refer to Table 9-1 of the QAPP)	89,022	2.0E-07	2.0E-01	3.9E-01	2.0E+00

PCB Oil Feed Rate @ 99.99995% DRE and Various Concentrations

PCB Liquid Conc., mg/kg	5,000	10,000	50,000
PCB Liquid Feed, lb/hr	79	39	7.9
PCB Liquid Feed, gph (est. @ 7.4 lb/gal)	11	5.3	1.1
Estimated Heat Input, MMBtu/hr	1.5	0.75	0.15

Stack Flow:	10,221	acfm
(1997 Test)	1,853	deg F
	11.32	%moisture
	2,002	dscfm
	56.68	dscm/min

	LINEAR DIMENSION	DUCT DIAMETERS
A	36"	1.1 (Limit: 0.5)
B	90"	2.7 (Limit: 2.0)
C	33.3" (I.D.)	

TRAVERSE POINT	DISTANCE % of diameter	DISTANCE (inches)
1	2.1	1.0
2	6.7	2.2
3	11.8	3.9
4	17.7	5.9
5	25.0	8.3
6	35.6	11.9
7	64.4	21.5
8	75.0	25.0
9	82.3	27.4
10	88.2	29.4
11	93.3	31.1
12	97.9	32.3

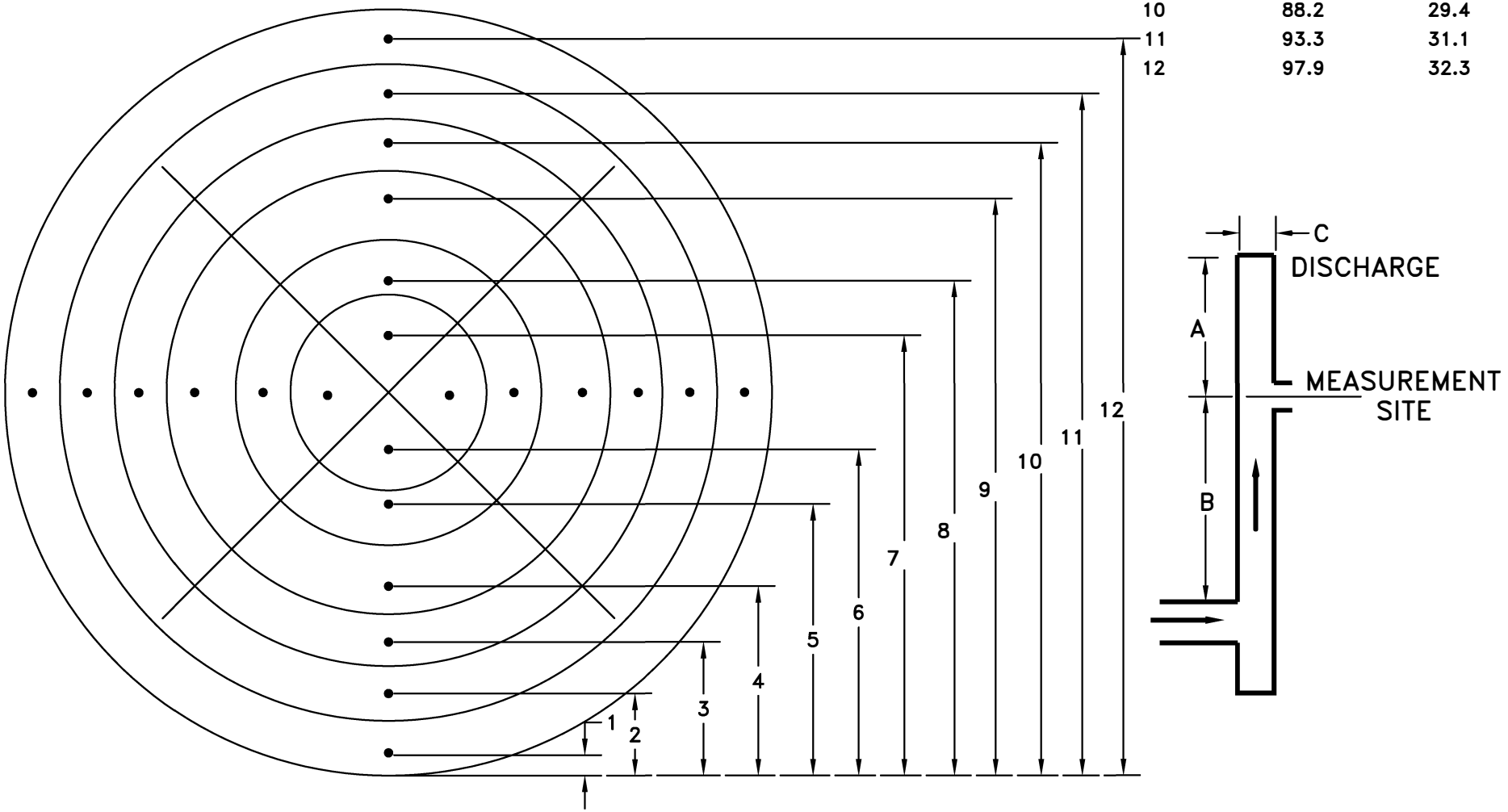
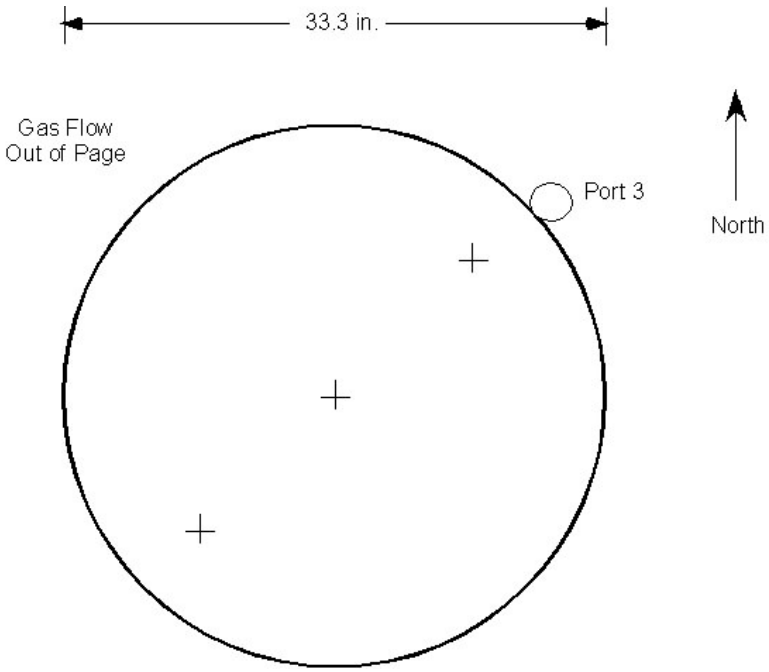


Figure 3–1. Isokinetic Stack Sample Point Layout (EPA Method 1)

Figure 3-2. Stack CEM Stratification Check Layout



Sampling Point	% of Stack Diameter	Port to Point Distance (inches)
1	83.3	27.7
2	50.0	16.7
3	16.7	5.6

Duct diameters upstream from flow disturbance (A): 3.6
Duct diameters downstream from flow disturbance (B): 5.8

End of Section

Figure 3-3. Photo of Sampling Port Locations

4.0 TEST SCHEDULE [40 CFR 63.1207(f)(1)(v)]

4.1 PLANNED TEST DATE

No date has been set for performing the MRF test. A-Line will notify ODEQ and EPA at least 60 days before the planned date for starting the test.

4.2 TEST DURATION

The MRF test will consist of three (3) replicate sampling runs of each performance and emissions sampling method. The anticipated general schedule of testing is as follows:

- Monday-Test team travels to test site, participates in on-site health and safety training, and begins test equipment setup.
- Tuesday-Complete testing set up; two MRF process cycles.
- Wednesday-Two MRF process cycles.
- Thursday-Two MRF process cycles.
- Friday-Two MRF process cycles.
- Saturday-Contingency day, if needed.

Possible sequencing and timing of the sampling during each day of testing is presented in Figures 4-1 through 4-3.

4.3 TEST INTERRUPTIONS

MRF is a batch operated system with a prescribed operational protocol and timing for the primary chamber operation. However, the focus of TSCA compliance testing is on the performance of the secondary chamber. With PCB liquid being continuously metered to the secondary chamber during the PCB DRE and HCl test cycles, the minimum primary chamber operation may be extended to allow completion of a test run that exceeds the normal cycle time.

In the event of a test interruption, all stack gas sampling will be suspended immediately. Stack sampling pumps will be switched off, but probes may remain in the stack. Should the situation be resolved shortly (less than 60 minutes) and normal MRF operation is resumed, stack sampling may be resumed at the discretion of the test coordinator and after consultation with the MRF operations staff. Optionally, the test coordinator and MRF operations staff may elect to void the test run.

The TSCA Permit prescribed minimum MRF cycle time is 2.5 hours at greater than 800^{o}F in the primary chamber. Should the situation that forced the pause in sampling take longer than 60 minutes to resolve, the test coordinator and MRF operations staff will likely elect to void the test run and reset the sampling trains for a new MRF cycle.

All test start/stop/resume/void decisions will be communicated to the regulatory observers present at the time of testing. Such decisions may include consultations between the test coordinator, the MRF operations staff, and the regulatory observers present.

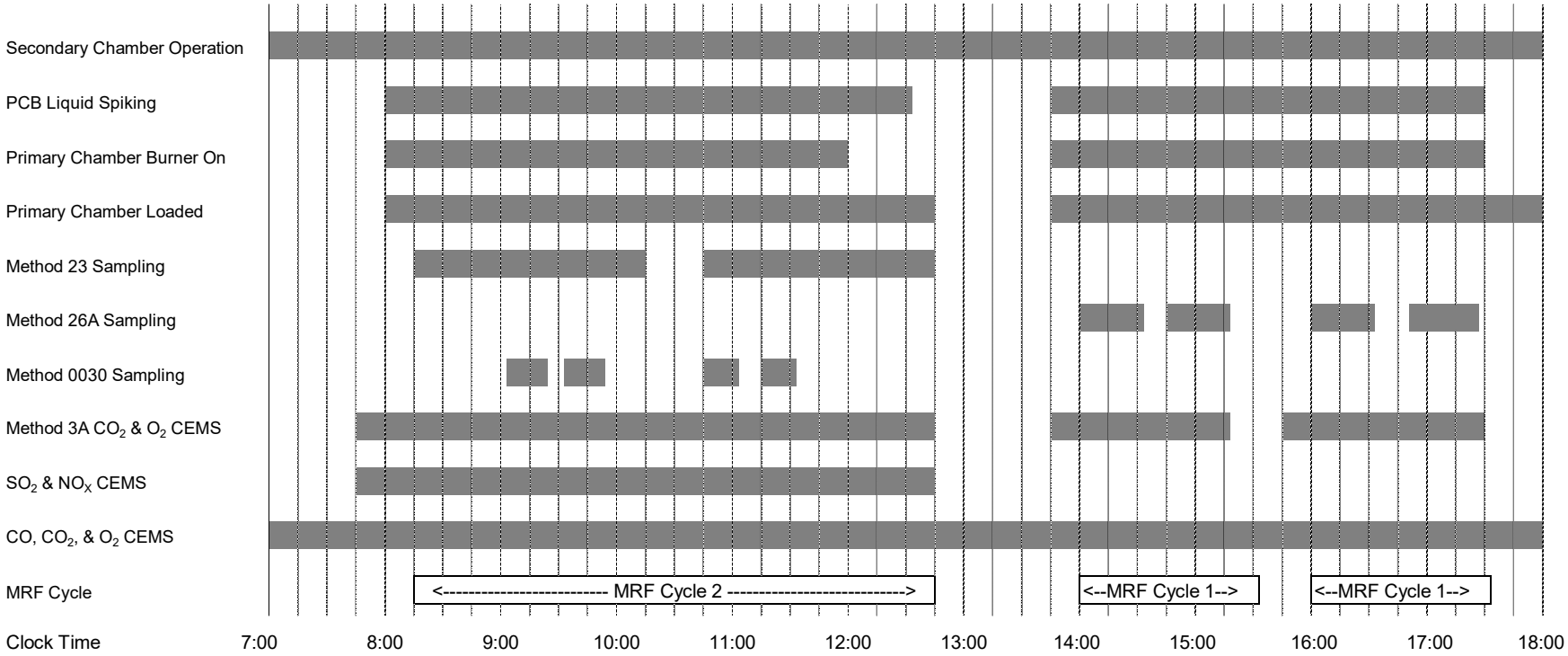


Figure 4-1. MRF TSCA Compliance Test Sampling Timeline for Separate Cycles 1 and 2

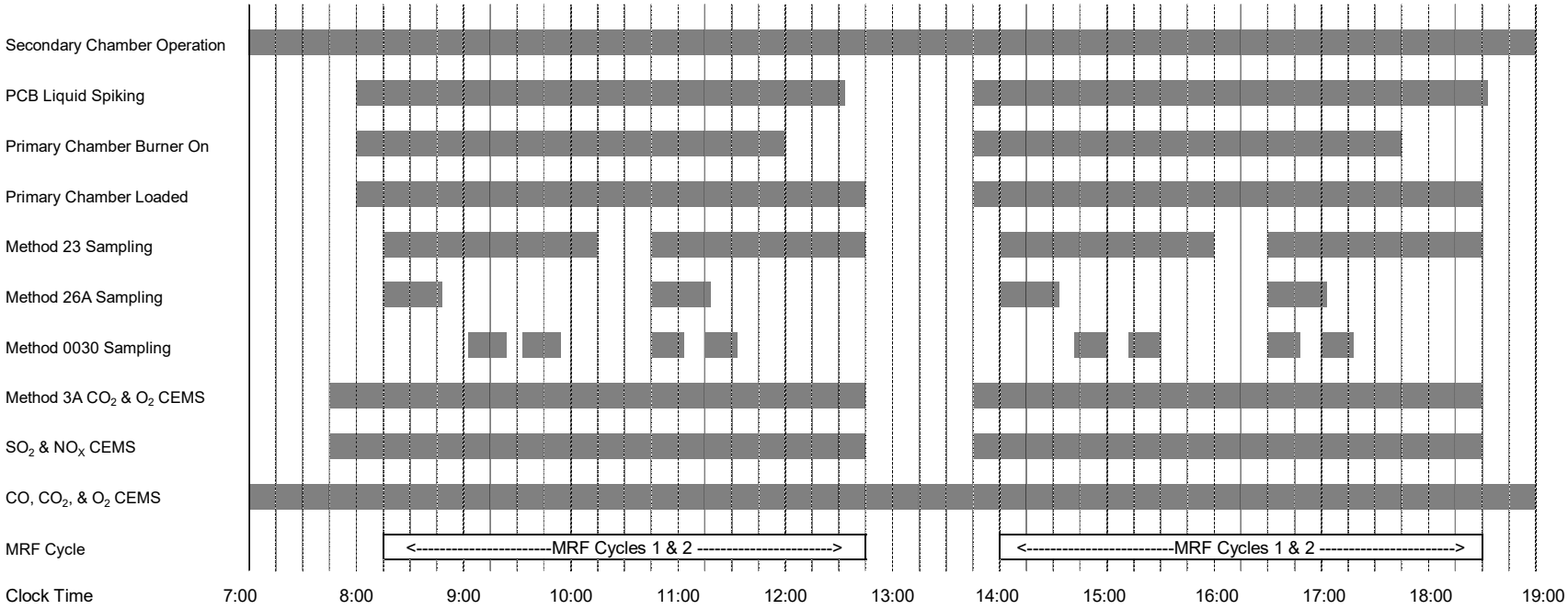


Figure 4-2. MRF TSCA Compliance Test Sampling Timeline for Concurrent Cycles 1 and 2

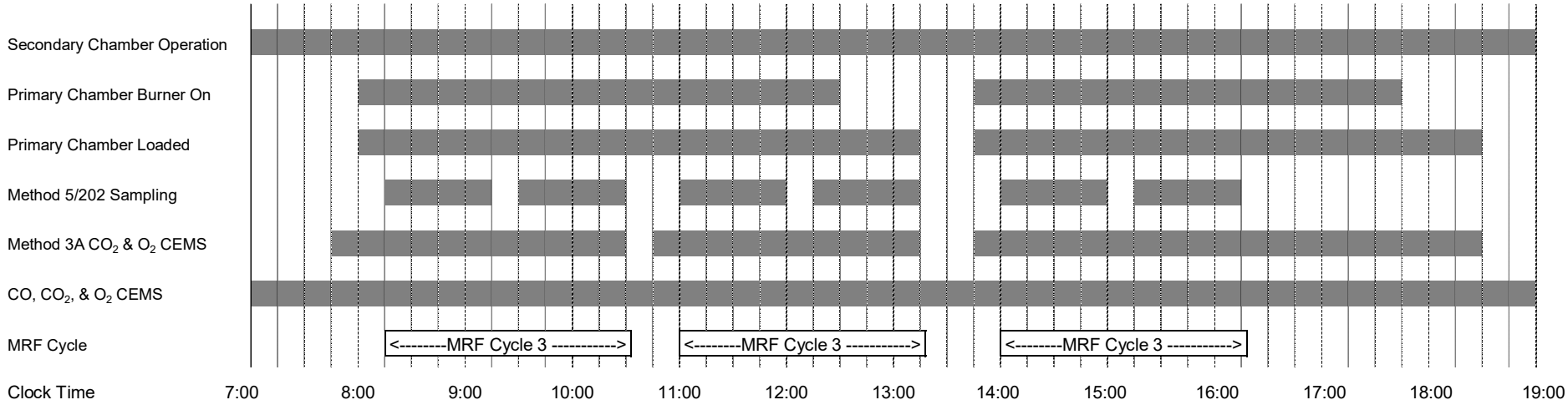


Figure 4-3. MRF TSCA Compliance Test Sampling Timeline for Cycle 3

5.0 TEST REPORT AND OPERATIONAL LIMITS

5.1 TEST REPORT

The final test report will be submitted to EPA Region 6 and ODEC within 90 days after completion of the test unless a time extension is requested. The final test report will contain a discussion of the test objectives; sampling, analysis, and QA/QC activities performed; summaries of process operating conditions; and the results of the test determinations; and proposed/confirmed permit conditions. The proposed outline of the test report is shown in Table 5-1.

5.2 OPERATING LIMITS

The following sections propose a methodology for establishing TSCA Permit operating limits based on the MRF operation during the test program.

5.2.1 Minimum Primary Chamber Temperature

The current TCSA Permit required operating protocol for the primary chamber is 500-1,200°F for a minimum of 2.0 hours and reach a minimum temperature of 1,200°F once during each cycle. The current Air Permit requires the primary chamber to be operated at a minimum of 800°F except for brief periods when the chamber is charged (loaded). The TSCA regulations at 40 CFR 761.72(a)(3) require the primary chamber to be operated at 537-650°C (999-1,202°F) for a minimum of 2.5 hours and reach a temperature of 650°C (1,202°F) once during the cycle.

A-Line operates the primary chamber at a minimum of 800°F for 2.5 hours and reaches a minimum of 1,200°F once during each cycle. A-Line will follow this temperature/cycle process during testing. Primary chamber temperature will be monitored and recorded continuously during each test run/cycle. Provided the required PCB DRE is achieved during testing, A-Line proposes to retain the current TSCA permit primary chamber temperature/cycle process. Alternatively, A-Line proposes changing the minimum temperature limit to be consistent with the current Air Permit of 800°F.

5.2.2 Minimum Secondary Chamber Temperature

The current TCSA Permit and Air Permit operating requirement for the secondary chamber is 1,200°C (2,192°F), with at least 3% excess oxygen, 2.0 seconds residence time, and 99.9% combustion efficiency ($[CO_2] / ([CO_2] + [CO]) * 100\%$). Both permits are consistent with the TSCA regulations at 40 CFR 761.72(a)(4).

A-Line operates the secondary chamber at a minimum of 1,200°C (2,192°F), with at least 3% excess oxygen, and 99.9% combustion efficiency. Combustion gas residence time substantially exceeds the minimum 2.0 seconds requirement at these operating conditions. Secondary chamber temperature will be monitored and recorded continuously during each test run/cycle. Provided the required PCB

DRE is achieved during testing, A-Line proposes to retain the current TSCA Permit secondary chamber temperature limit and operating conditions.

5.2.3 PCB Material Charge Limits

The current TSCA Permit limits the PCB material charges to the primary chamber to:

- A maximum stacked tray height of four (4) feet of drained PCB items
- A maximum tray net weight of 6,300 pounds
- PCB items shall be drained of all free-flowing liquid, removed from the housing, and chopped to achieve the maximum amount of surface area exposure practicable
- No more than one (1) 55-gallon drum, or its equivalent, of contaminated debris
- No more than one contaminated wooden pallet, and
- Charging or heating of the primary chamber shall not commence until the secondary chamber has reached a temperature of 1,200±100 °C (2,192 ° ±180 °F) [40 CFR 761.72(a)(5)].

Materials that may be treated in the MRF include solid PCB items that have been drained and flushed of all free-flowing PCB liquids. Other materials allowed are incidental PCB solids such as rags, debris, or wood pallets that may have been contaminated with PCBs.

During testing, A-Line will operate the MRF consistent with these limitations. Provided the required PCB DRE is achieved during testing, A-Line proposes to retain the current TSCA Permit PCB charge material limiting conditions with the additional specific delineated allowance of adding de-chlorination system salt water to the burn trays up to six (6) inches depth.

5.2.4 Required Monitoring Systems

In accordance 40 CFR 761.72(a)(6), A-Line shall operate CEMS and recorders for carbon dioxide, carbon monoxide, and excess oxygen in the secondary chamber, and continuous temperature recorders in the primary and secondary chambers to assure the operating parameters operating limits specified at 40 CFR 761.72(a)(3) through (a)(5) are met. Additionally, A-Line shall operate continuous draft pressure recorders in the primary and secondary chambers to assure compliance with the fugitive emissions standard of 40 CFR 761.72(a)(1) is met.

5.2.5 Monitoring of Minimum Residence (Dwell) Time

Section 2.4 of the MRF test plan presents an example calculation of the secondary chamber combustion gas residence (dwell) time. The MRF is a batch treatment system. The materials treated are almost entirely non-combustible with only surface PCB contamination. As such, these materials contribute nearly nothing to thermal input or gas generation during the treatment cycle. MRF gas generation is almost exclusively from the natural gas fired burners which operate on mechanical air-to-gas ratio control. Combustion gas is

therefore directly related to burner firing rate. Firing rate varies as necessary to maintain minimum chamber temperatures.

A-Line has installed a meter on the natural gas feed line to the MRF. During each MRF test cycle, the natural gas meter value will be manually recorded at 15-minute intervals. These values will be used to document the total and peak natural gas usage during each cycle. The stack flow rate and temperature will be measured during each MRF test cycle via the isokinetic sampling trains. The stack data will be used to calculate and document the secondary chamber combustion gas residence time for each test cycle in like manner as presented in Section 2.4 of the test plan. The combustion gas residence time is expected to substantially exceed the minimum required 2.0 seconds.

A-line proposes a maximum total per cycle natural gas firing rate limit based on 1.5 times (1.5X) the average of the peak firing rate during the test run. The test report will provide additional calculations and mass and energy balance modeling to show the proposed firing rate limit cannot result in an exceedance of the minimum required 2.0 seconds residence time. The proposed firing limit allows for natural variation in MRF operation due to seasonal ambient temperature that will require more or less natural gas firing to maintain minimum chamber temperatures. To document compliance with this limit, A-Line will add natural gas usage to the MRF Burn Log used to document each treatment batch. The natural gas meter reading will be recorded at the beginning and end of each treatment cycle. The total per cycle natural gas use (scf) will be calculated by difference. The burn logs are maintained as part of the MRF operating record.

Table 5-1. Example MRF Test Report Outline

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- APPENDIX E FIELD NOTES AND LIST OF SAMPLES
- APPENDIX F SUMMARY ANALYTICAL DATA REPORT

QUALITY ASSURANCE PROJECT PLAN
METAL RECOVERY FURNACE
TSCA COMPLIANCE TEST

PREPARED FOR:

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REVISION: 4A
SEPTEMBER 2025
FOCUS PROJECT NO. P-001578

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1.0 QUALITY ASSURANCE PROJECT PLAN APPROVAL FORM AND DISTRIBUTION LIST

Project Title: A-Line T.D.S., Inc. (A-Line)
Metals Recovery Furnace TSCA Compliance Test
Tonkawa, Oklahoma

Expected Test Date: To Be Determined

Project Approvals:

Name/Function/Organization	Signature	Date
Lynn Fritz Test Project Manager A-Line T.D.S., Inc.		
Chris McBride Test Coordinator Focus Environmental, Inc.		
Bill Ansel or Eric Doak Stack Sampling Team Leader Clean Air Engineering		
Courtney Adkins Laboratory Project Manager Eurofins Knoxville		
Teresa Bales Quality Assurance Officer Focus Environmental, Inc.		

QAPP Approval Statement: The individuals listed above:

1) Have received, read, and agreed to the appropriate information pertaining to assigned project responsibilities listed and provided in this QAPP, and

2) Agree if there are modifications or deviations from the sampling and analytical methods as specified in the associated Test Plan, they are to be identified and explained in the sampling and analytical narratives, and discussed in the body of the test report.

QAPP Distribution List

Project Organization Title	Organization/Name
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Test Project Manager	A-Line T.D.S., Inc.
Health and Safety Manager	A-Line T.D.S., Inc.
Operations Manager	A-Line T.D.S., Inc.
Test Coordinator	Focus Environmental, Inc.
Stack Sampling Team Leader	Clean Air Engineering, Inc.
Spiking Manager	Superior Spiking Industries
Sample Custodian	Focus Environmental, Inc.
Laboratory Project Manager	Eurofins Knoxville
Quality Assurance Officer	Focus Environmental, Inc.
U.S. Environmental Protection Agency	EPA Region 6

The QAPP was distributed to these individuals, was read by the individuals, and they agree to the appropriate information pertaining to their project responsibilities as listed and provided in this QAPP.

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A Stack Sampling Train Specification Sheets and Flow Charts

B Resumes and Certifications for Key Project Personnel

C Eurofins Certifications

D Documentation Associated with Approval of Method 23 Combined PCB-DF-SVOC RCL Sampling and Analysis

E Eurofins Analysis Standard Operating Procedures

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ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing Materials
B.P.	boiling point
CAR	corrective action request
CCB	continuing calibration blank
CCC	calibration check compound
CCV	continuing calibration verification
CEM	continuous emissions monitor
CEMS	continuous emissions monitoring system
CF	calibration factor
cfm	cubic feet per minute
CFR	Code of Federal Regulations
Cl_2	molecular chlorine
CLP	Contract Laboratory Program
CO	carbon monoxide
CMS	continuous monitoring system
COC	chain of custody
DF	polychlorinated dibenzo-p-dioxin and polychlorinated dibenzofuran
DI	deionized (water)
DOT	U.S. Department of Transportation
DQO	data quality objective
DRE	destruction and removal efficiency
dscf	dry standard cubic foot
dscfm	dry standard cubic feet per minute
dscm	dry standard cubic meter
dscmm	dry standard cubic meters per minute
EDL	estimated detection limit
EPA	U.S. Environmental Protection Agency
GC	gas chromatography
GC/ECD	gas chromatography/electron capture detector
GC/FID	gas chromatography/flame ionization detector
GC/MS	gas chromatography/mass spectrometry
g	grams
gr	grains
HCl	hydrogen chloride (gas) or hydrochloric acid (aqueous)
HRGC/HRMS	high resolution gas chromatography/ high resolution mass spectrometry
IATA	International Air Transport Association
ICB	initial calibration blank
Cl^-	chloride ion
ICV	initial calibration verification
IDL	instrument detection limit
inwc	inches water column
kg	kilograms
L	liter

lpm	liters per minute
lb or lbs	pounds
LCS	laboratory control standard
LCSD	laboratory control standard duplicate
m^3/min	cubic meters per minute
MDL	method detection limit
mg	milligrams
mg/L or mg/l	milligrams/liter
μg or ug	micrograms
μg/m^3 or ug/m^3	micrograms/cubic meter
min	minute
mL or ml	milliliters
mm	millimeters
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NaOH	sodium hydroxide
ND	non-detect
NELAP	National Environmental Laboratory Accreditation Program
ηg or ng	nanograms
non-Hg	non-mercury
O_2	oxygen
OCl^-	hypochlorite
OSW	EPA Office of Solid Waste
OTS	Office of Toxic Substances
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
PCB	polychlorinated biphenyl
PDS	post-digestion spike
PE	performance evaluation
pg	picograms
PIC	product of incomplete combustion
PID	product of incomplete destruction
PM	particulate matter
ppm	parts per million
ppmv or ppmdv	parts per million dry volume
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
RCl	total chlorinated organic content
RDL	reliable detection limit
RF	response factor

RFA	request for analysis
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
RRT	relative retention time
RSD	relative standard deviation
RT	retention time
SPCC	system performance check
SOP	standard operating procedure
SRE	system removal efficiency
SQL	sample quantitation limit
SVOC	semi-volatile organic compound
SW-846	"Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (SW-846)," Third Edition, 1986 and updates (December 1997).
TCL	target compound list
TSCA	Toxic Substances Control Act
wc	water column
WM	wide-mouth
VOA	volatile organic analysis
VOC	volatile organic compound
VOST	volatile organic sampling train

3.0 PROJECT DESCRIPTION

3.1 GENERAL

This Quality Assurance Project Plan (QAPP) is an integral part of the A-Line T.D.S., Inc. (A-Line) Metals Recovery Furnace (MRF) Toxic Substances Control Act (TSCA) Compliance Test Plan (Test Plan), and must be used in conjunction with this plan. This section provides a brief description of the test objectives, the unit operating protocol, the associated sampling and analytical protocol, and how they relate to testing of the MRF. Refer to the Test Plan for more detailed information on the scope of the testing.

3.2 QUALITY ASSURANCE PROJECT PLAN SCOPE

This QAPP presents the organization, objectives, functional activities, and specific Quality Assurance (QA) and Quality Control (QC) activities for test data collection. This QAPP also describes the specific QA/QC protocols that will be followed for sampling, sample handling and storage, chain-of-custody, and laboratory analysis during the test program.

All QA/QC procedures will be in accordance with applicable professional technical standards, government regulations and guidelines, and specific project goals and requirements. The Test Plan and this associated QAPP have been prepared in accordance with EPA hazardous waste thermal treatment system testing and QAPP guidance documents, in particular the following:

- EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5 EPA/240/B-01/003), March 2001
- Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80)
- Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, EPA/625/6-89/023, January 1990.
- EPA, "New Source Performance Standards, Test Methods and Procedures," Appendix A, 40 CFR 60.
- EPA, "Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (SW-846)", Third Edition, 1986 and updates.

3.3 FACILITY BACKGROUND INFORMATION

A-Line operates a transformer disposal service facility located in Tonkawa, Oklahoma. Transformers, capacitors, and other electrical equipment components containing polychlorinated biphenyls (PCB) are drained of free-flowing liquid and dismantled. The PCB-bearing liquid drained from these items may be chemically treated on-site to destroy the PCB via de-chlorination or may be shipped off-site for treatment in a Toxic Substances Control Act (TSCA) permitted commercial hazardous waste incinerator. The metal, cores, and dunnage from dismantling the electrical items are thermally treated in the MRF. The MRF thermally desorbs and destroys residual PCB contamination from the metal and non-metal solid components. The thermally treated metal is recovered for recycling. Ash and other non-metal, non-

combustible residuals (e.g., ceramic components) are containerized for off-site disposal at a TCSA permitted landfill. The chemical treatment process and MRF operate under a TSCA permit issued by the Environmental Protection Agency (EPA) Region 6 and an Air Permit issued by the Oklahoma Department of Environmental Quality (ODEQ). This test program is being performed as part of the TSCA permit renewal. The test program will demonstrate compliance of the MRF with the TSCA requirements.

3.4 UNIT CONFIGURATION AND GENERAL OPERATION

The MRF is a batch operated furnace that complies with the operating requirements of 40 CFR 761.72 *Scrap Metal Recovery Ovens and Smelters*. The MRF includes two chambers, each equipped with natural gas fired burners. Solid components are treated in the primary chamber. The gases from the primary chamber are thermally treated in the secondary chamber to destroy the desorbed PCB. Thermally treated gases are discharged to the atmosphere via the MRF stack; there are no additional emissions controls.

