APPENDIX 535
F-1 INDUSTRIAL FURNACE COMPREHENSIVE PERFORMANCE TEST PLAN OCCIDENTAL CHEMICAL CORPORATION EPA I.D. NO. LAD 092 681 824

PREPARED FOR:

OxyChem.

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GEISMAR, LOUISIANA 70734

November 2007
Revision 1
Focus Project No. 050703

PREPARED BY:

Focus Environmental, Inc.

ENGINEERING SOLUTIONS TO ENVIRONMENTAL PROBLEMS

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Occidental Chemical Corporation OxyChem®
A subsidiary of Occidental Petroleum Corporation

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Dr. Chuck Carr Brown
Assistant Secretary
Office of Environmental Services
Louisiana Department of Environmental Quality
P. O. Box 4313
Baton Rouge, LA 70821-4313

Re: Occidental Chemical Corporation – Geismar Plant
AI#3400, EPA ID LAD0926818
Comprehensive Performance Test (CPT) Plan

Dear Dr. Brown:

Occidental Chemical Corporation (OxyChem) is submitting three copies of the attached revision of the CPT Plan and Alternative Monitoring Application based on joint draft comments from the Environmental Protection Agency (EPA) Region 6 and LDEQ on the original draft submitted in May 2005. Should you have any questions or require additional information, please contact me at (225) 474-2695 or by email at Sharon_D._Caughman@oxy.com.

Sincerely,

Sharon D. Caughman

Sharon Caughman
Environmental Superintendent

Attachments

cc: Ms. Jill Martin, LDEQ

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LDEQ

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NOVEMBER 2007
Revision: 1
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List of Acronyms

acfm	actual cubic feet per minute
APC	air pollution control
ASTM	American Society for Testing and Materials
AWFCO	automatic waste feed cutoff
Btu	British thermal unit
CEM	continuous emissions monitoring
CEMS	continuous emissions monitoring system
CFR	Code of Federal Regulations
cm	centimeter
CMS	continuous monitoring system
cP	centipoises
CPT	comprehensive performance test
cSt	centistokes
CVAA or CVAAS	cold vapor atomic absorption spectrometry
DCBP	decachlorobiphenyl
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
FID	flame ionization detector
FRP	fiber reinforced plastic
ft	foot
g	gram
g/cc	grams per cubic centimeter
GC	gas chromatography
GC/MS	gas chromatograph/mass spectrometry
GFAAS	graphite furnace atomic absorption spectrometry
gpm	gallons per minute
gr	grain
HAP	hazardous air pollutant
HC or THC	total hydrocarbons
HCB	hexachlorobenzene
HCC	HydroChloroCarbon
hr	hour
HON	Hazardous Organic NESHAP
HRGC/HRMS	high resolution gas chromatography/high resolution mass spectrometry
HWC	hazardous waste combustor
ICP or ICAP	inductively coupled argon plasma spectroscopy
ICP-MS or ICAP-MS	Inductively coupled argon plasma spectroscopy/mass spectroscopy
in	inch
inwc	inches water column
kg	kilogram
l	liter
lb	pound
LDEQ	Louisiana Department of Environmental Quality
LELAP	Louisiana Environmental Laboratory Accreditation Program
LVM	low volatility metals
MACT	Maximum Achievable Control Technology
mg	milligram
ml	milliliter

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MM Btu/hr	million British thermal units per hour
MS	mass spectroscopy
mscfm	thousand cubic feet per minute
MSL	mean sea level
NDIR	non-dispersive infrared
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIST	National Institute for Standards and Testing
NO_X	Oxides of Nitrogen
NO_2	Nitrogen Dioxide
OTS	Office of Toxic Substances
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
pg	picogram
POHC	principal organic hazardous constituent
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
scfm	standard cubic feet per minute
sec	second
SRE	system removal efficiency
SVM	semivolatile metals
TBP	trial burn plan
TBP	TriButylPhosphate
TCDD	tetrachlorinated dibenzo-p-dioxin
TEQ	toxicity equivalents
THC or HC	total hydrocarbons
VOA	volatile organic analysis
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
5CP	1,1,1,3,3-pentachloropropane

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1.0 INTRODUCTION

1.1 GENERAL

Occidental Chemical Corporation (OxyChem) operates an industrial furnace, the F-1 Furnace, at its Geismar Plant located in Ascension Parish, Geismar, Louisiana. The F-1 Furnace is currently permitted under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA). Phase II of the Hazardous Waste Combustor (HWC) Maximum Achievable Control Technology (MACT) rule was promulgated in October 2005 at 40 CFR 63 Subpart EEE. The F-1 Furnace must comply with the HWC MACT performance standards for hydrochloric acid production furnaces (HAPFs). The HWC MACT performance standards supplant the corresponding RCRA performance standards for Hazardous Waste Burned in Boilers and Industrial Furnaces (BIF), 40 CFR 266 Subpart H. The promulgation date of HWC MACT coincided with OxyChem's RCRA permit renewal. Therefore, OxyChem submitted as part of the RCRA permit renewal application a HWC MACT comprehensive performance test (CPT) plan in lieu of a RCRA trial burn plan (TBP). This revision of the CPT plan is based on draft joint comments from the Environmental Protection Agency (EPA) Region 6 and Louisiana Department of Environmental Quality (LDEQ) on the original draft submitted in May 2005.

1.2 SYSTEM CONFIGURATION

The F-1 Furnace treats a number of chlorinated liquid hydrocarbon waste and vapor vent streams generated from manufacturing units at the Geismar Plant. The F-1 Furnace consists of a thermal oxidizer, energy recovery boiler, hydrochloric acid (HCl) recovery system, and caustic scrubber.

Liquid chlorinated hydrocarbon wastes and vapor vents are combusted in the oxidizer. Heat is removed from the resulting combustion gas by the fire-tube energy recovery boiler (B-3). The steam produced by the system's boiler is secondary benefit. The steam generation is relatively small compared to the facility's overall steam demand. However, the heat removal provided by the boiler is necessary to produce the high concentration HCl. Without the boiler, the high HCl concentration product would not be possible.

The combustion gas from the energy recovery boiler enters the HCl recovery system that includes the quenching and scrubber sections Tower T-10 and the lower two sections of Tower T-11. The recovered aqueous HCl is typically 10-25 weight percent HCl and is used in the facility's wastewater treatment system.

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Following the HCl recovery section, the caustic scrubber section of T-11 removes residual HCl and molecular chlorine (Cl_2) before the combustion gas is discharged to the atmosphere via the integrated stack. OxyChem is implementing engineering and operational modifications to the caustic scrubber section of T-11 to better comply with the HCl/Cl_2 emissions performance standards for HAPFs. The modifications are relatively minor and involve changes to the type of packing and the mechanics of water distribution within the T-11 caustic scrubber section to reduce differential pressure and improve acid gas scrubbing performance. These changes will be complete prior the start of the CPT.

1.3 APPLICABLE PERFORMANCE STANDARDS

As part of the RCRA permit renewal, OxyChem requested regulatory reclassification of the F-1 Furnace to a HAPF as defined in the proposed HWC MACT Phase II rule at 40 CFR 63.1201. This CPT plan is designed to demonstrate compliance of the F-1 Furnace with the following applicable performance standards:

- Destruction and removal efficiency (DRE) of greater than or equal to 99.99% for the selected principal organic hazardous constituent (POHC) [40 CFR 63.1218(c)(1)]
- Stack gas carbon monoxide (CO) concentration less than or equal to 100 parts per million volume (ppmv), dry basis, corrected to 7% oxygen (O_2) on an hourly rolling average basis [40 CFR 63.1218(a)(5)(i)]
- Stack gas total hydrocarbon (HC or THC) concentration less than or equal to 10 ppmv, dry basis, corrected to 7% O_2 as propane [40 CFR 63.1218(a)(5)(ii)]
- Combined emissions of hydrogen chloride (HCl) and chlorine (Cl_2) (expressed as Cl^- equivalents) are no greater than 150 ppmv, dry basis, corrected to 7% O_2, or a demonstrated system removal efficiency (SRE) of greater than 99.923% [40 CFR 63.1218(a)(6)(i) or (ii)].

Compliance with the HWC MACT HCl/Cl_2 emission performance standard is a surrogate for particulate matter (PM) and metals compliance [40 CFR 63.1218(a)(2), (3), (4) and (7)]. Compliance with either the HWC MACT CO or THC emission performance standard is a surrogate for dioxin/furan compliance [40 CFR 63.1218(a)(1)].

1.4 TEST OPERATING AND SAMPLING PROTOCOLS

The following test protocol consisting of two test conditions is proposed for the F-1 Furnace:

- Test 1, Minimum Combustion Temperature DRE Test: The F-1 Furnace will be operated at conditions of minimum combustion temperature and maximum combustion gas velocity. This test will demonstrate compliance with the HWC MACT performance standards for DRE, CO, and THC, while feeding hazardous waste and operating at minimum combustion temperature. Process vents routinely treated in the F-1 Furnace will be flowing to the unit during Test 1. This test will establish the minimum combustion temperature limit for the F-1 Furnace.
- Test 2, Maximum Waste Feed Rate Test: The F-1 Furnace will be operated at conditions of maximum waste feed rate and maximum combustion gas velocity. Test 2 will demonstrate

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compliance with the HWC MACT performance standards for DRE, CO, and HCl/Cl2, while feeding liquid hazardous waste at maximum rates. Process vents routinely treated in the F-1 Furnace will be directed to the F-2 Furnace during Test 2 in order that the maximum liquid waste treatment capacity of the F-1 Furnace can be demonstrated. This test will establish the maximum waste feed rate and chloride feed rate limits for the F-1 Furnace.

There is no specific HWC MACT numerical performance standard for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDFs) emissions from HAPFs. However, in accordance with 63.1207(b)(3), PCDD/PDCF emissions must be measured during the initial CPT. Both tests will include measurement PCDD/PCDFs emissions. Emissions results will be reported in nanograms per dry standard cubic meter (ηg/dscm) 2,3,7,8-tetrachlorodibenzo-p-dioxin toxicity equivalents (TEQ) corrected to 7% oxygen [40 CFR]. The two test conditions will include the following sampling and analyses:

Test 1, Minimum Combustion Temperature DRE Condition

- Liquid waste feed for the target POHC hexachlorobenzene (HCB), heating value, density, and total chloride analyses
- Caustic scrubber purge and HCl product streams for the target POHC
- Stack gas for the target POHC HCB using a SW-846 Method 0010 sampling train
- Stack gas for PCDD/PCDFs using a SW-846 Method 0023A sampling train
- Stack gas THC concentration using a temporary CEM calibrated and operated according to the protocols in 40 CFR 60 Appendix A, Method 25A.
- Stack gas CO and O_2 concentrations by installed continuous emissions monitors (CEMs) according to the protocols in 40 CFR 60, Appendix B, Performance Specification 4B.

Test 2, Maximum Waste Feed Rate Condition (Maximum Chloride)

- Liquid waste feed for the target POHC HCB, heating value, density, and total chloride analyses
- Caustic scrubber purge and HCl product streams for the target POHC
- Stack gas for the target POHC HCB using a SW-846 Method 0010 sampling train
- Stack gas for PCDD/PCDFs using a SW-846 Method 0023A sampling train
- Stack gas for HCl and Cl_2 using a 40 CFR 60, Appendix A, Method 26A sampling train
- Stack gas THC concentration using a temporary CEM calibrated and operated according to the protocols in 40 CFR 60 Appendix A, Method 25A.
- Stack gas CO and O_2 concentrations by installed continuous emissions monitors (CEMs) according to the protocols in 40 CFR 60, Appendix B, Performance Specification 4B.

The F-1 Furnace destroys organic wastes via combustion, and controls HCl/Cl_2 emissions via wet scrubbing of the combustion gases. The CPT is designed to demonstrate the range of worst-case operation of the F-1 Furnace. During all testing, the F-1 Furnace will be operated treating "hex" waste. The "hex" waste stream was selected for the CPT for the following reasons:

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1. "Hex" contains native HCB, the target POHC, for demonstration of the 99.99% DRE for HWC MACT compliance.

2. "Hex" is the most heavily chlorinated waste stream treated by the F-1 Furnace and will therefore provide the "worst case" indication of the system's capability to control HCl/Cl_2 emissions.

3. "Hex" contains chlorine, and a high percentage of cyclic and aromatic organic constituents including poly chlorinated biphenyls (PCBs), all of which are potential precursors to PCDD/PCDF formation in combustion systems, and will therefore provide the "worst case" indication of the system's PCDD/PCDF emissions.

An additional waste stream, groundwater organic phase (Dense Non-Aqueous Phase Liquid [DNAPL]), will be co-fired with hex waste during the CPT. The DNAPL is an organic phase mixture containing high concentrations of chlorinated cyclic and aromatic constituents. This stream will add to the demonstration of the "worst case" for HCl/Cl_2 and PCDD/PCDF emissions.

1.5 APPLICABLE OPERATING LIMITS

The applicable HWC MACT operating limits are summarized in Table 1-1. The CPT operating data will be used to establish the following operating limits:

- Maximum hazardous waste feed rate [40 CFR 63.1209(j)(3), (k)(4)]
- Minimum combustion temperature [40 CFR 63.1209(j)(1), (k)(2)]
- Maximum combustion gas flow rate [40 CFR 63.1209(j)(2), (k)(3), (o)(2)]
- Maximum chloride feed rate [40 CFR 63.1209(o)(1)]
- Minimum scrubber liquid to gas ratio (L/G) [40 CFR 63.1209(o)(2)]
- Minimum scrubber water pH [40 CFR 63.1209(o)(3)(iv)].

Other operating limits will be established based on values specified in the HWC MACT regulations, e.g., the maximum stack CO concentration, or manufacturer's recommendations, operational safety, and good operating practice considerations, e.g., minimum steam pressure for liquid waste feed atomization.

1.6 RISK ASSESSMENT EMISSIONS DATA COLLECTION

EPA and LDEQ comments on the May 2005 version of the CPT plan require adding risk assessment emissions data collection to the test program. These data are being collected under RCRA Omnibus Authority, 40 CFR 270.32(b)(2)-(3). Portions of these emissions data will be integrated into the two-test condition CPT program previously described for measuring HWC MACT performance. Risk assessment emissions data collection will include a third test condition (Test 3) to collect the full compliment of data normally required for such programs. This risk assessment emissions data collection, and its overlaps with the HWC MACT test program, are summarized in Table 1-2 and described in a separate test plan included as Appendix B.

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1.7 TEST PLAN ORGANIZATION

This test plan is prepared in a chapter format that includes HWC MACT regulatory citations where appropriate. The major sections of the test plan are as follows:

- Section 1.0 - Introduction
- Section 2.0 - Engineering Description
- Section 3.0 - Feedstream Description
- Section 4.0 - Test Design and Protocol
- Section 5.0 - Sampling, Analysis, and Monitoring Procedures
- Section 6.0 - Test Schedule
- Section 7.0 - Operating Permit Objectives
- Section 8.0 - Test Reporting

1.8 DEVELOPMENT OF PERMIT LIMITS

The test results will be used to develop operating limits for the F-1 Furnace to assure its ongoing compliance with the HWC MACT emissions limits and operating standards. The HWC MACT prescriptively establishes process control limits for the combustion and air pollution control (APC) system operation at 40 CFR 63.1209 (j) through (p). For specific HWC MACT prescribed operating limits, OxyChem is submitting an Alternative Monitoring Application (AMA) in accordance with 40 CFR 63.1209(g) and 63.8(f) [MACT *General Provisions*] that proposes operating limits that will provide equivalent or better assurance of compliance with the HWC MACT performance standards. The operating limits proposed in this CPT plan are consistent with the AMA. Should resolution of the final operational limits differ from those proposed in the CPT plan, OxyChem will revise the proposed limits accordingly.

1.9 REFERENCE DOCUMENTS

Reference documents that have been used in developing this test plan include the following:

- EPA, "Guidance on Setting Permit Conditions and Reporting Trial Burn Results", Volume II of the Hazardous Waste Guidance Series", EPA/625/6-89/019, January 1989.
- National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors, 40 CFR 63 Subpart EEE, October 12, 2005.
- Rules and Regulations of the State of Louisiana applicable to operators of hazardous waste incinerators [LAC 33:V.3111].
- 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).

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- 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.