Dismantled solid electrical components are loaded in a burn tray. The secondary chamber burners are started. Once the secondary chamber has reached the TSCA Permit required operating temperature of 1,100^{o}C (2,012^{o}F), the loaded burn tray is placed in the MRF primary chamber. The primary chamber burners are then started. The MRF operates for a time and temperature cycle/protocol consistent with the current TSCA Permit. Once the MRF cycle is complete, the primary chambers burners are shut off. After a cooling period, the primary chamber is opened and the burn tray with the treated materials is removed. The metals parts are allowed to continue to cool to ambient temperature at which point they can be wipe sampled and the samples analyzed to confirm the absence of PCB. The ash and other non-recycle materials in the burn tray can then also be removed. The decontaminated metal is made available for recycling. The ash and other non-recycle materials are containerized for eventual disposal in a TSCA permitted landfill

3.5 TEST OPERATING AND SAMPLING PROTOCOLS

Table 3-1 summarizes the planned sampling and analysis protocol. There are limited number of sampling ports on the stack: one set of two 4-inch ports configured for isokinetic sampling, and two additional 2-inch ports for non-isokinetic or temporary CEMS sampling. To complete the sampling and obtain representative emissions, two (2) or three (3) MRF cycles may be necessary per test run, with a total of nine (9) possible MRF cycles performed to complete the test program. For pruposes of test organization, the expected performance and emissions sampling is defined in cycles as follows:

- Cycle 1: Sampling will be performed to measure hydrogen chloride/molecular chorine (HCl/Cl_2) emissions. HCl/Cl_2 emissions will be measured using an EPA Method 26A sampling train. The PCB liquid spike will be sampled to determine the chlorine content and feed rate. Installed CEMS will measure CO, CO_2, and O_2 emissions.
- Cycle 2: Sampling will be performed to measure PCB destruction and removal efficiency (DRE) emissions. PCB, dioxin/furan (DF), and semi-volatile organic compound (SVOC) total chlorinated organic content (RCl) emissions will be sampled concurrently using a single EPA

Method 23 sampling train. VOC RCl emissions will be measured concurrently using a SW-846 Method 0030 sampling train. The PCB liquid spike will be sampled to determine the PCB content and feed rate. Temporary CEMS will measure sulfur dioxide (SO_2) (EPA Method 6C) and nitrogen oxides (NO_X) (EPA Method 7E). Installed CEMS will measure carbon monoxide (CO), carbon dioxide (CO_2), and oxygen (O_2) emissions.

- Cycle 3: Sampling will be performed to measure particulate matter (PM) emissions. Filterable and condensable PM emissions will be measured using an EPA Method 5/202 sampling train. PCB spiking will not be performed during PM emissions sampling. Installed CEMS will measure CO, CO_2, and O_2 emissions.

To accurately evaluate the PCB destruction and removal efficiency (DRE) and characterize resulting emissions from PCB destruction, PCB liquid will be continuously metered to the secondary chamber during PCB, DF, SVOC RCl, VOC RCl, and HCl/Cl_2 emissions sampling. The PCB liquid used will be sampled prior to the testing to determine the PCB content and set the PCB liquid feed rate necessary to demonstrate 99.9999% DRE. Dismantled electrical components constitute a multitude of geometries and surfaces, that often include narrowly-spaced laminated metal sheets with hairline spacing between each sheet and some porous surfaces. Therefore, it is not possible to accurately measure the net amount of PCB in the solid materials placed in the burn tray charged into the primary chamber. Previous testing (1998) did include pre-test wipe samples of burn tray items which provides a general measure of surface contamination. The wipe samples were used to develop estimates of PCB mass with the burn tray items. These wipe sample measurements simply confirm the presence of PCB and are at best only rough estimates of PCB mass. A-Line does not believe such characterization of burn tray materials serves an accurate measure of PCB charges. A-Line does not plan to perform any PCB sampling and analysis of the materials loaded into the burn tray, and consequently no credit for PCB mass with burn tray charges will be considered in the DRE calculation. PCB DRE will be based solely on the PCB feed rate to the secondary chamber and measured emissions. Refer to Section 3.0 of the MRF Test Plan for additional details on the test operating and sampling protocols.

Table 3-1. MRF Test Sampling and Analysis

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [1]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [1]
MRF Run Cycle 1						
Stack Gas	Isokinetic Port	Method 26A	EPA Method 26A	72 minutes [2,3]	HCl/Cl_2	EPA Method 26A
PCB Liquid Spike	Tap on Spiking Line	250 mL Sample Bottle	ASTM D-4057, E-300-03	Single grab sample once per run	Total Chlorine	SW-846 5050/9056A (Cl)
MRF Run Cycle 2						
Stack Gas	Isokinetic Port	Method 23 Sampling Train	EPA Method 23	240 minutes and target volume 4.0 dry standard cubic meters [2,3]	PCDD/PDCF PCB SVOC RCI	SW-846-8290A (PCDD/PDCF) EPA Method 1668C (PCB) SW-846-8270E (SVOC RCI)
Stack Gas	Non-Isokinetic Port	VOST	SW-846 0030 (VOST)	20 L sample per tube set at 1.0 L/min; four tube sets, 80 L total sampled per run	Volatile organic PICs	SW-846 5041A/8260D
Stack Gas	Isokinetic Port	Method 5/202	EPA Method 5/202	120 minutes [2,3]	Filterable and Condensable PM	EPA Method 5/202
PCB Liquid Spike	Tap on Spiking Line	250 mL Sample Bottle	ASTM D-4057, E-300-03	Single grab sample once per run	PCB	SW-846 1668C (PCB)
Stack Gas	CEMS Port	Temporary SO_2 CEMS	EPA Method 6C	Continuous	SO_2	40 CFR 60, Appendix A Method 6C
Stack Gas	CEMS Port	Temporary NO_X CEMS	EPA Method 7E	Continuous	NO_X	40 CFR 60, Appendix A Method 7E
MRF Run Cycle 3						
Stack Gas	Isokinetic Port	Method 5/202	EPA Method 5/202	120 minutes [2,3]	Filterable and Condensable PM	EPA Method 5/202
PCB Liquid Spike	Tap on Spiking Line	250 mL Sample Bottle	ASTM D-4057, E-300-03	Single grab sample once per run	PCB Total Chlorine	SW-846 1668C (PCB) SW-846 5050/9056A (Cl)
MRF Run Cycle 1, Cycle 2, and Cycle 3						
Stack Gas	CEMS Port	Installed CO, CO_2, and O_2 CEMS	40 CFR 60, Appendix F	Continuous	CO, CO_2, and O_2	40 CFR 60, Appendix F

Notes:

[1] Reference Method Sources:

“SW-846" refers to Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.

“EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.

“EPA Method 1668C” refers to Method 1668C, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-820-R-10-005, April 2010.

[2] The exact volume of gas sampled will depend on the isokinetic sampling rate.

[3] Isokinetic sampling trains include:

- Using CEMS for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3A)
- Performing stack gas velocity, pressure and temperature profile measurement for each sampling location (EPA Method 2)
- Determining the moisture content of the stack gas for each sampling train sample (EPA Method 4).

4.0 ORGANIZATION OF PERSONNEL, RESPONSIBILITIES, AND QUALIFICATIONS

4.1 GENERAL

The project organization for the MRF TSCA test program is summarized in Figure 4-1.

4.2 A-LINE TEST PROJECT MANAGER

The A-Line Test Project Manager is the corporate representative for A-Line. During the test, the A-Line Test Project Manager will be responsible for ensuring that the MRF operates properly and that the unit achieves the desired test conditions on each test day. As such, the A-Line Test Project Manager, working through the A-Line Operations Manager, will assign responsibilities the unit operations. The A-Line Test Project Manager will be responsible for ensuring all the applicable MRF operating data are collected during each cycle and test run. The A-Line Test Project Manager will also be the official communication link between A-Line and the respective contractors and regulatory observers.

4.3 A-LINE OPERATIONS MANAGER

The A-Line Operations Manager will be responsible for the operation of the MRF. The Operations Manager and MRF Operators' duties will include:

- Operating the MRF within current TSCA Permit protocol
- Maintaining logs of process data as required by the TSCA Permit
- Downloading and providing the MRF one-minute operating data to the Test Coordinator in Microsoft Excel format.

4.4 TEST COORDINATOR

The Focus Environmental, Inc (Focus) Test Coordinator is experienced in the technical coordination and QA/QC associated with the testing of combustion systems similar to the MRF. The Test Coordinator is responsible for the execution of the MRF Test Plan and associated QAPP, preparation of the final test report, and interpretation of the test results. During the test, the Test Coordinator is responsible for the overall implementation of the test program. The Test Coordinator will serve as the focal point between the A-Line Test Project Manager and the sampling contractors on testing related matters, and will coordinate activities among various project team members. Specific Test Coordinator responsibilities include:

- Ensuring compliance with the Test Plan and the QAPP by all project team members during the test
- Documenting testing activities in a field logbook
- Providing sample checklists, labels, and request for analysis (RFA) and chain of custody (COC) forms for use by the Stack Sampling Contractor

- Assisting the A-Line Test Project Manager in interfacing with the regulatory observers and/or oversight contractors during the test
- Providing coordination between the A-Line Test Project Manager and the sampling team during the test, especially regarding decisions to start/stop/void/repeat sampling runs
- Performing inspections of the process equipment, process controls, process operations, data acquisition and recording systems, and sampling activities for compliance with this QAPP and the test plan
- Providing field review of process operating logs, and completed sample collection sheets, stack sampling logs, COC forms, and RFA forms
- Interfacing with the Laboratory Project Manager while samples are being analyzed
- Interfacing with the other testing contractors while the stack sampling and other test data are being reduced
- Supervising production of the test report.

4.5 STACK SAMPLING TEAM LEADER

The Stack Sampling Contractor, Clean Air Engineering, Inc., is experienced in conducting the stack sampling called for in the test plan and will conduct the stack sampling for this project. The Stack Sampling Team Leader will have overall responsibility for the collection and handling of all stack gas related samples. The Stack Sampling Team Leader has the following oversight responsibilities:

- Preparing and shipping stack sampling equipment, and shipping containers to the test site
- Providing reagents necessary for assembling and recovering sampling trains
- Preparing and calibrating stack sampling equipment
- Directing and/or participating in stack sampling activities
- Recording field test data required by the test plan and stack sampling methods
- Reviewing and approving stack sample collection sheets and stack sampling field data sheets
- Overseeing recovery of stack sampling-related samples and preservation of those samples
- Notifying the Sample Custodian of all samples collected
- Reducing stack sampling data and performing all calculations and QA activities required by the stack sampling methods
- Preparing a draft and final report of stack sampling activities.

4.6 SPIKING MANAGER

The Spiking Manager will have responsibility for metering the PCB liquid to the secondary chamber during the test. The Spiking Manager has the following responsibilities:

- Preparing and shipping the spiking equipment and materials to the test site
- Preparing and calibrating the spiking equipment
- Spiking the PCB to the secondary chamber in accordance with the Test Plan

- Recording spiking system operating data
- Notifying the Test Coordinator immediately of any difficulties or interruption of the spiking system operations
- Reducing spiking data and performing the calculations required to report the spiking rates
- Preparing a draft and final report of spiking activities.

4.7 SAMPLE CUSTODIAN

A Sample Custodian will be appointed who will have overall responsibility for the collection and handling of all test samples. This person has the following responsibilities:

- Coordinating the preparation of the master sample list, sample media preparation, and shipment of the media to the test site
- Controlling the issuance of sample media and containers at the test site
- Packaging the test samples for shipment to the laboratory
- Reviewing the COC and RFA forms for all samples prepared by other test team members
- Coordinating the shipping of all samples to the laboratory.
- Monitoring the shipment of samples to the laboratory to ensure that all samples are received on schedule and with all preservation requirements being met.
- Reporting any sample handling discrepancies to the Test Coordinator and Quality Assurance Officer.

4.8 LABORATORY PROJECT MANAGER

The Eurofins Environment Testing, Inc., Knoxville, Tennessee Laboratory (Eurofins) is experienced with the sampling methods and analyses associated with the MRF testing. The Laboratory Project Manager will have overall responsibility for the analysis of the test samples. The Laboratory Project Manager has the following responsibilities:

- Preparation of the master sample list with input from the Test Coordinator
- Preparation of the pre-labeled sample recovery containers
- Preparation and providing the XAD resin traps and filters for the various sampling trains
- Preparation of the RFA/COC documentation for the sample collection
- Receiving, verifying, and documenting that incoming field samples correspond to the sample chain of custody information
- Notifying the Test Coordinator and A-Line Test Project Manager of any discrepancies or problems in the COC and RFA information, preservation, or sample condition
- Maintaining records of incoming samples
- Tracking samples through processing, analysis, and disposal
- Designating QC samples for analysis during the project
- Verifying that laboratory personnel are trained and qualified in specified laboratory QC and analytical procedures

- Verifying that laboratory QC and analytical procedures are being followed as specified in this QAPP, the laboratory specific QA/QC Plan, and the laboratory specific analytical standard operating procedures (SOPs)
- Reviewing QC and sample data during analysis and determining if repeat analyses are needed
- Submitting certified QC and sample analysis results and data packages to the Test Coordinator
- Notifying the Test Coordinator of any QC excursions during the preparation and analysis of the field samples or associated QC samples
- Archiving analytical data
- Preparing a statement of the analysis activities for inclusion in the final test report executive summary regarding if any of the test data are invalid or unusable.

4.9 QUALITY ASSURANCE OFFICER

The Quality Assurance Officer's (QAO's) responsibilities include the following:

- Assuring all individuals included in the QAPP Distribution List receive copies of the test plan and QAPP
- Reviewing the stack sampling and analytical reports for completeness and accuracy
- Conducting or coordinating any required audits of the data reduction or laboratory procedures to ensure compliance with the QAPP
- Reviewing the stack sampling report for completeness of the data including documentation of the required calibrations
- Conducting validation of the analytical data generated for completeness of the reports including documentation of the required QA/QC analyses and corrective actions
- Preparing a report of the QA/QC activities that summarizes the findings, including a statement for inclusion in the final the report executive summary regarding if any of the test data are invalid or unusable.

4.10 ENVIRONMENTAL SAFETY AND HEALTH MANAGER

The A-line Environmental, Safety, and Health (ESH) Manager is responsible for ensuring compliance of the personnel and facility with the industrial safety regulations and operating permits. ESH Manager reports independently to the President of A-Line. The EHS Manager will have communication to and with every test team member, including A-line employees, testing contractors, and visitors/observers, relative to compliance with the facility's environmental, safety, and health rules during the execution of the MRF test program. The EHS Manager has full authority to dismiss any person(s) or company from the site who is not adhering to facility EHS requirements.

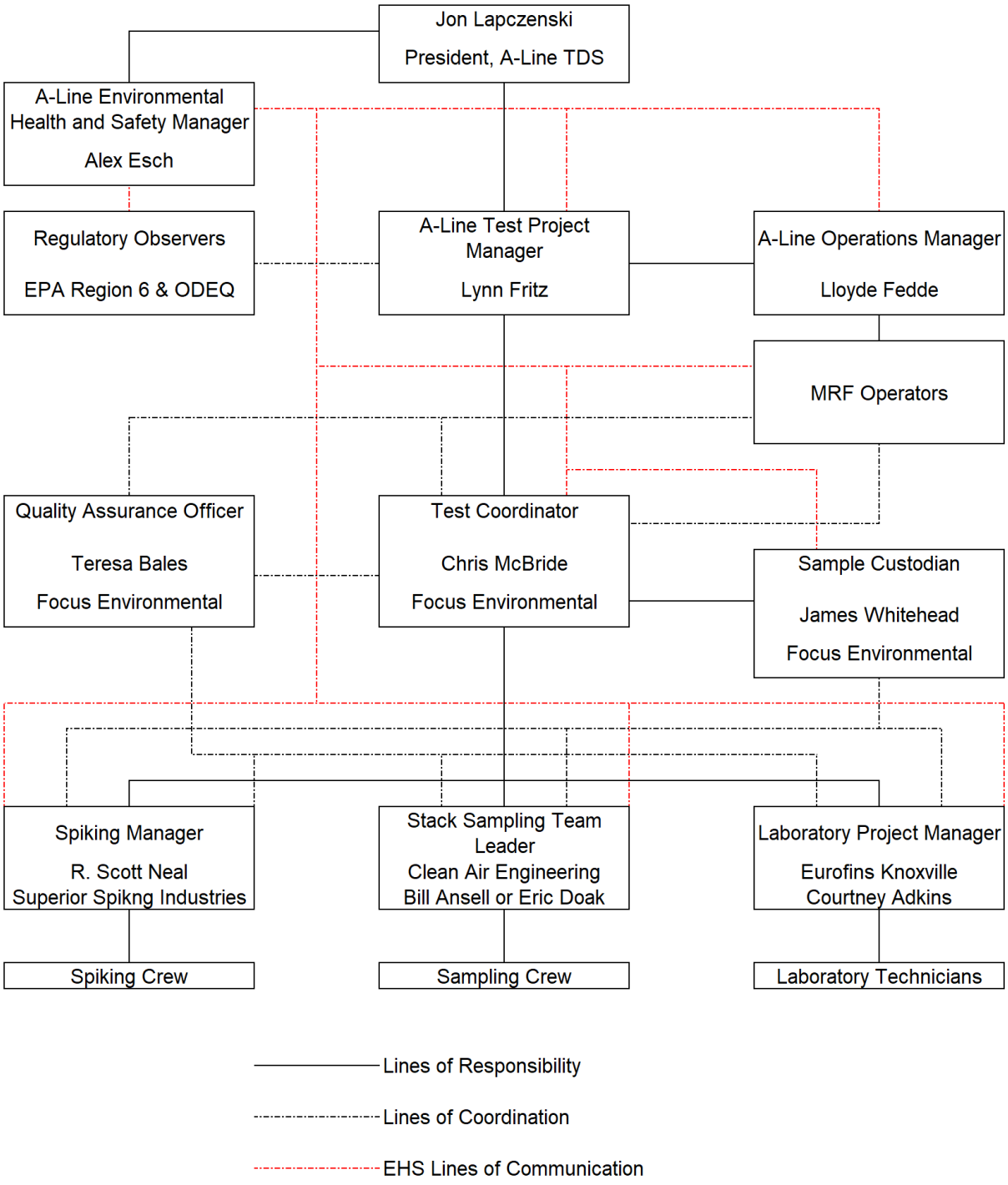

Figure 4-1. A-Line MRF Test Project Organization and Responsibility

5.0 QUALITY ASSURANCE OBJECTIVES AND QUALITY CONTROL OBJECTIVES

5.1 GENERAL

The project sampling and analysis scope is summarized in Section 3.0 of this QAPP. The selected stack sampling contractor and the contract laboratory are well experienced in the types of sampling and analyses represented by this test program. The analytical laboratory will provide method detection limits (MDL) and reporting limits (RL) for each analysis. The laboratory will provide the best and lowest detection limits for all testing parameters.

The overall quality assurance objective is to produce a complete data set that can be used to fully assess and validate the operation of MRF relative to the TSCA requirements. This includes a number of quality indicators necessary to assess the precision and accuracy of all the test data.

The field and laboratory data obtained during this test will be reviewed by the Test Coordinator and Quality Assurance Officer for compliance with data quality objectives (DQOs) and the overall project objective. Data that are outside of the target DQO limits will be evaluated relative to the impact(s) on the overall project objective of assessing the MRF's performance. The data evaluation narrative will be included in the final test report.

Table 5-1 presents target DQOs for precision and accuracy for each type of analysis that will be performed during the test program. QA/QC objectives for precision, accuracy, representativeness, completeness and comparability are defined in this section. Procedures and formulas for determining accuracy and precision are presented in Section 13.0 of this document. The following definitions briefly describe the meaning of each QA/QC objective:

Precision: A measure of mutual agreement among individual measurements of the same property, usually under "prescribed similar conditions". Various measures of precision exist depending on the prescribed similar conditions. If the number of samples is less than three, the precision is described as range percent or relative percent difference (RPD) from the average of replicate measured values for analysis of the same parameter. If the number of samples is three or greater, precision is best described in terms of relative standard deviation (RSD).

Accuracy: The degree of agreement of a measurement (or an average of measurements of the same parameter) X, with an accepted reference or true value, T. Accuracy is usually expressed as the difference between the two values, X - T, or the difference as a percentage of the reference or true value, 100 (X - T)/T, and sometimes expressed as a ratio, X/T. In some cases, accuracy is described as the percentage recovery of a known quantity of material added to a sample prior to analysis. Accuracy is a measure of the bias in a system.

Completeness: A measure of the amount of valid data obtained compared to the amount expected to be collected under normal conditions. Completeness is usually expressed as a percentage.

Representativeness: The degree to which data accurately and precisely represent a characteristic of a population, parameter variation at a sampling point, process condition, or an environmental condition.

Comparability: The confidence with which one set of data can be compared to another.

5.2 PRECISION AND ACCURACY

A number of procedures will be implemented to assess the precision and accuracy of the sampling and analytical data. All sampling and analytical activities will be conducted following referenced procedures. All reference materials used as calibration standards, surrogate compounds, or laboratory control samples will be of the highest purity commercially available. The calibration of instruments used during analysis will be verified each day that samples are analyzed as described in later sections of this QAPP. Assessment of data precision and accuracy will be accomplished by evaluating the results from multiple analyses of the same parameter, and analysis of standards, duplicates, and spiked samples. Field and laboratory contamination will be assessed through the analysis of reagent, instrument, method, and field and trip blanks.

Precision estimates presented in Table 5-1 represent variability for replicate measurements of the same parameters, expressed in terms of relative percent difference (RPD) for duplicate samples or relative standard deviation (RSD) for three or more measurements, as appropriate. For analyses of samples with detectable concentrations of the target analytes, precision is evaluated by conducting duplicate analyses of unspiked samples and assessing the RPD. In the evaluation of larger data sets (three or more data points), the RSD is assessed. When duplicate analyses are performed, the original analysis result will be used in test calculations. If the variances in the duplicate analyses bring into question the analytical precision, additional analyses, if allowed by the method, will be performed to better determine the actual value or to evaluate the potential reason(s) for the measurement variability.

For analytical results near the detection limit, precision can be impacted. For the cases where the original and duplicate results are a combination of detect and non-detect results at the method detection limit (MDL) where precision cannot be calculated, the data will be flagged as estimated.

Accuracy values in Table 5-1 include components of both random error and bias, expressed as a percentage of the “true” of “known” value (for reference materials) or percent analyte recovery (for spiked samples). The QA/QC program will focus upon controlling measurement error within the estimated limits of measurement uncertainty, as specified in Table 5-1. It should be noted that these limits are estimates that are, in most cases, described in the referenced analytical methods or in QA/QC guidance for hazardous waste thermal treatment. They represent the range of results that can be expected from these methods based on actual field sampling results and laboratory-based QA/QC studies. Therefore, it is reasonable to expect that the measurement errors associated with this project will be within the objectives shown in Table 5-1. QA/QC determinations which fall outside of the target range will be flagged and an assessment of the impact, if any, on the usefulness of the data on the overall results and conclusions of the test program will be provided in the final test report.

The analytical laboratory's National Environmental Laboratory Accreditation Program (NELAP) accredited standard operating procedures (SOPs) for each analysis will be followed. If during the course of test sample analyses, an analytical result exceeds the calibrated range for a target analyte, or any other analytical anomalies are noted with any test samples, the Test Coordinator is to be contacted immediately to discuss the results/issues and possible options before proceeding with the subject analyses. If ongoing QA/QC procedures reveal that a measurement's error has exceeded the estimated data quality limits, the source of the excessive error will be identified and corrective action will be taken, as described in Section 14.0. If data fall outside the acceptable range of precision and accuracy, even after corrective action has been taken, those data points will be flagged in the final analytical report. The precision and accuracy for those measurements will be reported as determined using the actual data. Also, alternative procedures (either sampling or analytical) may be considered and recommended if possible.

5.2.1 Method 23 PCB/PCDD/PCDF/SVOC RCl Sampling Precision and Accuracy

EPA Method 23 will be used to concurrently sample the stack gas for emissions of PCB, PCDD/PCDF, and SVOC total chlorinated organic content (RCl). Prior to use in the field, all of the XAD-2 resin traps for use in the Method 23 sampling train are spiked with isotopically-labeled PCB, PCDD/PCDF, and SVOC sampling surrogate compounds as noted in Table 5-1. Two of the XAD-2 resin traps prepared for this project will also have PCB, PCDD/PCDF, and SVOC matrix spikes applied and are retained by the laboratory. These two XAD resin traps are then included with the field samples when they are returned to the laboratory for analysis. The recoveries of the PCB, PCDD/PCDF, and SVOC isotopically-labeled sampling surrogates and matrix spike compounds from these two retained XAD resin trap samples provide an accuracy assessment of the Method 23 analytical methodology. The recovery of the isotopically-labeled sampling surrogates spiked onto every field-use XAD resin sample provides a field through analysis accuracy assessment of the Method 23 methodology.

The recoveries of the internal standard, alternate standard, and recovery standard compounds applied during the preparation and analysis of the Method 23 sampling train components provide accuracy and precision measurements for the sample preparation and analysis steps. Table 5-1 notes the RPD and RSD values for the Method 23 PCB, PCDD/PCDF, and SVOC analyses.

5.2.2 Method 5/202 Particulate Sampling Precision and Accuracy

The gravimetric analysis of the Method 5/202 samples for particulate analyses includes replicate weighings to assess analysis precision. The analytical balance accuracy is verified using Class S weights.

5.2.3 Method 26A Chloride Sampling Precision and Accuracy

The analysis of the Method 26A samples for chloride includes a system MS/MSD analyses to evaluate the precision and accuracy of the ion chromatography analytical methodology. Matrix spikes to Method 26A field samples and reagent blanks will be performed at the greater of 2 times (2X) the sample's apparent

native concentration or 10 times (10X) the MDL used for the ion chromatography method to demonstrate the recovery and reproducibility of the method. The relative recoveries of the matrix spikes provide a measure of the accuracy of the chloride ion analysis methodology. Additionally, precision is assessed via duplicate analyses of field, reagent blank, calibration standard, and QC samples.

5.2.4 VOST Precision and Accuracy

The Volatile Organic Sampling Train (SW-846, Method 0030) will be used to sample stack gases for volatile organic compound (VOC) total chlorinated organic content (RCl).

5.2.4.1 Spiked Resin Blanks

During the preparation of the Tenax® and Tenax®/Charcoal tubes sets for the test program, two VOST Tenax® and Tenax®/charcoal tube pairs will be spiked with the SW-846 Method 5041A/8260D specified surrogate spike compounds. These samples will be retained by the laboratory, and included with the field samples when they are returned from the field for analysis. The relative recoveries of the surrogate spikes from these samples provide an accuracy assessment of the VOST analytical methodology. The relative recoveries of the isotopically labeled surrogate and internal standard spikes applied to every VOST sample analysis provide an ongoing accuracy assessment of the VOST analytical methodology.

The two pairs of the spiked VOST tubes provide a precision (reproducibility) assessment for VOST methodology. The consistency of the isotopically labeled surrogate spike recoveries applied to every VOST sample analysis provides an ongoing precision assessment of the VOST analytical methodology.

5.2.4.2 VOST Breakthrough Analysis

A breakthrough assessment for the VOST is prescribed in Section 7.3.7 of the Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, EPA/625/6-89/023, January 1990. This reference requires that the Tenax® and Tenax®/charcoal VOST tubes from each set of test run tube pairs be analyzed separately to determine possible target VOC breakthrough to the Tenax®/charcoal tube. The analysis of a Tenax®/charcoal tube should indicate less than 30% of the target VOC concentration that is collected on the Tenax® tube. Breakthrough of the target VOC to the Tenax®/charcoal tube above this level may cause loss of the desorption efficiency and result in a low bias in the analytical result. This criterion does not apply when less than 75 ηg of the target VOC is detected on the Tenax®/charcoal tube.

5.2.5 PCB Liquid Sample Properties

Duplicate analyses will be used to demonstrate the precision (reproducibility) and accuracy of the PCB liquid sample analyses for total chlorine content. Where possible, laboratory standards will be used to demonstrate the accuracy of the analytical method applied to the project samples.

5.2.6 PCB Liquid Sample Organics

PCB liquid samples will be analyzed by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) to determine total PCB content (EPA Method 1668C). To demonstrate the precision (reproducibility) of PCB analyses, duplicate analyses are performed as part of sample analyses. Prepared samples are spiked with analysis surrogates to demonstrate the recovery and reproducibility of the methods. The relative recoveries of the surrogate spikes and analysis of laboratory standards will be used to demonstrate the accuracy of the analytical methods applied to the project samples.

5.2.7 Installed CO, CO_2, and O_2 CEMS Precision and Accuracy

The precision of the installed carbon monoxide, carbon dioxide, and oxygen continuous emissions monitoring system (CEMS) analyzers will be assessed using the recommended calibration gases in accordance with 40 CFR 60, Appendix F. Precision will be assessed using the following equation:

$$\text{Precision}(\%drift) = \left(\frac{R_f - R_i}{Span} \right) x100$$

where:

R_f = Final monitor response at end of the test run

R_i = Initial monitor response at start of the test run

Span = Maximum range of the analyzer.

The accuracy of all CEMS analyzers will be evaluated by the measurement of percent accuracy as defined by the equation below:

$$\text{Accuracy}(\%) = \left(\frac{R_a - R_c}{Span} \right) x100$$

where:

R_a = Analyzer indicated concentration of the calibration gas

R_c = Certified concentration of the calibration gas

Span = Maximum range of the analyzer.

During the test, the carbon monoxide, carbon dioxide, and oxygen CEMS analyzers will be calibrated daily before the start of testing.

5.2.8 Temporary NO_X and SO_2 CEMS Precision and Accuracy

Temporary analyzers for nitrogen oxides and sulfur dioxide will be used to demonstrate compliance with SO_2 and NO_X emissions standards. The temporary CEMS will be calibrated and operated in accordance with 40 CFR 60, Appendix A, Methods 7E and 6C. The precision and accuracy of the analyzers will be assessed during the test using the recommended calibration gases. During the test, the analyzers will be calibrated before and after each test run.

5.3 DETECTION LIMITS AND REPORTING

How the detection limits will be used in data reduction and reporting is described in Section 11.0.

For inorganic analyses and non-isotope dilution method organic analyses, the laboratory report will provide both the Method Detection Limit (MDL) and the laboratory specified reporting limit (RL). The laboratory will maintain on records documenting the MDL and RL determinations. Generally, all non-detects for target analytes will be reported and assessed at the laboratory-determined RL. If an analyte is detectable at some value between the MDL and RL, the detected value will be reported and flagged as estimated. If matrix interference(s) occurs or sample dilutions are necessary, a sample specific MDL or sample quantitation limit (SQL) may be reported. If a sample specific MDL or SQL is applicable, the documentation of the serial dilutions or other measures taken to arrive at the SQL will be documented in the analytical report. The RL and MDL will be reported for all analytes, detect or non-detect.

For PCB and DF isotope dilution organic analysis, the non-detects will be determined using the SW-846 Method 8290A definition of an estimated detection limit (EDL) and Method 23 for MDL. The RL, EDL, and MDL will be reported for all analytes, detect or non-detect.

5.3.1 Stack Gas PCB

Sampling for PCB emissions will be via use of the same Method 23 sampling train being used for DF and SVOC RCI. The Method 23 sampling train XAD-2 resin traps will be pre-spiked with isotopically labeled sampling surrogate compounds for PCB as prescribed by Method 23. The recoveries of the surrogate spikes will demonstrate the required accuracy performance.

The target list of the PCB compounds includes all 209 PCB congeners. PCB will be analyzed via HRGC/HRMS. The RL, EDL and MDL will be reported for each specific PCB compound that is non-detect in stack gas samples.

5.3.2 Stack Gas Dioxin/Furan

Sampling for DF emissions will be via use of the same Method 23 sampling train being used for PCB and SVOC RCI. The Method 23 sampling train XAD-2 resin traps will be pre-spiked with isotopically labeled sampling surrogate compounds for DF as prescribed by Method 23. The recoveries of the surrogate spikes will demonstrate the required accuracy performance. DF will be analyzed via HRGC/HRMS. The RL, EDL

and MDL will be reported for each 2,3,7,8-chlorinated dioxin and furan congener, and tetra- through octa-congener groupreportedThe RL,.

5.3.3 Stack Gas SVOC

Sampling for SVOC RCI emissions will be via use of the same Method 23 sampling train being used for PCB and DF. The Method 23 sampling train XAD-2 resin traps will be pre-spiked with isotopically labeled sampling surrogate compounds of SVOC. The recoveries of the surrogate spikes will demonstrate the required accuracy performance.

The target list of the SVOC for analysis via Method 8270E is noted in Section 9.0 of the QAPP. SVOC will be analyzed via gas chromatograph/mass spectrometry (GC/MS). The MDL and RL will be reported for each specific target SVOC compound.

In addition to the target list of compounds, all non-target chlorinated compound peaks greater than 10% of the nearest internal standard will be tentatively identified via a GC/MS library search using the mass spectral data. Only tentatively identified compounds (TICs) that can be matched with 85% or greater confidence will be reported. SVOC RCI TICs will be quantified based on nearest internal standard. SVOC RCI TICs less than 10% of the nearest internal standard will not be reported or quantified.

5.3.4 Stack Gas VOST

VOC RCI emissions will be assessed using the VOST. A target list of VOC or analysis via Method 8260D is noted in Section 9.0 of the QAPP. Compounds on the target compound list will be reported per the standard SW-846 method using laboratory-determined RLs and MDLs.

In addition to the target list of compounds, all non-target chlorinated compound peaks greater than 10% of the nearest internal standard will be tentatively identified via a GC/MS library search using the mass spectral data. Only tentatively identified compounds (TICs) that can be matched with 85% or greater confidence will be reported. VOC RCI TICs will be quantified based on the nearest internal standard. VOC RCI TICs less than 10% of the nearest internal standard will not be reported or quantified.

5.4 COMPLETENESS

Data completeness represents the valid data collected from the total number of valid tests conducted. Samples resulting from test runs that are judged invalid based on field performance indicators or aborted runs will not be submitted to the laboratory for analysis. Because the possibility exists that a sample may be lost or broken, the data from each individual analytical parameter may not be complete for all test runs. The impact of any occurrence of sample loss will be assessed with regard to the objective of obtaining valid runs and will be discussed in the final test report. The completeness objective of this test program is to generate sufficient data for the regulatory agencies to judge the performance of the system.

5.5 REPRESENTATIVENESS AND COMPARABILITY

The sampling procedures chosen for the test program are, wherever possible, approved EPA or American Society for Testing Materials (ASTM) sampling methods that are typically employed on thermal treatment system tests. The use of standard sampling methods affirms sample consistency and representativeness.

Use of standard, approved sampling and analysis methods, standardized data reduction procedures, and QC samples will provide data that is technically defensible and is comparable from test run to test run, test condition to test condition.

Table 5-1 Test Analytical Data Quality Objectives

Parameter	QC type	Precision	Accuracy
PCB Liquid			
Total Chlorine	Duplicate Analysis	≤ 10% RPD	---
Total Chlorine	Reference Sample	---	± 10%
Polychlorinated Biphenyls (PCB)	Duplicate Analysis	≤ 35% RPD	---
	Surrogate spikes	≤ 35% RPD	Notes 1, 3, 5
Method 23 Sampling Train (PCB)			
Method 23 PCB	Spiked Resin Blanks	≤ 25% RPD	75-125%
	PCB C^{13} Labeled Sampling Surrogate Spikes	≤ 35% RSD	Note 2
	PCB C^{13} Labeled Isotope Dilution Internal Standard Spikes	---	Note 3
	PCB C^{13} Labeled Optional Cleanup Standard Spikes	---	Note 4
	PCB C^{13} Labeled Pre-Analysis Internal Standard Spikes	---	Note 5
Method 23 Sampling Train (PCDD/PCDF)			
Method 23 PCDD/PCDF	Spiked Resin Blanks	≤ 25% RPD	75-125%
	PCDD/PCDF C^{13} Labeled Sampling Surrogate Spike	≤ 35% RSD	Note 6
	PCDD/PCDF C^{13} Isotope Dilution Internal Standard Spikes	---	Note 7
	PCDD/PCDF C^{13} Labeled Pre-Analysis Internal Standard Spikes	---	Note 8
Method 23 Sampling Train (SVOC RCI)			
Method 23 SVOC	Spiked Resin Blanks	≤ 25% RPD	75-125%
	C^{13} Labeled Sampling Surrogate Spike	≤ 35% RSD	Note 9
	Semi-volatile Surrogate Spikes	≤ 35% RSD	Note 10
	Semi-volatile Matrix Spikes	≤ 35% RSD	70-130%
Method 5/202 Sampling Train			
Particulate Matter	Replicate Weighings	± 0.5 mg	± 0.5 mg
Method 26A Sampling Train			
Hydrogen Chloride/Chlorine	Duplicate Analysis	≤ 35% RPD	---
	Matrix Spikes	≤ 35% RPD	± 30%
	Reference Sample	---	± 10%
Method 0030 Sampling Train (VOST)			
VOST Tubes	Spiked Resin Blanks	≤ 25% RPD	75-125%
VOST Tubes	Surrogate Spikes	≤ 35% RSD	Note 11
VOST Condensate	Surrogate Spikes	≤ 35% RSD	Note 11
VOST Breakthrough Analysis	Breakthrough Analysis	---	Note 12
Continuous Emissions Monitors			

Table 5-1 Test Analytical Data Quality Objectives

Parameter	QC type	Precision	Accuracy
Carbon Monoxide	40 CFR 60, Appendix F	± 3% of Span	± 5% of Span
Carbon Dioxide	40 CFR 60, Appendix F	± 0.5% Carbon Dioxide	± 0.5% Carbon Dioxide
Oxygen	40 CFR 60, Appendix F	± 0.5% Oxygen	± 0.5% Oxygen
Nitrogen Oxides and Sulfur Dioxide	EPA Methods 7E and 6C	± 3% of Span	± 5% of Certified Calibration Gas
EPA Method 3A			
Carbon Dioxide	Certified Calibration Gas	---	± 0.5% CO_2
Oxygen	Certified Calibration Gas	---	± 0.5% O_2

Note 1: PCB Surrogate Compound Recovery	
Compound	**Target Recovery**
Tetrachloro-meta-xylene	45-139% for Solid Matrix
	39-150% for Liquid Matrix

Note 2: Method 23 PCB Pre-Sampling (Field) Surrogates		
Compound	**BZ No.**	**Target Recovery**
$^{13}C_{12}$-2,4'-dichlorobiphenyl	8L	70 – 130%
$^{13}C_{12}$-3,3',4,5'-tetrachlorobiphenyl	79L	70 – 130%
$^{13}C_{12}$-2,2',3,5',6-pentachlorobiphenyl	95L	70 – 130%
$^{13}C_{12}$-2,2',4,4',5,5'-hexachlorobiphenyl	153L	70 – 130%

Note 3: Method 23 PCB Pre-Extraction Internal Dilution Standards (IDS)		
Compound	**BZ No.**	**Target Recovery**
$^{13}C_{12}$-2,3,3',4,5,5'-HxCB (Filter Recovery Standard)	159L	70 – 130%
$^{13}C_{12}$-2-monochlorobiphenyl	1L	20 – 145%
$^{13}C_{12}$-4-monochlorobiphenyl	3L	20 – 145%
$^{13}C_{12}$-2,2'-dichlorobiphenyl	4L	20 – 145%
$^{13}C_{12}$-4,4'-dichlorobiphenyl	15L	20 – 145%
$^{13}C_{12}$-2,2',6-trichlorobiphenyl	19L	20 – 145%
$^{13}C_{12}$-3,4,4'-trichlorobiphenyl	37L	20 – 145%
$^{13}C_{12}$-2,2',6,6'-tetrachlorobiphenyl	54L	20 – 145%
$^{13}C_{12}$-3,3',4,4'-tetrachlorobiphenyl	77L	20 – 145%
$^{13}C_{12}$-3,4,4',5-tetrachlorobiphenyl	81L	20 – 145%
$^{13}C_{12}$-2,2',4,6,6'-pentachlorobiphenyl	104L	20 – 145%
$^{13}C_{12}$-2,3,3',4,4'-pentachlorobiphenyl	105L	20 – 145%
$^{13}C_{12}$-2,3,4,4',5-pentachlorobiphenyl	114L	20 – 145%

Note 3: Method 23 PCB Pre-Extraction Internal Dilution Standards (IDS)		
Compound	**BZ No.**	**Target Recovery**
$^{13}C_{12}$-2,3',4,4',5-pentachlorobiphenyl	118L	20 – 145%
$^{13}C_{12}$-2',3,4,4',5-pentachlorobiphenyl	123L	20 – 145%
$^{13}C_{12}$-3,3',4,4',5-pentachlorobiphenyl	126L	20 – 145%
$^{13}C_{12}$-2,2',4,4',6,6'-hexachlorobiphenyl	155L	20 – 145%
$^{13}C_{12}$-2,3,3',4,4',5-hexachlorobiphenyl	156L	20 – 145%
$^{13}C_{12}$-2,3,3',4,4',5'-hexachlorobiphenyl	157L	20 – 145%
$^{13}C_{12}$-2,3',4,4',5,5'-hexachlorobiphenyl	167L	20 – 145%
$^{13}C_{12}$-3,3',4,4',5,5'-hexachlorobiphenyl	169L	20 – 145%
$^{13}C_{12}$-2,2',3,3',4,4',5-heptachlorobiphenyl	170L	20 – 145%
$^{13}C_{12}$-2,2',3,4',5,6,6'-heptachlorobiphenyl	188L	20 – 145%
$^{13}C_{12}$-2,3,3',4,4',5,5'-heptachlorobiphenyl	189L	20 – 145%
$^{13}C_{12}$-2,2',3,3',5,5',6,6'-octachlorobiphenyl	202L	20 – 145%
$^{13}C_{12}$-2,3,3',4,4',5,5',6-octachlorobiphenyl	205L	20 – 145%
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	206L	20 – 145%
$^{13}C_{12}$-2,2',3,3',4,5,5',6,6'-nonachlorobiphenyl	208L	20 – 145%
$^{13}C_{12}$-decachlorobiphenyl	209L	20 – 145%

Note 4: Method 23 PCB Optional Cleanup Standards		
Compound	**BZ No.**	**Target Recovery**
$^{13}C_{12}$-2,4,4'-trichlorobiphenyl	28L	20 – 145%
$^{13}C_{12}$-2,3,3',5,5'-pentachlorobiphenyl	111L	20 – 145%
$^{13}C_{12}$-2,2',3,3',5,5',6-heptachlorobiphenyl	178L	20 – 145%

Note 5: Method 23 PCB Pre-Analysis Internal Standard (IS) Compound Recoveries		
Compound	**BZ No.**	**Target Recovery**
$^{13}C_{12}$-2,5-dichlorobiphenyl	9L	S/N≥10
$^{13}C_{12}$-2,4',5-trichlorobiphenyl	31L	S/N≥10
$^{13}C_{12}$-2,4',6-trichlorobiphenyl	32L	S/N≥10
$^{13}C_{12}$-2,2',5,5'-tetrachlorobiphenyl	52L	S/N≥10
$^{13}C_{12}$-2,2',4,5,5'-pentachlorobiphenyl	101	S/N≥10
$^{13}C_{12}$-3,3',4,5,5'-pentachlorobiphenyl	127L	S/N≥10
$^{13}C_{12}$-2,2',3,4,4',5'-hexachlorobiphenyl	138L	S/N≥10
$^{13}C_{12}$-2,2',3,4,4',5,5'-heptachlorobiphenyl	180L	S/N≥10
$^{13}C_{12}$-2,2',3,3',4,4',5,5'-octachlorobiphenyl	194L	S/N≥10

S/N – Signal to Noise Ratio

Note 6: Method 23 PCDD/PCDF Sampling Surrogate Compound Recoveries	
Compound	**Target Recovery**
$^{13}C_{12}$-1,2,3,6-TCDD	70 – 130%
$^{13}C_{12}$-1,2,3,4,7-PeCDD	70 – 130%
$^{13}C_{12}$-1,2,3,4,6-PeCDF	70 – 130%
$^{13}C_{12}$-1,2,3,4,6,8,9-HpCDF	70 – 130%

Note 7: Method 23 PCDD/PCDF Isotope Dilution Internal Standard Compound Recoveries	
Compound	**Target Recovery**
$^{13}C_{12}$-1,2,7,8-TCDD (Filter Recovery Standard)	20 – 130%
$^{13}C_{12}$-1,2,3,4,6,8-HxCDD (Filter Recovery Standard)	20 – 130%
$^{13}C_{12}$-1,3,7,8-TCDD (Alternate Recovery Standard)	20 – 130%
$^{13}C_{12}$-1,2,4,7,8-PeCDD (Alternate Recovery Standard)	20 – 130%
$^{13}C_{12}$-2,3,7,8-TCDD	20 – 130%
$^{13}C_{12}$-2,3,7,8-TCDF	20 – 130%
$^{13}C_{12}$-1,2,3,7,8-PeCDD	20 – 130%
$^{13}C_{12}$-1,2,3,7,8-PeCDF	20 – 130%
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	20 – 130%
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	20 – 130%
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	20 – 130%
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	20 – 130%
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	20 – 130%
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	20 – 130%
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	20 – 130%
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	20 – 130%
$^{13}C_{12}$-OCDD	20 – 130%
$^{13}C_{12}$-OCDF	20 – 130%

Note 8: Method 23 PCDD/PCDF Pre-Analysis Internal Standard (IS) Compound Recoveries

Compound	**Target Recovery**
$^{13}C_{12}$-1,2,3,4-TCDD	S/N$\geq$10
$^{13}C_{12}$-1,2,3,4-TCDF	S/N$\geq$10
$^{13}C_{12}$-1,2,3,4,6,9-HxCDD	S/N$\geq$10
$^{13}C_{12}$-1,2,3,4,6,7,9-HpCDF	S/N$\geq$10

Note 9: Method 23 Semi-volatile Surrogate Compound Spike Recoveries		
Compound	**Aqueous Target Recovery**	**Solid, XAD-2 Resin, and Filter Target Recovery**
Nitrobenzene-d_5	35-114%	23-120%
2-Fluorobiphenyl	43-116%	30-115%
Terphenyl-d_{14}	33-141%	18-137%
Phenol-d_6	10-110%	24-113%
2-Fluorophenol	21-110%	25-121%
2,4,6-Tribromophenol	10-123%	19-122%

Note 10: Method 23 Semi-volatile Sampling Surrogate Compound Recovery	
Compound	**Target Recovery**
$^{13}C_3$-labeled Naphthalene	50 – 150%

Note 11: Volatile Surrogate Compound Spike Recoveries		
Compound	**Aqueous Target Recovery**	**Solid and VOST Target Recovery**
Dibromofluoromethane	80 – 120%	50 – 150%
1,2-Dichloroethane-d_4	77 – 128%	50 – 150%
Toluene-d_8	80 – 120%	50 – 150%
Bromofluorobenzene	72 – 129%	50 – 150%

Note 12: VOST Breakthrough Analysis Criterion.
The front half (Tenax® tube) and back half (Tenax®/charcoal tube) volatile organic sampling train traps are analyzed separately to determine the possible target VOC breakthrough to the Tenax®/charcoal portion of the adsorbents. The analysis of the Tenax®/charcoal trap should show less than 30 percent of each target VOC collected on the two front Tenax® traps. Breakthrough of each target VOC to the Tenax®/charcoal above this level may cause loss of desorption efficiency and would indicate a possible negative bias in the emissions calculations. This criterion does not apply when less than 75 ηg of target VOC is detected on the Tenax®/charcoal trap.

6.0 SAMPLING AND MONITORING PROCEDURES

6.1 GENERAL

The objective of this test program is the collection of representative PCB liquid and stack gas samples to demonstrate compliance of the MRF with the TSCA performance and emissions standards. To meet this objective requires minimizing the potential sources of sample contamination or bias imparted to the samples by the sampling equipment, ambient conditions, handling, and preservation. The test program samples will be collected using the methods summarized in Table 6-1. The total numbers of field samples expected to be generated during the MRF testing are also summarized Table 6-1.

Guidelines followed to determine sampling equipment to be used, sampling points, and the frequency at which samples are to be taken are presented in the Test Plan and are incorporated here by reference. The reference sources for the standard sampling method references include:

- Appendix A to 40 CFR 60, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60 (EPA)
- Test Methods for Evaluating Solid Waste, SW-846, Third Edition, 1986 and updates (SW-846)
- American Society for Testing and Materials (ASTM) Annual Book of ASTM Standards.

Reference sampling and analytical methods are identified in the Test Plan and this QAPP. The specifics of the sampling and analytical methodologies followed during the course of test execution by the selected sampling and analytical contractors include the referenced nationally recognized methods (ASTM, SW-846, 40 CFR 60 Appendix A, etc.) and/or the contractor-specific standard operating procedures (SOPs) as recognized by NELAP.

During the course of sampling and analysis, situations may still arise that require modifying the specific sampling or analytical procedures included or referenced in the Test Plan or this QAPP. For the stack gas samples, there are few alternatives to the analysis methods prescribed in SW-846 or 40 CFR 60. For the samples from the single sampling train (e.g., Method 23 for PCB, PCDD/PCDF, and SVOC RCl), the proposed procedures for the sample extractions and splitting of extracts for the respective analyses are discussed in this QAPP. The NELAP-approved laboratory SOPs, which include a number of procedures for special circumstances, will be followed. In cases where the laboratory finds it necessary to make adjustments to the analytical methods, the changes will be documented following the corrective action procedures noted in Section 14.0 of this QAPP. Any such changes must be approved by the Test Coordinator. Regulatory observer approval (if present on-site during testing) will be requested if significant deviations from planned sampling procedures are encountered during the testing.

All stack sampling equipment and glassware will be prepared prior to the test according to the method specifications. Following each test run, the samples will be recovered from the sampling trains. The sample recovery procedures include prescribed rinses of the trains, which serve a dual purpose of sample recovery and decontamination of the train in preparation for the next run. Rinses that are not included in the sample recovery will be placed into a waste solvent container.

Process samples will be collected using dedicated sampling equipment (sample bottles, funnels, jars, etc.) at each sampling location, thus eliminating the potential for cross contamination from one sample matrix to another. New sampling containers are used for each test run. If the same equipment will be used for more than one run, the equipment will be decontaminated by additional solvent rinses. Any decontamination solution generated will be collected by the facility operators for proper disposal.

During the test program, the MRF will be operated and tested at the conditions specified in the Test Plan. The following samples will be collected during the test:

- PCB Liquid Samples
- Stack Gas Samples
  - SW-846 Method 23 for PCB, PCDD/PCDF, and SVOC RCl
  - EPA Method 5/202 for particulate
  - EPA Method 26A for HCl and Cl_2
  - SW-846 Method 0030 VOST for VOC RCl
  - Temporary CEMS for SO_2 (EPA Method 6C)
  - Temporary CEMS for NO_X (EPA Method 7E)
  - Installed CEMS for CO, CO_2, and O_2.

Refer to Section 7.0 of this QAPP. Sample tracking is documented using unique alphanumeric sample numbering applied to every sample, completed sample collection forms, completed request for analysis (RFAs) forms, completed chain of custody (COC) forms and sample collection checklists.

6.2 STACK GAS SAMPLING METHODS

6.2.1 General

During the test program, the Stack Sampling Team Leader and the Test Coordinator are responsible for monitoring the sampling team's adherence to the standard stack sampling procedures, especially sampling train preparation; leak checks and recoveries (including blank trains); and reagent, field, and trip blanks. The Stack Sampling Team Leader is responsible for the operation and recovery of the stack sampling equipment and stack gas samples. The Test Coordinator and Sample Custodian are responsible for preparing the stack gas and process samples for shipment to the laboratory. Sampling train calibration procedures are discussed in Section 8.0.

EPA Methods 1 and 2 will be used to determine the number and location of sampling traverse of isokinetic sampling locations and check for cyclonic flow. Documentation of Method 1 (including cyclonic flow check) and Method 2 (pitot tube measurements) will be included in the stack sampling report. Pitot tube traverses will also be performed at 16.7%, 50%, and 83.3% of the stack diameter at the temporary CEMS sampling port to check for stratification.

During each test run, the stack gas carbon dioxide and oxygen concentrations will be measured using EPA Method 3A. The stack gas carbon dioxide and oxygen concentrations are used to determine the stack gas molecular weight. Certified calibration gases containing at least 5 percent volume carbon dioxide and/or at least 5 percent volume oxygen may be used as reference standards analyzer.

Stack gas moisture content will be determined for each isokinetic sampling train via EPA Method 4 (sampling train moisture gain). Isokinetic sampling train silica gel impingers will be filled with fresh, dry indicating silica gel at the beginning of the test program. During the sampling train recovery process, and subsequent test runs, each indicating silica gel impinger will be inspected prior to reuse to verify that sufficient capacity remains for moisture absorption during the next test run. Silica gel more than 50% utilized will be discarded and the impinger recharged with fresh dry indicating silica gel.

6.2.1.1 Method 23 for PCB/PCDD/PCDF/SVOC RCI

A Method 23 sampling train will be used to concurrently sample stack gas for PCB, PDCDD/PCDF, and SVOC RCI. The extracts from the Method 23 sampling train will be split three ways. One set of extract fractions will be analyzed for PCB via EPA Method 1668C (HRGC/HRMS). The second set of extract fractions from the Method 23 sampling train will be analyzed for PCDD/PCDF via Method 8290A (HRGC/HRMS). The third set of extract fractions from the Method 23 sampling train will be analyzed for SVOC RCI via Method 8270E (GC/MS). The Method 23 sampling train will be operated for 240 minute (4 hours) to sample a target volume of 4.0 dry standard cubic meters of stack gas during each sampling run.

The XAD-2 resin will be prepared with sampling surrogates for all three (3) target analyte groups. To accommodate concurrent sampling of SVOC RCI with PCB and PCDD/PCDF, the sampling train recovery requires: 1) incorporating methylene chloride rinses of the sampling train components, and 2) capturing and maintaining the toluene rinses separate from the acetone and methylene chloride rinses. Methylene chloride is required to assure recovery of the SVOC analytes. Including the toluene rinses with the acetone and methylene chloride rinses increases the difficulty of removing moisture from sample if present. Additionally, maintaining the toluene rinses separately is necessary to preclude masking of early eluting SVOC RCI compounds by a toluene solvent peak during the GC/MS analysis.

Prior to each test run, the Method 23 sampling train will be assembled and leak checked. At the end of each run, the sampling train will be disassembled and all train samples collected. Using a single sampling train for PCB, PCDD/PCDF, and SVOC RCI requires special considerations in the recovery of the sampling train components and their subsequent preparation for analysis.

6.2.1.1.1 Method 23 Recovery

For the concurrent/combined sampling of PCB, PCDD/PCDF, and SVOC RCI using the Method 23 sampling train, the following general procedures will be used for sample recovery:

- Particulate Filter -- The particulate filter is removed from its holder and placed into its original petri dish (Container No. 1) which is sealed with Teflon tape and placed in a plastic bag.
- XAD-2 Adsorbent Resin Trap -- The XAD-2 adsorbent resin trap is removed from the train, and both ends are capped. The trap is then labeled, covered with aluminum foil, sealed in a plastic bag and stored on ice in an insulated cold chest.
- Acetone/Methylene Chloride Rinses -- The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or glassware are brushed and rinsed three (3) times each with acetone, and then rinsed three (3) times with methylene chloride. The back half of the filter holder, the filter support, transfer line (if used), and condenser (if separate from trap) are rinsed three (3) times with acetone followed by three (3) rinses with methylene chloride. All the acetone and methylene chloride rinses are placed into a single amber glass sample bottle (Container No. 2A). The final liquid level is marked on the sample container.
- Toluene Rinses -- The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or glassware are rinsed three (3) times with toluene. The back half of the filter holder, the filter support, transfer line (if used), and condenser (if separate from trap) are rinsed three (3) times with toluene. All the toluene rinses are collected in a single amber glass sample bottle (Container No. 2B). The final liquid level is marked on the sample container.
- Impinger Liquids -- The contents of the impingers 1, 2, 3, and 4 are measured to the nearest milliliter or weighed to the nearest 0.5 g and observed for the presence or absence of color or film, which is recorded on the sample recovery sheet. The impinger water is collected in a single amber glass sample bottle (Container No. 3A). The impingers are rinsed three (3) times with deionized water with the rinses added to Container 3A. The final liquid level is marked on the sample container.
- The impingers and connecting glassware are rinsed three (3) times with acetone followed by three (3) rinses with methylene chloride, with all the rinses collected in single amber glass sample bottle (Container No. 3B).
- The impingers and connecting glassware are rinsed three (3) times with toluene with the rinses collected in single amber glass bottle (Container No. 3C).
- Silica Gel -- The silica gel contents of the last impinger are weighed to the nearest 0.5 g. The color and condition of the silica gel is noted on the sample recovery sheet. The silica gel may be discarded or recovered for reuse.

Figure 6-1 presents a flow chart for the Method 23 precedingly described sampling train recovery. In the laboratory, successive extractions are performed for the respective analyses and discussed in the next section.

6.2.1.1.2 Method 23 Preparation for Analysis

When the Method 23 samples for PCB, PCDD/PCDF, and SVOC RCI arrive at the laboratory, special procedures are required again in the preparation of the samples for analysis. Surrogate compounds as discussed below are applied to each fraction.

Figures 6-2A through 6-2E present flow charts for the Method 23 sample preparation for analysis. The particulate filter, acetone/methylene chloride solvent rinses, and XAD resin samples will be combined for extraction; the separate toluene rinses will not be included in the initial extraction. Isotope dilution internal standard compounds for the PCB, PCDD/PCDF, and SVOC RCl are spiked directly onto the filter before the Soxhlet extraction. The sample is then Soxhlet extracted using methylene chloride. The methylene chloride extract is removed from the Soxhlet extractor and is then blown down to 30 mL and split three (3) ways: one 10 mL fraction for PCB analysis, one 10 mL fraction for PCDD/PCDF analysis, and one 10 mL fraction for SVOC RCl analysis.

The separate toluene solvent rinses are then added to the particulate filter residue in the Soxhlet extractor, the sample is Soxhlet extracted a second time using toluene. The toluene extract is removed from the Soxhlet extractor and is then blown down to 30 mL and split three (3) ways: one 10 mL fraction for PCB analysis, one 10 mL fraction for PCDD/PCDF analysis, and one 10 mL archive fraction. The methylene chloride fractions extracted for PCB and PCDF/PDCF analysis are combined with the respective toluene extracts.

The Method 23 condensate impinger catch and solvent rinses are required for the PCB and SVOC RCl analyses; this fraction is not analyzed for PCDD/PCDF. The condensate impinger sample is placed in a continuous liquid-liquid extractor. The liquid undergoes three separate methylene chloride extractions to assure recovery of acid and base-neutral SVOCs. The initial extraction is performed with no pH adjustment; the condensate is continuous liquid-liquid extracted using methylene chloride and organic free water. The methylene chloride extract layer is then removed and fresh methylene chloride added to the sample. The sample is then pH adjusted to acid (pH<2) and continuous liquid-liquid extracted a second time using methylene chloride and organic free water. The second methylene chloride extract layer is then removed and fresh methylene chloride added to the sample. The methylene chloride/water extraction is then performed a third time with the pH adjusted to basic (pH>12). The third methylene chloride extract layer is then removed and combined with the other two methylene chloride extracts. The combined condensate extracts are then blown down to 30 mL and split three (3) ways: one 10 mL fraction for PCB analysis, one 10 mL fraction for SVOC RCl analysis, and one 10 mL archive fraction. (Note: Impinger water extraction is not required for PCDD/PCDF analysis.)

The acetone and methylene chloride impinger rinses are concentrated and split three (3) ways: one fraction for PCB analysis, one fraction for SVOC RCl analysis, and one archive fraction. (Note: The acetone and methylene chloride impinger rinses fraction is not required for PCDD/PCDF analysis.) The methylene chloride fractions concentrates for PCB and SVOC RCl analysis are combined with the respective front-half and back-half extracts.

The toluene impinger rinses are concentrated and split three (3) ways: one fraction for PCB analysis and two archive fractions. (Note: The toluene impinger rinses fraction is not required for PCDD/PCDF or SVOC

RCl analysis.) The toluene concentrate for PCB analysis is combined with the respective front-half and back-half extracts.

The isotopically-labeled materials noted in Table 5-1 are applied to the Method 23 sampling train samples:

- Pre-Sampling Standards – Isotopically labeled compounds spiked directly on the XAD-2 resin in the laboratory during XAD-2 tube preparation prior to stack sampling use. The recovery of these compounds provides a comprehensive accuracy indication (stack to final analysis) of the PCB, PCDD/PCDF, and SVOC RCl found using the Method 23 sampling method.
- Pre-Extraction Standards - Isotopically labeled PCB, PCDD/PCDF, and SVOC RCl compounds applied to the sample prior to extraction. The recoveries of these compounds reflect the overall relative accuracy of the sample handling preparation and analysis by the laboratory.
- Cleanup Standards - For PCB, isotopically labeled compounds are applied to the sample after extraction and before extract cleanup. The recovery of this compound reflects the impacts on the sample of the extract cleanup step of sample preparation.
- PCB and PCDD/PCDF Pre-Analysis Standards- Isotopically labeled compounds applied to the extracts just before HRGC/HRMS analysis. These compounds are providing the relative response factors, which are used to calculate analyte concentrations. (Note: SVOC RCl GC/MS analysis does not include use of pre-analysis standards.)

6.2.1.2 EPA Method 5/202 for PM

The stack gas filterable and condensable particulate emissions are determined by separate analysis of the Method 5/202 sampling train tare weighed filter, the front-half acetone probe rinses, condenser rinses and ambient impinger contents, ambient filter, and cold (iced) impinger contents.

The tare weighed particulate filter PM catch is determined by the differential weight of the particulate collected by the Method 5/202 sampling train. Filter samples are dried to a constant weight to the nearest 0.1 mg. Constant weight shall mean a difference between two consecutive weighings of no more than 0.5 mg.

The acetone probe rinse fraction is transferred to a tare weighed flask, evaporated and dried to a constant weight to the nearest 0.1 mg. Constant weight shall mean a difference between two consecutive weighings of no more than 0.5 mg.

The corresponding test run filter and probe rinse residue differential weights are added together. The sum is reported as the test run filterable particulate catch.

The ambient impinger contents, condenser and impinger solvent (acetone and hexane) rinses, ambient filter, and cold (iced) impinger contents are analyzed separately. Each fraction is evaporated or dried to a constant weight to the nearest 0.1 mg. Constant weight shall mean a difference between two consecutive weighings of no more than 0.5 mg. The sum of the respective fraction analyses is reported as the test run condensable particulate catch.

The analysis of the Method 5/202 sampling train includes a field blank train, and particulate, acetone, hexane, and deionized water reagent blanks to assess blank contamination. Precision for the particulate analyses is determined via replicate weighings. Accuracy is determined by using Class-S weight to verify the scale accuracy.

6.2.1.3 EPA Method 26A for HCl/Cl_2

An EPA Method 26A sampling train will be used to sample the stack gas for HCl, and Cl_2. The stack gas HCl/Cl_2 is sampled by sparging the sampled gas through impingers containing 0.1N H_2SO_4 (acid) and 0.1N NaOH (alkaline) solutions in series. In the acid impingers, HCl gas is captured. Any Cl_2 in the sampled stack gas passes through to the acid impingers and is captured in the alkaline impingers. The chloride concentrations of the acid and alkaline impinger samples are analyzed separately for chloride ion and are reported as HCl and Cl_2 catches, respectively. During the sampling train recovery, the pH of the NaOH impingers are checked separately and noted on the sampling train recovery sheet. Precision for these samples is determined through the use of duplicate analyses of the calibration standard, QC, reagent blank and field samples. Accuracy is determined by matrix spike analyses.

In the alkaline impinger, Cl_2 is captured in solution by its dissociation into chloride ion (Cl^-) and hypochlorite ion (OCl^-). Sodium thiosulfate ($Na_2S_2O_3$) is added to the recovered NaOH solution to convert the hypochlorite (OCl^-) in the sample to chloride (Cl^-). The analysis of the alkaline impinger may include additional thiosulfate addition by the laboratory analyst to complete the conversion of the hypochlorite (OCl^-) in the sample to chloride (Cl^-). The sample is then analyzed for chloride ion concentration. In the data reduction, the chloride analysis result for the alkaline impingers is reported as Cl_2.

The analysis of Method 26A includes H_2SO_4, NaOH and deionized water reagent blanks to assess blank contamination. Precision for the chloride analyses is determined through the use of duplicate analyses of all calibration standards, all QC samples and all field samples. Accuracy is determined by matrix spike analyses of field samples and reagent blanks.

6.2.1.4 VOST

The VOST will be used to sample stack gas for VOC RCl. The test program includes a target list of VOC compounds for the VOST analyses. The VOST sampling equipment will be inspected and leak checked prior to each test run. Four pairs of VOST tubes will be used during each sampling run to sample a nominal 20 liters of stack gas per tube set pair. VOST sampling will be conducted at a nominal rate of 1.0 liters per minute for 20 minutes per tube set pair. Three of the four pairs will be analyzed by Method 5041A/8260D. The fourth set pair will serve as an archive set in the event of sample breakage during shipping and handling. During the analysis, the Tenax® and Tenax®/charcoal tube sets used to sample the stack gas will be analyzed separately to assess breakthrough. Field blank and trip blank tube sets may be analyzed as a single sample or separately as breakthrough criterion need not be applied to these samples.