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Table 1-1. F-1 Furnace HWC MACT Standards Compliance

LIMIT	REGULATORY CITATION - 63.1209	HOW ESTABLISHED	AVERAGING TIME	ASSOCIATED STANDARD						
				DRE	Dioxins/ Furans	Hg	SVM	LVM	PM	HCl/ Cl_2
LIMITS ASSOCIATED WITH THE COMBUSTION SYSTEM										
Minimum combustion temperature	(j)(1), (k)(2)	Average of test run averages	Hourly rolling average	Low DRE Temp Test	Low DRE Temp Test					
Maximum combustion gas flow rate	(j)(2), (k)(3), (o)(2)	Average of the maximum hourly rolling averages	Hourly rolling average	Low DRE Temp Test	Low DRE Temp Test	Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Low DRE Temp Test
LIMITS ASSOCIATED WITH THE FEEDSTREAMS										
Maximum hazardous waste feed rate	(j)(3), (k)(4), Preamble 9/30/99 Rule, page 52937	Maximum pumpable and maximum total as the average of the maximum rolling hour averages	Hourly rolling average	Max FR DRE Test	Max FR DRE Test					
Maximum feed rate of total chlorine and chloride	(o)(1)	Average of the average hourly rolling averages	12-hour rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Max FR DRE Test
LIMITS ASSOCIATED WITH WET SCRUBBERS										
Minimum pressure drop across low energy wet scrubbers	(o)(3)(ii)	Manufacturer's specifications	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Mfr. Spec.
Minimum liquid feed pressure to a low energy wet scrubber	(o)(3)(iii)	Manufacturer's specifications	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Mfr. Spec.
Minimum scrubber water pH	(o)(3)(iv)	Average of the test run averages	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Max FR DRE Test
Minimum liquid to gas ratio (L/G)	(o)(3)(v)	Average of the test run averages	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Max FR DRE Test

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Table 1-2. F-1 Furnace CPT and Risk Assessment Data Collection and Use

Sample	Sampling Method	Analysis Reference Method	Parameter	Test 1	Test 2	Test 3	Regulatory, Guidance or Policy Citation	HWC MACT	Risk Assess-ment
Liquid Waste Feeds	ASTM E-300-86	SW846 Method 8270C	HCB (POHC)	X	X		HCB (POHC) DRE 40 CFR 63.1218(c)(1)	X	
			SVOCs	X	X	X	RCRA Omnibus 270.32(b)(2)-(3)		X
		SW846 Method 8082	PCBs	X	X		RCRA Omnibus 270.32(b)(2)-(3); TSCA 40 CFR 761.70(a)(6)(iii)(g)		X
		SW846 Method 8260B	VOCs			X	RCRA Omnibus 270.32(b)(2)-(3)		X
		SW846 Methods 6020 & 7470	Metals			X	RCRA Omnibus 270.32(b)(2)-(3)		X
		ASTM D-240	Heating Value	X	X	X	40 CFR 63.1207(f)(1)(A),(B) and	X	
		ASTM D-891	Density	X	X	X		X	
		ASTM D-445	Viscosity (Liquid)	X	X			X	
		ASTM D-482	Ash Content	X	X	X	RCRA Omnibus 270.32(b)(2)-(3)	X	X
		ASTM D-808 or E-442; SW846 5050/9056	Total Chloride Content	X	X	X		X	X
HCl Product & Scrubber Purge	ASTM E-300-86	SW846 Method 8270C	HCB (POHC)	X	X		Fate of POHC Determination	X	
Stack Gas	SW846 Method 0023A	SW846 Method 8290	PCDD/PCDFs	X	X		40 CFR 63.1207(b)(3), 63.1218(a)(1) and RCRA Omnibus 270.32(b)(2)-(3)	X	X
		EPA Method 1668A	Total PCBs	X	X		RCRA Omnibus 270.32(b)(2)-(3)		X
	SW846 Method 0010	SW846 Methods 3542/8270C	HCB	X	X		HCB (POHC) DRE 40 CFR 63.1218(c)(1)	X	X
			SVOC PICs	X	X		RCRA Omnibus 270.32(b)(2)-(3)		X
	SW846 Method 0030	SW846 Methods 5041A/8260B	VOC PICs	X	X		RCRA Omnibus 270.32(b)(2)-(3)		X

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Table 1-2. F-1 Furnace CPT and Risk Assessment Data Collection and Use

Sample	Sampling Method	Analysis Reference Method	Parameter	Test 1	Test 2	Test 3	Regulatory, Guidance or Policy Citation	HWC MACT	Risk Assess-ment
Stack Gas (continued)	EPA Method 26A	EPA Method 5	Particulate		X		RCRA Omnibus 270.32(b)(2)-(3)		X
		EPA Method 26A	HCl/Cl_2		X		40 CFR 63.1218(a)(6), 63.1218(a)(1) & RCRA Omnibus 270.32(b)(2)-(3)	X	X
	EPA Method 5	Scanning Electron Microscope (SEM)	Particle Size Distribution (PSD)			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	EPA Method 29	EPA Method 29; SW846 Methods 6020 & 7470	Metals			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	SW846 Method 0061	SW846 Method 7199	Hexavalent Chromium			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	SW-846 Method 0010	TCO/GRAV	Total Semivolatile and Nonvolatile PICs			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	SW-846 Method 0040	Gas Chromatograp hy	Volatile PICs (C_1 through C_7)			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	Installed CEMS	40 CFR 60, Appendix B, Specification 4B	Carbon Monoxide	X	X	X	40 CFR 63.1218(a)(5)(i) and RCRA Omnibus 270.32(b)(2)-(3)	X	X
			Oxygen	X	X	X	40 CFR 63.1218(a)(5)(i), (ii) and RCRA Omnibus 270.32(b)(2)-(3)	X	X
	Temporary CEMS	40 CFR 60, Appendix A, Method 25A	Hydrocarbons	X	X		HC Compliance 40 CFR 63.1218(a)(5)(ii)	X	

Note: For Test 3 details, refer to the Risk Burn Data Collection Plan.

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2.0 ENGINEERING DESCRIPTION [40 CFR 63.1207(f)(iii)]

2.1 GENERAL

Figure 2-1 provides a schematic of the F-1 Furnace system. The F-1 Furnace consists of a thermal oxidizer, energy recovery boiler, quench tower, and scrubbing tower. The F-1 Furnace is used to treat liquid chlorinated hydrocarbon waste and vapor vent streams generated from manufacturing units at the Geismar Plant. HCl is recovered from the combustion gas and is used in the facility's wastewater treatment system. The F-1 Furnace configuration is described in the following sections.

2.2 COMBUSTOR MANUFACTURER'S NAME AND MODEL NUMBER [40 CFR 63.1207(f)(1)(iii)(A)]

The F-1 Furnace was custom designed by John Zink Company and as such has no model number. System components were designed and supplied by various manufacturers.

2.3 COMBUSTOR TYPE [40 CFR 1207(f)(1)(iii)(B)]

The F-1 Furnace system is designed to oxidize liquid wastes and vapor vents. Most of the liquid wastes treated are capable of supporting autogeneous combustion. Vapor vents are generated by chemical production and loading operations on both a continuous and an intermittent basis, and are composed mostly of air and/or nitrogen and trace amounts of volatile organics.

2.3.1 Combustion Zone

The combustion zone is constructed of carbon steel lined with firebrick. All interconnections between the F-1 Furnace components, the waste feed lines, auxiliary fuel lines, vent lines, and other connections to the F-1 Furnace system are via bolted flange connectors and welded piping. Therefore, all sections of the furnace, including the burner plenum, thermal oxidizer, and primary cooler (energy recovery boiler), are completely sealed to preclude fugitive emissions. The dimensions of the combustion zone are 9 feet-8 inches internal diameter x 19 feet-2 inches long. The resulting cross-sectional area is 73.4 ft^2. The total volume of the combustion zone is 1,410 ft^3.

2.3.2 Energy Recovery Boiler

The energy recovery boiler (primary cooler) is a fire tube, shell-and-tube type boiler constructed of carbon steel with refractory on the inlet channels and tube sheets. The boiler dimensions are 4 feet-8 inches outside diameter x 24 feet-6 inches overall length containing 168 tubes, 2-inch diameter x 21 feet long. The net heat transfer area of the boiler cooler is 1,845 ft^2. The boiler is operated to produce 250 psig saturated steam.

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2.4 MAXIMUM CAPACITY [40 CFR 1207(f)(1)(iii)(C)]

The design capacity of the F-1 Furnace is approximately 15 MMBtu/hr from the combustion of wastes, vapor vents and auxiliary fuel.

2.5 FEED SYSTEM DESCRIPTION [40 CFR 1207(f)(1)(iii)(D)]

2.5.1 Auxiliary Fuel Burners

F-1 Furnace is equipped with two John Zink combination fuel gas and liquid burners designed for force draft operation. The burners use natural gas to maintain combustion temperature. The burners are equipped with electric ignition gas pilots, flame scanner ports, burner plenums, and refractory tiles. Each burner is rated at 7.5 MMBtu/hr.

2.5.2 Liquid Waste Feed

The liquid waste is pumped from storage tanks and is introduced into the combustion zone through the burners via steam atomized nozzles. Flow meters on the liquid waste lines measure the liquid waste feed rates.

2.5.3 Vapor Vents

Vapor vents are delivered to the F-1 Furnace via header systems. The vapor vents are primarily air and/or nitrogen containing organic vapors generated from chemical production and chemical loading operations. The organic vapors include the same organic constituents found in the liquid wastes. The process vapor vents are introduced into the combustion zone through the burners. The loading rack vapor vents are introduced into the inlet side of the combustion air blower and then through the burners.

2.5.4 Combustion Air

The F-1 Furnace is a forced draft (positive pressure) system. Air for combustion of auxiliary fuel, liquid waste feed and vapor vent feed is provided via the combustion air blower. The combustion air blower is the combustion gas prime mover. Combustion air is pushed by the combustion air blower through the burners, into the combustion zone. The forced draft pushes the combustion gas through the energy recovery zone, the HCl recovery system, the caustic scrubber, and out the stack. The combustion air blower has a designed capacity of approximately 4,100 standard cubic feet per minute (scfm) at 70 inches water column (inwc) static pressure.

2.5.5 Feed System Capacity [40 CFR 1207(F)(1)(III)(E)]

The design waste liquid feed capacity of either F-1 Furnace is approximately 3,743 lb/hr (1,872 lb/hr per gun X 2 guns).

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The vapor vent feeds continuously vary in flow rates and compositions. The portion of the F-1 Furnace capacity utilized in treating vapor vents varies based on the vapor vent flow rates and fraction of combustibles. To treat the vapor vent feeds, the F-1 Furnace is normally operated with a base load of liquid wastes at feed rates less than the maximum liquid feed capacity and with high excess air. The lower waste firing rate and high excess air provide a thermal *"freeboard"* to allow the vapor vents to be treated as delivered with no upset of the F-1 Furnace operation.

2.6 DESCRIPTION OF AWFCO SYSTEM [40 CFR 63.1207(f)(1)(iii)(F)]

The F-1 Furnace control system includes an automatic waste feed cutoff (AWFCO) system that stops the hazardous waste feed when the control system records an operating condition outside the limits necessary to comply with permit conditions.

Continuously monitored parameters that have permitted limits have two set point limits: 1) an alarm value, and 2) an AWFCO value. The alarm set points are established above or below the respective minimum or maximum permitted limits (AWFCO values).

When an alarm value is approached or reached, the control system initiates an audible alarm and a visual warning on the operator's control screen. There is no stoppage of liquid waste feed when an alarm set point is reached. An alarm set point is intended to provide the operator with sufficient warning to acknowledge the alarm and to make operational adjustments to avoid an AWFCO.

When a permitted limit is reached, the control system initiates an audible alarm, a visual warning on the operator's control screen, and an AWFCO. The operator must acknowledge the AWFCO and make operational adjustments to bring the monitored parameter within the permitted set point limit before liquid waste feed can be resumed.

During routine F-1 Furnace operations under HWC MACT, the AWFCO system will be tested weekly by the following or an equivalent method. The AWFCO system is activated by an electronic signal from the control system to verify that the control loop and physical cutoff system is working properly. Waste feeds are discontinued and auxiliary fuel is used to maintain the combustion temperature. The monitoring parameters listed in Table 2-1 are then checked for electronic operation and the associated software alarm levels are verified through documentation. Any malfunction is rectified before liquid waste feed is resumed.

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The vents treated in the F-1 Furnace are regulated under the facility Title V permit, and their treatment is subject to compliance with other MACT rule standards. These vents are not hazardous wastes per 40 CFR 261.21(a)(3). Vent flows to the F-1 Furnace may continue after an AWFCO occurs. Alternatively, the vents may be diverted to the F-2 Furnace.

2.7 HCl RECOVERY SYSTEM

Integral to the F-1 Furnace is an HCl recovery system. After the energy recovery boiler, HCl produced from the combustion of chlorinated organics is recovered from the combustion gas. The HCl recovery system includes the quench and scrubber tower (T-10) and the two water scrubber sections of the scrubbing tower (T-11). The HCl recovery system is operated to produce ~10-25% HCl.

T-10 is a packed column scrubber that uses recycled aqueous HCl to adiabatically saturate and cool the combustion gas to begin recovery of the HCl. The entire column is 6 feet inside diameter x 42 feet tall containing two packed sections. The bottom section is filled with ceramic packing. The top section is filled with Kynar packing. The bottom section is on a recycle loop. The bottom section recycle loop includes heat removal via a water-cooled heat exchanger. Weak acid from the T-11 bottoms is introduced to the top of the upper packed section to control HCl strength in the tower bottoms. The top section overflows (down flows) to the bottom section. The bottom section is operated on level control. The level controller actuates valves that control the flow rate of the recovered HCl to a storage tank.

The water scrubber includes two sections of the T-11 scrubbing tower (the two lower packed sections). These first two packed sections are filled with Kynar packing. Process water or clarified water is introduced to upper water section to maintain level in the bottom. The level controller actuates valves that control the flow rate of makeup water to the upper water section. The upper water scrubber section overflows (down flows) to the lower water scrubber section.

2.8 DESIGN, OPERATION AND MAINTENANCE OF APC SYSTEMS [40 CFR 63.1207(f)(1)(iii)(G)]

2.8.1 APC System

The T-11 scrubbing tower is operationally two devices in one column. The lower section of the T-11 scrubbing tower includes the two water scrubber sections described in the preceding section. The two water sections are the continuation of HCl recovery system. The upper section of the T-11 scrubbing tower, the caustic scrubber section, is the APC system. The combustion gas from the HCl recovery section is treated in the caustic scrubber portion of the T-11 scrubbing tower to remove residual HCl/Cl_2 remaining in the combustion gas after the HCl recovery.

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The modifications to the T-11 caustic scrubber section include replacement of the saddle-type Kynar packing with an ultra-low differential pressure Kynar Qpac® packing. Additionally, the current tray-type liquid distribution plate is replaced with a trough-style distributor. With the new packing and liquid distributor changes, the column differential pressure will be less than 1-inch water column (inwc). In the caustic scrubber section, the combustion gas is contacted with recycled, pH controlled water. The pH of the recycled water is controlled via caustic [sodium hydroxide (NaOH)] addition. The liquid level in the caustic scrubber section of the column is operated on level control. Water purged from the caustic scrubber is sent to the wastewater treatment system. Process water or clarified water is introduced to the caustic scrubber as needed to dilute salts and prevent solids precipitation.

2.8.2 Stack

The scrubbed combustion gas from the caustic scrubber exits the top of the column and is discharged through the integrated stack. The stack is 19-3/4 inches inside diameter, and its discharge is 74 feet above grade. The stack is equipped with sampling ports and a sampling platform. The F-1 Furnace stack is equipped with continuous emissions monitoring systems (CEMS) for carbon monoxide (CO) and oxygen (O_2).

2.8.3 APC System Maintenance

OxyChem maintains an extensive array of maintenance inspections, calibration, and preventive maintenance schedules. OxyChem has a preventive maintenance program and an existing system for corrective maintenance. By the HWC MACT documentation of compliance (DOC) date of October 14, 2008, OxyChem will have developed an Operation and Maintenance Plan (O&MP) for the F-1 Furnace that complies with the requirements of 40 CFR 63.1206(c)(7).

2.9 DESIGN, OPERATION AND MAINTENANCE OF STACK GAS CEMS [40 CFR 63.1207(f)(1)(iii)(H)]

The F-1 Furnace stack gas is continuously monitored for carbon monoxide (CO) and oxygen (O_2) to indicate proper operation of the combustion process using the following procedures:

- Stack gas CO by non-dispersive infrared (NDIR) analyzer [Rosemount Model 880A or equivalent] according to the protocols of 40 CFR 60, Appendix B, Specification 4B
- Stack gas O_2 by eletroconductivity fuel cell analyzer [Teledyne Model 95001-20 or equivalent] according to the protocols of 40 CFR 60, Appendix B, Specification 4B.