6.3 FIELD QUALITY CONTROL SAMPLES

Field QC samples will be collected during the test to provide an indication of quality assurance for the test samples. The field QC samples include:

- Spiked XAD-2 resin blanks for Method 23 (PCB, PCDD/PCDF, & SVOC RCl) retained by the laboratory and included with the field samples when they are delivered to the laboratory
- Blank train for Method 23 (PCB, PCDD/PCDF, & SVOC RCl)
- Blank train for Method 5/202 (PM)
- Spiked Tenax® and Tenax®/charcoal blanks for VOST retained by the laboratory and included with the field samples when they are delivered to the laboratory
- Tenax® and Tenax®/charcoal field and trip blanks for VOST
- Reagent blanks for all sampling trains.

Table 6-1 includes the field QC samples that will be collected.

6.3.1 Spiked Resin Blanks

During the preparation of the Tenax® and Tenax®/Charcoal tubes sets for the test program, two VOST Tenax® and Tenax®/charcoal resin tube pairs will be spiked with standard surrogate spike compounds. The VOST tube preparation laboratory, to demonstrate the resin is free of background contamination, and to confirm that efficient surrogate recoveries are, achievable will analyze these samples.

Two XAD-2 resin traps prepared for the Method 23 PCB, PCDD/PCDF, and SVOC RCl sampling train will be spiked with a sampling surrogate and matrix spike compounds. These samples will be extracted and analyzed for PCB, PCDD/PCDF, and SVOC RCl by the XAD-2 trap preparation laboratory to demonstrate the resin is free of background contamination, and to confirm that efficient surrogate recoveries are achievable.

6.3.2 VOST Field Blanks

Field blanks are sampling media that are handled at the sampling location in the same manner as the actual test samples. However, these media are not used to collect stack gas samples. The field blank samples will be collected and analyzed to demonstrate that the sample handling procedures do not expose the samples to contaminants. This test program includes collecting one pair of VOST tubes as field blanks once during each test run (three samples total per test condition). Each field blank VOST tube pair is opened in the field by the VOST operator during the sampling run and are allowed to remain open for a period equivalent to the time required for a tube pair change-out during testing. The field blank pair is then sealed up, labeled and handled in the same manner as other VOST samples. The compounds found in field blanks reflect exposure to field fugitives, laboratory contaminants and resin degradation products, and are used to assess any contamination that can impact test results.

6.3.3 VOST Trip Blanks

Trip blanks are similar to field blanks in that they are used to assess contamination resulting from sample shipment. With each shipment of VOST samples from the test site to the laboratory, a pair of VOST tubes that have remained sealed as shipped from the laboratory to the field to be used as trip blanks. Additionally, a pair of volatile organic analysis (VOA) vials filled with organic free water is included with the VOST samples shipped from the test site back to the laboratory. The trip blank and organic free water analyses demonstrate that the samples are not exposed to contamination during transport from the field to the laboratory.

6.3.4 Blank Trains and Reagent Blanks

Blank train samples are the samples recovered from sampling trains that have been assembled and charged with all the required chemical reagents and collection media in the same manner as the sampling trains used to sample the stack gases. The sampling trains are leak checked and heated to temperature in a location near the stack. The sampling train remains sealed at the stack location for a period equivalent to the length of time the corresponding sampling train is operated during the test run. The blank train is then recovered in the same way that actual stack gas sampling trains are recovered. The recovered blank train components are labeled as blank train samples and submitted for analysis with the actual stack gas train samples. The results of the blank train samples provide an indication of possible contamination introduced to the samples by reagents, glassware, sampling environment, and sampling recovery. The blank train samples for the stack sampling trains used during this test program will be collected as summarized in Table 6-1. For this test program one blank train for Method 23 PCDD/PCDF, PCB, and SVOC RCl, and one Method 5/202 blank train for particulate matter will be collected for analysis.

Reagent blanks are samples of the reagent source solvents, solutions, and other media used in stack sampling. Reagent blank samples for all sampling trains as summarized in Table 6-1.

Table 6-1. A-Line TSCA Compliance Test Total Field Samples

Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Cycle 1		Cycle 2		Cycle 3		Total Field Samples
					Test	Field QC	Test	Field QC	Test	Field QC	
PCB Liquid	ASTM D-4057, E-300-03	250 mL glass sample bottle	PCB	Collect a 250 mL grab sample during the PCB DRE sampling cycle	--	--	3	--	--	--	3
		250 mL glass sample bottle	Total Chlorine	Collect a 250 mL grab sample during the HCl/Cl2 sampling cycle	3	--	--	--	--	--	3
Method 0023A Particulate Filter	Method 0023A	Petri Dish	PCB, DF, & SVOC RCl	Collect integrated sample for PCB, DF, & SVOC RCl during each test run. Sample for 240 minutes with a target volume of 4.0 dry standard cubic meters of stack gas.	--	--	3	1	--	--	4
Method 0023A XAD-2 Resin		Resin Trap	PCB, DF, & SVOC RCl		--	--	3	1	--	--	4
Method 0023A Acetone & Methylene Chloride Rinses		500 mL glass sample bottle	PCB, DF, & SVOC RCl		--	--	3	1	--	--	4
Method 0023A Toluene Rinses		500 mL glass sample bottle	PCB & DF Only		--	--	3	1	--	--	4
Method 0023A Condensate		2.5-liter glass sample bottle	PCB & SVOC RCl Only		--	--	3	1	--	--	4
Method 0023A Acetone Reagent Blank		250 mL glass sample bottle	PCB, DF, & SVOC RCl	Reagent Blank	--	--	--	1	--	--	1
Method 0023A Methylene Chloride Reagent Blank		250 mL glass sample bottle	PCB, DF, & SVOC RCl	Reagent Blank	--	--	--	1	--	--	1
Method 0023A Toluene Reagent Blank		250 mL glass sample bottle	PCB & DF Only	Reagent Blank	--	--	--	1	--	--	1

Table 6-1. A-Line TSCA Compliance Test Total Field Samples (cont'd)

Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Cycle 1		Cycle 2		Cycle 3		Total Field Samples
					Test	Field QC	Test	Field QC	Test	Field QC	
Method 5/202 Particulate Filter	EPA Method 5/202	Petri Dish	Filterable Particulate	Collect integrated sample for particulate for 120 minutes during each test run.	--	--	--	--	3	1	4
Method 5/202 Front Half Acetone Rinses		250 mL glass sample bottle	Filterable Particulate		--	--	--	--	3	1	4
Method 5/202 Back-Half-Filter Holder, Condenser, and Ambient Impinger Contents and Deionized Rinses		1-liter glass sample bottle	Condensable Particulate		--	--	--	--	3	1	4
Method 5/202 Back-Half-Filter Holder, Condenser, and Ambient Impinger Acetone and Hexane Rinses		500 mL glass sample bottle	Condensable Particulate		--	--	--	--	3	1	4
Method 5/202 Ambient Filter		Petri Dish	Condensable Particulate		--	--	--	--	3	1	4
Method 5/202 Cold (Iced) Impinger Contents and Deionized Water Rinses		500 mL polyethylene sample bottle	Condensable Particulate		--	--	--	--	3	1	4
Method 5/202 Particulate Filter Reagent Blank		Petri Dish	Particulate	Reagent Blank	--	--	--	--	--	1	1
Method 5/202 Acetone Reagent Blank		250 mL glass sample bottle	Particulate	Reagent Blank	--	--	--	--	--	1	1
Method 5/202 Hexane Reagent Blank		250 mL glass sample bottle	Particulate	Reagent Blank	--	--	--	--	--	1	1
Method 5/202 Particulate Ambient Filter Reagent Blank		Petri Dish	Particulate	Reagent Blank	--	--	--	--	--	1	1

Table 6-1. A-Line TSCA Compliance Test Total Field Samples

Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Cycle 1		Cycle 2		Cycle 3		Total Field Samples
					Test	Field QC	Test	Field QC	Test	Field QC	
Method 5/202 Deionized Water Reagent Blank	EPA Method 5/202 (cont'd)	250 mL glass sample bottle	Particulate	Reagent Blank	--	--	--	--	--	1	1
Method 26A Sulfuric Acid Impingers and Rinses	Method 26A	1-liter polyethylene sample bottle	Chloride Ion	Collect integrated sample for HCl and Cl_2 during each test run. Sample for a minimum 60 minutes.	3	--	--	--	--	--	3
Method 26A Sodium Hydroxide Impingers and Rinses		1-liter polyethylene sample bottle	Chloride Ion		3	--	--	--	--	--	3
Method 26A Deionized Water Reagent Blank		250 mL polyethylene sample bottle	Chloride Ion	Reagent Blank	--	1	--	--	--	--	1
Method 26A Sulfuric Acid Reagent Blank		250 mL polyethylene sample bottle	Chloride Ion	Reagent Blank	--	1	--	--	--	--	1
Method 26A Sodium Hydroxide Reagent Blank		250 mL polyethylene sample bottle	Chloride Ion	Reagent Blank	--	1	--	--	--	--	1
VOST Resin Tubes	SW846 Method 0030	VOST Resin Tube Pairs	VOC RCI	Collect four (4) tube set pairs per test run ~20 liters of stack gas sampled per tube set pair.	--	--	--	12	--	--	12
VOST Condensate		40 mL glass VOA	VOC RCI	Collect one (1) composite stack gas condensate for each test run.	--	--	--	3	--	--	3
VOST Field Blank Resin Tubes		VOST Resin Tube Pairs	VOC RCI	Collect one (1) tube set pair per test run.	--	--	--	1	--	--	1
VOST Trip Blank Resin Tubes		VOST Resin Tube Pairs	VOC RCI	Collect one (1) tube set pair per test condition.	--	--	--	1	--	--	1
VOST Condensate Trip/Field Blank		40 mL glass VOA	VOC RCI	Collect one (1) glass VOA per test condition.	--	--	--	1	--	--	1
TOTAL SAMPLES											89

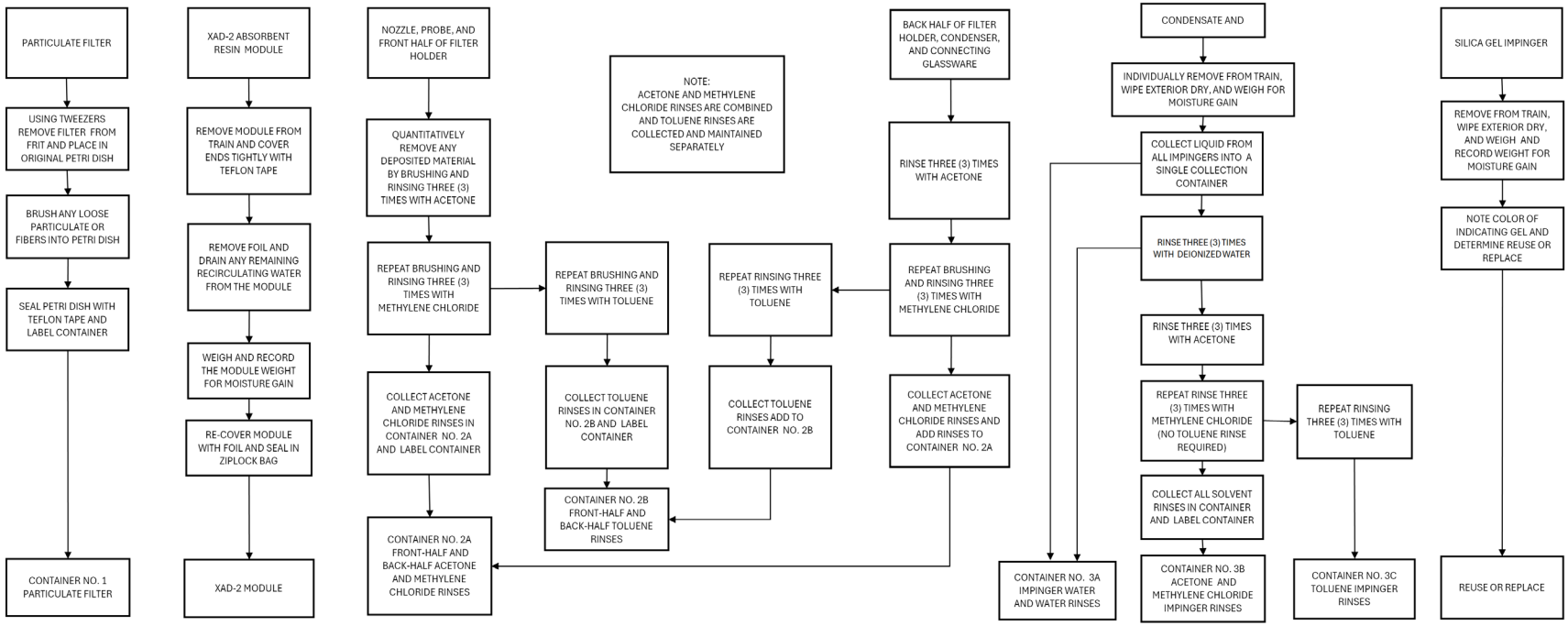

Figure 6-1. Method 23 Sampling Train Recovery

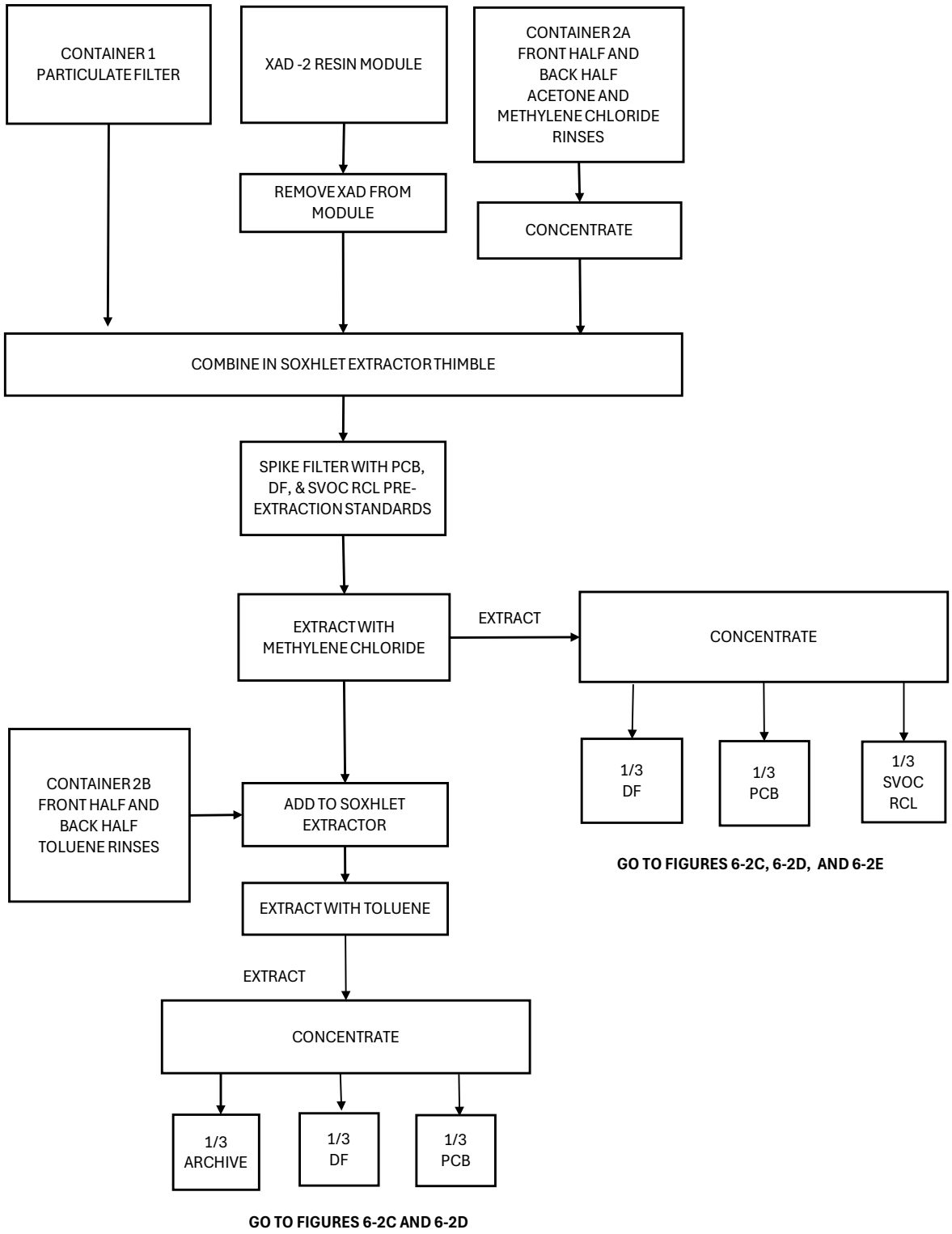

Figure 6-2A. Method 23 Soxhlet Extraction of XAD-2 Resin, and Front Half and Back Half Solvent Rinses

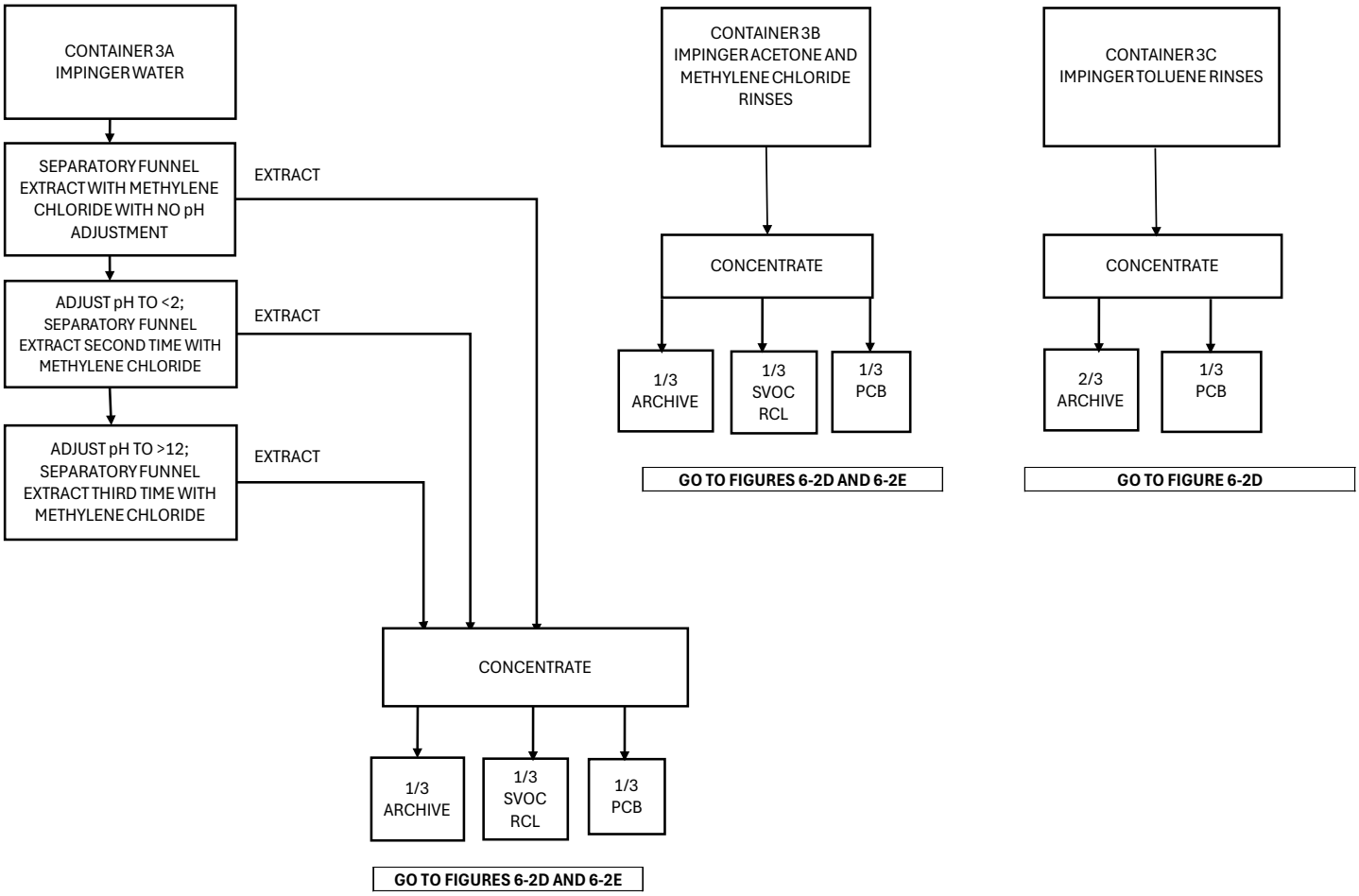

Figure 6-2B. Method 23 Extraction of Impinger Condensate and Concentrating of Impinger Solvent Rinses

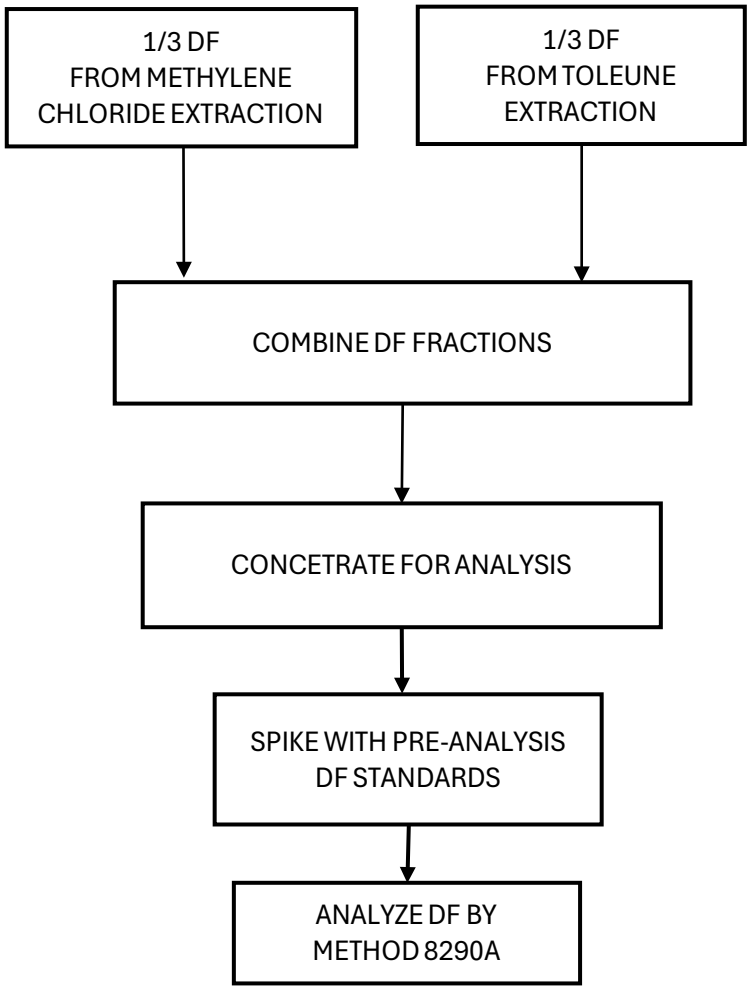

Figure 6-2C. Method 23 Combining of Extracts for Dioxin/Furan Analysis

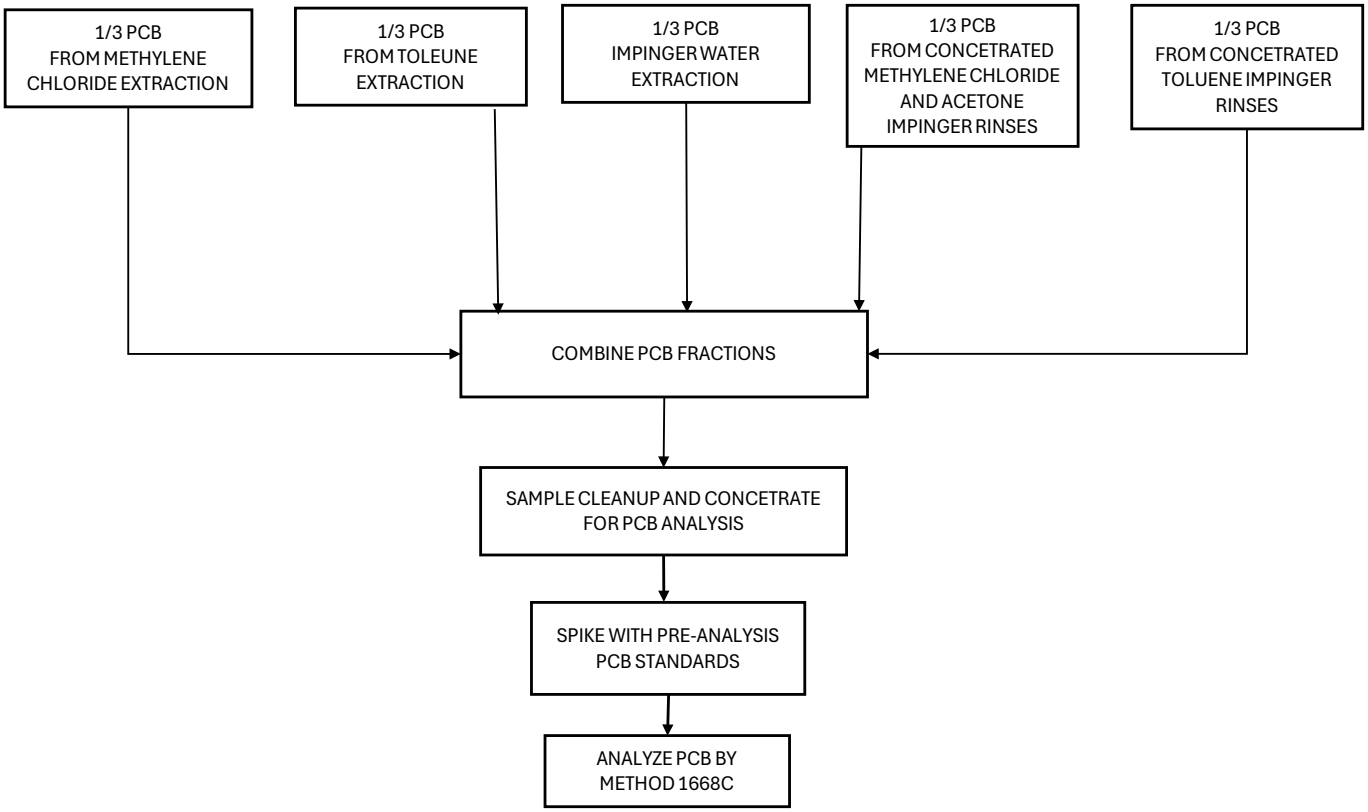

Figure 6-2D. Method 23 Combining of Extracts for PCB Analysis

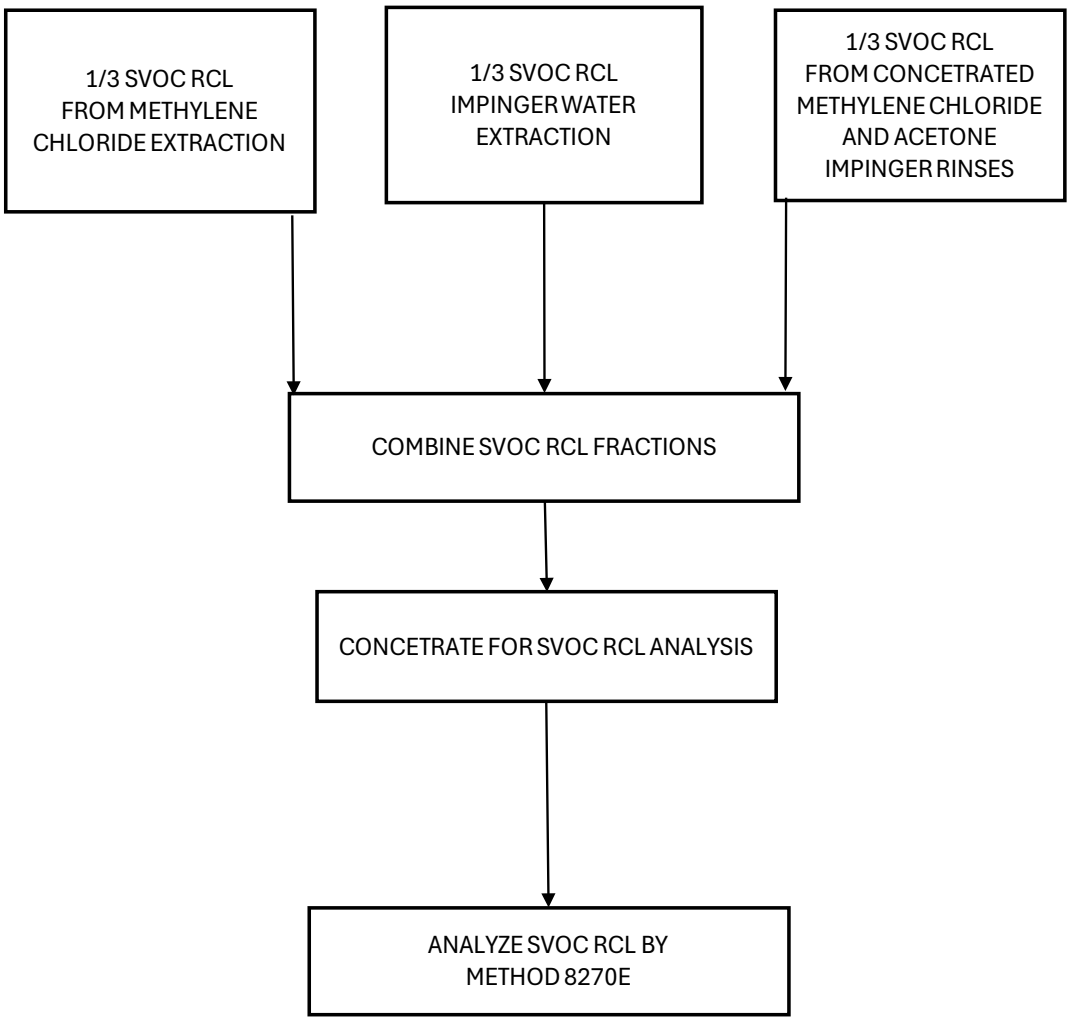

Figure 6-2E. Method 23 Combining of Extracts for SVCO RCL Analysis

7.0 SAMPLE HANDLING, TRACEABILITY, AND HOLDING TIMES

7.1 SAMPLE CUSTODY AND SECURITY

A sample will be considered to be in the custody of a person if it is in his or her possession, in his or her sight, or secured by that person in an approved location accessible only to authorized personnel. Evidence tamper seals will be placed on each sample container.

Sample collection will include preparation of a chain of custody (COC). The COC will accompany the samples from the field to the analytical laboratory. If overnight couriers are utilized, the air bill will serve to document the transfer of custody to the courier. The courier's air bill becomes part of the chain of custody (COC) record. Upon transfer of the samples from the courier to the analytical laboratory, sample custody will be maintained by the analytical laboratory performing the analyses.

Samples for organic analysis (VOST, Method 23, etc.) will be maintained on ice ($4\pm2^{o}C$) and shipped to the analytical laboratory in insulated shipping containers. All ice used for shipping samples shall be double bagged in Ziplock® bags to prevent leakage of water during shipping. "Blue ice" may also be used to chill samples. Samples not requiring chilling (particulate, chloride, properties, etc.) may be shipped without ice.

7.2 SAMPLE IDENTIFICATION

Refer to Figure 7-1. In consultation with the Test Coordinator, the Laboratory Project Manager will prepare the master sample list for the test program. Once the master sample list is set, the alpha-numeric sample numbers will be assigned to every sample. The sample numbers are used to track individual samples from collection through analysis. These items will be shipped to the test site in sealed transport containers. The stack sampling contractor will provide the sampling reagents for field use.

7.3 STACK SAMPLE COLLECTION FORMS

While stack sampling is being performed, the sampling technician will complete a stack sampling record. An example stack field sampling record for iso-kinetic sampling is presented as Figure 7-2. The stack sampling record will be completed in its entirety for every sampling train. This will provide information necessary to perform the emissions calculations. The sampling technician shall provide the completed stack sampling record to the Stack Sampling Coordinator at the completion of each sampling run.

7.4 SAMPLE LABELING

An example sample label format is presented in Figure 7-3. Each sample container will be labeled to show the source of the sample as A-Line; the project identification; sampler's initials; laboratory to which the sample will be shipped; the unique alphanumeric sample number; date and time; sample description; test number; and run number. If a single sample requires multiple containers, the number of the container and the total number of containers will be noted on the label. Project samples will be tracked via the assigned

unique alphanumeric sample numbers. The sample number will appear on the sample label, the request for analysis (RFA), and the chain of custody (COC).

7.5 SAMPLE COLLECTION CHECKLIST

The master sample list identifies every sample by the assigned unique alphanumeric sample numbers (Refer to Figure 7-1), and the corresponding analytical test(s) required. As field samples are acquired and routed through the Sample Custodian, the samples will be checked off against the master list to ensure that all of the appropriate samples have been collected.

7.6 REQUEST FOR ANALYSIS/CHAIN OF CUSTODY

Collected samples will be shipped from the site to the laboratory in sealed containers with COC and RFA forms. Example RFA and COC forms are presented as Figures 7-4 and 7-5, respectively. The Sampling Technician and Sample Custodian will complete the COC and RFA forms for every sample. Some samples may consist of several sub-samples. Each individual component of the sample will be listed separately on the RFA/COC with its own unique alphanumeric sample identification number. The samples will be preserved as needed, and will remain in the possession of the Sample Custodian. The Sample Custodian will secure the samples in a location accessible only to authorized personnel until custody is transferred to a courier for delivery to the laboratory.

7.7 SAMPLE SHIPMENT

Field samples may be transported directly to the analytical laboratory by the test management or sampling contractor. If the samples are shipped via overnight courier, e.g., Federal Express, an individual trained in Federal Department of Transportation (DOT) and International Air Transport Association (IATA) regulations will package the samples to assure compliance with the applicable portions of these regulations.

Prior to shipping any samples, the condition of the samples will be verified: sample temperatures for organic analyses samples, condition of all containers, level of sample within all containers (to be marked on the outside of the container), and type of packing material used. RFA/COCs will be checked to verify there is a RFA and COC for every sample being shipped.

7.8 SAMPLE DELIVERY

Upon receipt of samples at the laboratory, the receiver will accept custody for the shipment by an exchange of signatures with the delivering agent. The shipping containers will be opened by the Laboratory Project Manager or his/her designee and inspected. The container contents will verified against the accompanying RFA/COC. Any damage to the contents of the shipping container or deviations from the original shipment documents will be noted on the COC. A labeled temperature blank (labeled bottle or VOA vial with water) will be shipped in every container with samples for organic analysis expressly for the purpose of determining sample temperatures. The Laboratory Project Manager or designee will, immediately upon opening the

sample packaging, open the temperature blank and measure the temperature of the water inside the temperature blank using a thermometer. This temperature will be recorded on the COCs and any applicable laboratory documentation (sample receipt log).

Individual samples will be sorted and directed to the respective laboratory section responsible for the analyses noted on the RFA. Samples will be secured in a location accessible only to authorized personnel. Samples for organic analysis shall be secured in refrigerated sample storage. The COC forms are used specifically to track the samples. To provide specific instructions to the analysts, the RFAs will accompany the respective COCs.

Transfer of custody to and within the analytical laboratory is addressed in the Laboratory's QA Manual. Upon completion of analysis, samples will be maintained at the laboratory under COC until they are released for proper disposal.

7.9 SAMPLE PRESERVATION

Table 7-1 shows the appropriate containers, preservation, and holding times for all samples to be collected during the test.

Table 7-1. Sample Containers, Preservation, and Holding Times

Parameter	Sample Name/Matrix	Sample Containers	Preservation	Maximum Holding Time[a]
Liquid PCB for PCB Analysis	PCB Liquid	Amber glass bottles with Teflon-lined caps	Chill to 4°C	14 days
Liquid PCB for Total Chlorine Analysis	PCB Liquid	Amber glass bottles with Teflon-lined caps	NA	180 days
Stack gas PCB, PCDD/PCDF, & SVOC RCl	Stack Gas Method 23 Filter	Glass petri dish	Chill to 4°C	14 days until extraction, 40 days after extraction
	Stack Gas Method 23 Sorbent Tube	Standard cartridge wrapped in aluminum foil and sealed in plastic bag	Chill to 4°C	14 days until extraction, 40 days after extraction
	Stack Gas Method 23 Solvents	Amber glass bottles with Teflon-lined caps	Chill to 4°C	14 days until extraction, 40 days after extraction
	Stack Gas Method 23 Condensate	Amber glass bottles with Teflon-lined caps	Chill to 4°C	14 days until extraction, 40 days after extraction
Stack Gas Particulate	Method 5/202 Filters	Glass or plastic petri dish	NA	180 days
	Method 5/202 Acetone Probe Rinses	Amber glass bottles with Teflon-lined caps	NA	180 days
	Method 5/202 Impingers Contents and Solven Rinses	Amber glass bottles with Teflon-lined caps	NA	180 days
Stack Gas Chloride	Method 26A Impinger Liquids	Amber glass bottles with Teflon-lined caps or polyethylene bottles	NA	28 days
Stack VOC RCl	Stack Gas VOST Tubes	Glass culture tube in foam cushioned plastic tube	Chill to 4°C	14 days
	Stack gas VOST condensate	Glass VOA vials with Teflon-lined lined caps or septum caps	Chill to 4°C	14 days

Table Notes:

[a] Reference: Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, EPA/625/6-89/023, January, 1990 and promulgated method.

A-Line T.D.S., Inc.
Tonkawa, OK
Focus Project No. P-001578

MRF TSCA TEST MASTER SAMPLE LIST

Eurofins, Knoxville, TN
25-Oct -24

Field Sample No.		Test No.	Run No.	RFA/COC No.	Sample Source	Sample Description	Sample Container	Analytical Parameters	Analytical Laboratory	QC Analysis
A-	4000	NA	1	001	PCB Liquid	PCB Liquid Spike	250 mL amber bottle	PCB	Eurofins-Knox	DUP
A-	4001	NA	1	002	PCB Liquid	PCB Liquid Spike	250 mL amber bottle	Total Cl	Eurofins-Knox	MS/MSD
A-	4002	NA	1	003	Method 23 Train	Particulate Filter	Petri dish	PCB/DF/SVOC RCl	Eurofins-Knox	
A-	4003	NA	1	003	Method 23 Train	Acetone & MeCl2 FH&BH Rinses	250 mL amber bottle	PCB/DF/SVOC RCl	Eurofins-Knox	
A-	4004	NA	1	003	Method 23 Train	Toluene FH&BH Rinses	250 mL amber bottle	PCB/DF	Eurofins-Knox	
A-	4005	NA	1	003	Method 23 Train	Impinger Liquid & DI Water Rinses	2.5-L amber bottle	PCB/SVOC RCl	Eurofins-Knox	
A-	4006	NA	1	003	Method 23 Train	Acetone & MeCl2 Impinger Rinses	250 mL amber bottle	PCB/SVOC RCl	Eurofins-Knox	
A-	4007	NA	1	003	Method 23 Train	Toluene Impinger Rinses	250 mL amber bottle	PCB	Eurofins-Knox	
A-	4008	NA	1	003	Method 23 Train	Acetone Reagent Blank	250 mL amber bottle	PCB/DF/SVOC RCl	Eurofins-Knox	RB
A-	4009	NA	1	003	Method 23 Train	Methylene Chloride Reagent Blank	250 mL amber bottle	PCB/DF/SVOC RCl	Eurofins-Knox	RB
A-	4010	NA	1	003	Method 23 Train	Toluene Reagent Blank	250 mL amber bottle	PCB/DF	Eurofins-Knox	RB
A-	4011	NA	1	004	Method 5/202 Train	Particulate Filter	Petri dish	Filterable Particulate	Eurofins-Knox	
A-	4012	NA	1	004	Method 5/202 Train	Acetone Probe Rinses	250 mL amber bottle	Filterable Particulate	Eurofins-Knox	
A-	4013	NA	1	004	Method 5/202 Train	Ambient Impinger Liquid	1-L amber bottle	Condensable Particulate	Eurofins-Knox	
A-	4014	NA	1	004	Method 5/202 Train	Acetone & Hexane Rinses	500 mL amber bottle	Condensable Particulate	Eurofins-Knox	
A-	4015	NA	1	004	Method 5/202 Train	Ambient Particulate Filter	Petri dish	Condensable Particulate	Eurofins-Knox	
A-	4016	NA	1	004	Method 5/202 Train	Cold (Iced) Impinger Liquid	500 mL HPDE bottle	Condensable Particulate	Eurofins-Knox	
A-	4017	NA	1	004	Method 5/202 Train	Filter Reagent Blank	250 mL amber bottle	Particulate	Eurofins-Knox	RB
A-	4018	NA	1	004	Method 5/202 Train	Acetone Reagent Blank	250 mL amber bottle	Particulate	Eurofins-Knox	RB
A-	4019	NA	1	004	Method 5/202 Train	Hexane Reagent Blank	250 mL amber bottle	Particulate	Eurofins-Knox	RB
A-	4020	NA	1	004	Method 5/202 Train	DI Water Reagent Blank	250 mL amber bottle	Particulate	Eurofins-Knox	RB
A-	4021	NA	1	004	Method 26A Train	H2SO4 Impingers	1-L amber bottle	Chloride	Eurofins-Knox	
A-	4022	NA	1	004	Method 26A Train	NaOH Impingers	500 mL HPDE bottle	Chloride	Eurofins-Knox	
A-	4023	NA	1	004	Method 26A Train	H2SO4 Reagent Blank	250 mL amber bottle	Chloride	Eurofins-Knox	RB
A-	4024	NA	1	004	Method 26A Train	NaOH Reagent Blank	250 mL HDPE bottle	Chloride	Eurofins-Knox	RB
A-	4025	NA	1	004	Method 26A Train	DI Water Reagent Blank	250 mL amber bottle	Chloride	Eurofins-Knox	RB
A-	4026	NA	1	005	VOST Tenax Tube A	Tenax Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4027	NA	1	005	VOST Tenax/Char Tube A	Tenax/Charcoal Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4028	NA	1	005	VOST Tenax Tube B	Tenax Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4029	NA	1	005	VOST Tenax/Char Tube B	Tenax/Charcoal Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4030	NA	1	005	VOST Tenax Tube C	Tenax Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4031	NA	1	005	VOST Tenax/Char Tube C	Tenax/Charcoal Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4032	NA	1	005	VOST Tenax Tube D	Tenax Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4033	NA	1	005	VOST Tenax/Char Tube D	Tenax/Charcoal Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4034	NA	1	005	VOST Condensate	Aqueous	40 mL VOA	VOC RCl	Eurofins-Knox	

Figure 7-1. Example Master Sample List

Isokinetic Stack Sample Data Collection Sheet

Contract No.	80201	Method:	Method 5/202			Page 1 of 1	
Facility	A-Line T.D.S., Inc.	Initial Leak Rate (ft^3 @ in.Hg)	<0.010 @ 10"			Operator	MJK
Source	MRF Stack	Final Leak Rate (ft^3 @ in.Hg)	<0.010 @ 10"			Pitot No.	K-004
Date	29-Oct-24	Start Time	0800	Meter No.	1442	PTCF	0.84
Condition No.	NA	End Time	0926	DGMCF	1.004	Init. Pitot Leak Check	0.0
Run No.	1	Duration (min)	120	ΔH @	1.645	Final Pitot Leak Check	0.0
Stat. Press. (in. H_2O)	-0.94	Bar. Press. (in.Hg)	29.73	Nozzle Dia.(")	0.251	Kf	2.3

Point	Time	Volume	ΔP	ΔH	Temperatures (°F)							Vacuum
No.	(24 Hr)	(ft^3)	(in. H_2O)	(in. H_2O)	Flue Gas	Probe	Filter	Impingers	Meter in	Meter Out	Cond. Exit	(in. Hg)
A-1	0800	352.13	0.78	1.79	294	225	258	68	103	105	NA	6.0
A-1	0805	353.94	0.78	1.79	294	260	257	67	105	104		6.0
A-2	0810	355.75	0.74	1.70	294	257	261	66	106	104		6.0
A-2	0815	357.48	0.74	1.70	294	261	258	66	107	104		6.0
A-3	0820	359.05	0.68	1.56	292	258	257	64	108	104		6.0
A-3	0825	360.75	0.68	1.56	292	257	258	63	109	104		6.0
A-4	0830	362.68	0.77	1.77	292	258	258	67	104	104		6.0
A-4	0835	364.68	0.77	1.77	292	258	256	67	109	103		6.0
A-5	0840	366.60	0.77	1.70	293	258	259	61	110	104		6.0
A-5	0845	368.55	0.77	1.70	289	256	258	61	108	104		6.0
A-6	0850	370.34	0.74	1.43	285	259	255	62	106	105		6.0
A-6	0855	372.06	0.74	1.43	290	258	255	62	105	103		6.0
STOP	0900	373.61										
B-1	0920	373.71	0.62	1.77	292	255	259	66	96	95		7.0
B-1	0925	375.47	0.62	1.77	292	259	257	65	96	95		7.0
B-2	0930	377.38	0.77	1.43	293	257	257	62	99	95		7.0
B-2	0935	379.11	0.77	1.29	289	257	258	62	102	95		6.0
B-3	0940	380.76	0.62	1.04	285	258	257	62	104	97		6.0
B-3	0945	382.26	0.56	1.10	290	257	253	61	106	99		7.0
B-4	0950	383.90	0.45	1.50	296	257	257	63	109	100		6.0
B-4	0955	383.96	0.56	1.50	296	253	258	64	111	101		6.0
B-5	1000	387.26	0.45	0.99	296	257	259	61	112	103		6.0
B-5	1005	388.76	0.44	0.94	297	258	258	60	112	104		5.5
B-6	1010	390.24	0.65	0.85	297	259	258	61	113	105		5.5
B-6	1015	391.59	0.65	0.85	294	258	257	61	112	105		5.5
END	1020	392.97										

Comments:

Figure 7-2. Example Stack Sampling Record

A-Line T.D.S., Inc.
Tonkawa, OK
Focus Project No. P-001578

Sample Type:	Method 5/202 PM Filter	**Sample No.:**	**A-4011**
Test No. 1	**Run No.** 1	**Container(s):**	1 of 1
Analysis Required:	Particulate Method 5 (Gravimetric)		
Analysis Laboratory:	Eurofins, Knoxville, TN		
Date:	18-Mar-25	**Initials:**	MJK
Time:	1215	**Preservation:**	NA

Figure 7-3 Example Sample Label Format

Request for Analysis/Chain of Custody No. 004
A-Line T.D.S., Inc.
Tonkawa, OK
Focus Project No. P-001578

Eurofins-Knoxville Lot No. _H-XXXXXXXX_____
Eurofins-Knoxville Project No. ___XXXXXXX_____

Project Description:	MRF TSCA Test
Client Project No.:	Focus Project No. P-001578
Test America Project No:	XXXXXXX
Client Project Mgr:	Chris McBride
	865-692-8662
Test America Contact:	Courtney Adkins
	865-291-3019

Laboratory Deliverable Requirements

Analytical Due Date: 21 days from lab receipt

Data Package Due Date: 30 days from lab receipt
Holding Time: 180 to analysis
Data Package Due Date: 30 days from lab receipt

Analytical Testing QC Requirements:
MS - Matrix Spike
MSD - Matrix spike duplicate
PDS - Post-digestion spike
DUP - Duplicate
BT- Blank train

Laboratory Destination:

Eurofins-Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
(865)-291-3000

Courier: Hand deliver

Project Deliverables:
Report analytical results on R-02 Reports and in data packages. Include "Field Number", "Sample Type", "test Number", and "Run Number" on all R-02 Reports.

Holding Time Requirements:

Particulate	180 days to analysis

Field Sample No.	Test No.	Run No.	Sample Collection Date	Sample Container	Sample Description	Analysis Specifications	Project QC Requirements
A-4011	NA	1	18-Mar-25	Petri dish	Method 5/202 Train Particulate Filter	Desiccate to constant mass; determine differential from logbook recorded original tare weight (EPA Method 5)	Replicate weighings
A-4012	NA	1	18-Mar-25	250 mL amber bottle	Method 5/202 Train Acetone Probe Rinse	Transfer sample to tare weighed beaker; evaporate/desiccate to constant mass; determine differential mass (EPA Method 5)	Replicate weighings
A-4013	NA	1	18-Mar-25	250 mL amber bottle	Method 5/202 Train Ambient Impinger Liquid	Transfer sample to tare weighed beaker; evaporate/desiccate to constant mass; determine differential mass (EPA Method 202)	Replicate weighings

Figure 7-4. Example Request for Analysis

Request for Analysis/Chain of Custody No. 004
A-Line T.D.S., Inc.
Tonkawa, OK
Focus Project No. P-001578

Sample Receipt Log and Condition of the Samples Upon Receipt

Please fill in the following information:		Comments
		(Please write "NONE" if no comment is applicable.)
(1)	Record the identities of any samples that were listed on the Request for Analysis form but were not found in the sample shipment	
(2)	Record the sample shipping cooler temperature of all coolers transporting samples listed on the Request for Analysis form.	
(3)	Record any apparent sample loss or breakage.	
(4)	Record any unidentified samples transported with this shipment of samples.	
(5)	Indicate if all samples were received according to the project's required specifications (i.e, no non-conformances).	

Custody Transfer

	Name	Company	Date/Time
Relinquished by:			
Accepted by:			
Relinquished by:			
Accepted by:			
Relinquished by:			
Accepted by:			

Figure 7-5. Example Chain of Custody

8.0 SPECIFIC CALIBRATION PROCEDURES AND FREQUENCY

The objective of this section is to assure that process instrumentation, gas sampling equipment, and analytical instruments are performing properly before conducting the test and analyzing samples. Equipment and instruments used to generate data for determining compliance with performance requirements or to establish quantitative allowable operating limits will be calibrated according to the manufacturer's instructions, prior to and/or during the test as necessary.

The calibration procedures are separated into groups according to the personnel who will perform them. A-Line operations personnel will calibrate the process instruments. Stack sampling equipment will be calibrated by the stack sampling contractor and analytical instruments will be calibrated by the contracted laboratory personnel. The calibration procedures for process instrumentation, stack gas sampling, and laboratory analytical instruments are described in the following subsections.

8.1 PROCESS INSTRUMENTATION

Within 30 days of the start of testing, the thermocouples and pressure transducers will be calibrated. The report of the most recent Relative Accuracy Test Audit (RATA) of the installed CO, and CO_2, and O_2 CEMS will be included with the final test report. The CEMS RATA will be performed within 30 days of the expected test date. The MRF operating data will be reported on 1-minute intervals and will be archived in the CMS data acquisition system. Table 8-1 summarizes the general procedures for the MRF key instrumentation,

8.2 STACK SAMPLING EQUIPMENT

Sampling equipment is calibrated according to the criteria specified in the reference method being employed. In addition, the guidelines set forth in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods (EPA-600/4-77-027b) will be followed. Dry gas meters, orifices, nozzles, pitot tubes, etc. are calibrated in accordance with this document. The range of the calibration is specified for all environmental measurements to encompass the range of probable experimental values. This approach ensures that all results are based upon interpolative analyses rather than extrapolative analyses.

Calibrations are designed to include, where practical, at least three measurement points evenly spaced over the range. This practice minimizes the probability that false assumptions of calibration linearity will be made. In addition, it is common practice to select, when practical, at least one calibration value approximating the levels anticipated in the actual measurement. Typically, calibration frequency is dictated by the need to demonstrate the stability of the calibration value over the course of measurements. Calibrations are made both pre- and post-test to accomplish the demonstration of stability.

Following the test program, calibrations are checked on all relevant items of sampling equipment to ensure the validity of data collected in the field. New items for which calibration is required are calibrated before

initial field use. Equipment whose calibration status may change with use or time is inspected in the field before testing begins and again upon return from each field use. When an item of equipment is found to be out of calibration, it is repaired and recalibrated or retired from service. All equipment is periodically recalibrated in full, regardless of the outcome of these regular inspections.

Data obtained during calibrations are recorded on standardized forms, which are checked for completeness and accuracy by management personnel. Data reduction and subsequent calculations are performed using standard procedures, and are computerized where appropriate. Calculations are checked at least twice for accuracy. Copies of calibration forms are included in the test or project reports.

Emissions sampling equipment requiring calibration include pitot tubes, pressure gauges, thermometers, dry gas meters, and barometers. The following sections elaborate on the calibration procedures for these specific equipment items.

8.2.1 Pitot Tubes

All Type S pitot tubes, whether separate or attached to a sampling probe, are inspected in accordance with the geometry standards contained in EPA Method 2.

For Type S pitot tubes with a D_t between 3/16 and 3/8 inches, the pitot tube may be calibrated according to the procedure outlined in Sections 10.1.2 through 10.1.5 of Method 2 before and after the test, or a baseline (isolated tube) coefficient value of 0.84 may be assigned.

All Type S pitot tubes >3/8 inches are calibrated over an eight-point range with a wind tunnel and a calibration coefficient is calculated for each pitot tube. The acceptance limits are listed in Table 8-2.

8.2.2 Differential Pressure Gauges

Some meter consoles are equipped with 10-inch water column (W.C.) inclined-vertical manometers. Fluid manometers do not require calibration other than leak-checks. Manometers are leak-checked in the field prior to each test series.

8.2.3 Digital Temperature Indicator

One digital temperature indicator is used to determine the flue gas temperature, probe temperature, oven temperature, "train temperature" and dry gas meter temperature. The digital temperature indicator is calibrated over a seven-point range (32°F-450°F) using an ASTM mercury-in-glass thermometer as a reference. The calibration is acceptable if the agreement is within ±2% or 2°F from 50°F-180°F.

8.2.4 Dry Gas Meter and Orifice

A calibrated wet test meter is used to calibrate the dry gas meter and orifice. The full calibration procedure is used to obtain the calibration factor of the dry gas meter. Full calibrations are performed using a calibrated wet test meter as a reference standard.

8.2.4.1 Dry Gas Meter

Each metering system receives a full calibration at the time of purchase and quarterly. Upon request, a post-test calibration can be performed after each field use. If the calibration factor deviates by less than five percent from the initial value, the test data are acceptable. If it deviates by more than 5%, the meter is recalibrated and the meter coefficient (initial or recalibrated) that yields the lowest sample volume for the test runs is used.

EPA Method 5 requires another full calibration anytime the post-test calibration check indicates that the calibration factor has changed by more than 5%. Standard practice is to recalibrate the dry gas meter quarterly and check the orifice calibration during and after each field use.

8.2.4.2 Orifice

An orifice calibration factor is calculated for each of the eighteen flow settings during a full calibration. The arithmetic average of the values obtained during the calibration is used.

8.2.5 Barometer

Each field barometer is adjusted before each test series to agree within ±0.1 inches of a reference aneroid barometer. The reference barometer is checked against the weather station pressure value (corrected for elevation difference) reported by the National Weather Service or mercury barometer. This information is obtained via a call to the weather line or the nearest airport

8.3 LABORATORY ANALYTICAL EQUIPMENT

The laboratory instruments will be calibrated as specified by the appropriate method before analyzing the test samples. The laboratory instrument calibration procedures are based on instructions in the referenced analytical methods and are summarized, along with other routine quality control checks, in Table 8-3. The calibrations performed and the results will be reported as appropriate to assure the quality of data in the laboratory sample analysis report.

Table 8-1. MRF Compliance Instrumentation Calibration Procedures

Parameter	Instrument Type	Calibration Procedure	Calibration Frequency	Actions taken if Criteria is not Met
Primary and Secondary Chamber Temperatures	Thermocouples and Temperature Transmitters	Factory calibrated thermocouples are purchased, and used to replace thermocouples as they fail. The manufacturer's calibration certificate of the current thermocouples are maintained in file. The thermocouple transmitter is calibrated using a standard thermocouple simulator. The simulator is used to generate a millivolt signal from the ANSI standard thermocouple tables corresponding to a given temperature and adjust output signal to generate the proper temperature readout.	Quarterly	Replace with new thermocouple and/or transmitter and re-check calibration
Primary Chamber Pressure	Pressure Transmitter	Use a standard pressure calibrator or manometer to generate a signal corresponding to pressure signal data provided by instrument manufacturer.	Quarterly	Replace with new transmitter and re-check calibration
Combustion Air Flow Rate	Orifice Plate w/Transmitter	Calibrate transmitter output with an electromagnetic calibrator standard. Generate a signal according to process value and check electronically 0, 50% and 100% of the span.	Quarterly	Replace with new transmitter and re-check calibration

Table 8-1. MRF Compliance Instrumentation Calibration Procedures

Parameter	Instrument Type	Calibration Procedure	Calibration Frequency	Actions taken if Criteria is not Met
CO, CO_2 and O_2 Continuous Emissions Monitoring System (CEMS)	CO & CO_2: Non-Dispersive Infrared (NDIR) Monitor O_2: Paramagnetic Monitor	Perform zero and span checks per 40 CFR 60, Appendix A Perform Relative Accuracy Test Audit (RATA) and Cylinder Gas Audit (CGA) per 40 CFR 60, Appendix A	Zero and Span Checks: Each MRF operating day before system operation. RATA: Annually CGA: Quarterly except in calendar quarter when RATA is performed.	Failure of Zero and Span Checks: Adjust zero and span, then recheck calibration. Contact vendor for repair or replacement if monitor continues to fail calibration. Failure of RATA or CGA: Contact vendor for repair or replace. Recheck calibration of repaired or replaced monitor via CGA followed by RATA within 90 days.

Table 8-2. Sampling Equipment Calibration Requirements

Stack Sampling Equipment	Acceptance Criteria	Measurement Frequency	Action If Criteria Are Not Met
Volumetric Flow Measurements			
Type S pitot tube inspection	All dimension specifications met	Calibrate prior to test and visually inspect after each field test	Use pitot tubes that meet face opening specifications; repair or replace as required
Type S pitot tube calibration	± 3% for volumetric flows >1,000 fpm ± 5-6% for volumetric flows >600 and <1,000 fpm	Refer to Section 10.0 of Method 2: If D_t is between 0.48 and 0.95 cm (3/16 and 3/8 in.), and if P_A and P_B are equal and between 1.05 and 1.50 D_t, there are two possible options: (1) the pitot tube may be calibrated according to the procedure outlined in Sections 10.1.2 through 10.1.5 of Method 2 before and after the test, or (2) a baseline (isolated tube) coefficient value of 0.84 may be assigned to the pitot tube with pitot tube inspection before and after the test.	Check for blockage. If blockage is significant, recalculate calibration coefficient.
Barometers	±0.1 inches Hg (± 2.5mm Hg) of mercury-in-glass barometer	Calibrate initially versus mercury-in-glass barometer; check before and after field test	Adjust to agree with a certified barometer
Stack gas temperature measurement system	Capable of measuring within ± 2°F (± 1°C) of mercury-in-glass thermometer	Calibrate prior to test and after each field use	Adjust to agree with Hg bulb thermometer; construct calibration curve, correct readings
Pressure sensors (excludes inclined manometer)	Agree within ± 5 percent of inclined manometers	Prior to and after field use	Adjust to agree with Hg bulb thermometer; construct calibration curve, correct readings
Wet test meter	$Y_{mi} = Y_m \pm 0.030$ Y (before test) Y_{mf}/Y_{mi} is 0.95 to 1.05 (after test)	Calibration prior to test Check calibration after test	Before test: Adjust until specifications are met. After test: Recalculate calibration coefficient.
Dry gas meters	$Y_i = Y \pm 0.02$ Y (before test) Y_{mf}/Y_{mi} is 0.95 to 1.05 (after test)	Calibration versus wet test meter initially, and when post-check exceeds $\Delta Y \pm 0.05$	Before test: Repair or replace and then calibrate After test: Recalculate calibration coefficient.

Table 8-2. Sampling Equipment Calibration Requirements

Stack Sampling Equipment	Acceptance Criteria	Measurement Frequency	Action If Criteria Are Not Met
Assembled isokinetic sampling train leakage	0.02 cfm (0.00057 m^3/min) at vacuum of $\geq$ 10 inches Hg (250 mm Hg) before the start of stack sampling, and $\geq$ maximum vacuum value recorded during sampling run for post sampling leak checks	Just prior to start of first sampling traverse (required); after first sampling traverse (recommended); after moving sampling train from first traverse port to second traverse port (recommended); end of second sampling traverse (required).	Before stack sampling or at post port change: Isolate and repair leak point(s); repeat leak check. End of first traverse or end of second traverse: Determine leak rate; If <4% of sampling rate, correct sample volume per procedures in Section 6.3 of Method 5. If >4% of sampling rate, invalid test sample; discard sample and repeat sampling run for invalid train.
Oxygen and carbon dioxide analyzers used for Method 3A analyses	3-point Calibration Error Test: $\pm$ 0.5 vol% 2-point Calibration Drift Check: $\pm$ 0.5 vol% 2-point System Bias Check: $\leq$ 0.5 vol%)	Calibration Error: Beginning of each test day Calibration Drift: Before and after each test run System Bias: Before and after each test run	Calibration Error: Repair or replace Monitor Calibration Drift: Void test run; re-calibrate or repair/replace monitor System Bias: Void test run; re-calibrate or repair/replace monitor
Analytical balance (for moisture)	± 1 mg of Class-S weights	Check with Class-S weights upon receipt and daily	Adjust or repair
Sampling Train Heating Systems and Thermocouples			
Probe heating system (isokinetic sampling trains)	Capable of maintaining 248° ± 25°F (120°C ± 14°C) at a flow of 0.75 cfm (21.2 L/min)	Calibrate initially by APTD-0576(11) or use published calibration curves	Repair, or replace, and then verify the calibration
Probe nozzle (isokinetic sampling trains)	Average of three ID measurements of nozzle within 0.001 inches (0.0025 mm); difference between high and low 0.002 inches (0.0050 mm)	Use a micrometer to measure to nearest 0.025mm (0.001 in.); check before and after field test	Recalibrate, reshape, and sharpen when nozzle becomes nicked, dented, or corroded

Table 8-2. Sampling Equipment Calibration Requirements

Stack Sampling Equipment	Acceptance Criteria	Measurement Frequency	Action If Criteria Are Not Met
Probe heating system (VOST)	Maintained at a temperature >130°C (>266°F)	Periodic check during sampling	Immediately increase the VOST system to the proper temperature
Thermocouples (stack gas meters and final impinger)	Impinger thermocouple ± 1°C (2°F) [Method 5]; dry gas thermocouple ± 3°C (5.4°F) [Method 0010]; stack thermocouple within ± 1°C(± 2°F) of absolute temperature.	Calibrate prior to test against a mercury thermometer	Adjust; determine a correction factor or reject

Sources:
Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, EPA-600/R-94/038c, September 1994.
Maintenance, Calibration, and Operation of Isokinetic Source Sampling Equipment, APTD-0576, U.S. EPA, Office of Air Programs, March 1972.
Construction of Isokinetic Source Sampling Equipment, APTD-0581, U.S. EPA, Office of Air Programs, April 1971.
Method 0030, Volatile Organics Sampling Train and Method 0010, Modified Method 5 Sampling Train, Test Method for Evaluating Solid Waste Physical/Chemical Methods (SW-846), U.S. EP A Office of Solid Waste, Update III, December 1997.
Determination of Particulate Emissions from Stationary Sources, U.S. EPA, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60, Appendix A.