The CEMS are calibrated daily and are audited quarterly. Proper operation of the CEMS will be verified in accordance with the CMS Performance Evaluation Test Plan (PETP). The installed CO and O_2 CEMS will be maintained in accordance with Operation and Maintenance Plan (O&MP) prepared in accordance

with 40 CFR 63.1206(c)(7). These plans will be prepared and included in the F-1 Furnace operating record by the DOC date.

The HWC MACT requires demonstrating compliance with a hydrocarbons (HC) performance standard. HC monitoring will not be performed as part of routine F-1 Furnace operations. Compliance with the HC performance standard will be demonstrated during the DRE portion of the performance test using a temporary CEMS as allowed by 40 CFR 63.1206(b)(6). The temporary HC CEMS will be calibrated and operated in accordance with the procedures in 40 CFR 60, Appendix A, Method 25A. HC concentration will be reported as propane, corrected to 7% oxygen, dry basis.

2.10 RESIDENCE TIME DETERMINATION [40 CFR 63.1207(f)(1)(Ix)]

The F-1 Furnace combustion zone is constructed of carbon steel and lined with refractory. The energy recovery boiler is also constructed of carbon steel. The inlet channel and tube sheet of the energy recovery boiler is refractory lined.

The location of the shutoff valves for the liquid waste feed lines are immediately outside the F-1 Furnace shell. Because there is essentially no waste feed to drain from the waste feed lines into the combustion zone after waste feed cutoff, waste feed is immediately stopped when an AWFCO occurs. Hot refractory and air flow provided by the combustion air blower provides for thermal destruction of any residual liquids in the waste guns after waste feed cutoff. Even in the event of a complete plant-wide power failure when the combustion air blower is shutdown, air flow continues through the combustion zone as the combustion air blower wheel decelerates and via natural draft after the blower wheel stops. Therefore, all liquid waste that drains from between the shutoff valves and waste guns and into the combustion zone after an AWFCO will be destroyed with no release of untreated combustion gas.

The designed minimum combustion gas residence time for the F-1 Furnace is 2.5 seconds. Calculations of combustion gas residence times based on stack sampling, waste composition, waste feed rate and combustion temperature are provided in Table 2-2. These calculations confirm the design combustion residence time is at least 2.5 seconds after waste feed cutoff for the solid, liquid and gaseous materials from hazardous waste combustion, excluding residues that may adhere to the combustion and energy recovery zone surfaces.

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2.11 CONTINUOUS MONITORING SYSTEM (CMS) [40 CFR 63.8(c)(3)]

Table 2-1 lists the F-1 Furnace major process instruments. Figure 2-1 shows the general monitoring locations for temperature, pressure, flow and other measurement instruments related to the automatic waste feed cutoff (AWFCO) system.

Integral to the control system and AWFCO system is a continuous monitoring system (CMS). The CMS maintains an electronic record of the system's operation. The CMS's electronic records include three types of data: 1) one-minute average values for each continuously monitored regulatory parameter, 2) data registers for calculating and recording rolling average values for rolling average limited regulatory parameters, and 3) an alarm and AWFCO history log. The CMS's electronic data records are periodically transferred from the CMS data storage to magnetic storage media, compact disks, or 3.5-inch disks for long term record storage.

As part of the system detail design of F-1 Furnace engineering modifications to comply with HWC MACT, OxyChem may consider the use of data compression and may request to use data compression as provided in 63.1211(e). The data are electronically retrievable for regulatory inspection for any operating period. Additionally, the CMS data management system will be used to generate compliance data for periodic regulatory reporting. Proper operation of the CMS will be verified in accordance with the CMS Performance Evaluation Test Plan.

2.11.1 Continuously Monitored Parameters

The CMS calculates and records multiple, continuously monitored operating parameters. Each continuously monitored parameter is polled at least once every 15 seconds. Every minute, the latest four 15-second readings are averaged and recorded electronically as the one-minute operating value for each continuously monitored parameter.

2.11.2 Rolling Average Limited Parameters

For continuously monitored parameters with rolling average limits, the CMS calculates and records the rolling average values. The rolling average value for each rolling average limited parameter is calculated by adding the newest one-minute value to the rolling average data register, dropping the oldest one-minute value and then recalculating and recording the new rolling average using the new data set of one-minute values.

2.11.3 Alarm and AWFCO History

The CMS is an integral portion of the control system. The control system compares the values calculated by the CMS to the corresponding alarm and AWFCO set point limits. When a set point limit is reached,

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the control system will trigger the appropriate alarm or AWFCO. The CMS will electronically record the time, the date, and the identity of the impacted alarm or AWFCO parameter.

2.12 CMS PERFORMANCE EVALUATION TEST PLAN [40 CFR 63.8(e)]

A CMS Performance Evaluation Test Plan (CMS PETP) is included as Appendix E of the CPT plan. This plan outlines the performance evaluation testing of the parameter CMS (flow, temperature, pressure, etc.), and the CO and O_2 CEMS that will be conducted immediately before and in conjunction with the F-1 Furnace CPT.

2.13 CMS PERFORMANCE EVALUATION PLAN [40 CFR 63.8(d), 63.1207(f)(1)(iii)(H)]

By the DOC date, OxyChem will develop a CMS Performance Evaluation Plan (PEP) that includes the detailed procedures and frequencies for calibration and maintenance of the parameter CMS' (flow, temperature, pressure, etc.), and CO and O_2 CEMS. This plan will be included as part of the F-1 Furnace system's operating record.

2.14 STARTUP, SHUTDOWN, AND MALFUNCTION PROCEDURES [40 CFR 63.1206(c)(2)]

By the DOC date, OxyChem will develop a Startup, Shutdown, and Malfunction Plan. This plan will be included as part of the F-1 Furnace system's operating record.

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Table 2-1. F-1 Furnace Major Process Instrumentation

Parameter	Location	Inst. No.	Units	Scale	Accuracy (±% Full Scale)	Instrument Type
Hex Waste Feed	Waste Feed Line	FI-18A_PV	gpm	0-5	2%	Orifice
Solvent Waste Feed	Waste Feed Line	FI-21A_PV	gpm	0-3	2%	Orifice
Natural Gas Feed	Waste Feed Line	FI-26_PV	mscfh	0-2,000	2%	Orifice
Atomizing Steam Pressure	Steam Supply Line	PSL-19	psig	NA	NA	Low Pressure Switch
Atomizing Steam Pressure	Hex Waste Feed Line	PI-1-1	psig	0-200	0.065%	Pressure Transmitter
Atomizing Steam Pressure	Solvent Waste Feed Line	PI-1-2	psig	0-200	0.065%	Pressure Transmitter
Combustion Air Flow Rate	Compressor Discharge	FI-24A_PV	scfm	0-8,440	2%	Pitot tube
D-9 Vent Flow [a]	Vent Duct	FI-9	scfm	0-130	2%	Thermal dispersion
D-35 Vent Flow [a]	Vent Duct	FI-24-1A_PV FI-24-1B_PV	scfm	0-40 0-600	0.25%	Thermal Dispersion
D-64 Vent Flow [a]	Vent Duct	FI-64-1_PV	scfm	0-512	2%	Mass flowmeter w/ Orifice
D-76 Vent Flow [a]	Vent Duct	FI-76-1_PV	scfm	0-1,005	1%	Mass flowmeter w/ Orifice
D-398 Vent Flow [a]	Vent Duct	FI-398-1_PV	lb/hr	0-51	1%	Mass flowmeter w/ Orifice
D-559 Vent Flow [a]	Vent Duct	FIC-559-1_PV	scfm	0-2,000	2%	Orifice w/Differential Pressure
DR-2180 Vent Flow [a]	Vent Duct	FI-2180_PV	scfm	0-200	1%	V-Cone w/Differential Pressure
Oxidizer Temperature	Exit of Combustion Chamber	TI-10_PV, TI-37_PV	°F	1,000-2,500	0.2%	Type K thermocouple
Oxidizer Temperature	Exit of Combustion Chamber	TIC-5_PV	°F	1,000-2,500	0.2%	Type K thermocouple
T-11 Bottoms Acid Conc.	Discharge Line	AIC-15_PV	wt%	0-21	0.2%	Refractive index
Caustic Scrubber Recycle Flow Rate	T-11 Column Caustic Scrubber Section Recycle Line	FI-40_PV	gpm	0-300	0.5%	Magnetic flowmeter
Caustic Scrubber Recycle Flow Pressure	T-11 Column Caustic Scrubber Section Recycle Line	PI-11-3	psig	0-60	0.075%	Pressure Transmitter
Caustic Scrubber Differential Pressure	T-11 Column Caustic Scrubber Section	PDI-11-1	inwc	0-10	0.075%	Pressure Transmitter
Caustic Scrubber pH	T-11 Column Caustic Scrubber Section Recycle	AIC-2_PV	pH units	0-14	≤ 0.1 pH	pH probe and transmitter

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Table 2-1. F-1 Furnace Major Process Instrumentation

Parameter	Location	Inst. No.	Units	Scale	Accuracy (±% Full Scale)	Instrument Type
Caustic Scrubber Ox/Red Potential	T-11 Column Caustic Scrubber Section Recycle	AIC-22-1_PV	mV	-800 to +800	≤ 1 mV	Glass measure & Reference electrodes
Water to T-11	Feed Line to T-11 Column Water Scrubber Section Recycle	FIC-35_PV	gpm	0-50	2%	Orifice
Water to D-22 (T-11)	Feed Line	FI-22-4_PV	gpm	0-15	2%	Orifice
Caustic Flow to D-22 (T-11)	Feed Line	FIC-22-3_PV	gpm	0-28	0.5%	Magnetic flowmeter
Stack Gas CO Concentration	T-11 Stack	CO-AN-4_PV	ppm	0-100 0-1,000	2%	Non-dispersive Infrared (NDIR)
Stack Gas O_2 Concentration	T-11 Stack	O2-AN-3_PV	%vol	0-25	0.2%	Electroconductivty fuel cell
Stack Temperature	T-11 Stack	TI-7A_PV, TI-7B_PV	°F	0-400	0.2%	Type J thermocouple
Steam to Header	Steam Line	FI-27_PV	lb/hr	0-13,620	0.2%	Orifice
Boiler Temperature (B-3)	B-3	TI-6A_PV, TI-14_PV	°F	0-1,200	0.2%	Type J thermocouple

Notes:

[a] Vent flows are monitored for chlorine feed rate contribution.

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Table 2-2. F-1 Furnace Combustion Gas Residence Time

F-1 Furnace Combustion Gas Residence Time at Low Combustion Temperature

Estimated Stack Gas Flow:	7,600 acfm @	174 °F	
Combustion Chamber Temperature:		1,650 °F	
Estimated Stack Gas Flow @ Combustion Chamber Temperature:		25,293 acfm	
Acid Gas (as HCl) Removed by Acid Recovery and APC Systems:			
Hex Waste Feed Rate:	1,678 lb/hr	2.4 gpm	
Other Waste Waste Feed Rate:	661 lb/hr	0.90 gpm	
Hex Waste Chloride Content:	50 wt%		
Other Waste Chloride Content:	39 wt%		
Total Chloride Feed as Cl:	1,100 lb/hr		
Total Chloride Feed as HCl:	1,131 lb/hr		
Total Chloride Feed as HCl:	31.0 lbmol/hr		
HCl Volume @ Combustion Chamber Temperature:		795 acfm @	1,650 °F
Total Estimated Volumetric Flow through Combustion Chamber:		26,088 acfm @	1,650 °F
Total Combustion Chamber Volume:		1,410 ft^3	
Hazardous Waste Residence Time in the Combustion Zone:		3.2 seconds	

F-1 Furnace Combustion Gas Residence Time at Maximum Waste Feed Rate

Estimated Stack Gas Flow:	7,200 acfm @	174 °F	
Combustion Chamber Temperature:		2,200 °F	
Estimated Stack Gas Flow @ Combustion Chamber Temperature:		30,208 acfm	
Acid Gas (as HCl) Removed by Acid Recovery and APC Systems:			
Hex Waste Feed Rate:	2,797 lb/hr	4.0 gpm	
Other Waste Waste Feed Rate:	1,101 lb/hr	1.5 gpm	
Hex Waste Chloride Content:	50 wt%		
Other Waste Chloride Content:	39 wt%		
Total Chloride Feed as Cl:	1,833 lb/hr		
Total Chloride Feed as HCl:	1,884 lb/hr		
Total Chloride Feed as HCl:	51.6 lbmol/hr		
HCl Volume @ Combustion Chamber Temperature:		1,670 acfm @	2,200 °F
Total Estimated Volumetric Flow through Combustion Chamber:		31,878 acfm @	2,200 °F
Total Combustion Chamber Volume:		1,410 ft^3	
Hazardous Waste Residence Time in the Combustion Zone:		2.7 seconds	

Note: Flow data are based on previous emissions testing results.

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INSERT FIGURE 2-1

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3.0 FEEDSTREAM DESCRIPTION [40 CFR 63.1207(f)(1)(i), (ii)]

3.1 GENERAL

This section of the CPT plan provides descriptions on the types of liquid waste feedstreams, the auxiliary fuel used in combustion, and other streams which are fed to F-1 Furnace. An overview is also provided on the management of the waste and vapor vent streams before being transferred to the F-1 Furnace.

3.2 FEEDSTREAM CHARACTERISTICS [40 CFR 63.1207(f)(1)(i), (ii),(xi)]

The liquid waste streams treated in the F-1 Furnace are well-known and well-characterized wastes, and have exhibited little historical variation in composition. Combustion air, atomizing steam, and vapor vent streams are also fed to the combustion zone in addition to the liquid waste streams and natural gas.

Because of the heating value of the liquid waste streams, these waste streams are used as fuel through the F-1 Furnace's burner assemblies. When liquid waste is not being treated, the F-1 Furnace operates using natural gas in a standby mode. When liquid wastes are fed at low rates or the injected wastes have low heating values, natural gas can be used as a supplemental fuel to maintain combustion temperature.

3.2.1 Liquid Wastes Feedstreams [40 CFR 63.1207(f)(1)(i), (ii)]

The primary liquid waste streams treated in F-1 Furnace include:

- Hex Waste (Carbon Tetrachloride [CCl4] Heavy Ends) (D-228)
- Waste Solvents (D-40)
- Recovered Groundwater Organic Phase (Dense Non-Aqueous Phase Liquid [DNAPL])(D-2009)
- Brominated Organic Liquid Purge (D-163)
- Laboratory Organic Sample Waste (included with D-40)
- Lube Oil (DR-73A/B).

The only liquid waste streams treated in F-1 Furnace are those generated by OxyChem operations and site activities. The HWC MACT constituent characterizations for the liquid waste streams are presented in Table 3-1.

3.2.2 Other Feedstreams [40 CFR 63.1207(f)(1)(xi)]

The other feedstreams to the F-1 Furnace include vapor vents, natural gas, combustion air, and atomizing steam. The following sections discuss each of these feedstreams.

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3.2.2.1 Vapor Vent System

The vapor vent system, which captures vapors from various reactors, distillation columns, process vessels, transfer, and storage operations, is ducted directly to F-1 Furnace, and the vapors are burned in the combustion zone. Vapor vents are from the following sources:

- Ethylene dichloride (EDC) distillation vents and perchloroethylene (Perc) feedstock tanks vents (D-9)
- EDC MCI Reactor Vent (D-35)
- Utilities vents (hazardous waste tanks and groundwater system vent) and shipping loading vents (D-42)
- Chlorine process adsorber (D-76)
- EDC wastewater vent (D-398)
- Methyl chloride loading, storage and process vents (D-559)
- 5CP vents (D-2180).

The vapor vents are mostly air and/or nitrogen with trace amounts of the same organic constituents present in the liquid waste streams. Organic constituent characterizations for the vapor vent streams are presented in Table 3-2.

3.2.2.2 Natural Gas

Natural gas is used as auxiliary fuel to bring the F-1 Furnace temperature to the liquid waste feed permissive minimum temperature to start liquid waste feed. The HWC MACT-regulated constituents in natural gas based formation from the Gas Research Institute are presented in Table 3-3.

3.2.2.3 Combustion Air

Combustion air is always supplied to the combustion zone when the F-1 Furnace is operating to provide sufficient oxygen for proper combustion. Ambient air is used for combustion air in F-1 Furnace. The combustion air does not contain constituents for which operating limits will be established. Combustion air is introduced to the combustion zone via a combustion air blower. Combustion air flow is monitored, and is controlled based on controlling stack gas carbon monoxide and oxygen concentrations.

3.2.2.4 Atomizing Steam

The F-1 Furnace is equipped with steam atomizing burner nozzles. Plant-produced steam is used for atomizing the liquid wastes in the F-1 Furnace burner nozzles. The steam does not contain constituents for which operating limits will be established. Atomizing steam pressure and flow are continuously monitored.

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3.3 FEEDSTREAM MANAGEMENT

3.3.1 Liquid Waste

OxyChem manages the liquid waste streams in separate tanks and does not blend or premix any of the liquid wastes for F-1 Furnace injection. Therefore, 40 CFR 63.1207(f)(1)(ii)(C) does not apply. The liquid wastes are transferred via pipeline from the production areas to the respective accumulation tanks. The liquid waste streams are pumped separately from their respective storage tanks to the F-1 Furnace for treatment.

3.3.2 Vapor Vent Streams

The vapor vents from OxyChem's on-site operations are delivered to the F-1 Furnace via header systems. Because the vapor vent streams are not compressed, ignitable gases as defined in 49 CFR 173.300, the vapor vent streams are not hazardous wastes per 40 CFR 261.21(a)(3).

The flow rates of the D-9, D-35, D-398, D-559 and D-2180 vent streams are individually measured on a continuous basis. These streams are introduced into the burners on the F-1 Furnace through dedicated lines and nozzles.

The D-76 vent stream has a direct connection to the side of the thermal oxidizer. The flow rate of the D-76 vent stream is individually measured on a continuous basis.

The D-42 vent stream is introduced to the F-1 Furnace via the suction side of the combustion air blower. This stream is from tank conservation and shipping loading vents, and therefore is a very low volume and intermittent stream. The flow of D-42 vent stream is part of the combustion air flow; the flow rate of the D-42 vent is not separately measured.

3.3.3 Feedstream Analysis Plan

In accordance with the HWC MACT compliance schedule, OxyChem will develop and maintain a Feedstream Analysis Plan (FAP) as required by 40 CFR 63.1209(c)(2) and will have this plan as part of the F-1 Furnace system operating record by the DOC date. The Feedstream Analysis Plan specifically addresses the HWC MACT compliance of the F-1 Furnace operation with the liquid waste feed limit for chloride. Waste information on organic HAPs in the liquid wastes will be based on knowledge of the processes generating the waste streams.

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Table 3-1. Liquid Waste Feed Characterization

Parameter	Units	Hex Waste (D-228)	Waste Solvents (D-40)	DNAPL (D-2009)	Brominated Organic Liquid (D-163)	Laboratory Organic Sample Waste	Lube Oil (D-73A/B)
Average Heating Value, Flash Point, Ash and Total Halogens							
Average Annual Amount Treated, 2001-2006	lbs	6,730,748	333,264	719,826	470,918	Ltd. Qty.	15,297
	gal	576,487	32,021	59,490	43,758	Varies	1,869
Density	g/cc	1.40	1.24	1.47	1.29	Varies	1.02
Heating Value	Btu/lb	2,554	2,959	2,143	4,480	2,285	16,167
Viscosity	cSt	0.24-0.50 cP @ 420 deg F (Note a)	ND @ 1.0	1.50	1.27	NA	50.76
Flash Point	°F	Freezes	47	59	53	53	54
Ash	wt%	0.12	ND	0.43	0.060	ND	0.65
Chlorine	mg/kg	24,780	271,600	123,955	118,929	176,076	39,379
Bromine	mg/kg	ND	ND	36	2,660	ND	15
Total Halogens	mg/kg	502,333	595,000	388,373	571,000	771,000	64,767
Average Metal Constituent Concentrations (Note b)							
Antimony (Sb)	mg/kg	ND	ND	ND	ND	ND	ND
Arsenic (As)	mg/kg	ND	ND	ND	ND	0.0250	ND
Barium (Ba)	mg/kg	ND	ND	0.97	ND	1.5	ND
Beryllium (Be)	mg/kg	ND	ND	ND	ND	ND	ND
Cadmium (Cd)	mg/kg	ND	ND	0.032	ND	0.036	ND
Chromium (Cr)	mg/kg	2.9	6.1	1.3	1.8	1.3	ND
Lead (Pb)	mg/kg	ND	ND	0.11	0.41	0.048	0.55
Mercury (Hg)	mg/kg	ND	0.155	0.087	ND	0.087	ND
Silver (Ag)	mg/kg	ND	ND	ND	ND	34	ND
Thallium (Tl)	mg/kg	ND	ND	ND	ND	ND	0.96
Average Organic Constituent Concentrations (Note c)							
Acetone	mg/kg	ND	ND	ND	ND	170	ND
1-bromo-2-chloroethane	mg/kg	ND	ND	ND	96,333	890	ND
Carbon tetrachloride	mg/kg	9,900	190,800	44,800	28,000	155,911	2,615
Chloroethane	mg/kg	ND	35,801	ND	ND	1,377	ND
Chloroform	mg/kg	18,100	124,503	26,208	31,000	181,498	57,538
1,1-Dichloroethane (1,1-Di)	mg/kg	ND	ND	ND	ND	28,595	ND
1,2-Dichloroethane (EDC)	mg/kg	88,800	326,817	124,050	353,333	160,980	14,315
1,1-Dichloroethene (Vinylidene Chloride)	mg/kg	ND	7,640	ND	ND	3,411	ND
Hexachlorobutadiene	mg/kg	246,633	2,853	411,679	ND	ND	55
Methylene chloride	mg/kg	ND	2,957	ND	ND	92,151	14,168
1,1,1,2-Tetrachloroethane	mg/kg	ND	ND	ND	35,900	ND	ND

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Table 3-1. Liquid Waste Feed Characterization

Parameter	Units	Hex Waste (D-228)	Waste Solvents (D-40)	DNAPL (D-2009)	Brominated Organic Liquid (D-163)	Laboratory Organic Sample Waste	Lube Oil (D-73A/B)
1,1,2,2-Tetrachloroethane	mg/kg	ND	ND	ND	21,640	ND	ND
Tetrachloroethene (Perchloroethylene)	mg/kg	138,367	98,333	91,040	19,900	145,948	24,825
1,1,1-Trichloroethane	mg/kg	ND	54,000	6,282	ND	75,183	3,934
1,1,2-Trichloroethane	mg/kg	ND	31,100	ND	596,000	10,716	ND
Vinyl chloride	mg/kg	ND	ND	ND	ND	640	ND
Total PCBs	mg/kg	661	ND	158	ND	ND	ND
Total Decachlorobiphenyl	mg/kg	656	ND	155	ND	ND	ND
Hexachlorobenzene	mg/kg	50,232	56	5,270	ND	ND	51
Hexachlorobutadiene	mg/kg	95,683	1,153	436,600	ND	ND	55
Hexachloroethane	mg/kg	20,118	392	83,680	9,400	360	ND

Notes:

[a] The hex waste stream is a solid at ambient conditions and therefore its viscosity estimated. According to the instrument specification sheets, the hex stream viscosity is 0.5 cP at 420°F. Chemcad® calculates a viscosity of 0.24 cP at 420°F using the following composition: 20% Perchloroethylene, 20% Hexachloroethane, 58% Hexachlorobutadiene, 2% Hexachlorobenzene.

[b] Averages are based on detectable levels only; the detection limit from non-detect results is not averaged with the detectable values. Therefore, if there is only one, two or three, etc. detectable values from multiple analyses, the average of the detectable values is noted. For a stream where there is only one detectable value, that single value is reported as the average for the stream. For parameters noted as non-detect (ND), this parameter was non-detect in all analyses. The organic compounds listed are those identified in one or more waste streams.

[c] The waste streams organic analyses included volatile and semivolatile organic compounds. The organic compounds listed are only those identified in one or more of the waste streams.

cP – centipoises
cSt - centistokes
ND – non-detect
NA – not applicable

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Table 3-2. Vent Vapor Characterization

Organic Constituents	D-9	D-35	D-42	D-64	D-76	D-398	D-559	DR-2180	Weighted Organics (Note c)	Mole Percent Chlorine	Weighted Chlorine (as Cl) (Note c)
	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Mole %	Average (ppmv)
	ND	ND	ND	ND	ND	100	ND	ND	2	50%	1
1,1,1-Trichloroethane	129	1,591	2,756	120	1	97	ND	ND	329	38%	123
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	0	50%	0
1,1,2-Trichloroethane	94	160	129	ND	ND	ND	ND	8	15	38%	6
1,1-Dichloroethane	997	16,279	1,246	ND	1	49	24	39	793	25%	198
1,1-Dichloroethene	3,298	13,475	153	ND	ND	431	ND	ND	613	33%	204
1,2, Dichloropropane	22,459	ND	9,175	111	ND	19,678	ND	4,064	989	22%	220
1,2-Dichloroethane	16,260	716	32,757	110	29	20,339	1,237	744	2,436	25%	609
1-Bromo-2-Chloroethane	68	ND	32	ND	ND	ND	ND	ND	2	13%	0
Carbon Tetrachloride	13,412	178	3,297	2,602	2,022	521	611	3,235	2,320	80%	1,856
Chloroethane	68,120	94	1,064	16	0	6,802	519	713	260	13%	33
Chloroform	12,326	195	8,993	6,679	1	3,625	580	340	5,807	60%	3,484
Chloromethane	10,401	631	39	116,156	23	1,719	219,480	2,476	92,045	20%	18,409
Cis-1,2-Dichloroethene	764	147	39	4	ND	51	ND	ND	14	33%	5
Methylene Chloride	1,080	109	5,999	18,447	23	408	16,340	724	14,827	40%	5,931
Ethylene	ND	ND	ND	ND	ND	ND	ND	ND	0	0%	0
Propylene	ND	ND	110	105	6	ND	ND	ND	88	0%	0
Tetrachloroethene	115	220	919	122	136	373	832	231	177	67%	118
Trans-1,2-Dichloroethene	1,133	1,068	6	ND	ND	2,555	ND	ND	92	33%	31
Trichloroethylene	38	ND	24	ND	ND	16	ND	964	2	50%	1
Vinyl Chloride	9,097	7,564	96	142	14	2,028	2,400	157,864	512	17%	85
Total Composition									**121,321**		**31,313**
Average Flow, 2006 (scfm) (Note b)	**56.4**	**0.83**	**42**	**56.6**	**740.5**	**33.13**	**16.4**	**7.7**	**954**		**246**

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Table 3-2. Vent Vapor Characterization

Parameter	Value (Note c)
Total Vent Flow (scfm)	954
Total Vent Flow (scfh)	57,214
Total Vent Flow (lb-mol/hr)	151
Total Vent Flow Organics (lb-mol/hr)	18.29
Total Vent Chlorine (lb-mol/hr as Cl)	4.72
Total Vent Chlorine (lb/hr as Cl)	168

Notes:

[a] Average of analyses performed 2001-2006.

[b] Calendar year 2006 average flow rates.

[c] Calculated based three-year rolling average 2001-2006 composition data and 2006 average flow rates.

Vent No.	Identification
D-9	Ethylene dichloride (EDC) distillation vents and perchloroethylene (Perc) feedstock tanks vents
D-35	EDC MCI reactor vent
D-42	Utilities vents (hazardous waste tanks and groundwater system vent) and shipping loading vents
D-64	Methyl chloride high pressure vent
D-76	Chlorine process adsorber
D-398	EDC wastewater vent
D-559	Methyl chloride low pressure loading, storage and process vents
DR-2180	5CP vents (D-2180)

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Table 3-3. Natural Gas Characterization

Constituent/Property	Typical Value	Units	Feed Rate per MMBtu/hr Fired	Units
Arsenic	< 0.20	ug/m^3	< 5.5E-06	g/hr
Beryllium	No Data			
Chromium	< 0.01	ug/m^3	< 2.7E-07	g/hr
Total LVM (As+Be+Cr)	< 0.21	ug/m^3	< 5.8E-06	g/hr
Cadmium	< 0.01	ug/m^3	< 2.7E-07	g/hr
Lead	< 0.05	ug/m^3	< 1.4E-06	g/hr
Total SVM (Cd+Pb)	< 0.06	ug/m^3	< 1.6E-06	g/hr
Mercury	< 0.01	ug/m^3	< 2.7E-07	g/hr
Chlorine/chloride	< 1.6	ug/m^3	< 4.4E-05	g/hr

Source: "Analysis of Trace Level Compounds in Natural Gas" Gas Research Institute, Document Number GRI-99/0111, February, 2000

Note: Arsenic and mercury, which are occasionally found at ppmv or sub-ppmv levels in some raw natural gas wells, were not detected in processed and distributed natural gas. The concern expressed in some reports regarding the possibility that these metals may be picked up by natural gas flowing through the gas delivery system was not corroborated. The lack of metals found in this study suggest that the metals found in earlier work were due to carryover from combustion systems which had been fired using other fuels (coal and/or oil).

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4.0 TEST DESIGN AND PROTOCOL

4.1 TEST OBJECTIVES

The F-1 Furnace will demonstrate compliance with following applicable performance standards:

- Destruction and removal efficiency (DRE) of greater than or equal to 99.99% for the selected principal organic hazardous constituent (POHC) [40 CFR 63.1218(c)(1)]
- Stack gas carbon monoxide (CO) concentration less than or equal to 100 parts per million volume (ppmv), dry basis, corrected to 7% oxygen (O_2) on an hourly rolling average basis [40 CFR 63.1218(a)(5)(i)]
- Stack gas total hydrocarbon (HC or THC) concentration less than or equal to 10 ppmv, dry basis, corrected to 7% O_2 as propane [40 CFR 63.1218(a)(5)(ii)]
- Combined emissions of hydrogen chloride (HCl) and chlorine (Cl_2) (expressed as Cl^- equivalents) are no greater than 150 ppmv, dry basis, corrected to 7% O_2, or demonstrated system removal efficiency (SRE) of greater than 99.923% [40 CFR 63.1218(a)(6)(i) or (ii)]

Compliance with the HWC MACT HCl/Cl_2 emission performance standard is a surrogate for particulate matter (PM) and metals compliance [40 CFR 63.1218(a)(2), (3), (4) and (7)]. Compliance with either the HWC MACT CO or THC emission performance standard is a surrogate for dioxin/furan compliance [40 CFR 63.1218(a)(1)].

The following F-1 Furnace permit operating limits for will be established based on the CPT results:

- Maximum hazardous liquid waste feed rates [40 CFR 63.1209(j)(3), (k)(4)]
- Minimum combustion temperature [40 CFR 63.1209(j)(1), (k)(2)]
- Maximum combustion gas flow rate [40 CFR 63.1209(j)(2), (k)(3), (o)(2)]
- Maximum total chloride feed rate [40 CFR 63.1209(o)(1)]
- Minimum scrubber liquid to gas ratio (L/G) [40 CFR 63.1209(o)(2)]
- Minimum scrubber water pH [40 CFR 63.1209(o)(3)(iv)].

4.2 TEST PROTOCOL [40 CFR 63.1207(f)(1)(vi)]

The CPT protocol includes demonstrating compliance with the HWC MACT performance standards and emission limits via two operating conditions: 1) a minimum combustion temperature DRE test, maximum combustion gas velocity, and 2) a maximum waste feed rate DRE test. The CPT target operating conditions are presented in Table 4-1. OxyChem may conduct miniburn testing at the proposed CPT conditions to verify the system's performance before the formal CPT.

4.2.1 DRE Testing

Per 40 CFR 63.1209(j) and (k), DRE and PCDD/PCDF emissions performance must be demonstrated at minimum combustion temperature, maximum combustion gas velocity, and maximum waste feed rate.

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The design of F-1 Furnace does not allow for simultaneous demonstration of these three operational limits. Therefore, DRE and PCDD/PCDF emissions performance of F-1 Furnace will be measured during both test conditions. Test 1 will demonstrate DRE and PCDD/PCDF emissions at minimum combustion temperature and maximum combustion gas velocity. Test 2 will demonstrate DRE and PCDD/PCDF emissions at a maximum waste feed rate. Compliance with the HWC MACT performance standards for CO and HC emissions will be included during both test conditions. The two test conditions will demonstrate that the DRE performance standard is being met over the range of F-1 Furnace operation.