Table 8-3. Laboratory Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
Volatile organics by GC/MS (SW-846 8260D)	Initial calibration	3 - 5 standards bracketing expected concentrations	Prior to sample analysis	Variability of average RRF less than or equal to 20% RSD for POHCs and CCCs SPCCs (chlorobenzene and 1,1,2,2-tetrachloroethane) will be μ 0.3, and SPCCs (chloromethane, 1,1-dichloroethane, and bromoform) will be μ 0.1	Recalibrate
	Continuing calibration	Midlevel standard	Prior to sample analysis, then every 12 hours or after sample set	RRF for POHCs and CCCs within 25% difference of the initial calibration average RRF. SPCCs (chlorobenzene and 1,1,2,2-tetrachloroethane) will be μ 0.3, and SPCCs (chloromethane, 1,1-dichloroethane, and bromoform) will be μ 0.1	Reanalyze standard. If second analysis does not meet criteria, recalibrate and reanalyze samples or justify acceptance of sample results since the last successful check.
	Consistency in chromatography	For MS methods, monitor internal standard retention time and area. For non-MS methods, monitor retention time windows for compounds of interest.	Every sample, standard, and blank	Retention time within 30 seconds of last calibration check. Area within -50 to +100% of last calibration check	Perform calibration standard check. Reanalyze sample if possible, or flag data.
	Calibration check or LCS	Analysis of independent calibration check standard	In association with each initial calibration	Within 3 std. deviations of historical mean (laboratory specific)	Recalibrate and recheck.
	Method Blank	Analysis of blank	Analyze one with each analytical batch	Result less than method detection limit	Flag data and discuss in case narrative.
Semi-volatile organics GC/MS (SW-846 8270E)	Initial calibration	5 standards bracketing expected concentrations. Critical level should be at least 10 times higher than lowest standard	Prior to sample analysis	Variability of average RRF less than or equal to 30% RSD for CCCs. SPCCs greater than or equal to 0.05.	Recalibrate

Table 8-3. Laboratory Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
Semi-volatile organics GC/MS (SW-846 8270E) (continued)	Continuing calibration	Midlevel standard	Prior to sample analysis, then every 12 hours or after sample set	RRF for CCCs within 20% of initial calibration average RRF. SPCCs greater than or equal to 0.05.	Reanalyze standard. If second analysis does not meet criteria, recalibrate and reanalyze samples or justify acceptance of sample results since the last successful check.
	Consistency in chromatography	For MS methods, monitor internal standard retention time and area. For non-MS methods, monitor retention time window for compounds of interest.	Every sample, standard, and blank	Retention time within 30 seconds of last calibration check. Area within -50 to +100% of last calibration check	Perform calibration standard check. Reanalyze sample if possible, or flag data.
	Calibration check	Analysis of independent calibration check standard	In association with each initial calibration	Within 3 std. deviations of historical mean (laboratory specific)	Recalibrate and recheck.
	Method Blank	Analysis of blank	Analyze one with each analytical batch	Results less than method detection limit	Flag data and discuss in the case narrative.
PCB and PCDD/PCDF by High Resolution GC/High Resolution MS (EPA Method 1668C and SW-846 8290A)	Initial Calibration	All five high resolution concentration calibration solutions must be used for the initial calibration	Prior to sample analysis	PCDD/PCDF: The %RSD for the mean RRF from the each of the unlabeled standards must not exceed $\pm$ 20%, and those for the labeled reference compounds must not exceed $\pm$ 30%. PCB: Mean RRF %RSD must be no greater than 30% for both unlabeled analytes and internal standards	Recalibrate
	Continuing Calibration	Midlevel standard	At the beginning and end of each 12 hour shift	PCDD/PCDF: RFs must be within $\pm$ 20% of the initial calibration mean RRF for unlabeled standards and $\pm$ 30% for labeled standards PCB: RRFs must be within $\pm$30% of the initial calibration mean RRF for all analytes (both labeled and unlabeled)	Reanalyze standard. If second analysis does not meet criteria, recalibrate and reanalyze samples or justify acceptance of sample results since the last successful check.

Table 8-3. Laboratory Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
PCB and PCDD/PCDF by HRGC/HRMS (continued)	Retention time window verification and GC column performance	Monitor retention times	Start of each 12 hour shift	PCDD/PCDF: Compliance with Section 8.2.1 of Method 8290A PCB: The internal standard RT must be within ± 10 seconds of the continuing calibration.	Correct according to method
	Method Blank	Analysis of blanks	Analyze one with each analytical batch	Results less than method detection limit	Flag data as discussed in case narrative
Particulate and Gravimetric (EPA Method 5/202)	Calibration check	Calibration of balance with standardized weights	Prior to analysis, between each group of sample weighings, and at the end of each day.	99 – 101% of theoretical value	Recalibrate and recheck sample weights.
Chloride by Ion Chromatography SW-846 Method 9056A)	Initial Calibration	4 standards bracketing expected concentrations Note: Separate calibrations are required for the acid and alkaline samples	Prior to sample analysis	Linear correlation coefficient >0.995	Recalibrate
	Retention time check for ion identification	Determine average retention time for ions of interest or relative retention time of several ions for every calibration curve	Prior to sample analysis	Average Retention Time - Sample identification is positive if results are within retention time window of standards Relative Retention Time – Sample identification is positive if results are within 3 SD of average RRT	Ions of interest are not present if criteria are not met.
Chloride by Ion Chromatography (continued)	Control check sample	Midlevel independent standard analyzed in duplicate	Beginning and end of each analysis period and after every 10 samples	90 – 110% of theoretical value	Repeat calibration check. If second check fails criteria, regenerate analytical system and reanalyze all samples since last acceptable calibration check.

Table 8-3. Laboratory Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
	Reagent blank (ICB and CCBs)	Analysis of blanks	Immediately following the ICV and following each CCV.	Less than 1 mg/L	Contamination source must be found and corrected. All samples analyzed since the last acceptable CCB must be reanalyzed.
	Reagent blank (ICB and CCBs)	Analysis of blanks	Immediately following the ICV and following each CCV.	Less than 1 mg/L	Contamination source must be found and corrected. All samples analyzed since the last acceptable CCB must be reanalyzed.

9.0 ANALYTICAL PROCEDURES

Analytical procedures and methods are summarized in Tables 3-1.

The target PCB, PCDD/PCDF, and SVOC RCI compounds and expected detection limits are noted in Tables 9-1, 9-2, and 9-3.

Table 9-4 presents expected detection limits for stack gas particulate for Method 5/202. Table 9-5 presents expected detection limits for stack gas HCl and Cl_2 for the Method 26A. These data show the expected resolution for particulate, HCl, and Cl_2 for emissions determinations.

Table 9-6 presents the stack gas target volatile organic analytes for the VOST samples and expected detection limits.

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
1	1	2-monochlorobiphenyl	2051-60-7	0.0230	0.00575	0.144	0.0360	0.300	0.0750
2	2	3-monochlorobiphenyl	2051-61-8	0.0244	0.00610	0.120	0.0300	0.300	0.0750
3	3	4-monochlorobiphenyl	2051-62-9	0.0241	0.00603	0.129	0.0323	0.300	0.0750
4	4	2,2'-dichlorobiphenyl	13029-08-8	0.0227	0.00568	0.180	0.0450	0.600	0.150
5	5	2,3-dichlorobiphenyl	16605-91-7	0.0184	0.00460	0.138	0.0345	0.300	0.0750
6	6	2,3'-dichlorobiphenyl	25569-80-6	0.0160	0.00400	0.108	0.0270	0.300	0.0750
7	7	2,4-dichlorobiphenyl	33284-50-3	0.0175	0.00438	0.150	0.0375	0.300	0.0750
8	8	2,4'-dichlorobiphenyl	34883-43-7	0.0155	0.00388	0.132	0.0330	0.600	0.150
9	9	2,5-dichlorobiphenyl	34883-39-1	0.0173	0.00433	0.096	0.0240	0.300	0.0750
10	10	2,6-dichlorobiphenyl	33146-45-1	0.0188	0.00470	0.126	0.0315	0.300	0.0750
11	11	3,3'-dichlorobiphenyl	2050-67-1	0.0190	0.00475	0.189	0.0473	0.600	0.150
12	12	3,4-dichlorobiphenyl	2974-92-7	0.0185	0.00463	0.168	0.0420	0.600	0.150
13	13	3,4'-dichlorobiphenyl	2974-90-5	0.0185	0.00463	0.168	0.0420	0.600	0.150
14	14	3,5-dichlorobiphenyl	34883-41-5	0.0176	0.00440	0.108	0.0270	0.300	0.0750
15	15	4,4'-dichlorobiphenyl	2050-68-2	0.0166	0.00415	0.150	0.0375	0.300	0.0750
16	16	2,2',3-trichlorobiphenyl	38444-78-9	0.0451	0.0113	0.177	0.0443	0.300	0.0750
17	17	2,2',4-trichlorobiphenyl	37680-66-3	0.0409	0.0102	0.195	0.0488	0.300	0.0750
18	18	2,2',5-trichlorobiphenyl	37680-65-2	0.0288	0.00720	0.285	0.0713	0.600	0.150
19	19	2,2',6-trichlorobiphenyl	38444-73-4	0.0397	0.0099	0.150	0.0375	0.300	0.0750
20	20	2,3,3'-trichlorobiphenyl	38444-84-7	0.0132	0.00330	0.252	0.0630	0.600	0.150
21	21	2,3,4-trichlorobiphenyl	55702-46-0	0.0144	0.00360	0.273	0.0683	0.600	0.150
22	22	2,3,4'-trichlorobiphenyl	38444-85-8	0.0130	0.00325	0.126	0.0315	0.300	0.0750
23	23	2,3,5-trichlorobiphenyl	55720-44-0	0.0143	0.00358	0.162	0.0405	0.300	0.0750
24	24	2,3,6-trichlorobiphenyl	55702-45-9	0.0303	0.0076	0.222	0.0555	0.300	0.0750
25	25	2,3',4-trichlorobiphenyl	55712-37-3	0.0122	0.00305	0.123	0.0308	0.300	0.0750
26	26	2,3',5-trichlorobiphenyl	38444-81-4	0.0138	0.00345	0.231	0.0578	0.600	0.150
27	27	2,3',6-trichlorobiphenyl	38444-76-7	0.0278	0.00695	0.135	0.0338	0.300	0.0750
28	28	2,4,4'-trichlorobiphenyl	7012-37-5	0.0132	0.00330	0.252	0.0630	0.600	0.150
29	29	2,4,5-trichlorobiphenyl	15862-07-4	0.0138	0.00345	0.231	0.0578	0.600	0.150
30	30	2,4,6-trichlorobiphenyl	35693-92-6	0.0288	0.00720	0.285	0.0713	0.600	0.150
31	31	2,4',5-trichlorobiphenyl	16606-02-3	0.0135	0.00338	0.141	0.0353	0.600	0.150
32	32	2,4',6-trichlorobiphenyl	38444-77-8	0.0278	0.00695	0.129	0.0323	0.300	0.0750

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
33	33	2',3,4-trichlorobiphenyl (2,3',4'-trichlorobiphenyl)	38444-86-9	0.0144	0.00360	0.273	0.0683	0.600	0.150
34	34	2',3,5-trichlorobiphenyl (2,3',5'-trichlorobiphenyl)	37680-68-5	0.0138	0.00345	0.165	0.0413	0.300	0.0750
35	35	3,3',4-trichlorobiphenyl	37680-69-6	0.0137	0.00343	0.171	0.0428	0.300	0.0750
36	36	3,3',5-trichlorobiphenyl	38444-87-0	0.0140	0.00350	0.123	0.0308	0.300	0.0750
37	37	3,4,4'-trichlorobiphenyl	38444-90-5	0.0136	0.00340	0.117	0.0293	0.300	0.0750
38	38	3,4,5-trichlorobiphenyl	53555-66-1	0.0143	0.00358	0.129	0.0323	0.300	0.0750
39	39	3,4',5-trichlorobiphenyl	38444-88-1	0.0134	0.00335	0.0900	0.0225	0.300	0.0750
40	40	2,2',3,3'-tetrachlorobiphenyl	38444-93-8	0.0186	0.00465	0.420	0.105	0.900	0.225
41	41	2,2',3,4-tetrachlorobiphenyl	52663-59-9	0.0186	0.00465	0.420	0.105	0.900	0.225
42	42	2,2',3,4'-tetrachlorobiphenyl	36559-22-5	0.0203	0.00508	0.168	0.0420	0.300	0.075
43	43	2,2',3,5-tetrachlorobiphenyl	70362-46-8	0.0159	0.00398	0.243	0.0608	0.600	0.150
44	44	2,2',3,5'-tetrachlorobiphenyl	41464-39-5	0.0169	0.00423	0.390	0.0975	0.900	0.225
45	45	2,2',3,6-tetrachlorobiphenyl	70362-45-7	0.0199	0.00498	0.267	0.0668	0.600	0.150
46	46	2,2',3,6'-tetrachlorobiphenyl	41464-47-5	0.0232	0.00580	0.138	0.0345	0.300	0.0750
47	47	2,2',4,4'-tetrachlorobiphenyl	2437-79-8	0.0169	0.00423	0.390	0.0975	0.900	0.225
48	48	2,2',4,5-tetrachlorobiphenyl	70362-47-9	0.0196	0.00490	0.165	0.0413	0.300	0.0750
49	49	2,2',4,5'-tetrachlorobiphenyl	41464-40-8	0.0154	0.00385	0.270	0.0675	0.600	0.150
50	50	2,2',4,6-tetrachlorobiphenyl	62796-65-0	0.0192	0.00480	0.306	0.0765	0.600	0.150
51	51	2,2',4,6'-tetrachlorobiphenyl	68194-04-7	0.0199	0.00498	0.267	0.0668	0.600	0.150
52	52	2,2',5,5'-tetrachlorobiphenyl	35693-99-3	0.0179	0.00448	0.132	0.0330	0.300	0.0750
53	53	2,2',5,6'-tetrachlorobiphenyl	41464-41-9	0.0192	0.00480	0.306	0.0765	0.600	0.150
54	54	2,2',6,6'-tetrachlorobiphenyl	15968-05-5	0.00301	0.00075	0.135	0.0338	0.300	0.0750
55	55	2,3,3',4-tetrachlorobiphenyl	74338-24-2	0.0124	0.00310	0.090	0.0225	0.300	0.0750
56	56	2,3,3',4'-tetrachlorobiphenyl	41464-43-1	0.0134	0.00335	0.102	0.0255	0.300	0.0750
57	57	2,3,3',5-tetrachlorobiphenyl	70424-67-8	0.0152	0.00380	0.111	0.0278	0.300	0.0750
58	58	2,3,3',5'-tetrachlorobiphenyl	41464-49-7	0.0124	0.00310	0.123	0.0308	0.300	0.0750
59	59	2,3,3',6-tetrachlorobiphenyl	74472-33-6	0.0139	0.00348	0.420	0.105	0.900	0.225
60	60	2,3,4,4'-tetrachlorobiphenyl	33025-41-1	0.0147	0.00368	0.102	0.0255	0.300	0.0750
61	61	2,3,4,5-tetrachlorobiphenyl	33284-53-6	0.0131	0.00328	0.480	0.120	1.200	0.300
62	62	2,3,4,6-tetrachlorobiphenyl	54230-22-7	0.0139	0.00348	0.420	0.105	0.900	0.225

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
63	63	2,3,4',5-tetrachlorobiphenyl	74472-34-7	0.0146	0.00365	0.156	0.0390	0.300	0.0750
64	64	2,3,4',6-tetrachlorobiphenyl	52663-58-8	0.0140	0.00350	0.195	0.0488	0.300	0.0750
65	65	2,3,5,6-tetrachlorobiphenyl	33284-54-7	0.0169	0.00423	0.390	0.0975	0.900	0.225
66	66	2,3',4,4'-tetrachlorobiphenyl	32598-10-0	0.0131	0.00328	0.120	0.0300	0.300	0.0750
67	67	2,3',4,5-tetrachlorobiphenyl	73575-53-8	0.0116	0.00290	0.120	0.0300	0.300	0.0750
68	68	2,3',4,5'-tetrachlorobiphenyl	73575-52-7	0.0131	0.00328	0.156	0.0390	0.300	0.0750
69	69	2,3',4,6-tetrachlorobiphenyl	60233-24-1	0.0154	0.00385	0.270	0.0675	0.600	0.150
70	70	2,3',4',5-tetrachlorobiphenyl	32598-11-1	0.0131	0.00328	0.480	0.120	1.200	0.300
71	71	2,3',4',6-tetrachlorobiphenyl	41464-46-4	0.0186	0.00465	0.420	0.105	0.900	0.225
72	72	2,3',5,5'-tetrachlorobiphenyl	41464-42-0	0.0150	0.00375	0.129	0.0323	0.300	0.0750
73	73	2,3',5',6-tetrachlorobiphenyl	74338-23-1	0.0159	0.00398	0.243	0.0608	0.600	0.150
74	74	2,4,4',5-tetrachlorobiphenyl	32690-93-0	0.0131	0.00328	0.480	0.120	1.200	0.300
75	75	2,4,4',6-tetrachlorobiphenyl	32598-12-2	0.0139	0.00348	0.420	0.105	0.900	0.225
76	76	2',3,4,5-tetrachlorobiphenyl (2,3',4',5'-tetrachlorobiphenyl)	70362-48-0	0.0131	0.00328	0.480	0.120	1.200	0.300
77	77	3,3',4,4'-tetrachlorobiphenyl	32598-13-3	0.0147	0.00368	0.126	0.0315	0.300	0.0750
78	78	3,3',4,5-tetrachlorobiphenyl	70362-49-1	0.0142	0.00355	0.105	0.0263	0.300	0.0750
79	79	3,3',4,5'-tetrachlorobiphenyl	41464-48-6	0.0115	0.00288	0.0990	0.0248	0.300	0.0750
80	80	3,3',5,5'-tetrachlorobiphenyl	33284-52-5	0.0124	0.00310	0.120	0.0300	0.300	0.0750
81	81	3,4,4',5-tetrachlorobiphenyl	70362-50-4	0.0158	0.00395	0.0960	0.0240	0.300	0.0750
82	82	2,2',3,3',4-pentachlorobiphenyl	52663-62-4	0.0126	0.00315	0.168	0.0420	0.300	0.0750
83	83	2,2',3,3',5-pentachlorobiphenyl	60145-20-2	0.0124	0.00310	0.246	0.0615	0.600	0.150
84	84	2,2',3,3',6-pentachlorobiphenyl	52663-60-2	0.0143	0.00358	0.171	0.0428	0.300	0.0750
85	85	2,2',3,4,4'-pentachlorobiphenyl	65510-45-4	0.0100	0.00250	0.273	0.0683	0.900	0.225
86	86	2,2',3,4,5-pentachlorobiphenyl	55312-69-1	0.00996	0.00249	0.600	0.150	1.800	0.450
87	87	2,2',3,4,5'-pentachlorobiphenyl	38380-02-8	0.00996	0.00249	0.600	0.150	1.800	0.450
88	88	2,2',3,4,6-pentachlorobiphenyl	55215-17-3	0.0130	0.00325	0.210	0.0525	0.600	0.150
89	89	2,2',3,4,6'-pentachlorobiphenyl	73575-57-2	0.0134	0.00335	0.195	0.0488	0.300	0.0750
90	90	2,2',3,4',5-pentachlorobiphenyl	68194-07-0	0.0109	0.00273	0.390	0.0975	0.900	0.225
91	91	2,2',3,4',6-pentachlorobiphenyl	68194-05-8	0.0130	0.00325	0.210	0.0525	0.600	0.150
92	92	2,2',3,5,5'-pentachlorobiphenyl	52663-61-3	0.0122	0.00305	0.126	0.0315	0.300	0.0750
93	93	2,2',3,5,6-pentachlorobiphenyl	73575-56-1	0.0124	0.00310	0.315	0.0788	0.600	0.150

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
94	94	2,2',3,5,6'-pentachlorobiphenyl	73575-55-0	0.0137	0.00343	0.165	0.0413	0.300	0.0750
95	95	2,2',3,5',6-pentachlorobiphenyl	38379-99-6	0.0130	0.00325	0.147	0.0368	0.300	0.0750
96	96	2,2',3,6,6'-pentachlorobiphenyl	73575-54-9	0.00954	0.00239	0.105	0.0263	0.300	0.0750
97	97	2,2',3',4,5-pentachlorobiphenyl (2,2',3,4',5'-pentachlorobiphenyl)	41464-51-1	0.00996	0.00249	0.600	0.150	1.800	0.450
98	98	2,2',3',4,6-pentachlorobiphenyl (2,2',3,4',6'-pentachlorobiphenyl)	60233-25-2	0.0126	0.00315	0.246	0.0615	0.600	0.150
99	99	2,2',4,4',5-pentachlorobiphenyl	38380-01-7	0.0124	0.00310	0.246	0.0615	0.600	0.150
100	100	2,2',4,4',6-pentachlorobiphenyl	39485-83-1	0.0124	0.00310	0.315	0.0788	0.600	0.150
101	101	2,2',4,5,5'-pentachlorobiphenyl	37680-73-2	0.0109	0.00273	0.390	0.0975	0.900	0.225
102	102	2,2',4,5,6''-pentachlorobiphenyl	68194-06-9	0.0126	0.00315	0.246	0.0615	0.600	0.150
103	103	2,2',4,5',6-pentachlorobiphenyl	60145-21-3	0.0119	0.00298	0.153	0.0383	0.300	0.075
104	104	2,2',4,6,6'-pentachlorobiphenyl	56558-16-8	0.0103	0.00258	0.195	0.0488	0.300	0.0750
105	105	2,3,3',4,4'-pentachlorobiphenyl	32598-14-4	0.0124	0.00310	0.102	0.0255	0.300	0.0750
106	106	2,3,3',4,5-pentachlorobiphenyl	70424-69-0	0.0141	0.00353	0.153	0.0383	0.300	0.0750
107	107/109	2,3,3',4',5-pentachlorobiphenyl	70424-68-9	0.0126	0.00315	0.150	0.0375	0.300	0.0750
108	108/107	2,3,3',4,5'-pentachlorobiphenyl	70362-41-3	0.0134	0.00335	0.192	0.0480	0.600	0.150
109	109/108	2,3,3',4,6-pentachlorobiphenyl	74472-35-8	0.00996	0.00249	0.600	0.150	1.800	0.450
110	110	2,3,3',4',6-pentachlorobiphenyl	38380-03-9	0.00875	0.00219	0.300	0.075	0.600	0.150
111	111	2,3,3',5,5'-pentachlorobiphenyl	39635-32-0	0.00860	0.00215	0.123	0.0308	0.300	0.0750
112	112	2,3,3',5,6-pentachlorobiphenyl	74472-36-9	0.00739	0.00185	0.123	0.0308	0.300	0.0750
113	113	2,3,3',5',6-pentachlorobiphenyl	68194-10-5	0.0109	0.00273	0.390	0.098	0.900	0.225
114	114	2,3,4,4',5-pentachlorobiphenyl	74472-37-0	0.0142	0.00355	0.165	0.0413	0.300	0.0750
115	115	2,3,4,4',6-pentachlorobiphenyl	74472-38-1	0.00875	0.00219	0.300	0.0750	0.600	0.150
116	116	2,3,4,5,6-pentachlorobiphenyl	18259-05-7	0.0100	0.00250	0.273	0.0683	0.900	0.225
117	117	2,3,4',5,6-pentachlorobiphenyl	68194-11-6	0.0100	0.00250	0.273	0.0683	0.900	0.225
118	118	2,3',4,4',5-pentachlorobiphenyl	31508-00-6	0.0127	0.00318	0.183	0.0458	0.300	0.0750
119	119	2,3',4,4',6-pentachlorobiphenyl	56558-17-9	0.00996	0.00249	0.600	0.150	1.800	0.450
120	120	2,3',4,5,5'-pentachlorobiphenyl	68194-12-7	0.00707	0.00177	0.111	0.0278	0.300	0.0750
121	121	2,3',4,5',6-pentachlorobiphenyl	56558-18-0	0.00805	0.00201	0.0750	0.0188	0.300	0.0750
122	122	2',3,3',4,5-pentachlorobiphenyl (2,3,3',4',5'-pentachlorobiphenyl)	76842-07-4	0.0160	0.00400	0.138	0.0345	0.300	0.0750

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
123	123	2',3,4,4',5-pentachlorobiphenyl (2,3',4,4',5'-pentachlorobiphenyl)	65510-44-3	0.0143	0.00358	0.171	0.0428	0.300	0.0750
124	124	2',3,4,5,5'-pentachlorobiphenyl (2,3',4',5',5-pentachlorobiphenyl)	70424-70-3	0.0134	0.00335	0.192	0.0480	0.600	0.150
125	125	2',3,4,5,6'-pentachlorobiphenyl (2,3',4',5',6-pentachlorobiphenyl)	74472-39-2	0.0100	0.00250	0.600	0.150	1.80	0.450
126	126	3,3',4,4',5-pentachlorobiphenyl	57465-28-8	0.0144	0.00360	0.123	0.0308	0.300	0.0750
127	127	3,3',4,5,5'-pentachlorobiphenyl	39635-33-1	0.0134	0.00335	0.126	0.0315	0.300	0.0750
128	128	2,2',3,3',4,4'-hexachlorobiphenyl	38380-07-3	0.00103	0.000258	0.204	0.0510	0.600	0.150
129	129	2,2',3,3',4,5-hexachlorobiphenyl	55215-18-4	0.00107	0.000268	0.510	0.128	1.20	0.300
130	130	2,2',3,3',4,5'-hexachlorobiphenyl	52663-66-8	0.00144	0.000360	0.153	0.0383	0.300	0.0750
131	131	2,2',3,3',4,6-hexachlorobiphenyl	61798-70-7	0.00135	0.000338	0.174	0.0435	0.300	0.0750
132	132	2,2',3,3',4,6'-hexachlorobiphenyl	38380-05-1	0.00135	0.000338	0.177	0.0443	0.300	0.0750
133	133	2,2',3,3',5,5'-hexachlorobiphenyl	35694-04-3	0.00125	0.000313	0.180	0.0450	0.300	0.0750
134	134	2,2',3,3',5,6-hexachlorobiphenyl	52704-70-8	0.00127	0.000318	0.390	0.098	0.600	0.150
135	135	2,2',3,3',5,6'-hexachlorobiphenyl	52744-13-5	0.00195	0.000488	0.270	0.0675	0.600	0.150
136	136	2,2',3,3',6,6'-hexachlorobiphenyl	38411-22-2	0.00140	0.000350	0.144	0.0360	0.300	0.0750
137	137	2,2',3,4,4',5-hexachlorobiphenyl	35694-06-5	0.00131	0.000328	0.096	0.0240	0.300	0.0750
138	138	2,2',3,4,4',5'-hexachlorobiphenyl	35065-28-2	0.00107	0.000268	0.510	0.128	1.20	0.300
139	139	2,2',3,4,4',6-hexachlorobiphenyl	56030-56-9	0.00116	0.000290	0.273	0.0683	0.600	0.150
140	140	2,2',3,4,4',6'-hexachlorobiphenyl	59291-64-4	0.00116	0.000290	0.273	0.0683	0.600	0.150
141	141	2,2',3,4,5,5'-hexachlorobiphenyl	52712-04-6	0.00116	0.000290	0.177	0.0443	0.300	0.0750
142	142	2,2',3,4,5,6-hexachlorobiphenyl	41411-61-4	0.00135	0.000338	0.150	0.0375	0.300	0.0750
143	143	2,2',3,4,5,6'-hexachlorobiphenyl	68194-15-0	0.00127	0.000318	0.390	0.098	0.600	0.150
144	144	2,2',3,4,5',6-hexachlorobiphenyl	68194-14-9	0.00180	0.000450	0.132	0.0330	0.300	0.0750
145	145	2,2',3,4,6,6'-hexachlorobiphenyl	74472-40-5	0.00146	0.000365	0.123	0.0308	0.300	0.0750
146	146	2,2',3,4',5,5'-hexachlorobiphenyl	51908-16-8	0.00105	0.000263	0.135	0.0338	0.300	0.0750
147	147	2,2',3,4',5,6-hexachlorobiphenyl	68194-13-8	0.00113	0.000283	0.360	0.090	0.600	0.150
148	148	2,2',3,4',5,6'-hexachlorobiphenyl	74472-41-6	0.00186	0.000465	0.165	0.0413	0.300	0.0750
149	149	2,2',3,4',5',6-hexachlorobiphenyl	38380-04-0	0.00113	0.000283	0.360	0.090	0.600	0.150
150	150	2,2',3,4',6,6'-hexachlorobiphenyl	68194-08-1	0.00139	0.000348	0.144	0.0360	0.300	0.075
151	151	2,2',3,5,5',6-hexachlorobiphenyl	52663-63-5	0.00195	0.000488	0.270	0.0675	0.600	0.150

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
152	152	2,2',3,5,6,6'-hexachlorobiphenyl	68194-09-2	0.00143	0.000358	0.159	0.0398	0.300	0.0750
153	153	2,2',4,4',5,5'-hexachlorobiphenyl	35065-27-1	0.000928	0.000232	0.249	0.0623	0.600	0.150
154	154	2,2',4,4',5,6'-hexachlorobiphenyl	60145-22-4	0.00174	0.000435	0.180	0.0450	0.300	0.075
155	155	2,2',4,4',6,6'-hexachlorobiphenyl	33979-03-2	0.00150	0.000375	0.156	0.0390	0.300	0.075
156	156	2,3,3',4,4',5-hexachlorobiphenyl	38380-08-4	0.00115	0.000288	0.255	0.0638	0.600	0.150
157	157	2,3,3',4,4',5'-hexachlorobiphenyl	69782-90-7	0.00115	0.000288	0.255	0.0638	0.600	0.150
158	158	2,3,3',4,4',6-hexachlorobiphenyl	74472-42-7	0.000774	0.000194	0.156	0.0390	0.300	0.0750
159	159	2,3,3',4,5,5'-hexachlorobiphenyl	39635-35-3	0.000732	0.000183	0.117	0.0293	0.300	0.0750
160	160	2,3,3',4,5,6-hexachlorobiphenyl	41411-62-5	0.00107	0.000268	0.510	0.128	1.200	0.300
161	161	2,3,3',4,5',6-hexachlorobiphenyl	74472-43-8	0.000899	0.000225	0.111	0.0278	0.300	0.0750
162	162	2,3,3',4',5,5'-hexachlorobiphenyl	39635-34-2	0.000807	0.000202	0.150	0.0375	0.300	0.0750
163	163	2,3,3',4',5,6-hexachlorobiphenyl	74472-44-9	0.00107	0.000268	0.510	0.128	1.20	0.300
164	164	2,3,3',4',5',6-hexachlorobiphenyl	74472-45-0	0.000977	0.000244	0.075	0.0188	0.300	0.075
165	165	2,3,3',5,5',6-hexachlorobiphenyl	74472-46-1	0.000990	0.000248	0.150	0.0375	0.300	0.075
166	166	2,3,4,4',5,6-hexachlorobiphenyl	41411-63-6	0.00103	0.000258	0.204	0.0510	0.600	0.150
167	167	2,3',4,4',5,5'-hexachlorobiphenyl	52663-72-6	0.000736	0.000184	0.180	0.0450	0.300	0.075
168	168	2,3',4,4',5',6-hexachlorobiphenyl	59291-65-5	0.000928	0.000232	0.249	0.0623	0.600	0.150
169	169	3,3',4,4',5,5'-hexachlorobiphenyl	32774-16-6	0.000746	0.000187	0.123	0.0308	0.300	0.075
170	170	2,2',3,3',4,4',5-heptachlorobiphenyl	35065-30-6	0.00107	0.000268	0.132	0.0330	0.300	0.075
171	171	2,2',3,3',4,4',6-heptachlorobiphenyl	52663-71-5	0.00101	0.000253	0.279	0.0698	0.600	0.150
172	172	2,2',3,3',4,5,5'-heptachlorobiphenyl	52663-74-8	0.00111	0.000278	0.150	0.0375	0.300	0.075
173	173	2,2',3,3',4,5,6-heptachlorobiphenyl	68194-16-1	0.00101	0.000253	0.279	0.0698	0.600	0.150
174	174	2,2',3,3',4,5,6'-heptachlorobiphenyl	38411-25-5	0.000980	0.000245	0.075	0.0188	0.300	0.075
175	175	2,2',3,3',4,5',6-heptachlorobiphenyl	40186-70-7	0.000992	0.000248	0.138	0.0345	0.300	0.075
176	176	2,2',3,3',4,6,6'-heptachlorobiphenyl	52663-65-7	0.000766	0.000192	0.186	0.0465	0.300	0.075
177	177	2,2',3,3',4',5,6-heptachlorobiphenyl (2,2',3,3',4,5',6'-heptachlorobiphenyl)	52663-70-4	0.000967	0.000242	0.0960	0.0240	0.300	0.075
178	178	2,2',3,3',5,5',6-heptachlorobiphenyl	52663-67-9	0.00106	0.000265	0.0600	0.0150	0.300	0.075
179	179	2,2',3,3',5,6,6'-heptachlorobiphenyl	52663-64-6	0.000662	0.000166	0.126	0.0315	0.300	0.075
180	180	2,2',3,4,4',5,5'-heptachlorobiphenyl	35065-29-3	0.000809	0.000202	0.204	0.0510	0.600	0.150
181	181	2,2',3,4,4',5,6-heptachlorobiphenyl	74472-47-2	0.000994	0.000249	0.150	0.0375	0.300	0.075
182	182	2,2',3,4,4',5,6'-heptachlorobiphenyl	60145-23-5	0.00102	0.000255	0.156	0.0390	0.300	0.075

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
183	183	2,2',3,4,4',5',6-heptachlorobiphenyl	52663-69-1	0.000962	0.000241	0.231	0.0578	0.600	0.150
184	184	2,2',3,4,4',6,6'-heptachlorobiphenyl	74472-48-3	0.000691	0.000173	0.135	0.0338	0.300	0.075
185	185	2,2',3,4,5,5',6-heptachlorobiphenyl	52712-05-7	0.000962	0.000241	0.231	0.0578	0.600	0.150
186	186	2,2',3,4,5,6,6'-heptachlorobiphenyl	74472-49-4	0.000641	0.000160	0.144	0.0360	0.300	0.075
187	187	2,2',3,4',5,5',6-heptachlorobiphenyl	52663-68-0	0.000857	0.000214	0.126	0.0315	0.300	0.075
188	188	2,2',3,4',5,6,6'-heptachlorobiphenyl	74487-85-7	0.000662	0.000166	0.126	0.0315	0.300	0.075
189	189	2,3,3',4,4',5,5'-heptachlorobiphenyl	39635-31-9	0.00674	0.001685	0.147	0.0368	0.300	0.075
190	190	2,3,3',4,4',5,6-heptachlorobiphenyl	41411-64-7	0.000709	0.000177	0.150	0.0375	0.300	0.075
191	191	2,3,3',4,4',5',6-heptachlorobiphenyl	74472-50-7	0.000733	0.000183	0.153	0.0383	0.300	0.075
192	192	2,3,3',4,5,5',6-heptachlorobiphenyl	74472-51-8	0.000702	0.000176	0.120	0.0300	0.300	0.075
193	193	2,3,3',4',5,5',6-heptachlorobiphenyl	69782-91-8	0.000809	0.000202	0.204	0.0510	0.600	0.150
194	194	2,2',3,3',4,4',5,5'-octachlorobiphenyl	35694-08-7	0.002780	0.000695	0.144	0.0360	0.300	0.075
195	195	2,2',3,3',4,4',5,6-octachlorobiphenyl	52663-78-2	0.00327	0.00082	0.159	0.0398	0.300	0.075
196	196	2,2',3,3',4,4',5,6'-octachlorobiphenyl	42740-50-1	0.00132	0.000330	0.180	0.0450	0.300	0.075
197	197	2,2',3,3',4,4',6,6'-octachlorobiphenyl	33091-17-7	0.000896	0.000224	0.141	0.0353	0.300	0.075
198	198	2,2',3,3',4,5,5',6-octachlorobiphenyl	68194-17-2	0.00118	0.000295	0.246	0.0615	0.600	0.150
199	201/199	2,2',3,3',4,5,5',6'-octachlorobiphenyl	52663-75-9	0.00118	0.000295	0.246	0.0615	0.600	0.150
200	199/200	2,2',3,3',4,5,6,6'-octachlorobiphenyl	52663-73-7	0.00102	0.000255	0.102	0.0255	0.300	0.0750
201	200/201	2,2',3,3',4,5',6,6'-octachlorobiphenyl	40186-71-8	0.00105	0.000263	0.159	0.0398	0.300	0.0750
202	202	2,2',3,3',5,5',6,6'-octachlorobiphenyl	2136-99-4	0.000991	0.000248	0.153	0.0383	0.300	0.0750
203	203	2,2',3,4,4',5,5',6-octachlorobiphenyl	52663-76-0	0.00111	0.000278	0.204	0.0510	0.300	0.0750
204	204	2,2',3,4,4',5,6,6'-octachlorobiphenyl	74472-52-9	0.000979	0.000245	0.144	0.0360	0.300	0.0750
205	205	2,3,3',4,4',5,5',6-octachlorobiphenyl	74472-53-0	0.00248	0.000620	0.165	0.0413	0.300	0.0750
206	206	2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	40186-72-9	0.0519	0.0130	0.171	0.0428	0.300	0.0750
207	207	2,2',3,3',4,4',5,6,6'-nonachlorobiphenyl	52663-79-3	0.0411	0.0103	0.114	0.0285	0.300	0.0750
208	208	2,2',3,3',4,5,5',6,6'-nonachlorobiphenyl	52663-77-1	0.0419	0.0105	0.153	0.0383	0.300	0.0750
209	209	2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl	2051-24-3	0.000617	0.000154	0.138	0.0345	0.300	0.0750
Total		All Congeners	NA	2.18	0.546	44.8	11.2	105	26.2

Table 9-1. Stack Gas PCB Target Analytes

Table 9-1 Notes:

1. The PCB congener number is from Method 1668C and Chemical Abstract Services.

2. The BZ number is from Ballschmiter and Zell (1980). The IUPAC number, when different from the BZ, follows the recommended changes to the BZ number per Schulte and Malisch (1983) and Guitart et al. (1993).