4.2.2 Maximum Waste Feed Rate Testing

The maximum waste feed rate test condition, Test 2, will demonstrate the ability of the F-1 Furnace to treat waste at maximum feed rates including maximum chloride feed rate. Test 2 includes sampling and analyses to demonstrate compliance with the HWC MACT HCl/Cl_2 performance standard. The F-1 Furnace maximum waste feed rate testing also includes sampling and analyses for DRE, and PCDD/PCDF, CO and HC emissions performance demonstration as described in Section 4.2.1 above. The maximum waste feed rate and maximum chloride feed rate demonstrated during Test 2 will establish limits for these parameters. Test 2 will also establish many of the limits for APC system operation.

4.3 WASTE FEED CHARACTERISTICS [40 CFR 63.1207(f)(1)(vi)]

Waste feedstream characteristics are described in Section 3.0 of this test plan. Table 3-1 presents the liquid waste stream characteristics. OxyChem has selected the "hex" waste stream for compliance demonstration for following reasons:

1. "Hex" contains native HCB, the target POHC, for demonstration of the 99.99% DRE for HWC MACT compliance.
2. Hex" is the most heavily chlorinated waste stream treated by the F-1 Furnace and will therefore provide the "worst case" indication of the system's capability to control HCl/Cl_2 emissions.
3. "Hex" contains chlorine, and a high percentage of cyclic and aromatic organic constituents, both potential precursors to PCDD/PCDF formation in combustion systems, and will therefore provide the "worst case" indication of the system's PCDD/PCDF emissions.

The "hex" represents the majority of liquid waste treated in F-1 Furnace and has a high chloride content. An additional waste stream, groundwater organic phase (Dense Non-Aqueous Phase Liquid [DNAPL]), will be co-fired with hex waste during the CPT. The DNAPL is an organic phase mixture containing high concentrations of chlorinated cyclic and aromatic constituents. This stream will add to the demonstration of the "worst case" for HCl/Cl_2 and PCDD/PCDF emissions.

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4.3.1 POHC Selection Rationale [40 CFR 63.1218(c)(3)(ii)]

To evaluate the effectiveness of combustion systems to destroy organic compounds, EPA developed the POHC Thermal Stability Index (circa 1989). The Thermal Stability Index is based on laboratory studies of the destruction of organic compounds under low oxygen conditions in a non-flame environment. The EPA's Thermal Stability Index divides specific organic compounds into seven thermal stability classes, with Class 1 compounds being the most stable, and Class 7 compounds being the least thermally stable. The EPA Thermal Stability Index is structured on the principle that if a combustion system is successful in destroying compounds in a particular class, it is appropriate to assume that other compounds within the same and lower classes will be destroyed at efficiencies equal to or greater than the efficiencies demonstrated.

OxyChem proposes the use of hexachlorobenzene (HCB) as a POHC for the DRE portion of the CPT. HCB is a Class 1 compound (most thermally stable) on EPA's Thermal Stability Index. The selection of HCB also satisfies the 40 CFR 63.1218(c)(3)(ii) requirement to use a listed HAP as a POHC. HCB is native to the "hex" waste stream. OxyChem believes that the choice of HCB as a POHC represents a significant challenge to the thermal destruction capabilities of the F-1 Furnace. During DRE testing, OxyChem will collect samples of the waste feeds for analysis to determine the feed rate of HCB, and measure HCB emissions to assess DRE performance. The waste feed analyses and waste feed rates will be used to determine the total HCB feed rate. The emission rate of HCB will be determined via stack sampling using SW-846 Method 0010 sampling train.

4.3.2 Chloride Content [40 CFR 63.1209(o)(1)]

The data presented in Table 3-1 includes the chloride content data for liquid waste streams treated by OxyChem. During the CPT maximum waste feed rate testing, OxyChem intends to feed actual liquid waste at maximum rates. OxyChem does not intend to supplement the chloride content of the actual liquid waste by spiking chloride to the liquid waste. During the maximum waste feed rate testing, samples of the waste feed will be analyzed for chloride content. The waste feed chloride analyses and the total waste feed rates will be used to determine the chloride feed rates. Provided that the HCl and Cl_2 emissions results during the CPT maximum waste feed rate test are in compliance with the HWC MACT standard, the permit limit for chloride feed rate to F-1 Furnace will be proposed as the total chloride feed rate demonstrated during the maximum waste feed rate test.

4.3.3 Ash Content [40 CFR 63.1209(m)(3)]

In accordance 40 CFR 63.1218(a)(7), compliance with HWC MACT particulate emissions performance standard is satisfied by demonstrating compliance with the HAPF HCl/Cl_2 emissions performance requirement, 40 CFR 63.1218(a)(6). Maximum ash feed rate will not be demonstrated during the CPT, and no ash feed rate limit is proposed or expected in the final permit.

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4.3.4 Metals Content [40 CFR 63.1209(l)(1), (n)(2)]

In accordance 40 CFR 63.1218(a)(2)-(4), compliance with HWC MACT metals emissions performance standards is satisfied by demonstrating compliance with the HAPF HCl/Cl_2 emissions performance requirement, 40 CFR 63.1218(a)(6). Maximum metals feed rates will not be demonstrated during the CPT, and no metals feed rate limit are proposed or expected in the final permit.

4.3.5 Expected Constituent Levels in Auxiliary Fuel and Other Feedstreams [40 CFR 63.1207(f)(1)(i)(A), (xi)]

In accordance 40 CFR 63.1218(a)(2)-(4),(7), compliance with HWC MACT particulate and metals emissions performance standards are satisfied by demonstrating compliance with the HAPF HCl/Cl_2 emissions performance requirement, 40 CFR 63.1218(a)(6). Additionally, the ash and metals contents of vent vapors, natural gas, combustion air, process water and steam are such that their quantification would be meaningless to the facility operating records. Therefore, these streams will not be sampled or analyzed for ash or metals during the test.

4.4 OPERATING CONDITIONS [40 CFR 63.1207(f)(1)(vii)]

The target operating conditions for the CPT are shown in Table 4-1. Steady-state operating conditions will be achieved when the liquid waste feed rate, combustion temperature, and caustic scrubber recycle pH have stabilized at the target operating conditions. During the CPT, sampling may commence when the system has been at the test target operating conditions for one hour. Calculations are provided in Appendix D.

4.5 CMS PERFORMANCE EVALUATION TEST PLAN [40 CFR 63.8(e), 63.1209(d)]

The process monitoring systems will be evaluated just prior to the initiation of the CPT, in accordance with the provisions of the HWC MACT regulations. This evaluation will include the following elements, as a minimum:

- Calibration of all CMS primary sensing elements.
- Functional audit of monitoring and recording systems to ensure that data are collected and recorded in accordance with regulatory requirements (e.g., definition of "continuous monitoring", calculation of one-minute and rolling averages, data storage and retrieval functionality, etc.).
- Verification that specific input signals are displayed and recorded properly.
- Operational test of alarms and interlocks.

The carbon monoxide and oxygen CEMS are permanently installed. Prior to conducting the test, OxyChem will perform a CEMS evaluation using the protocols described in 40 CFR 60, Appendix B, Performance Specification 4B, and the Appendix to 40 CFR 63, Subpart EEE for carbon monoxide and oxygen.

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As allowed by 40 CFR 63.1206(b)(6), a temporary CEMS operated in accordance with 40 CFR 60 Appendix A, Method 25A will be used to sample for hydrocarbons during the test to demonstrate compliance with the hydrocarbon standard of 40 CFR 63.1218(a)(5)(ii).

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Table 4-1. F-1 Furnace CPT Target Operating Conditions

Operational Parameter	Units	CPT Target (Note 1)		AWFCO	Averaging Period
		Min. Temp. DRE Test	Max. Feed DRE Test		
Group 1 Parameters					
Maximum total liquid waste feed rate	lb/hr	NA	4,604	Yes	HRA
	gpm	NA	5.5	Yes	HRA
Hex waste feed	lb/hr	NA	3,349	NA	NA
Hex waste feed	gpm	NA	4.0	NA	NA
Solvent waste feed (DNAPL)	lb/hr	NA	1,256	NA	NA
Solvent waste feed (DNAPL)	gpm	NA	1.5	NA	NA
Maximum total chloride feed rate	lb/hr	NA	1,612	Yes	THRA
Minimum combustion temperature	° F	1,650	>1,650	Yes	HRA
Maximum combustion air flow	scfm	4,000	4,000	Yes	HRA
Minimum caustic scrubber pH	pH units	>9.0	9.0	Yes	HRA
Minimum caustic scrubber L/G	gpm/scfm	>0.060	0.060	Yes	HRA
Group 2 Parameters					
Maximum stack gas CO	ppmv, dry @ 7% O_2	100		Yes	HRA
Group 3 Parameters					
Minimum hex waste atomization steam pressure	psig	50		Yes	HRA
Minimum solvent waste atomization steam pressure	psig	50		Yes	HRA
Minimum caustic scrubber recycle pressure	psig	30		Yes	HRA

Notes

1. Refer to Table 7-2 for testing setpoints for AWFCO parameters.

AWFCO - automatic waste feed cutoff
HRA - hourly rolling average
N/A - not applicable
THRA - 12-hour rolling average

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5.0 SAMPLING, ANALYSIS, AND MONITORING PROCEDURES [40 CFR 63.1207(f)(1)(iv)]

5.1 GENERAL

The proposed CPT will consist of two test conditions for F-1 Furnace as described in Section 4.2. Each test condition will be composed of three replicate sampling runs. Sampling, analytical and monitoring protocols for the tests are summarized below.

The CPT program includes two test conditions with sampling and analyses for demonstrating the F-1 Furnace's compliance with the HWC MACT emissions and performance standards for HAPFs. The collection of data for use in a site-specific risk assessment plan is detailed in a separate Risk Burn Data Collection Plan. The Risk Burn Data Collection Plan is provided as Appendix B to the CPT plan. The Risk Burn Data Collection Plan includes three test conditions, the first two of these test conditions being concurrent risk assessment data collection during the two CPT test conditions for demonstrating HWC MACT compliance. Where and when data are being collected for use in the risk assessment during the two compliance demonstration test conditions are noted in this section. The third test condition (Test 3) is specifically for collection of additional risk assessment emissions data not gathered during the two compliance test conditions. The third test condition operating conditions, and the sampling and analysis program are defined in the Risk Burn Data Collection Plan.

5.2 CPT SAMPLING AND ANALYSIS PROTOCOL

The CPT involves sampling and analysis protocols for wastes, HCl product, caustic scrubber purge, DRE and HWC MACT emission limit standards. The sampling and analysis for the protocols are discussed in more detail in the following sections. The sampling and analytical protocols are summarized in Tables 5-1 and 5-2. The CPT data collection and use are summarized in Table 1-2.

5.3 SAMPLING LOCATIONS AND PROCEDURES

Sample collection points are shown on Figures 2-1 and 5-1. Sample collection locations, equipment, methods, and frequency are summarized in Tables 5-1 and 5-2. Alternative methods may be used with the prior approval of LDEQ.

The following paragraphs discuss the planned sampling and analyses. The sampling procedures and analytical methods to be used during the test are located in Appendix C.

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5.3.1 Liquid Waste Feed Samples

Samples of the liquid waste feed will be collected during each test run. The waste feed samples will be analyzed for the parameters as indicated in Tables 5-1 and 5-2.

5.3.1.1 Hex Waste Sampling

The "hex" waste is circulated continuously from the dedicated process tank to the F-1 Furnace area and back to the storage tank by the waste circulation pumps. The "hex" waste feed to F-1 Furnace is a side stream taken from the circulation line. Because the "hex" waste is circulated continuously, it is always well mixed. The "hex" waste is typically maintained at approximately 475°F for pumpability (melting point is approximately 400°F). The "hex" waste rapidly solidifies upon cooling which does not allow for homogenization of the final waste feed sample. For this reason, grab samples of the well-mixed liquid waste stream will only be collected three (3) times during each test run (beginning, middle and end [B-M-E]). Three separate liquid waste feed grab samples will collected per test run, one at each sampling interval. In the laboratory, equal size aliquots from the three run samples will be composited to produce a single run sample for the various analyses.

5.3.1.2 DNAPL Waste Feed Sampling

One composite sample of the DNAPL liquid waste feed will be collected during each test run. The composite sample will be built from grab samples collected at 30-minute intervals throughout the test run. The composite sample will be maintained on ice in a cooler between each sampling interval. At the end of the test run, aliquots will be collected from the homogenized composite sample for the various analyses as noted in Tables 5-1 and 5-2. After collection, the samples for organic analysis will be maintained on ice in coolers; samples for inorganic analyses do not require chilling.

5.3.2 HCl Product and Caustic Scrubber Purge Streams

For fate of POHC determination, grab samples of the HCl product stream and the caustic scrubber purge will be collected every 30 minutes during each test run to build a run composite sample of the respective streams. The composite samples will be maintained on ice during each test run. At the end of each test run, samples will be collected from the homogenized composite samples collected.

5.3.3 Stack Gases

Stack gas samples are collected from a set of ports located on the exhaust stack. Each stack sampling method is briefly described below.

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5.3.3.1 Stack Gas Method 0023A (PCDD/PCDFs)

The stack gas will be sampled for PCDD/PCDFs using a SW-846 Method 0023A sampling train. The Method 0023A sampling train will be analyzed for PCDD/PCDFs via Method 8290 [high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS)]. The target PCDD/PCDF compounds are listed in Table 9-7 of the Quality Assurance Project Plan (QAPP).

At 40 CFR 63.1208(b)(1)(iii), the HWC MACT rule requires that the Method 0023A sampling train be operated for a minimum of 180 minutes (3 hours) to sample a minimum of 2.5 dry standard cubic meters of stack gas during each sampling run so that any PCDD/PCDF congener that is non-detect may be counted as zero. The Method 0023A sampling train will be operated for the minimum specified time and to obtain the minimum specified volumes as required.

For risk assessment data collection purposes, the extracts from the Method 0023A sampling train will be spilt for concurrent analysis of PCB emissions. The details of these procedures are noted in the separate Risk Assessment Data Collection Plan provided as Appendix B. The extract fractions for PCB analysis will be analyzed via EPA Method 1668A (HRGC/HRMS) for the 13 "dioxin-like" co-planar PCB compounds and the totals for the 10 PCB homologue groups. The target PCB compounds are listed in Table 9-8 of the QAPP.

Although splitting the analysis extracts two ways does have an impact on detection limits for both sets of target analytes as described above, the impact is negligible relative to PCDD/PCDF emissions demonstration. PCDD/PDCF emissions are typically reported in terms of total PCDD/PCDF and 2,3,7,8-tetrachlorianted dibenzo-p-dioxin (2,3,7,8-TCDD) toxicity equivalents (TEQ). The sum of the expected detection limits for the total PCDD/PCDF emissions presented in Table 9-7 of the QAPP is 0.043 nanograms per dry standard cubic meter (ng/dscm) corrected to 7% oxygen (O_2) before applying the toxicity equivalence factors (TEFs). The expected detection limit in terms of toxicity equivalent PCDD/PCDF emissions is 0.0072 ng/dscm TEQ corrected to 7% O_2. Combined sampling and analysis of naphthalene for DRE and PCDD/PCDF can be accomplished without compromising PCDD/PCDF emissions demonstration.

5.3.3.2 Stack Gas Method 0010 (Semivolatile POHC)

The stack gas will be sampled for HCB, using a SW-846 Method 0010 sampling train. When Method 0010 is being used to demonstrate DRE using a semivolatile POHC, Section 6.3.4 of Method 0010 requires that the sampling train be operated to sample a minimum of three (3) dry standard cubic meters of stack gas during each sampling run; no minimum sampling time is specified. The sampling train

extract fractions will be analyzed for HCB via Method 8270C [gas chromatography/mass spectrometry (GC/MS)].

For risk assessment data collection purposes, in addition to the target POHC, the extracts from the Method 0010 sampling train analyzed for semivolatile products of incomplete combustion (PICs). The details of these procedures are noted in the separate Risk Assessment Data Collection Plan provided as Appendix B. The extract fractions will be analyzed via SW-846 Method 8270 GC/MS for target list of compounds noted in Table 9-9 of the QAPP.

5.3.3.3 Stack Gas Method 0030 (VOST)

For risk assessment data collection purposes, to determine the emissions of the volatile PICs, the stack gas will be sampled using the SW-846 Method 0030 Volatile Organic Sampling Train (VOST). The details of these procedures are noted in the separate Risk Assessment Data Collection Plan provided as Appendix B. Four pairs of VOST tubes 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/8260B. The target volatile organic compounds are listed in Table 9-6 of the QAPP.

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

The stack gas will be sampled isokinetically for HCl and Cl_2 according to EPA Method 26A. HCl and Cl_2 emissions will be determined via analysis of the impinger solutions for chloride ion as specified in EPA Method 26A.