3. The chemical structure names are from Ballschmiter and Zell (1980). IUPAC nomenclature structure names are listed in parenthesis when different from the BZ name (source CAS Registry).

4. Chemical Abstract Service Registry number (source CAS Registry and 1668A Table 1).

5. Detection limits based on analysis of extracts split three ways: one-third for PCB, one-third for DF, and one-third for SVOC. The PCB detection limits values represent approximate, relative limits using isotope dilution and HRGC/SIMS analysis which can result in detection limit variations.

6. Based on four (4.0) dry standard cubic meters of stack gas sampled.

Table 9-2. Stack Gas Dioxin/Furan Target Analytes

Compound	CAS No.	Per Analysis EDL (pg) [1]	Per Analysis MDL (pg) [1]	Per Analysis RL (pg) [1]	Train Detection Limit @ EDL (ng/m^3) [1,2,3]	Train Detection Limit @ MDL (ng/m^3) [1,2,4]	Train Detection Limit @ RL (ng/m^3) [1,2,3]	2,3,7,8-TCDD TEQ Factor	2,3,7,8-TCDD TEQ @ EDL (ng/m^3) [1,2]	2,3,7,8-TCDD TEQ @ MDL (ng/m^3) [1,2]	2,3,7,8-TCDD TEQ @ RL (ng/m^3) [1,2]
2,3,7,8 - TCDD	1746-01-6	2.06	6.30	30.0	0.000514	0.00158	0.00750	1	0.000514	0.00158	0.00750
Total TCDD	NA	2.06		30.0	0.000514		0.00750	NA	NA		NA
2,3,7,8 - TCDF (DB225)	51207-31-9	4.23	9.60	30.0	0.00106	0.00240	0.00750	0.1	0.000106	0.000240	0.000750
Total TCDF	NA	2.39		30.0	0.000597		0.00750	NA	NA		NA
1,2,3,7,8 - PeCDD	40321-76-4	1.99	25.2	150	0.000497	0.00630	0.0375	0.5	0.000249	0.00315	0.0188
Total PeCDD	NA	1.99		150	0.000497		0.0375	NA	NA		NA
1,2,3,7,8 - PeCDF	57117-41-6	0.966	18.9	150	0.000242	0.00473	0.0375	0.05	0.0000121	0.000236	0.00188
2,3,4,7,8 - PeCDF	57117-31-4	0.948	20.1	150	0.000237	0.00503	0.0375	0.5	0.000119	0.00251	0.0188
Total PeCDF	NA	0.957		150	0.000239		0.0375	NA	NA		NA
1,2,3,6,7,8 - HxCDD	57653-85-7	1.19	28.2	150	0.000299	0.00705	0.0375	0.1	0.0000299	0.000705	0.00375
1,2,3,4,7,8 - HxCDD	39227-28-6	1.13	21.3	150	0.000283	0.00533	0.0375	0.1	0.0000283	0.000533	0.00375
1,2,3,7,8,9 - HxCDD	19408-74-3	1.11	23.7	150	0.000277	0.00593	0.0375	0.1	0.0000277	0.000593	0.00375
Total HxCDD	NA	1.14		150	0.000286		0.0375	NA	NA		NA
1,2,3,6,7,8 - HxCDF	57117-44-9	1.41	23.1	150	0.000352	0.00578	0.0375	0.1	0.0000352	0.000578	0.00375
1,2,3,4,7,8 - HxCDF	70648-26-9	1.29	20.4	150	0.000323	0.00510	0.0375	0.1	0.0000323	0.000510	0.00375
1,2,3,7,8,9 - HxCDF	72918-21-9	1.39	27.9	150	0.000348	0.00698	0.0375	0.1	0.0000348	0.000698	0.00375
2,3,4,6,7,8 - HxCDF	60851-34-5	1.52	28.8	150	0.000379	0.00720	0.0375	0.1	0.0000379	0.000720	0.00375
Total HxCDF	NA	1.40		150	0.000350		0.0375	NA	NA		NA
1,2,3,4,6,7,8 - HpCDD	35822-39-4	6.54	21.0	150	0.00164	0.00525	0.0375	0.01	0.0000164	0.0000525	0.000375
Total HpCDD	NA	6.54		150	0.00164		0.0375	NA	NA		NA
1,2,3,4,6,7,8 - HpCDF	67562-394	1.04	24.0	150	0.000260	0.00600	0.0375	0.01	0.00000260	0.0000600	0.000375
1,2,3,4,7,8,9 - HpCDF	55673-89-7	1.25	27.9	150	0.000312	0.00698	0.0375	0.01	0.00000312	0.0000698	0.000375
Total HpCDF	NA	1.14		150	0.000286		0.0375	NA	NA		NA
Total OCDD	3268-87-9	1.30	123	300	0.000324	0.0308	0.0750	0.001	0.000000324	0.0000308	0.0000750

Table 9-2. Stack Gas Dioxin/Furan Target Analytes

Compound	CAS No.	Per Analysis EDL (pg) [1]	Per Analysis MDL (pg) [1]	Per Analysis RL (pg) [1]	Train Detection Limit @ EDL (ng/m^3) [1,2,3]	Train Detection Limit @ MDL (ng/m^3) [1,2,4]	Train Detection Limit @ RL (ng/m^3) [1,2,3]	2,3,7,8-TCDD TEQ Factor	2,3,7,8-TCDD TEQ @ EDL (ng/m^3) [1,2]	2,3,7,8-TCDD TEQ @ MDL (ng/m^3) [1,2]	2,3,7,8-TCDD TEQ @ RL (ng/m^3) [1,2]
Total OCDF	39001-02-0	0.984	57.0	300	0.000246	0.0143	0.0750	0.001	0.000000246	0.0000143	0.0000750
TOTAL					0.00497	0.127	0.390		0.00125	0.0123	0.0752

Notes:

[1] Detection limits based on combined analysis of the front-half and back-half extracts split three (3) ways for PCB, PCDD/PCDF, and SVOC RCl . PCDD/PCDF detection limits using isotope dilution and HRGS/HRMS analysis method can vary. The detection values represent approximate, relative limits of detection.

[2] Based on 4.0 dry standard cubic meters (dscm) of stack gas sampled.

[3] "TOTAL" based on sum of the individual congener group "Total" detection limits.

[4] "TOTAL" based on sum of the individual 2,3,7,8-congener detection limits.

Table 9-3 Stack Gas Semivolatile Organic Target Analytes

Compound [1]	CAS No.	Combined Fractions @ Method Detection Limit (ug) [2]	Train Detection Limit @ MDL (ug/m^3) [2,3]	Combined Fractions @ Reporting Limit (ug) [2]	Train Detection Limit @ RL (ug/m^3) [2,3]
bis(2-Chloroethoxy)methane	111-91-1	3.00	0.750	30	7.50
bis(2-Chloroethyl) ether	111-44-4	3.30	0.825	30	7.50
4-Chloroaniline	106-47-8	36.0	9.00	60	15.0
4-Chloro-3-methylphenol	59-50-7	3.75	0.938	30	7.50
2-Chloronaphthalene	91-58-7	3.00	0.750	30	7.50
2-Chlorophenol	95-57-8	3.00	0.750	30	7.50
4-Chlorophenyl phenyl ether	7005-72-3	3.00	0.750	30	7.50
1,2-Dichlorobenzene	95-50-1	3.00	0.750	30	7.50
1,3-Dichlorobenzene	541-73-1	3.60	0.900	30	7.50
1,4-Dichlorobenzene	106-46-7	3.30	0.825	30	7.50
3,3'-Dichlorobenzidine	91-94-1	45.0	11.3	150	37.5
2,4-Dichlorophenol	120-83-2	4.50	1.13	30	7.50
Hexachlorobenzene	118-74-1	3.00	0.750	30	7.50
Hexachlorobutadiene	87-68-3	4.50	1.13	30	7.50
Hexachlorocyclopentadiene	77-47-4	60.0	15.0	150	37.5
Hexachloroethane	67-72-1	7.50	1.88	30	7.50
Pentachlorobenzene	608-93-5	3.00	0.750	30	7.50
Pentachloronitrobenzene	82-68-8	3.00	0.750	30	7.50
Pentachlorophenol	87-86-5	100	25.0	150	37.5
1,2,4-Trichlorobenzene	120-82-1	3.60	0.900	30	7.50
2,4,5-Trichlorophenol	95-95-4	7.80	1.95	30	7.50
2,4,6-Trichlorophenol	88-06-2	4.50	1.13	30	7.50

Notes:

[1] In addition to the target SVOC compounds listed above, all non-target chlorinated SVOC compound peaks greater than 10% of the nearest internal standard will be tentatively identified with 85% or better match via GC/MS library search of the mass spectral data, with quantity estimated based on the nearest internal standard.

[2] Detection limits are based on previous similar sampling and Method 8270E analysis. Detection limits based on combined analysis of the front-half and back-half extracts split three (3) ways for PCB, PCDD/PCDF, SVOC RCl and archive.

[3] Based on four (4) dry standard cubic meters (dscm) of stack gas sampled.

Table 9-4. Stack Gas Particulate

Parameter	Probe Rinse (mg)	Filter (mg)	Conden-sate (mg)	Filterable Train Detection Limit (mg/m^3) [1]	Filterable Train Detection Limit (gr/dscf) [1]	Filterable & Condesable Train Detection Limit (mg/m^3) [1]	Filterable & Condensable Train Detection Limit (gr/dscf) [1]
Particulate Matter	0.5	0.5	0.5	0.50	0.00022	0.75	0.00033

Notes:

[1] For particulate, the measurement is of differential weight. The detection limit accuracy for gravimetric is $\pm$0.5 mg for each of the two fractions, the filter and the probe rinse. The stack gas concentration limit is based on 2.0 dry standard cubic meters (dscm) of stack gas sampled.

Table 9-5. Method 26A HCl/Cl_2 Detection Limts

Parameters	H_2SO_4 Impinger Method Detection Limit (ug)	NaOH Impinger Method Detection Limit (ug)	Train Method Detection Limit (ug/m^3)[1]	H_2SO_4 Impinger Reporting Limit (ug)	NaOH Impinger Reporting Limit (ug)	Train Reporting Limit (ug/m^3)[1]
HCl/Cl_2						
Hydrogen Chloride [1]	200	NA	200	400	NA	400
		ug/m^3 as HCl:	206		ug/m^3 as HCl:	411
		ppm as HCl:	0.14		ppm as HCl:	0.27
Chlorine [1]	NA	100	100	NA	200	200
		ug/m^3 as Cl_2:	100		ug/m^3 as Cl_2:	200
		ppm as Cl_2:	0.034		ppm as Cl_2:	0.068
Total as Cl^-	200	100	300	400	200	600
		ug/m^3 as Cl^-:	300		ug/m^3 as Cl^-:	600
		ppm as Cl^-:	0.20		ppm as Cl^-:	0.41

Notes:

[1] Detection limits are for chloride ion via Ion Chromatography (IC) analysis, SW-846 Method 9056A. The stack gas concentration limit is based on 1.0 cubic meters of stack gas sampled using a Method 26A sampling train. Method detection limit (MDL) and reporting limit (RL) values are based on previous similar testing.

Table 9-6. Stack Gas Volatile Organic Target Analytes

Compound [1]	CAS No.	Method Detection Limit per Tube (ug)	Tube Total @ MDL (ug)[1]	Condensate @ MDL (ug)[c]	Train Total @ MDL (ug/m^3) [4]	Reporting Limit per Tube (ug)	Tube Total @ RL (ug) [2]	Condensate @ RL (ug) [3]	Train Total @ RL (ug/m^3) [4]
Bromochloromethane	74-97-5	0.00560	0.0336	0.00960	0.720	0.0250	0.150	0.0400	3.17
Bromodichloromethane	75-27-4	0.00420	0.0252	0.00400	0.487	0.0250	0.150	0.0400	3.17
Carbon tetrachloride	56-23-5	0.00690	0.0414	0.00480	0.770	0.0250	0.150	0.0400	3.17
Chlorobenzene	108-90-7	0.00320	0.0192	0.00400	0.387	0.0250	0.150	0.0400	3.17
Chlorodibromomethane	124-48-1	0.00560	0.0336	0.00800	0.693	0.0250	0.150	0.0400	3.17
Chloroethane	75-00-3	0.00680	0.0408	0.00960	0.840	0.0500	0.300	0.0800	6.33
Chloroform	67-66-3	0.00700	0.0420	0.00400	0.767	0.0250	0.150	0.0400	3.17
Chloromethane	74-87-3	0.00480	0.0288	0.00480	0.560	0.0500	0.300	0.0800	6.33
2-Chlorotoluene	95-49-8	0.00180	0.0108	0.00960	0.340	0.0250	0.150	0.0400	3.17
4-Chlorotoluene	106-43-4	0.00180	0.0108	0.00840	0.320	0.0250	0.150	0.0400	3.17
1,2-Dibromo-3-chloro-propane	96-12-8	0.0110	0.0660	0.0180	1.40	0.0500	0.300	0.0800	6.33
1,2-Dichlorobenzene	95-50-1	0.00770	0.0462	0.00400	0.837	0.0250	0.150	0.0400	3.17
1,3-Dichlorobenzene	541-73-1	0.00380	0.0228	0.00400	0.447	0.0250	0.150	0.0400	3.17
1,4-Dichlorobenzene	106-46-7	0.00550	0.0330	0.00480	0.630	0.0250	0.150	0.0400	3.17
Dichlorodifluoromethane	75-71-8	0.00510	0.0306	0.00600	0.610	0.0250	0.150	0.0800	3.83
1,1-Dichloroethane	75-34-3	0.00640	0.0384	0.00400	0.707	0.0250	0.150	0.0400	3.17
1,2-Dichloroethane	107-06-2	0.00660	0.0396	0.00400	0.727	0.0250	0.150	0.0400	3.17
cis-1,2-Dichloroethene	156-59-2	0.00620	0.0372	0.00480	0.700	0.0250	0.150	0.0400	3.17
trans-1,2-Dichloroethene	156-60-5	0.00740	0.0444	0.00400	0.807	0.0250	0.150	0.0400	3.17
1,1-Dichloroethene	75-35-4	0.00670	0.0402	0.00400	0.737	0.0250	0.150	0.0400	3.17
1,2-Dichloropropane	78-87-5	0.00490	0.0294	0.00400	0.557	0.0250	0.150	0.0400	3.17
1,3-Dichloropropane	142-28-9	0.00730	0.0438	0.00680	0.843	0.0250	0.150	0.0400	3.17
2,2-Dichloropropane	594-20-7	0.00700	0.0420	0.00440	0.773	0.0250	0.150	0.0400	3.17
cis-1,3-Dichloropropene	10061-01-5	0.00460	0.0276	0.00400	0.527	0.0250	0.150	0.0400	3.17
trans-1,3-Dichloropropene	10061-02-6	0.00590	0.0354	0.00440	0.663	0.0250	0.150	0.0400	3.17
1,1-Dichloropropene	563-58-6	0.00770	0.0462	0.00400	0.837	0.0250	0.150	0.0400	3.17
Hexachlorobutadiene	87-68-3	0.0120	0.0720	0.00480	1.28	0.0250	0.150	0.0800	3.83
Methylene chloride	75-09-2	0.0160	0.0960	0.00920	1.75	0.0250	0.150	0.0800	3.83

Table 9-6. Stack Gas Volatile Organic Target Analytes

Compound [1]	CAS No.	Method Detection Limit per Tube (ug)	Tube Total @ MDL (ug)[1]	Condensate @ MDL (ug)[c]	Train Total @ MDL (ug/m^3) [4]	Reporting Limit per Tube (ug)	Tube Total @ RL (ug) [2]	Condensate @ RL (ug) [3]	Train Total @ RL (ug/m^3) [4]
1,1,1,2-Tetrachloroethane	630-20-6	0.00370	0.0222	0.00480	0.450	0.0250	0.150	0.0400	3.17
1,1,2,2-Tetrachloroethane	79-34-5	0.00970	0.0582	0.00600	1.07	0.0250	0.150	0.0400	3.17
Tetrachloroethene	127-18-4	0.00620	0.0372	0.00400	0.687	0.0250	0.150	0.0400	3.17
1,2,3-Trichlorobenzene	87-61-6	0.0140	0.0840	0.00920	1.55	0.0250	0.150	0.0400	3.17
1,2,4-Trichlorobenzene	120-82-1	0.0130	0.0780	0.00600	1.40	0.0250	0.150	0.0400	3.17
1,1,1-Trichloroethane	71-55-6	0.00820	0.0492	0.00400	0.887	0.0250	0.150	0.0400	3.17
1,1,2-Trichloroethane	79-00-5	0.00700	0.0420	0.0100	0.867	0.0250	0.150	0.0400	3.17
Trichloroethene	79-01-6	0.00650	0.0390	0.00400	0.717	0.0250	0.150	0.0400	3.17
Trichlorofluoromethane	75-69-4	0.00680	0.0408	0.00480	0.760	0.0500	0.300	0.0800	6.33
1,2,3-Trichloropropane	96-18-4	0.0100	0.0600	0.0144	1.24	0.0250	0.150	0.0400	3.17
Vinyl chloride	75-01-4	0.0250	0.150	0.00960	2.66	0.0250	0.150	0.0400	3.17

Notes:

[1] In addition to the target compounds listed above, all non-target chlorinated compound peaks greater than 10% of the nearest internal standard will be tentatively identified with 85% or better match via GC/MS library search of the mass spectral data, with quantity estimated based on the nearest internal standard.

[2] Based on summation of analysis of three tube sets at the method detection limit (MDL) presented. MDLs are based on previous similar VOST sampling and analysis.

[3] Based on 40 mL of VOST Cond. (one 40-mL VOA).

[4] Based on 60 liters (0.060 cubic meters)of stack gas sampled using three tube sets and 40 mL of VOST Condensate

10.0 SPECIFIC INTERNAL QUALITY CONTROL CHECKS

10.1 DEFINITIONS

The various types of QA/QC checks that may be performed as part of the test, both for sampling and analysis, are defined below. One or more of these QA/QC checks are associated with each measurement system in order to assess the compliance of the data to the DQOs established in Section 5.0. Table 10-1 is a summary of all the sample analyses and their associated internal quality control checks associated with this test program.

Audit Sample An audit sample is a field or alternate laboratory prepared blank spike submitted to the test laboratory to assess accuracy or potential sample degradation.

Blank, Field A field blank is a sampling train or sampling component that is set-up in the field but is not used for test sampling. The field blank is used to assess background contamination that may affect the representativeness of the field samples.

Blank, Media A sample of unused sampling media analyzed to ensure the media are uncontaminated. This type of sample may also be referred to as a “reagent blank” (see below).

Blank, Method A method blank is a sample of unused media that is prepared and analyzed in the test laboratory to assess background contamination that may exist in the laboratory, on glassware, or in the analytical system.

Blank, Reagent A sample of unused reagent(s) used to demonstrate the absence of contamination in the reagents.

Blank, Spike A blank spike is a laboratory prepared sample of blank media that is spiked with a known amount of target analyte(s) used to assess the accuracy of the analytical method.

Blank, System An aliquot of uncontaminated reagent used to clean out the analytical system after high level samples have been analyzed or before analysis begins.

Blank, Trip A trip blank is an unused sample component that is shipped to the field along with the sampling equipment/media and/or returned to the laboratory without having been exposed to field conditions. If contamination is encountered in the field blank(s), the trip blank is analyzed to assess whether or not the contamination originates in the field, is inherent in the equipment/media, or results from exposure during shipping and handling.

Breakthrough Check The result of the analysis of a secondary component (i.e., sorbent tube) in a sampling train is compared to the result of the primary component to assess whether or not the primary component has successfully captured the target analytes. If the result of the secondary component analysis is high compared to the primary component analysis, the possibility exists that the analytical results may be artificially low.

Calibration Check A standard solution from a source other than the calibration standards used to verify the integrity of an instrument's calibration.

Calibration Standards High purity compounds or mixtures of compounds used to adjust the response of an analytical instrument. The laboratory will use traceable standards and submit standard preparation logs as part of the deliverables package.

Contingency Sample An archived portion of a field sample from the same location as other field samples that is collected and held in case of breakage or QA/QC failure during the handling or analysis of the primary sample. This type of sample is sometimes referred to as an “archive sample.”

Continuing Calibration Verification A mid-point standard, from the same Calibration source as the initial calibration solution analyzed periodically to verify that calibration conditions have not drifted from the initial calibration.

Duplicate Analysis A duplicate is a sample that is split in the laboratory and prepared and analyzed twice. The results of the two analyses are compared as a measure of precision.

Duplicate Injection A second analysis of a single sample preparation. This QC test may be used to assess analytical QC failures, matrix interferences, or as a measure of analytical system precision.

Initial Calibration A series of analyses of solutions, that have known concentrations, used to establish the correspondence between the amount of an analyte present in the solution and the instrument's response across the expected analytical range of the samples. Initial calibrations also establish retention time windows for identification purposes in chromatographic methods.

Internal Standard Recovery Internal standards are non-target spikes added to samples for quantitation purposes. The percent recovery of the internal standards is checked to assess whether or not significant matrix interferences may affect the accuracy and precision of analytical results.

Performance Evaluation (PE) Sample See Audit Sample.

Proficiency Test A series of blank spikes analyzed in the test laboratory to demonstrate an analyst's ability to successfully perform the method with acceptable precision and accuracy.

Replicate One of a series of identical samples or splits of a single sample used to assess precision.

Serial Dilution The result of the analysis of a highly contaminated sample, run undiluted, is compared to the results for the same sample after serial dilution. The two results are expected to match to within method specified criteria. This test is a measure of the linearity of ICP calibration and the analysis technique.

Spike, Field See Audit Sample.

Spike, Matrix Spike of the known or controlled amount of an actual target analyte to an actual sample matrix that is then analyzed for that analyte. The percent recovery of the spiked analyte provides a measure of the matrix bias.

Surrogates Non-target or isotopically labeled analytes spiked into field samples as a measure of method efficiency and accuracy.

10.2 SPECIFIC QUALITY CONTROL CHECKS AND ACCEPTANCE CRITERIA

A variety of QC checks are required both in the field and in the laboratory to ensure the collection of samples that accurately represent the field conditions under study, to assess compliance with the Data Quality Objectives (DQOs), and to assess biases in the measurement system.

10.2.1 Field Activities

In order to ensure the representativeness of samples collected during the test, and to ensure integrity of field measurements, a variety of QC checks and controls will be implemented throughout the sampling program. These checks and controls will include:

- Standard forms and/or standard field notebooks will be used to document field activities and for data collection. The data collection forms and field notebooks will be reviewed routinely by senior staff for accuracy, completeness, and internal consistency.
- The strict adherence to detailed operating procedures as documented in the various project controlling documents and related SOPs will be enforced by experienced senior technical staff.
- Project personnel will be selected based on appropriate levels of training and experience and will receive site-specific training prior to working on-site. The site-specific training will include health and safety requirements; security requirements; briefings on overall project goals, objectives, and schedules; and, specific technical training related to their assigned tasks.
- Routine calibration will be performed on measurement systems and sampling equipment including metering systems, thermocouples, barometers, rotameters, and pitot tubes. Guidance related to equipment calibration is provided in Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods and Quality Assurance/Quality Control Procedures for Hazardous Waste Incinerators, Appendix A. The detailed specifications, acceptance criteria, and corrective action requirements are presented in Section 8.0 of this QAPP. All calibrations will be documented and the documentation maintained in the project files.
- Leak checks will be performed according to method specifications before and after sampling.
- Field QC samples for sampling train are submitted including field blanks, media blanks, reagent blanks, trip blanks, and contingency samples. The frequency of submittal for these field QC samples and other field samples are provided in Tables 5-1 and 8-2.
- Field QC samples of process samples, e.g., spiking material, are not routinely collected unless split or duplicate samples are to be provided to a third party to perform their own independent comparative analysis.
- Field audits/surveillance will be performed periodically to assess conformance to specifications. If nonconforming conditions are noted, the corrective action provisions of the QA plan will be invoked.

10.2.2 Laboratory Activities

Standard laboratory QA procedures, required of each laboratory, provide discussions related to QA/QC checks and controls within the laboratory. Specific data quality objectives, calibration requirements, acceptance criteria, and corrective action requirements for this test program are presented in Table 5-1 and Table 8-3 of this plan.

In addition to the requirements referenced above the laboratory will provide for quality control of sampling media and sample collection equipment. Sorbents used in the organic sampling trains will be prepared according to method specifications. Samples of the prepared media will be tested according to the intended method of use. The results of these tests will be retained in the laboratory's files for future reference.

10.3 PCB SPIKNG MATERIAL ANLAYSES

Actual liquid drained items expected to have very high PCB concentrations will be accumulated and retained for purposes of conducting the MRF DRE testing. Samples of the reserved PCB liquid will be taken prior to the test date and analyzed using EPA Method 1668C. This analytical method will provide speciation of all 209 congeners. This pre-test analysis will identify the total concentration of PCB. This

information can then be used to estimate the PCB liquid feed rate necessary to demonstrate 99.9999% DRE. The DRE will be calculated based on the total PCB feed and total PCB emission rates

Table 9-1 of the QAPP summarizes the expected in-stack detection limit for each of the 209 PCB congeners. Table 3-2 of the MRF test plan includes a DRE analysis using the expected in-stack detection limit. The in-stack PCB detection limit for each congener is based on the expected stack gas sampled volume of four (4) dry standard cubic meters (dscm) and the analytical detection limit for single analysis of the combined Method 23 fractions. To allow for operational and analytical variability, the PCB liquid feed rate will be based on demonstrating between 99.99995% to 99.99999% DRE, a 5X to 10X DRE target window.

Table 3-2 of the MRF test plan provides an example calculation of the potential PCB liquid feed rates necessary to effectively demonstrate 99.9999% DRE. A grab sample of the PCB liquid spike will be collected once during each test run for PCB concentration analysis by Method 1668C as noted in Table 3-1 of the MRF test plan and Tables 6-1 and 10-1 of this QAPP. This analysis method will provide the total PCB content based on full speciation of all 209 congeners. The DRE will be calculated based on the total as-fed PCB liquid sample analysis, PCB liquid feed rate, and total PCB emission rate. One duplicate analysis of the PCB liquid feed is included Table 10-1 of the QAPP to provide a measure of analytical precision.