For risk assessment data collection purposes, the acetone probe rinse and filter fractions from the EPA Method 26A sampling train will be recovered and analyzed via EPA Method 5 for particulate matter as allowed by Section 2.1 of Method 26A. The details of these procedures are noted in the separate Risk Assessment Data Collection Plan provided as Appendix B.

5.3.3.5 Stack Gas Method 25A (Hydrocarbons)

During the test, the stack gas will be monitored for hydrocarbons (HC) to demonstrate compliance with the HWC MACT performance standard. HC monitoring will be performed using a temporary CEMS. The temporary HC CEMS will be calibrated and operated in accordance with the procedures in 40 CFR 60 Appendix A, Method 25A. HC concentration will be reported as propane, corrected to 7% oxygen dry basis.

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5.3.4 Analytical Procedures

Analytical methods planned for the test are summarized in Tables 5-1 and 5-2. Analytical procedure descriptions are presented in Appendix C.

Reference sampling and analytical methods are identified throughout this test plan. 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, SW846, 40 CFR 60 Appendix A, etc.) and/or the contractor-specific standard operating procedures (SOPs) as recognized by the Louisiana Environmental Laboratory Accreditation Program (LELAP). LELAP approvals for the selected stack sampling and analytical contractors are included as attachments to the QAPP.

During the course of sampling and analysis, situations may still arise that require modifying the specific sampling or analytical procedures included or referenced in this CPT Plan. In cases where the laboratory finds it necessary to make adjustments to the analysis methods, the changes will be documented following the corrective action procedures noted in Section 14.0 of the QAPP. Any such changes must be approved by the test-designated Quality Assurance Officer (QAO).

5.4 MONITORING PROCEDURES [40 CFR 63.1207(f)(1)(iv)]

Continuous monitoring of emissions and process operating variables is conducted as described in Section 2.0.

5.5 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

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

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Table 5-1. F-1 Furnace Minimum Temperature DRE Test Sampling and Analysis (Test 1)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
Hex Liquid Waste	Tap on line	250 mL wide-mouth VOA jars	ASTM E-300-86	Grab samples taken at the beginning, middle and end (B-M-E) of each test run using 250 mL VOA jars. All three grab samples are collected as individual samples; Sample compositing will be performed in the laboratory.	HCB and SVOCs VOCs PCBs Heating Value Density Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056
Other Liquid Waste	Tap on line	250 mL wide-mouth bottle; 40 mL VOAs and 250 and 500 mL sample bottles	ASTM E-300-86	Collect a 250 mL grab sample at 30-minute intervals during each test run. The grab samples are transferred to a 4L jug to build a composite sample. The run composite is maintained on ice between sampling intervals. At the end of the test run, collect two 40mL VOAs, and 250 or 500 mL sample bottles from the homogenized composite sample.	HCB and SVOCs VOCs PCBs Heating Value Density Viscosity Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-445 ASTM D-808 or E-442; SW846 5050/9056

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Table 5-1. F-1 Furnace Minimum Temperature DRE Test Sampling and Analysis (Test 1)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
HCl Product	Tap on line	250 mL bottle; 4 L glass jug; 1-liter sample bottles	ASTM E-300-86	At each 30-minute interval, collect a 250 mL grab sample. Transfer the grab samples to a 4 L glass jug maintained on ice to build run composite. At the end of the test run, collect one 1-liter sample of the homogenized composite sample.	HCB	SW846 8270C
Scrubber Purge Water	Tap on line	Same as HCl product	ASTM E-300-86	Same procedure as HCl product.	HCB	SW846 8270C
Stack Gas	Non-Isokinetic Port	VOST	SW846 0030 (VOST)	80 L integrated sample; 0.5 to 1.0 L/min, four tube set pairs, 20 L per Tube set pair	Volatile organic PICs	SW846 5041A/8260B
Stack Gas	Isokinetic Port	Method 0023A Sampling Train	SW846 0023A	Minimum of 3 hours and 3.0 dry standard cubic meters [b,c]	PCDD/PDCFs PCBs	SW846-8290 (PCDD/PDCFs) SW846 3542/EPA Method 1668A (PCBs)
Stack Gas	Isokinetic Port	Method 0010 Sampling Train	SW846 0010	Minimum of 3 dry standard cubic meters [b,c]	HCB; semivolatile organic PICs	SW846 3542/8270C
Stack Gas	CEMS Port	Installed CO and O_2 CEMS	40 CFR 60 Appendix B Specification 4B	Continuous	CO and O_2	40 CFR 60 Appendix B Specification 4B
Stack Gas	CEMS Port	Temporary HC CEMS	EPA Method 25A	Continuous	HC	40 CFR 60 Appendix A Method 25A

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Table 5-1. F-1 Furnace Minimum Temperature DRE Test Sampling and Analysis (Test 1)

Notes:

(a) Reference Method Sources:
"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series

"SW846" 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 1668A" refers to Method 1668A, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-821-R-00-002, December 1999.

(b)The exact volume of gas sampled will depend on the isokinetic sampling rate.

(c) Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3)
- 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).

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Table 5-2. F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling and Analysis (Test 2)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
Hex Liquid Waste	Tap on line	250 mL wide-mouth VOA jars	ASTM E-300-86	Grab samples taken at the beginning, middle and end (B-M-E) of each test run using 250 mL VOA jars. All three grab samples are collected as individual samples; Sample compositing will be performed in the laboratory.	HCB and SVOCs VOCs PCBs Heating Value Density Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056
Other Liquid Waste	Tap on line	250 mL wide-mouth bottle; 40 mL VOAs and 250 and 500 mL sample bottles	ASTM E-300-86	Collect a 250 mL grab sample at 30-minute intervals during each test run. The grab samples are transferred to a 4L jug to build a composite sample. The run composite is maintained on ice between sampling intervals. At the end of the test run, collect two 40mL VOAs, and 250 or 500 mL sample bottles from the homogenized composite sample.	HCB and SVOCs VOCs PCBs Heating Value Density Viscosity Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-445 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056

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Table 5-2. F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling and Analysis (Test 2)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
HCl Product	Tap on line	250 mL bottle; 4 L glass jug; 1-liter sample bottles	ASTM E-300-86	At each 30-minute interval, collect a 250 mL grab sample. Transfer the grab samples to a 4 L glass jug maintained on ice to build run composite. At the end of the test run, collect one 1-liter sample of the homogenized composite sample.	HCB	SW846 8270C
Scrubber Purge Water	Tap on line	Same as HCl product	ASTM E-300-86	Same procedure as HCl product.	HCB	SW846 8270C
Stack Gas	Non-Isokinetic Port	VOST	SW846 0030 (VOST)	80 L integrated sample; 0.5 to 1.0 L/min, four tube set pairs, 20 L per Tube set pair	Volatile organic PICs	SW846 5041A/8260B
Stack Gas	Isokinetic Port	Method 0023A Sampling Train	SW846 0023A	Minimum of 3 hours and 3.0 dry standard cubic meters [b,c]	PCDD/PDCFs PCBs	SW846-8290 (PCDD/PDCFs) SW846 3542/EPA Method 1668A (PCBs)
Stack Gas	Isokinetic Port	Method 0010 Sampling Train	SW846 0010	Minimum of 3 dry standard cubic meters [b,c]	HCB; semivolatile organic PICs	SW846 3542/8270C
Stack Gas	Isokinetic Port	Method 26A	EPA Method 26A	Minimum of 60 minutes [b,c]	Particulate HCl/Cl_2	EPA Method 5 (Particulate) EPA Method 26A (HCl/Cl_2)
Stack Gas	CEMS Port	Installed CO and O_2 CEMS	40 CFR 60 Appendix B Specification 4B	Continuous	CO and O_2	40 CFR 60 Appendix B Specification 4B
Stack Gas	CEMS Port	Temporary HC CEMS	EPA Method 25A	Continuous	HC	40 CFR 60 Appendix A Method 25A

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Table 5-2. Test 2: F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling and Analysis (Test 2)

Notes:

(a) Reference Method Sources:

"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series

"SW846" 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 1668A" refers to Method 1668A, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-821-R-00-002, December 1999.

(b) The exact volume of gas sampled will depend on the isokinetic sampling rate.

(c) Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3)
- 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).

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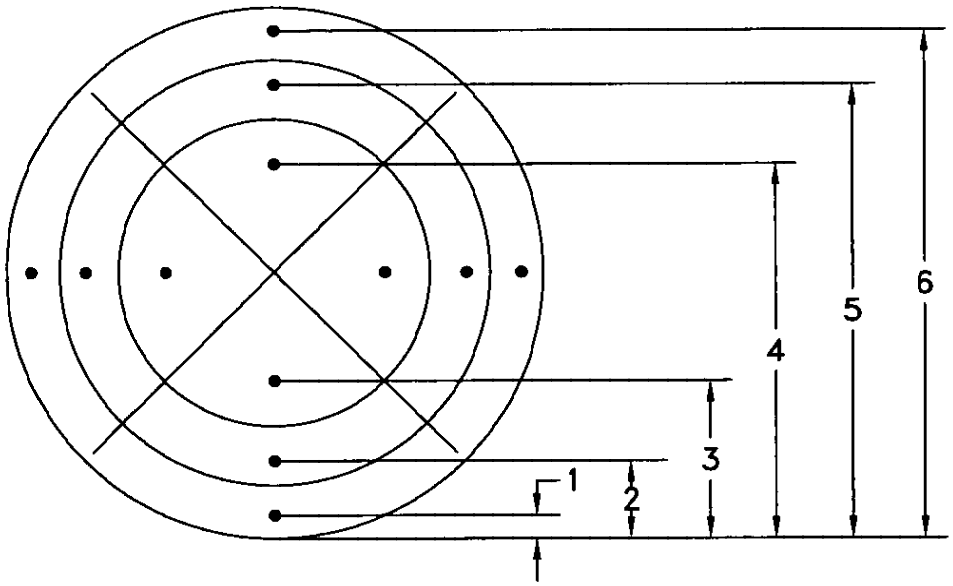
	LINEAR DIMENSION	DUCT DIAMETERS
A	6'-9"	4.10
B	11'-11"	7.24
C	19'-.75"	

TRAVERSE POINT	DISTANCE % of diameter	DISTANCE (inches)
1	4.4	.875
2	14.6	2.875
3	29.6	5.875
4	70.4	13.875
5	85.4	16.875
6	95.6	18.875



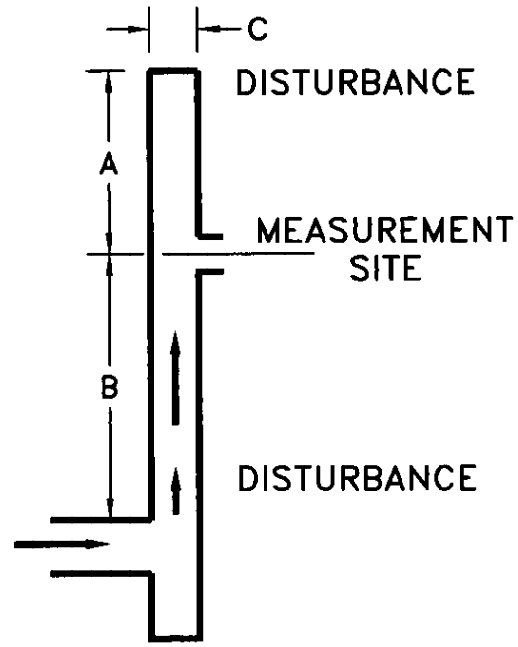


Figure 5-1. F-1 Furnace Stack Sampling Ports

05/24/05	VULFIG5-1	090309

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

6.1 GENERAL SCHEDULE

The following sections present a detailed schedule for performance testing as required by 40 CFR 63.1207(f)(1)(v).

6.2 PLANNED TEST DATE

In accordance with 40 CFR 63.1207(e)(1)(i)(B), OxyChem will notify LDEQ and EPA at least 60 days before the planned date for starting the test. The CPT start date will be confirmed one week before the start of the test.

6.3 TEST DURATION

Each CPT test condition will consist of three replicate sampling runs. The anticipated order 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; conduct Test 1, Run 1.
- Wednesday-Conduct Test 1, Runs 2 and 3.
- Thursday-Conduct Test 2, Runs 1 and 2.
- Friday-Conduct Test 2, Run 3.

The proposed sequencing of the CPT stack sampling is outlined in Figures 6-1 and 6-2. The CPT sampling may begin once the F-1 Furnace has stabilized at the target test conditions for at least one hour to establish rolling average values.

6.4 QUANTITY OF WASTE TO BE BURNED

The estimated hours of operation to complete testing and the amount of liquid waste feed that will be used are summarized in Table 6-1.

6.5 DETAILED SCHEDULE OF PLANNED TEST ACTIVITIES

The activities for a typical test day during the test are shown in Figures 6-1 and 6-2.

6.6 TEST INTERRUPTIONS

In the event of an AWFCO or similar test interruption, all stack gas sampling will be suspended immediately. Stack sampling pumps will be switched off, but probes may remain in the stack. The waste

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feed, HCl product, and scrubber water discharge sampling will continue pending a determination and assessment of the expected stoppage or test delay time by the test manager.

Should the situation be resolved very shortly (15 minutes or less), and waste feed instantaneous rates are resumed at or above 90% of the rates prior to the test stoppage event, and other target conditions are comparable to before the test interruption, stack sampling may be resumed at the discretion of the test manager and after consultation with the F-1 Furnace operations staff. Optionally, the test manager may elect to hold off the re-start of sampling until hourly rolling averages have re-established at or closer to test target values.

Should the situation take longer to be resolved (more than 15 minutes), all sampling will be suspended until the hourly rolling averages have re-established at or close to test target values. The stack gas sampling probes will be removed from the stack ports and the nozzles sealed off with Teflon tape. Stack sampling equipment will be maintained on hot standby pending a test re-start decision. Once the situation is corrected, waste feed has resumed, and the hourly rolling averages are re-established, testing will resume at the direction of the test manager.

Should the situation become evident that testing can not be resumed in 1-2 hours, or will take even longer to resolve, the test manager may suspend testing for the day. The test manager will assess whether any stack gas sampling trains that have been completed should be retained or discarded. Most incomplete sampling trains may be held for up to 24 hours and then resumed. Process samples (waste, HCl product and water) may be held over as well. If testing can be resumed the following day, the incomplete stack gas sampling trains, the process sampling equipment, and completed sampling train samples will be secured for the night in such manner as to properly preserve the samples. Sampling will resume the following day where testing the previous day ended once the unit is back at the target test conditions. Optionally, the test run may be scrubbed altogether with all samples to that point being discarded, and all stack gas and process sampling started anew when testing can be resumed. No incomplete sampling train or process samples will be held over for more than 24 hours.

All test start/stop/suspension/scrub decisions will be communicated to the regulatory observers present at the time of testing. Such decisions may include consultations between the test manager, the F-1 Furnace operations staff, and the regulatory observers present.