Table 10-1. A-line TSCA Compliance Test Program Analyses

Analysis	Sample Matrix	Field Samples						Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2		Cycle 3							
		Test	Field QC	Test	Field QC	Test	Field QC						
PCB Content and Speciation	PCB Liquid	--	--	3	--	--	--	Serial Dilution	HRGC/HRMS for PCB (EPA Method 1668C)	Duplicate	One per test	1	4
Total Chlorine		3	--	--	--	--	--	Bomb or flask combustion (SW-846 Method 5/202050)	Ion chromatography of residue (SW-846 Method 9056)	Duplicate	One per test	1	4
PCB, DF, & SVOC RCl by EPA Method 0023A	Method 0023A Filter, XAD-2, Acetone & Methyelne Chloride Solvent Rinses (First Extraction)	--	--	3	1	--	--	Soxhlet Extraction	HRGC/HRMS for PCB and GC/MS Analysis for SVOC RCl	PCB isotope dilution internal standard spike	Every analysis	4	4
										PCB recovery standard spike	Every analysis	4	
										SVOC surrogate spike	Every analysis	4	4
	Method 0023A Filter, XAD-2, Toluene Solvent Rinses (Second Extraction)								HRGC/HRMS for DF	DF isotope dilution internal standard spike	Every analysis	4	4
										DF recovery standard spike	Every analysis	4	

Table 10-1. A-line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples						Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2		Cycle 3							
		Test	Field QC	Test	Field QC	Test	Field QC						
PCB, DF, & SVOC RCl by EPA Method 0023A (cont'd)	Method 0023A Impinger Liquid and Rinses	--	--	3	1	--	--	Separatory Funnel Extraction	HRGC/HRMS for PCB and GC/MS Analysis for SVOC RCl	PCB isotope dilution internal standard spike	Every analysis	Combine w/ Corresponding FH & BH Extract for Single Analysis	NA
										PCB recovery standard spike	Every analysis		
										SVOC surrogate spikes	Every analysis	Combine w/ Corresponding FH & BH Extract for Single Analysis	NA
	Method 0023A Acetone Reagent Blank	--	--	--	1	--	--	NA	HRGC/HRMS for PCB & DF, GC/MS Analysis for SVOC RCl	PCB isotope dilution internal standard spike	Every analysis	1	1
										PCB recovery standard spike	Every analysis	1	
										SVOC surrogate spike	Every analysis	1	1
										DF isotope dilution internal standard spike	Every analysis	1	1
										DF recovery standard spike	Every analysis	1	

Table 10-1. A-line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples						Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2		Cycle 3							
		Test	Field QC	Test	Field QC	Test	Field QC						
PCB, DF, & SVOC RCl by EPA Method 0023A (cont'd)	Method 0023A Methylene Chloride Reagent Blank	--	--	--	1	--	--	NA	HRGC/HRMS for PCB & DF, GC/MS Analysis for SVOC RCl	PCB isotope dilution internal standard spike	Every analysis	1	1
										PCB recovery standard spike	Every analysis	1	
										SVOC surrogate spike	Every analysis	1	1
										DF isotope dilution internal standard spike	Every analysis	1	1
										DF recovery standard spike	Every analysis	1	
	Method 0023A Toluene Reagent Blank	--	--	--	1	--	--	NA	HRGC/HRMS for DF	DF isotope dilution internal standard spike	Every analysis	1	1
										DF recovery standard spike	Every analysis	1	
	Method 0023A Spiked XAD-2 Resin Blank	--	--	--	--	--	--	Soxhlet Extraction	HRGC/HRMS for PCB, DF, & SVOC RCl	PCB isotope dilution internal standard spike	Every analysis	1	1
										PCB recovery standard spike	Every analysis	1	
										SVOC surrogate spike	Every analysis	1	1
										DF isotope dilution internal standard spike	Every analysis	1	1
										DF recovery standard spike	Every analysis	1	

Table 10-1. A-line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples						Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2		Cycle 3							
		Test	Field QC	Test	Field QC	Test	Field QC						
Particulate by Method 5/202	Method 5/202 particulate filter	--	--	--	--	3	1	Desiccate to constant mass	Method 5	Gravimetric (Method 5)	Replicate weighing to constant weight	Every sample	4
	Method 5/202 probe and filter holder acetone rinses	--	--	--	--	3	1	Evaporate/Desiccate to constant mass	Method 5	Gravimetric (Method 5)	Replicate weighing to constant weight	Every sample	4
	Method 5/202 impinger water and rinses	--	--	--	--	3	1	Extract/Evaporate/Desiccate to constant mass	Method 202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	4
	Method 5/202 impinger acetone and hexane rinses	--	--	--	--	3	1	Extract/Evaporate/Desiccate to constant mass	Method 202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	4
	Method 5/202 ambient particulate filter	--	--	--	--	3	1	Extract/Evaporate/Desiccate to constant mass	Method 202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	4
	Method 5/202 cold impinger water and rinses	--	--	--	--	3	1	Extract/Evaporate/Desiccate to constant mass	Method 202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	4

Table 10-1. A-line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples						Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2		Cycle 3							
		Test	Field QC	Test	Field QC	Test	Field QC						
Particulate by Method 5/202 (cont'd)	Method 5/202 filter reagent blank	--	--	--	--	--	1	Desiccate to constant mass	Method 5/202	Gravimetric (Method 5/202)	Replicate weighing to constant weight	Every sample	1
	Method 5/202 acetone reagent blank	--	--	--	--	--	1	Evaporate/Desiccate to constant mass	Method 5/202	Gravimetric (Method 5/202)	Replicate weighing to constant weight	Every sample	1
	Method 5/202 hexane reagent blank	--	--	--	--	--	1	Evaporate/Desiccate to constant mass	Method 5/202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	1
	Method 5/202 ambient filter reagent blank	--	--	--	--	--	1	Evaporate/Desiccate to constant mass	Method 5/202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	1
	Method 5/202 water reagent blank	--	--	--	--	--	1	Evaporate/Desiccate to constant mass	Method 5/202	Gravimetric (Method 5/202)	Replicate weighing to constant weight	Every sample	1

Table 10-1. A-line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples						Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2		Cycle 3							
		Test	Field QC	Test	Field QC	Test	Field QC						
HCl & Cl_2 by Method 26A	Method 26A H_2SO_4 Impingers	3	--	--	--	--	--	NA	Ion chromatography (EPA Method 26A)	Duplicate	Every Sample	3	8
										MS/MSD analyzed	One per batch (all samples in one batch)	2	
	Method 26A H_2SO_4 reagent blank	--	1	--	--	--	--	NA	Ion chromatography (EPA Method 26A)	Reagent Blank	One per test	1	1
	Method 26A NaOH impingers	3	--	--	--	--	--	NA	Ion chromatography (EPA Method 26A)	Duplicate	Every Sample	3	8
										MS/MSD analyzed	One per batch (all samples in one batch)	2	
	Method 26A NaOH Reagent Blank	--	1	--	--	--	--	NA	Ion chromatography (EPA Method 26A)	Reagent Blank	One per test	1	1
	Method 26A Deionized Water Reagent Blank	--	1	--	--	--	--	NA	Ion chromatography (EPA Method 26A)	Reagent Blank	One per test	1	1

Table 10-1. A-line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples						Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2		Cycle 3							
		Test	Field QC	Test	Field QC	Test	Field QC						
HCl & Cl2 by Method 26A (cont'd)	Analytical System QC	NA	NA	NA	NA	NA	NA	NA	Ion chromatography (EPA Method 26A)	LCS/LCSD	One per batch following initial calibration (separate calibration for each matrix)	2	2
										Method Blank	One per batch/ matrix specific - analyzed in duplicate	2	2
Method 0030 VOST for Volatile RCI	VOST stack sample tube pairs	--	--	--	12	--	--	NA (Note: Only 3 of the 4 tube pairs from each test run will be analyzed; the fourth pair is a back-up in case of tube breakage.	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260C); Each tube in each tube pair is analyzed separately.	Surrogate spikes[c]	Every sample	18	18
	VOST Condensate	--	--	--	3	--	--	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260C)	Surrogate spikes[c]	Every analysis [c]	3	3

Table 10-1. A-line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples						Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2		Cycle 3							
		Test	Field QC	Test	Field QC	Test	Field QC						
Method 0030 VOST for Volatile RCI (cont'd)	VOST field blank tube pairs	--	--	--	1	--	--	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260C); Tube pair is analyzed as a single sample.	Surrogate spikes[c]	Every analysis [c]	1	1
	VOST trip blank tube pairs	--	--	--	1	--	--	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260D); Tube pair is analyzed as a single sample.	Surrogate spikes[c]	Every analysis [c]	1	1
	VOST Cond. Trip Blanks	--	--	--	1	--	--	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260D)	Surrogate spikes[c]	Every analysis [c]	1	1
	Spiked resin blank tube pairs	--	--	--	--	--	--	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260D); Tube pair is analyzed as a single sample.	Surrogate spikes[c]	Every analysis [c]	2	2
	Analytical system QC	NA	NA	NA	NA	NA	NA	NA	Purge and trap, GC/MS (SW-846 Method 8260D)	LCS	1 per condensate batch	2 or more	2
										Method blank	1 per analytical run	2 or more	2
TOTAL													**116**

11.0 DATA REDUCTION, DATA VALIDATION, AND DATA REPORTING

11.1 DATA REDUCTION

This section of the QAPP describes the approach that will be used to report, review, and reduce the field and laboratory data. The raw data include field samples and sampling documentation, sample tracking documentation, laboratory preparation documentation, and raw analytical data. The analytical results from the laboratory are assembled into complete analytical data packages. The analytical data packages include the analytical results and their defensible backup data. The analytical data are evaluated for compliance with the project DQOs. Data determined to meet the analytical requirements will be used to calculate the unit performance and emissions.

11.2 ORGANIC ANALYSES

Organic analyses will be conducted using gas chromatography (GC) techniques. Although the principles of operation and specific methods of calibration differ according to the analyte specific methods, the general data reduction scheme is the same for all of these tests. The individual methods should be consulted for details. A summary of the data reduction scheme is presented below.

Depending on the specific method, analytical instrumentation is calibrated using 3 to 5 points covering the expected analytical range. The gas chromatograph/flame ionization detector (GC/FID) or gas chromatograph/electron capture detector (GC/ECD) methods generally employ an external standard calibration technique while the GC/MS methods employ an internal standard technique. For GC/FID and GC/ECD methods, a calibration factor (CF) is calculated using the following formula:

$$CF = \frac{R}{M}$$

Where: CF = Calibration Factor

R = Response or Area of the GC Peak

M = Mass Injected (in nanograms)

The calibration factors must agree to within method specified criteria for the percent relative standard deviation (%RSD). The formula for %RSD is given below.

$$\%\,\mathrm{RSD} = \frac{\sigma}{\mathrm{avg\,CF}} \times 100$$

Where: $\%RSD$ = Percent Relative Standard Deviation

σ = Standard Deviation of the Calibration Factors

$avg\ CF$ = Average Calibration Factor

For gas chromatograph/mass spectral (GC/MS) calibrations, a response factor (RF) is used rather than the CF. The formula for the RF is:

$$RF = \frac{(A_s \times C_{is})}{(A_{is} \times C_s)}$$

Where: RF = Response Factor

A_s = Response for the Analyte

A_{is} = Response for the Internal Standard

C_s = Concentration of the Analyte

C_{is} = Concentration of the Internal Standard

The RFs must also pass a test of the %RSD in order for the calibration to be considered valid.

When samples are analyzed, the area of the peak produced by a given analyte is compared to the CF or RF to arrive at an analytical result according to the following formula:

$$M_x = A_x \times CF$$

Where: M_x = The Mass of Analyte in the Sample

A_x = The Response of the Analyte in the Sample

CF = The Calibration (or Response) Factor

Samples containing a concentration of an analyte exceeding the concentration the instrument is calibrated for, will have a serial dilution performed, if such a dilution is practical given the sample preparation method, to bring the concentration within the calibrated range of the instrument. Such dilutions will be documented in the analytical data report and preparation logs. In that case M_x is multiplied by the dilution factor to arrive at the final result. If, under the circumstances of the method, a dilution is not possible (sample is completely consumed in original analysis), the original analytical result must be considered estimated.

To arrive at a concentration in the gas sample the mass of any sub-samples must be added together and then compared to the volume of gas sampled according to the following formula:

$$C_x = \frac{(M_1 + M_2 + ...M_n)}{V}$$

Where: C_x = The Concentration of the Analyte in the Gas Sample

M_n = The Result (Mass) for Each Component in the Sampling Train

V = The Volume of Gas Sampled

11.3 ION CHROMATOGRAPHY

Anions, such as chloride, are separated on the ion chromatograph using a system comprising separator columns, guard columns, and eluents. The system is calibrated using a minimum of 3 points and the calibration is verified with a mid-range standard. Samples are quantitated in the same manner as described above.

11.4 DIRECT READING INSTRUMENTS

Gravimetric, temperature, pressure, flow, and CEMS data are directly read from the measurement instrumentation. The instrumentation will be calibration checked prior to the test, and routinely prior to reading measurements, however, no data reduction beyond formatting into tables is expected

11.5 ANALYTICAL DATA PACKAGES

Analytical data packages will be organized in accordance with the laboratory standard operating procedures. The complete analytical data package is a stand-alone deliverable that includes the final analysis results, raw analytical instrument data, initial and continuing calibration data, parameter-specific quality control documentation, sample preparation documentation, and records of sample traceability. These data are sufficient for performing independent verification of the final analytical results. Every analytical data package includes the following:

- Cover Page—Identifies the laboratory-assigned lot number, project identification, laboratory project manager, and issue date.
- Table of Contents—Organization of the data package.
- Sample Summary—Cross reference to project sample identifications and laboratory sample identifications.
- Analytical/Preparation Methods Summary—Identifies the methods used to prepare and analyze the samples.
- Narrative— Summarizes the project-specific information and any pertinent information concerning data quality. The narrative documents sample delivery and condition upon receipt, and any analytical difficulties or anomalies encountered during sample preparation and analysis.

- QC Data Association Summary—Comparison of sample results to the project and laboratory DOQs and association of project samples to laboratory QC.

- Analytical Data Report—Summarized analytical data for all samples and associated quality assurance samples including as appropriate: data flags, duplicate analysis results, surrogate recovery results, method blank results, laboratory control sample results, and matrix spike/matrix spike duplicate/post digestion spike (MS/MSD/PDS) results.

- Chain-of-custody (COC) documentation

Each analytical data package will include the identification and signature or initials of each analyst who handles the test samples. The Laboratory Project Manager will certify via signature the contents of each analytical data package. Analytical data packages will be transmitted in Acrobat® PDF format. Acrobat® PDF files will be transmitted to A-Line and its testing consultants using Eurofins' secure file transfer protocol (FTP) portal website.

11.5.1 Organic Analyses

The organic analytical data packages will include the following:

- Sample Results
- Raw Sample Data
  - Sample Data
  - Tentatively Identified Compound Data for VOC or SVOC RCl by GC/MS
- • Standards Data
  - Initial Calibration Summary(s) and Raw Data
  - Continuing Calibration Summary(s) and Raw Data
  - Initial Calibration(s) Tuning Raw Data (GC/MS only)
  - Continuing Calibration(s) Tuning Raw Data (GC/MS only)
- Raw QC Data
  - Method Blank Data
  - Tentatively Identified Compound Data for VOC or SVOC RCl by GC/MS
  - MS/MSD Data and Evaluation Reports
  - Laboratory Control Standard Data and Evaluation Reports
- Miscellaneous data
  - Sample Data Review Checklist
  - Calibration Data Review Checklists
  - Run Logs
  - Extraction sheets.
  - Sample Results
- Example Calculations

11.5.2 Non-Metal Inorganic Analyses

The data packages for other inorganic analyses will include the following:

- Sample Results

- QC Summary
  - Method Blank Report
  - Sample Duplicate report
  - MS/MSD Data and Evaluation Report(s)
  - Laboratory Control Sample Data and Evaluation Report
- • Raw Data
  - Data Review Checklist
  - Sample, Standards, and Quality Control Data
  - Distillation, Extraction, and Sample Preparation Sheets
  - Standards Preparation Logs
  - Run Logs

11.6 DATA REPORTING

11.6.1 Project Reporting Format

The outlines for the final test reports are presented in Figures 11-1 and 11-2.

11.6.2 Detection Limit Definitions

The detection limit for each project target analyte will be derived according to the referenced analytical method and the laboratory's standard operating procedures. The laboratory will provide detection limits for each analyte. There are a number of types of detection limits associated non-isotope dilution analytical methods. The U.S. EPA Office of Solid Waste (OSW) in the "Human Health Risk Assessment Protocol" (RA Protocol) published in July 1998 defines the following detection limits:

> *Instrument Detection Limit (IDL)-the smallest signal above background that an instrument can reliably detect, but not quantify. Also, commonly described as a function of the signal-to-noise (S/N) ratio.*

> *Method Detection Limit (MDL)-the minimum concentration of a substance that can be measured (via non-isotope dilution methods) and reported with 99 percent confidence that the analyte concentration is greater than zero, and is determined from analysis of a sample in a specific matrix type containing the analyte. The MDL is considered the lowest level at which a compound can be reliably detected. The MDL is based on statistical analyses of laboratory data. In practice, the MDLs are determined on analytical reagents (e.g., water) and not on the matrix of concern. MDLs for a given method, are laboratory and compound specific. The determine the MDL as specified in 40 CFR Part 136, Appendix A, at least seven replicate samples with a concentration of the compound of interest near the estimated MDL are analyzed. The standard deviation among these analyses is calculated and multiplied by 3.14. The result of the calculation becomes the MDL. The factor of 3.14 is based on a t-test with six degrees of freedom and provides a 99 percent confidence that the analyte can be detected at this concentration.*

Reliable Detection Limit (RDL)-the detection level recommended by the National Environmental Research Laboratory in Cincinnati, Ohio. The RDL is defined as 2.63 times the MDL. The RDL is a total of eight (8) standard deviations above the MDL development test data (3.14 times 2.63).

Reporting Limit (RL)-the laboratory determined detection, normally the lowest calibration standard.

The risk assessment protocol recommends that non-isotope dilution methods quantify non-detects using the method MDL and the derived RDL.

Component 2 of the EPA Region 6 Hazardous Waste Combustion Unit Permitting Manual uses the term sample quantitation limit (SQL). The SQL is the matrix-specific MDL. The SQL may be equal to the laboratory-specific MDL or some factor greater than (e.g., 5X-10X) the laboratory-specific MDL that takes into consideration matrix specific interferences or sample serial dilutions.

Isotope dilution methods quantify non-detects using estimated detection limits (EDLs) as defined in SW-846 Method 8290A. The EDL is defined as follows:

EDL (from SW-846 Method 8290A) -*"The sample specific estimated concentration of a given analyte required to produce a signal with a peak height of 2.5 times the background signal level."*

The laboratory will provide the MDL or SQL for each non-isotope dilution analyte on the analytical certificate. The laboratory will maintain documentation and validation for the reported MDL. If matrix interference(s) occurs or serial dilutions are necessary, the sample specific MDL (SQL) will be reported. If a sample specific MDL (SQL) is applicable, the analytical data package shall include the documentation of the serial dilutions or other measures taken to determine the detection limit. EDLs are sample-specific and analyte-specific, and will be provided on the analytical certificate for each sample and each analyte.

11.6.3 Detection Limits and Data Reduction

Analytical results for all analyses that are reported as "not-detect" in compliance demonstration samples will be handled in the following manner. The analytical result will be reported as "non-detect" and the appropriate detection limit as discussed above will be shown. In subsequent calculations, the following rules will apply for data reporting and performance demonstrations:

- For analyses of single component samples (e.g., feed or residue samples) that are reported as non-detect, the values will be accompanied by a "less than" ("<") and/or a data flag that denotes a non-detect result was obtained. .

- For analyses of single component samples (e.g., feed or residue samples) that are reported as non-detect, any subsequent calculations using detection limit values will be accompanied by a "less than" ("<") sign.
- For analyses of multi-component samples (e.g., VOST), where multiple analytical results must be combined or summed for use in subsequent calculations and the calculations involve the use of one or more non-detect values in combination with one or more detectable values, the final calculated values shall also include "<".
- For analyses of multi-component samples where all of the multiple analytical results are non-detect values, the final calculated values shall include a data flag such as "ND" or "U" with the "<" to indicate that the target analyte was non-detect in all of the relevant sample fractions.
- Where destruction and removal efficiency (DRE), system removal efficiency (SRE), or similar performance measurements are calculated using emissions rates reported with "<" or non-detect flagged values, the resulting performance measurement will be accompanied by a "greater than" (">") sign.

In accordance with 40 CFR 63.1208(b)(1)(iii), by operating the Method 23 sampling train a minimum of 180 minute (3 hours) to sample a minimum of 2.5 dry standard cubic meters of stack gas during each sampling run, any dioxin/furan congener that is non-detect is allowed to be counted as zero in determining compliance. For this test program, a sampling time of 240 minutes is planned to a sample volume of 4.0 dry standard cubic meters is targeted. For the analyses of the Method 23 samples, if a fraction is non-detect for a specific dioxin/furan congener, the specific congener's EDL will be reported. For calculating total dioxin/furan emissions, the EDL value will be used for non-detect results. In calculating 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (TCDD) toxicity equivalent (TEQ) emissions, any 2,3,7,8-chlorinated dioxin/furan congener that is non-detect will be counted as zero.

For calculating PCB emissions, the MDL value will be used for non-detect results.

For calculating VOC and SVOC RCl, HCl, and Cl_2 emissions, the MDL value will be used for non-detect results.

For calculating particulate matter emissions, 0.5 mg will be used for non-detect results.

11.6.4 Other Quality Control Data Reporting

The following quality assurance measures will be discussed in the analytical data validation report prepared by the Quality Assurance Officer:

- Sample holding times
- Sample surrogate recovery results
- Duplicate results
- MS/MSD results
- Blank train results
- Reagent blank results (if analyzed)
- Trip and field blank results
- RPD and RSD evaluations of accuracy or precision

These data will be evaluated against the target DQOs. Any data that fall outside of the DQO limits will be flagged, footnoted, and assessed relative to the performance and emissions testing objectives. The data from the field blanks and trip blanks will be used to assess possible contamination from field handling and transport of the samples to the laboratory. The reagent blank and blank train results will be used to assess contamination resulting from reagents used, sample handling, and sample recovery procedures. Any blank results that may have impacted performance and emissions testing results or evaluations will be flagged, footnoted, and discussed in the test report and analytical data validation report.

11.6.5 Final Case Files

At a minimum, the following documents will be retained as part of the facility operating upon the completion of the project. These files will be maintained at the A-Line facility for a period of at least five (5) years or until the next compliance test is completed, whichever occurs later:

- All legal documents and orders,
- All field documents including those used for preliminary field activities,
- Copies of all analytical data,
- Copies of the final report and background documents, and
- All correspondence relating to the project as well as corrective action requests.

The test report will be maintained on-site in hard copy form and electronically (Acrobat® PDF format on computer hard drive and/or flash drive). Supporting documentation (test report appendices such as the stack sampling report, PCB spiking report, analytical data packages, etc.) will be maintained on-site electronically (PDF format on computer hard drive and/or flash drive). Final versions of the test report and supporting documentation (stack sampling report, PCB spiking report, analytical data packages, etc.) will be maintained electronically by A-Line in a files system that is not connected to the internet. Files maintained there can only be accessed by A-Line personnel.

Figure 11-1. Example MRF Test Report Outline

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12.0 ROUTINE MAINTENANCE PROCEDURES AND SCHEDULES

12.1 SAMPLING EQUIPMENT

All equipment used in emission testing measuring systems must be maintained in good operating order. To achieve this objective, a routine preventive maintenance program is necessary. Procedures used in this program follow those outlined in Maintenance Calibration and Operation of Isokinetic Source Sampling Equipment, Publication No. APTD-05-76 and Volume III of the Quality Assurance Handbook for Air Pollution Measurement Systems.

The potential impact of equipment malfunction on data completeness is minimized through two complementary approaches. First, an equipment maintenance program is part of routine operations. The maintenance program's strengths include:

- Trained technicians experienced in the details of equipment maintenance and fabrication,
- Adequate spare parts inventory, and
- The availability of tools and specialized equipment.

The second approach is based upon equipment redundancy. Backup equipment, spare parts and tools are included on the materials transported to the field for each sampling task. This approach allows the sampling team to respond to equipment breakage or malfunction in a timely fashion, minimizing the quantity of lost data.

For field equipment, preventive maintenance schedules are based on the results of routine inspections and on accumulated experience. At a minimum, equipment will be inspected prior to the beginning of and at the conclusion of each test. A record of each inspection (Figure 12-1) will be kept as part of the final case file. Maintenance schedules for continuous emissions monitors follow manufacturer's recommendations.

Each item of field test equipment is assigned a unique, permanent identification number. An effective preventive maintenance program is necessary to ensure data quality. Each item of equipment returning from the field is inspected before it is returned to storage. During the course of these inspections, items are cleaned, repaired, reconditioned and recalibrated where necessary. Each item of equipment transported to the field for this test program is inspected again before being packed to detect equipment problems that may originate during periods of storage. This minimizes lost time on the job site due to equipment failure. Occasional equipment failure in the field is unavoidable despite the most rigorous inspection and maintenance procedures. For this reason, adequate spare parts are kept in a central location so the sampling contractor can quickly respond to the job site with replacement equipment for all critical sampling train components.

12.2 LABORATORY INSTRUMENTS

The laboratories perform regular maintenance on all analytical instruments. An inventory of replacement parts is kept to prevent downtime. Manufacturers' service representatives are also contracted, as required, for major instrument repairs.

Preventive and routine maintenance is covered in each of the laboratories' QA Manuals and SOPs or in accordance with manufacturer's recommendations (i.e., instrument manuals). Daily maintenance (such as replacement of injector septa, etc.) is covered in instrument SOPs. Inoperative equipment is tagged as non-usable until repairs are performed. Logbooks are maintained for each instrument to record usage, maintenance, and repairs.

12.3 PROCESS INSTRUMENTS

On-site personnel perform regular maintenance on all process instrumentation. Routine and preventive maintenance programs are used. Where appropriate, manufacturers' recommendations for maintenance of process instruments are followed. Operators conduct daily reviews of process instrumentation by noting suspicious or inconsistent readings. Maintenance logs are used to record the frequency and type of repairs necessary for process instruments. Process instruments used to demonstrate compliance with operating limits will be calibrated prior to the test. Records of these calibrations will be included in the final test report.

Equipment Inspection Record

A-Line T.D.S., Inc., Tonkawa, OK

Date/Time of inspection: _____

Equipment Inspected:

1) _____

Condition: Good See Problems Section Below

2) _____

Condition: Good See Problems Section Below

3) _____

Condition: Good See Problems Section Below

4) _____

Condition: Good See Problems Section Below

5) _____

Condition: Good See Problems Section Below

Problems Noted:

_____

_____

_____

_____

Action Taken

_____

_____

_____

Inspector's Signature_____

Figure 12-1. Example Equipment Inspection Record Form

13.0 ASSESSMENT PROCEDURES FOR ACCURACY, PRECISION, & COMPLETENESS

The QA activities implemented in this study will provide a basis for assessing the accuracy and precision of the analytical measurements. Section 5.0 discusses the QA activities that will generate the accuracy and precision data for each sample type. The generalized forms of the equations that will be used to calculate accuracy and precision are presented below.

13.1 ACCURACY

When a reference standard material is used in the analysis, percent Accuracy (A) will be calculated as follows:

$$A = \frac{\text{Found concentration}}{\text{True concentration}} \times 100$$

Percent analyte Recovery (R) will be calculated as follows:

$$R = \frac{X - N}{S} \times 100$$

Where X is the experimentally determined value, N is the amount of native material in the sample, and S is the amount of spiked material of the species being measured. Recoveries are used to determine accuracy when standards are not available, or are not appropriate for a given matrix.

13.2 PRECISION

When less than three analyses of the same parameter are available, precision will be calculated as a Relative Percent Difference (RPD) from the average of replicate measurements according to:

$$\text{RPD} = \frac{(X_1 - X_2)}{\text{Average } X} \times 100$$

Where X_1 and X_2 are the highest and lowest results of replicate measurements.

Where three or more analyses of the same parameter are available, the precision will be determined as the Relative Standard Deviation (RSD) according to:

$$\text{RSD} = \frac{\text{Standard deviation}}{\text{Average X}} \times 100$$

13.3 COMPLETENESS

Completeness of data generated from a test program is usually calculated as follows:

$$\%\,\text{Completeness} = \frac{\text{Valid data}}{\text{Expected data}} \times 100$$

Data completeness is defined in Section 5.0 of this QAPP as the percentage of valid data collected from the total number of valid tests conducted. Three valid test runs, at each test condition, are required for the test to be completed. If an individual sample from a test run is lost or broken, the data for that individual analytical parameter may not be 100% complete. This, however, may not invalidate the test run. The completeness objective for this test program is to generate sufficient data for the regulatory agencies to judge the performance of the system.

14.0 AUDIT PROCEDURES, CORRECTIVE ACTION, AND QA REPORTING

14.1 PERFORMANCE AND SYSTEM AUDITS

This section presents information related to the procedures used by the QA staff to assess conformance of the project staff to the specifications contained in the relevant project controlling documents. Further, auditing may be employed to assess the ability of subcontractors to successfully perform the work.

14.1.1 Field Surveillance

The Test Coordinator assigned to the project will actively evaluate the operations at the site during testing to ensure that work is being performed in accordance with the various project controlling documents and associated standard operating procedures. Checklists appropriate to the activities may be used. The field surveillance will cover, but is not necessarily be limited to, such areas as:

- Conformance to SOPs
- Completeness and accuracy of documentation
- Chain of custody procedures
- Compliance with Health and Safety requirements.

The Test Coordinator will be present on-site for the testing. The Test Coordinator is there to observe and provide overall direction of testing and sampling activities. Review includes unit operations, sampling train preparation, process and emissions sampling activities, process and emissions sample recovery, and recovered sample management.

14.1.2 Performance Evaluations (Analytical Audits)

At the time of this test plan publication, EPA's Stationary Source Audit Sample Program (SSASP) is suspended. From EPA's website:

https://www.epa.gov/emc/emc-technical-support#audit

"*List of Accredited Audit Sample Providers and Audit Samples*

The general provisions to 40 CFR Parts 60 and 63 (see §60.8(g)(1) and §63.7(c)(2)(iii)(A)) require that the owner or operator obtain audit samples if the audit samples are "commercially available" and have defined "commercially available" as two or more independent accredited audit sample providers (AASP) to have blind audit samples available for purchase. Since there are no longer two providers, the requirement to obtain these audit samples is no longer in effect until such time as another independent AASP has audit samples available for purchase.

When there are two or more AASP with audit samples available for purchase, we will update this webpage with the name or names of the providers and audit sample(s)

available for purchase. At that time, this information must be listed on the EMC website for 60 days before audits are required again."

14.1.3 Laboratory Audits

The selected laboratory is audited and accredited annually under the National Environmental Laboratory Accreditation Program (NELAP). Refer to QAPP Attachment C. However, A-Line or its appointed representative may choose to audit the laboratory at any time during the course of this test project to assess the laboratory's ability to successfully perform the work and to ensure mutual agreement between A-Line and the laboratory with regard to the scope of work, QA/QC requirements, and deliverable requirements. Reasonable notice will be provided prior to any on-site inspection of the laboratory.

14.2 CORRECTIVE ACTION

The following procedures have been established to ensure that nonconforming conditions, such as malfunctions, deficiencies, deviations, and errors are promptly investigated, documented, evaluated and corrected. Every person employed in the test program is expected to function as a QC inspector to ensure the quality of the final product. Quality, as it relates to this project, is defined as "performing the work according to the agreed upon specifications contained in the Test Plan and relevant SOPs or causing the specification to be changed *in a controlled manner*." Each individual is encouraged to identify any condition adverse to the successful completion of the work or any modification to the specifications that might result in a better end product. These improvements might be framed in terms of higher quality, greater safety, greater efficiency, and/or lower cost.

14.2.1 Field

When a nonconforming condition or an opportunity for improvement is noted at the site or contractor location, the corrective action provisions of this plan will be invoked to identify the condition and recommend corrective action. Condition identification, cause, reference documents and the corrective action planned to be taken will be documented.

“Non-conformances” are identified on a case-by-case basis. Field corrections and adjustments will be made as necessary. Such field corrections or adjustment will be communicated and documented in the test report quality assurance discussion as they may impact compliance determinations or data acceptance. The laboratory report narrative will similarly address any minor variances, e.g., surrogate results outside of DQOs limits due to matrix interference. A formal “non-conformance” report will only be generated and communicated for significant changes or deviations from the test plan or QAPP that could impact compliance determinations or data acceptance.

A Corrective Action Request (CAR), as shown in Figure 14-1, should be used to identify the adverse condition or opportunity for improvement, reference document(s) and recommended corrective action(s). The CAR is directed to the Test Coordinator. The Test Coordinator affixes his signature and the date to

the corrective action block that states the cause of the condition(s) and corrective action(s) to be taken. The Test Coordinator is responsible for first notifying the regulatory agency representative of any problems or deviations from the QAPP, or the test plan identified in the CAR.

14.2.2 Laboratory

The laboratories' QA Manuals and the related SOPs, contain detailed discussions of corrective actions to be taken if established criteria fail during laboratory analysis. The laboratory has the responsibility to immediately notify the Test Coordinator when any analytical QC nonconformance occurs, so a mutually acceptable course of action can be pursued.

14.3 QA REPORT

The Test Coordinator will include in the final test report that addresses the following:

- Overview of activities and significant events related to QA/QC
- Summary of any audit results
- Review of corrective action request status
- Laboratory QA/QC reports
- Data validation results
- Summary of significant changes in procedures or QA/QC programs
- Recommendations.

The Test Coordinator will include the information in the final test report. Additionally, the QAO's analytical data validation report is included with the final test report. The analytical data validation report compares the data to the data quality objectives (DQO) delineated in the QAPP and includes assessment of the data usability. The Test Coordinator can provide formal written reports daily during testing to A-Line and any regulatory officials present.

Corrective Action Request

Number:
Date:
File Name:
Client: A-Line T.D.S., Inc., Tonkawa, OK

REQUEST

To:

You are hereby requested to take corrective actions indicated below and as otherwise determined by you (A) to resolve the noted condition and (B) to prevent it from recurring. Your written response is to be returned to the project Test Coordinator or other responsible manager by.

Condition:

Reference Documents:

Recommended Corrective Actions:

_____	_____	_____	_____	_____	_____
Originator	Date	Approval	Date	Approval	Date

RESPONSE

Cause of Condition:

Resolution:

Prevention:

Affected Documents:

Test Coordinator	Date
Responsible Party	Date
Test Coordinator Follow-up	Date

Figure 14-1. Example Corrective Action Request Form