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Table 6-1. F-1 Furnace Quantity of Feed Materials for Testing

Test Condition	Waste Feed Hours						Waste Rate (lb/hr)	Waste (lbs)	Waste Rate (gpm)	Waste (gallons)
	Ramp Up	Run 1	Run 2	Run 3	Contingency	Total				
Minimum Temp Test (Test 1)	2	6	6	6	6	**26**	**2,763**	**71,829**	**3.3**	**5,148**
						Hex	2,009	52,239	2.4	3,744
						DNAPL	753	19,590	0.9	1,404
Maximum Feed Rate Test (Test 2)	2	6	6	6	6	**26**	**4,604**	**119,715**	**5.5**	**8,580**
						Hex	3,349	87,065	4.0	6,240
						DNAPL	1,256	32,649	1.5	2,340
TOTALS	**4**	**12**	**12**	**12**	**12**	**52**	**N/A**	**191,543**	**N/A**	**13,728**

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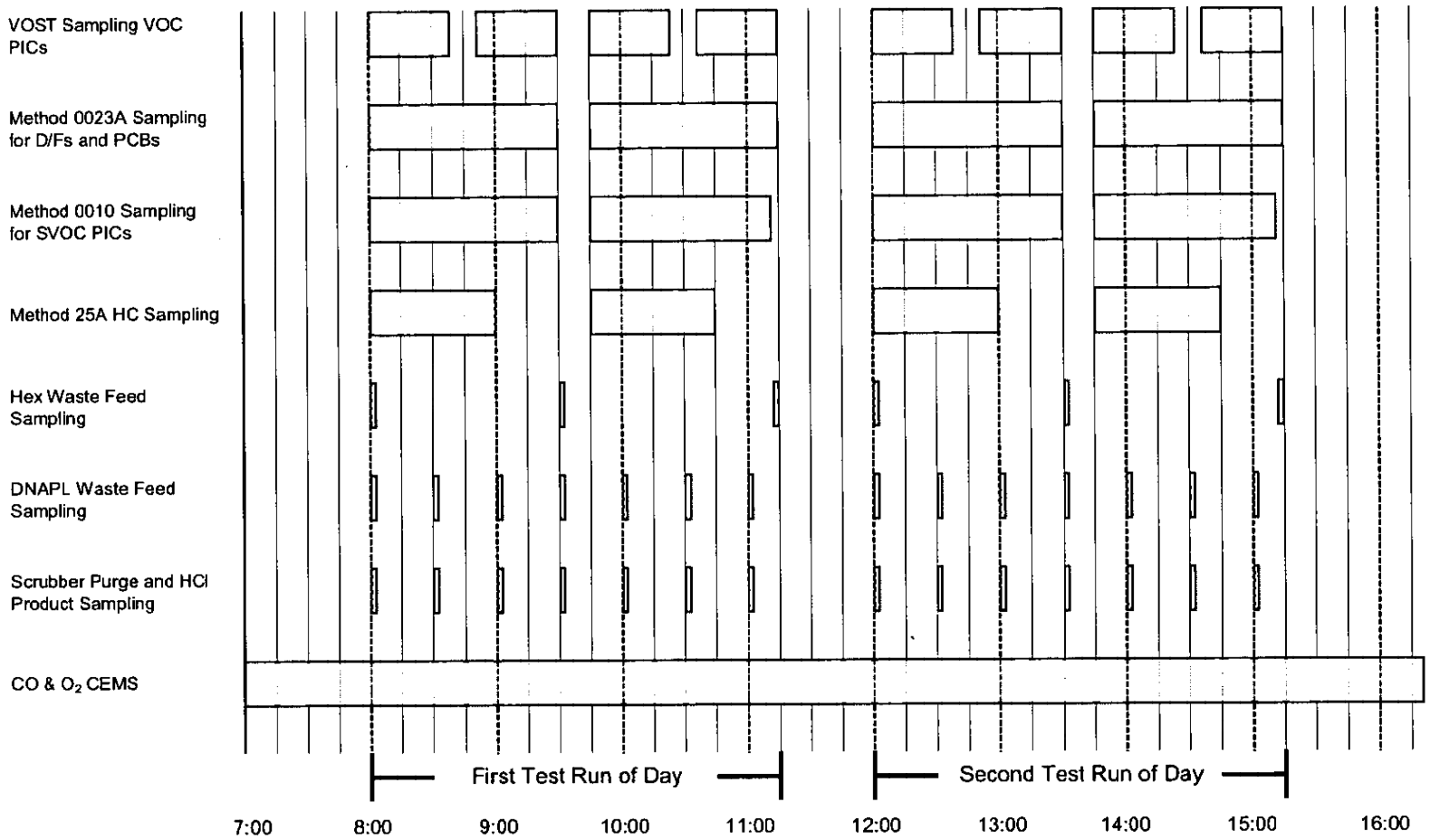

Figure 6-1. F-1 Furnace Minimum Temperature DRE Test Sampling Activities (Test 1)

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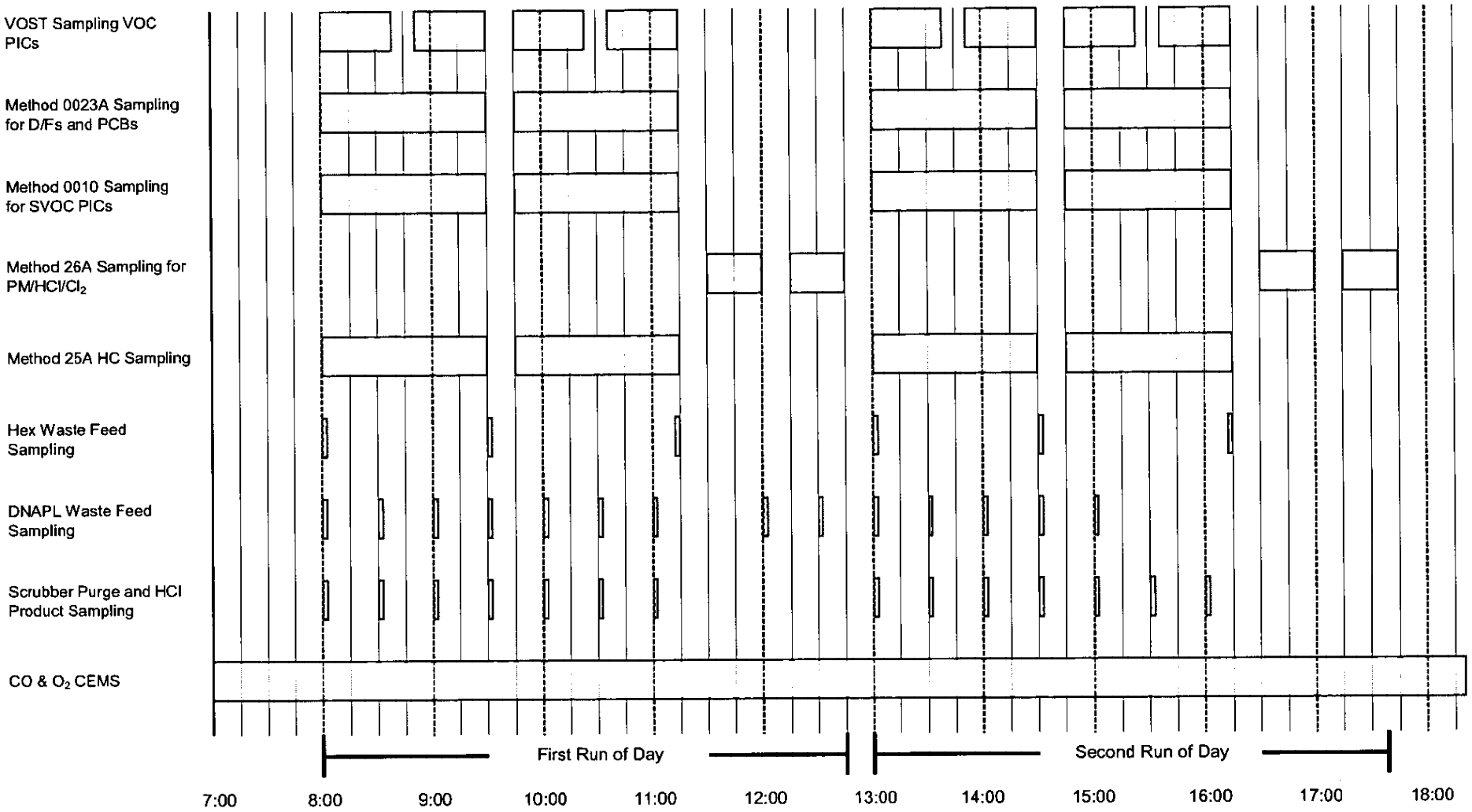

Figure 6-2. F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling Activities (Test 2)

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7.0 OPERATING PERMIT OBJECTIVES

7.1 GENERAL

Based on the results of the testing, OxyChem will propose operating limits for the F-1 Furnace in the Notification of Compliance submitted in accordance with 40 CFR 63.1207(j)(1) that assure continuing compliant performance of the F-1 Furnace. Most of the parameter limits will be proposed based on the operating conditions demonstrated during the CPT, however, several limits will be based on established regulatory guidance, manufacturer's recommendations, or good operating practice. The operating parameters discussed in this section will have permitted limits to assure compliance with the HWC MACT performance standards. If the required performance objectives of the testing are achieved, the F-1 Furnace should be allowed to operate under the conditions proposed in this section.

7.2 CONTROL PARAMETERS DEFINED

Table 7-1 summarizes the anticipated operating limits for the F-1 Furnace. To achieve the desired operating conditions and demonstrate unit operations at the limits shown in Table 7-1, the AWFCO set points for certain operating parameters must be set higher or lower during testing periods. The recommended AWFCO interlock set points during testing periods are presented in Table 7-2. The following sections present a discussion of each parameter. To facilitate review, the control parameters are grouped into the following categories:

- Group 1 parameter limits are established from test operating data, and are used to ensure that the system operating conditions are not significantly less rigorous than those demonstrated during the test. Most Group 1 parameters are continuously monitored and recorded, and are interlocked with the automatic waste feed cutoff system. During the test periods (miniburn and formal test), continuously monitored and interlocked Group 1 parameters will be operational, but will be set at values that will allow the desired operating limits to be demonstrated (refer to Table 7-2).
- Group 2 parameter limits are regulatory specified limits, and are not based on the test operating conditions, e.g., the maximum stack CO or HC concentration. Most Group 2 parameters are continuously monitored and recorded, and are interlocked with the automatic waste feed cutoff system. Interlocks for continuously monitored Group 2 parameters will be operational during the test periods, without modification to the interlock set points.
- Group 3 parameter limits are based on manufacturer's recommendations, operational safety, and good operating practice considerations rather than on the test operating conditions. Group 3 parameter limits may be regulatory specified limits. Some Group 3 parameters may be continuously monitored and recorded, and may be interlocked with the automatic waste feed cutoff system. Interlocks for continuously monitored Group 3 parameters will be operational during the test periods.

The T-10 column and water scrubbing section of the T-11 column (HCl recovery system) of the F-1 Furnace is controlled to produce 10-18% HCl. Because this system is a production operation, OxyChem

proposes no permit operating limits. Acid control limits related to the operation of the subsequent T-11 column caustic scrubber system are proposed in following sections.

7.3 DEVELOPMENT OF PERMIT LIMITS

Except as noted, the final operating limits for each of the control parameters will be established as specified in the HWC MACT regulations given in 40 CFR 63.1209. The following sections describe how each control parameter limit will be established.

In addition to establishing specific operating limits, OxyChem anticipates having limits on the types of waste that can be burned in the F-1 Furnace. Since OxyChem will demonstrate a 99.99% DRE using hexachlorobenzene (HCB), OxyChem expects to be permitted to burn all of the wastes represented by the waste codes in the facility's most recent RCRA Part A permit application. The TSCA permit allows continued treatment of TSCA-listed wastes (wastes containing greater than 50 mg/kg of PCBs).

7.3.1 Parameters Demonstrated During the Test (Group 1 Limits)

Group 1 parameter limits are based on the results of the testing. The following parameters are proposed as Group 1 parameters for the F-1 Furnace.

7.3.1.1 Maximum Total Hazardous Waste Feed Rates [40 CFR 63.1209(j)(3), (k)(4)]

The F-1 Furnace maximum waste feed rate test will be conducted in order to demonstrate the maximum feed rates of liquid waste. The liquid waste feed rate will be monitored on a continuous basis. The maximum allowable liquid waste feed rate for F-1 Furnace will be established as hourly rolling average limits from the averages of the maximum hourly rolling average feed rate demonstrated during the three runs of the maximum waste feed rate test (Test 2).

7.3.1.2 Maximum Total Chloride Feed Rates [40 CFR 63.1209(o)(1)]

OxyChem will feed waste normally treated in F-1 Furnace during the testing. These wastes contain significant amounts of native chloride. Provided that the HCl and Cl_2 emissions measured during the maximum waste feed rate test (Test 2) are less than the HWC MACT standard expressed as Cl^- equivalents, the final total chloride feed rate limit for F-1 Furnace should be the test demonstrated feed rate. The total chloride feed rate limit should be expressed as a 12-hour rolling average, equal to the average of the average chloride feed rate during the three runs of the maximum waste feed rate test. Records of waste feed analyses, and the electronic waste feed operational data, will be maintained to demonstrate compliance with the chloride feed rate limit.

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7.3.1.3 Maximum Ash Feed Rates [40 CFR 63.1209(m)(3)]

In accordance 40 CFR 63.1218(a)(7), compliance with HWC MACT particulate emissions performance standard is satisfied by demonstrating compliance with the HAPF HCl/Cl_2 emissions performance requirement, 40 CFR 63.1218(a)(6). Therefore, no ash feed rate limit is proposed.

7.3.1.4 Maximum Metals Feed Rates [40 CFR 63.1209(l)(1), (n)(2)]

In accordance 40 CFR 63.1218(a)(2)-(4), compliance with HWC MACT metals emissions performance standards is satisfied by demonstrating compliance with the HAPF HCl/Cl_2 emissions performance requirement, 40 CFR 63.1218(a)(6). Therefore, no metals feed rate limits are proposed.

7.3.1.5 Minimum Combustion Temperature [40 CFR 63.1209(j)(1), (k)(2)]

The CPT includes testing of F-1 Furnace at the conditions of the minimum combustion temperature with maximized combustion gas flow (minimum combustion gas residence time), since these conditions are least favorable for DRE. Combustion gas temperature will be monitored on a continuous basis. Based on successful demonstration of DRE during the F-1 Furnace minimum temperature test (Test 1), maximum combustion gas velocity test, the minimum combustion temperature limit for F-1 Furnace will be established as an hourly rolling average equal to the average of the F-1 Furnace minimum temperature DRE test run average values.

7.3.1.6 Minimum Caustic Scrubber L/G [40 CFR 63.1209(o)(3)(v)]

The F-1 Furnace maximum waste feed rate test will be conducted to demonstrate the minimum caustic scrubber minimum liquid to gas ratio (L/G). The L/G will be continuously calculated using the liquid recycle flow to caustic scrubber section of the T-11 column as "L" and combustion air flow as "G". F-1 Furnace caustic scrubber L/G will be monitored on a continuous basis. Based on successful demonstration of HCl and Cl_2 control during the F-1 Furnace maximum waste feed rate test (Test 2), the minimum caustic scrubber L/G limit will be established as an hourly rolling average equal to the average values demonstrated during the F-1 Furnace maximum waste feed rate test run average L/G.

7.3.1.7 Minimum Caustic Scrubber pH [40 CFR 63.1209(o)(3)(iv)]

The F-1 Furnace maximum waste feed rate test (Test 2) will be conducted to demonstrate the minimum caustic scrubber pH. F-1 Furnace caustic scrubber pH will be monitored on a continuous basis. Based on successful demonstration of HCl and Cl_2 control during the F-1 Furnace maximum waste feed rate test, the minimum caustic scrubber pH limit will be established as an hourly rolling average value equal to the averages demonstrated the F-1 Furnace maximum waste feed rate test run average pH values.

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7.3.1.8 Maximum Combustion Air Flow Rate [40 CFR 63.1209(j)(2), (k)(3), (o)(2)]

The F-1 Furnace uses combustion air flow rate measurement as the indicator of combustion gas velocity and residence time. The maximum combustion air flow rate for F-1 Furnace will be established from the average of the maximum hourly rolling average combustion air flows demonstrated during the three runs of the maximum waste feed rate test (Test 2).

7.3.2 Parameters Established by Regulatory Requirements (Group 2 Limits)

Group 2 parameter limits are based on regulatory requirements. The following parameters are proposed as Group 2 parameters for the F-1 Furnace.

7.3.2.1 Maximum Stack Gas CO Concentration [40 CFR 63.1218(b)(5)(i)]

The maximum hourly rolling average stack gas CO concentrations will be maintained at or below 100 ppmv corrected to 7% oxygen (dry basis) during the test. OxyChem expects a final operating limit specifying a maximum allowable stack gas carbon monoxide concentration of 100 ppmv hourly rolling average corrected to 7% oxygen, dry basis.

7.3.2.2 Fugitive Emissions Control [40 CFR 63.1206(c)(5)(i)(A), 63.1209(p)]

The F-1 Furnace combustion zone is sealed to fugitive emissions and complies with the standards of 40 CFR 63.1206(c)(5)(i)(a).

7.3.3 Parameters Established by Manufacturer's Recommendations, Operational Safety and Good Operating Practice (Group 3 Limits)

Group 3 parameter limits are based on manufacturer's recommendations, operational safety and good operating practice considerations. The following parameters are proposed as Group 3 parameters.

7.3.4 Minimum Waste Atomization Steam Pressure [40 CFR 63.1209(j)(4)]

Based on operating experience, the final permit should include a limit on the minimum waste atomization steam pressure of 50 psig. The waste feed atomization steam lines are currently equipped with local pressure indicators. OxyChem is adding instrumentation to continuously measure atomization steam pressure. Compliance will be via an hourly rolling average limit.

7.3.4.1 Minimum Liquid Feed Pressure for Caustic Scrubber Recycle [40 CFR 63.1209(o)(3)(iii)]

The HWC MACT requires establishing a minimum recycle liquid feed pressure limits for "low energy wet scrubbers" like the caustic scrubber system. Recycle flow pressure provides an indication that proper liquid distribution is being maintained in the caustic scrubber. The caustic scrubber recycle line is currently equipped with a local pressure indicator. OxyChem is adding instrumentation to continuously measure recycle line pressure. Compliance will be via an hourly rolling average limit.

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7.3.4.2 Minimum Differential Pressure for Low Energy Wet Scrubbers [40 CFR 63.1209(o)(3)(ii)]

The HWC MACT requires establishing a minimum differential pressure limit for "low energy wet scrubbers". The caustic scrubber meets the definition of a "low energy wet scrubber". OxyChem is adding instrumentation to continuously measure differential pressure. However, OxyChem proposes to waive the minimum differential pressure requirement. The current Kynar saddle packing in the caustic scrubber is being replaced with ultra-low differential pressure Kynar Q-pac®. Additionally, the current tray-type liquid distribution plate will be replaced with a trough-style distributor. With the new packing and liquid distributor changes, the expected pressure drop across the caustic scrubber will be approximately 0.25 inches water column (inwc). This differential pressure estimate is based on a recycle flow of 200 gpm and a combustion gas flow based on 1.5 gpm of liquid waste feed to the F-1 Furnace and no process vents. These conditions would be the relative nominal, low end of the operating conditions for the F-1 Furnace. The expected pressure drop is really too low as to provide any reliable or practicable indication or measure of proper liquid distribution.

OxyChem proposes, via the Alternative Monitoring Application (AMA), to waive this requirement on the basis that: 1) the minor variations in differential pressures through the very low pressure drop caustic scrubber do not provide any relevant indication of scrubber performance, and 2) the limits on minimum recycle flow rate and pressure for the caustic scrubber will provide equivalent assurance of proper liquid distribution and liquid to gas (L/G) ratio.

7.4 TRANSITION FROM RCRA TO HWC MACT OPERATING LIMITS [40 CFR 63.1211(d)(4), 63.1210(d)(2)]

Upon satisfactory completion of the CPT and demonstrated compliance with the HWC MACT performance standards, OxyChem will submit with the Notification of Compliance (NOC) a RCRA Class 1 permit modification requesting to remove the operating limits for F-1 Furnace from the current RCRA permit. The F-1 Furnace operating limits will be incorporated into the facility Title V permit.

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Table 7-1. Summary of Anticipated F-1 Furnace Operating Limits

Operational Parameter	Units	Limit	AWFCO	Averaging Period	Method of Setting Limit
Group 1 Parameters					
Maximum total liquid waste feed rate	lb/hr	4,604	Yes	HRA	Average of the maximum rolling average feed rate during the maximum waste feed rate test . [40 CFR 63.1209(j)(3), (k)(4)]
	gpm	5.5			
Maximum total chloride feed rate	lb/hr	1,612	Yes	THRA	Average of the average feed rate during the maximum waste feed rate test. [40 CFR 63.1209(o)(1)]
Minimum combustion temperature	° F	1,650	Yes	HRA	Average of the average combustion temperature during the minimum temperature DRE test. [40 CFR 63.1209(j)(1), (k)(2)]
Maximum combustion air flow	scfm	4,000	Yes	HRA	Average of the maximum rolling average flow rate during the maximum waste feed rate test . [40 CFR 63.1209(j)(2), (k)(3), (o)(2)]
Minimum caustic scrubber pH	pH units	9.0	Yes	HRA	Average of the average pH during the maximum waste feed rate test. [40 CFR 63.1209(o)(3)(iv)]
Minimum caustic scrubber L/G	gpm/scfm	0.060	Yes	HRA	Average of the average L/G during the maximum waste feed rate test. [40 CFR 63.1209(o)(v)]
Group 2 Parameters					
Maximum stack gas CO	ppmv, dry @ 7% O_2	100	Yes	HRA	HWC MACT Rule [40 CFR 63.1218(a)(5)(i)]
Fugitive Emissions	N/A	N/A	N/A	N/A	HWC MACT Rule [40 CFR 63.1206(c)(5)(i)(A)]
Group 3 Parameters					
Minimum hex waste atomization steam pressure	psig	50	Yes	HRA	Operating experience [40 CFR 63.1209(j)(4)]
Minimum solvent waste atomization steam pressure	psig	50	Yes	HRA	Operating experience [40 CFR 63.1209(j)(4)]
Minimum caustic scrubber recycle pressure	psig	30	Yes	HRA	Operating experience [40 CFR 63.1209(o)(3)(iii)]

AWFCO - automatic waste feed cutoff
HRA - hourly rolling average
N/A - not applicable
THRA - 12-hour rolling average

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Table 7-2. Recommended F-1 Furnace AWFCO Set Points during Testing

Operational Parameter	Units	Limit	Basis	AWFCO	Averaging Period
Group 1 Parameters					
Maximum total liquid waste feed rate	lb/hr	5,065	Target +10%	Yes	HRA
	gpm	6.1			
Minimum combustion temperature	° F	1,600	Target -50 °F	Yes	HRA
Maximum combustion air flow	scfm	4,400	Target +10%	Yes	HRA
Minimum caustic scrubber pH	pH units	8.0	Target -1.0 pH units	Yes	HRA
Minimum caustic scrubber L/G	gpm/scfm	0.045	Target -25%	Yes	HRA
Group 2 Parameters					
Maximum stack gas CO	ppmv, dry @ 7% O_2	100	N/A	Yes	HRA
Group 3 Parameters					
Minimum hex waste atomization steam pressure	psig	50	N/A	Yes	HRA
Minimum solvent waste atomization steam pressure	psig	50	N/A	Yes	HRA
Minimum caustic scrubber recycle pressure	psig	30	N/A	Yes	HRA

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8.0 TEST REPORT

In accordance with 40 CFR 63.1210(d)(1)(iii), the final test report will be postmarked before the close of business on the 90th day after completion of the test unless a time extension must be requested under 40 CFR 63.1207(j)(4). The final test report will be a comprehensive test report that contains a discussion of the test objectives; sampling, analysis, and QA/QC activities performed; summaries of process operating conditions; the results of the test determinations; and proposed permit conditions. The planned outline of the test report is shown in Table 8-1.

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Table 8-1. Example F-1 Furnace CPT Report Outline

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- **2.4** Test Chronology
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APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN FOR THE F-1 INDUSTRIAL FURNACE COMPREHENSIVE PERFORMANCE TEST OCCIDENTAL CHEMICAL CORPORATION EPA I.D. NO. LAD 092 681 824

PREPARED FOR:

OxyChem.

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NOVEMBER 2007
Revision: 1
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1.0 QUALITY ASSURANCE PROJECT PLAN APPROVAL FORM AND DISTRIBUTION LIST

Project Title: Occidental Chemical Corporation (OxyChem)
Comprehensive Performance Test for the F-1 Furnace
Geismar, Ascension Parish, Louisiana

Expected Comprehensive Performance Test (CPT) Date: February 2008

Project Approvals:

Name/Function/Organization	Signature	Date
Sharon D. Caughman Test Project Manager Occidental Chemical Corporation		
Chris E. McBride Test Coordinator Focus Environmental, Inc.		
Michael J. Krall Stack Sampling Coordinator TRC Environmental, Inc		
Dr. William C. Anderson Laboratory Analysis Coordinator Test America, Inc.		
Teresa L. 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 that no testing methods will be modified. If modifications do occur to any sampling and analytical methods as specified in the associated CPT Plan and Risk Assessment Data Collection Plan, they are to be identified and explained in the sampling and analytical narratives, and discussed in the body of the test report. Approval for modifications to the test program specified sampling and analytical methods will be requested as appropriate from the U.S. EPA Region 6 if the modification is minor or intermediate, and Research Triangle Park (RPT) if the modification is major.

QAPP Distribution List

Project Organization Title	Organization/Name	No. of Copies
Test Project Manager	Occidental Chemical Corporation	1
Test Coordinator	Focus Environmental, Inc.	1
Process Sampling Coordinator/Sample Custodian	Focus Environmental, Inc.	1
Stack Sampling Coordinator	TRC Environmental, Inc	1
Laboratory Analysis Coordinator	Test America, Inc.	1
Quality Assurance Officer	Focus Environmental, Inc.	1
Louisiana Department of Environmental Quality	LDEQ	3
U.S. Environmental Protection Agency	EPA Region 6	2

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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ATTACHMENTS

A Resumes of Key Individuals
B LELAP Approvals
C Audit Sample Requests

ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing Materials
B-M-E	beginning-middle-end
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
CPT	comprehensive performance test
CMS	continuous monitoring system
COC	chain of custody
CVAA or CVAAS	cold vapor atomic adsorption spectroscopy
DCBP	decachlorobiphenyl
DI	deionized (water)
DNAPL	dense non-aqueous phase liquid
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
FR	feed rate
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
Grav	gravimetric
HAPF	hydrochloric acid production furnace
HNO_3	nitric acid
H_2O_2	hydrogen peroxide

H_2SO_4	sulfuric acid
HC	hydrocarbons
HCB	hexachlorobenzene
HCl	hydrogen chloride (gas) or hydrochloric acid (aqueous)
HRGC/HRMS	high resolution gas chromatography/ high resolution mass spectrometry
HWC	Hazardous Waste Combustor
IATA	International Air Transport Association
ICB	initial calibration blank
Cl^-	chloride ion
ICP or ICAP	inductively coupled argon plasma spectroscopy
ICP/MS or ICAP/MS	inductively coupled argon plasma spectroscopy/mass spectroscopy
ICV	initial calibration verification
IDL	instrument detection limit
inwc	inches water column
kg	kilograms
KOH	potassium hydroxide
$KMnO_4$	potassium permanganate
L	liter
L/G	liquid to gas ratio
L/min	liters per minute
LAC	Laboratory Analysis Coordinator
lb or lbs	pounds
LCS	laboratory control standard
LCSD	laboratory control standard duplicate
LDEQ	Louisiana Department of Environmental Quality
LELAP	Louisiana Environmental Laboratory Accreditation Program
m^3/min	cubic meters per minute
MACT	Maximum Achievable Control Technology
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
$Na_2S_2O_3$	sodium thiosulfate
ND	not detect
ηg or ng	nanograms

non-Hg	non-mercury
O_2	oxygen
OCl^-	hypochlorite
OSW	EPA Office of Solid Waste
OTS	Office of Toxic Substances
OxyChem	Occidental Chemical Corporation
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
PM	particulate matter
POHC	principal organic hazardous constituent
ppm	parts per million
ppmv or ppmdv	parts per million dry volume
PSD	particle size distribution
QA	quality assurance
QAO	quality Assurance Officer
QAPP	quality Assurance Project Plan
QC	quality control
RA	risk assessment
RCRA	Resource Conservation and Recovery Act
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
SEM	scanning electron microscope
SPCC	system performance check
SOP	standard operating procedure
SRE	system removal efficiency
SQL	sample quantitation limit
SVOC	semivolatile organic compound
SW846	"Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (SW-846)," Third Edition, 1986 and updates (December 1997).
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCL	target compound list

TCO	total chromatographable organics
TEQ	toxicity equivalents
TEF	toxicity equivalents factors
THC	total hydrocarbons
TIC	tentatively identified compound
TOE	total organic emissions
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 Comprehensive Performance Test (CPT) Plan and Risk Assessment Data Collection Plan for the Occidental Chemical Company (OxyChem) F-1 Furnace, located in Geismar, Louisiana, and must be used in conjunction with these plans. 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 establishing operating limits for the F-1 Furnace. Refer to the respective test plans 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 the CPT and risk assessment data collection testing of the F-1 Furnace. 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 plans 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.
- National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors, 40 CFR 63 Subpart EEE, October 12, 2005.
- Rules and Regulations of the State of Louisiana applicable to operators of hazardous waste incinerators [LAC 33:V.3111].
- 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, Region 6, "Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities", EPA 530D-98-001C, July, 1998

3.3 FACILITY BACKGROUND INFORMATION

OxyChem operates an industrial furnace, the F-1 Furnace, at its Geismar Plant located in Ascension Parish, Geismar, Louisiana. The F-1 Furnace is currently permitted under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA). Phase II of the Hazardous Waste Combustor (HWC) Maximum Achievable Control Technology (MACT) rule promulgated October 2005 is applicable to the F-1 Furnace. Under HWC MACT, the F-1 Furnace is classified as a hydrochloric acid production furnace (HAPF).

A risk assessment has never been performed related to the emissions from the F-1 Furnace. Under the RCRA Omnibus Provisions at 40 CFR 270.32(b)(2)-(3), Environmental Protection Agency (EPA) Region 6 and Louisiana Department of Environmental Quality (LDEQ) have indicated that the CPT program needs to include risk assessment data collection.

3.4 UNIT CONFIGURATION

The F-1 Furnace treats a number of chlorinated liquid hydrocarbon waste and vapor vent streams generated from manufacturing units at the Geismar Plant. The F-1 Furnace consists of a thermal oxidizer, energy recovery boiler, hydrochloric acid (HCl) recovery system, and caustic scrubber.

Liquid chlorinated hydrocarbon wastes and vapor vents are combusted in the oxidizer. Heat is removed from the resulting combustion gas by the fire-tube energy recovery boiler. The steam produced by the system's boiler is secondary benefit and is relatively small compared to the facility's overall steam demand. However, the heat removal provided by the boiler is necessary to produce the high concentration HCl. Without the boiler, the high HCl concentration product would not be possible.

The combustion gas from the energy recovery boiler enters the HCl recovery system that includes the quenching and scrubber sections Tower T-10 and the lower two sections of Tower T-11. The recovered aqueous HCl is typically 10-25 weight percent HCl and is used in the facility's wastewater treatment system.

Following the HCl recovery section, the caustic scrubber section of T-11 removes residual HCl and molecular chlorine (Cl_2) before the combustion gas is discharged to the atmosphere via the integrated stack.

The F-1 Furnace includes a process control system inclusive of continuous monitoring system (CMS) (measurement of flows, temperatures, pressures, etc., to assure compliant operation) and a continuous emissions monitoring system (CEMS) for stack gas carbon monoxide (CO) and oxygen (O_2).

More detailed engineering information for the F-1 Furnace can be found in Section 2.0 of the HWC MACT CPT Plan.

3.5 APPLICABLE HWC MACT PERFORMANCE STANDARDS

The F-1 Furnace must comply with the following HWC MACT performance standards for HAPFs:

- Destruction and removal efficiency (DRE) of greater than or equal to 99.99% for the selected principal organic hazardous constituent (POHC) [40 CFR 63.1218(c)(1)]
- Stack gas carbon monoxide (CO) concentration less than or equal to 100 parts per million volume (ppmv), dry basis, corrected to 7% oxygen (O_2) on an hourly rolling average basis [40 CFR 63.1218(a)(5)(i)]
- Stack gas total hydrocarbon (HC or THC) concentration less than or equal to 10 ppmv, dry basis, corrected to 7% O_2 as propane [40 CFR 63.1218(a)(5)(ii)]
- Combined emissions of hydrogen chloride (HCl) and chlorine (Cl_2) (expressed as Cl^- equivalents) are no greater than 150 ppmv, dry basis, corrected to 7% O_2, or demonstrated system removal efficiency (SRE) of greater than 99.923% [40 CFR 63.1218(a)(6)(i) or (ii)].

Table 3-1 provides the regulatory citations for the applicable performance standards and the operating limits. Compliance with the HWC MACT HCl/Cl_2 emission performance standard is a surrogate for particulate matter (PM) and metals compliance [40 CFR 63.1218(a)(2), (3), (4) and (7)]. Compliance with either the HWC MACT CO or THC emission performance standard is a surrogate for dioxin/furan compliance [40 CFR 63.1218(a)(1)]. However, in accordance with 63.1207(b)(3), polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PDCF) emissions must be measured during the initial CPT. The unit operating data will be used to establish the following operating limits:

- Maximum hazardous waste feed rate [40 CFR 63.1209(j)(3), (k)(4)]
- Minimum combustion temperature [40 CFR 63.1209(j)(1), (k)(2)]
- Maximum combustion gas flow rate [40 CFR 63.1209(j)(2), (k)(3), (o)(2)]
- Maximum chloride feed rate [40 CFR 63.1209(o)(1)]
- Minimum scrubber liquid to gas ratio (L/G) [40 CFR 63.1209(o)(2)]
- Minimum scrubber water pH [40 CFR 63.1209(o)(3)(iv)].

Other operating limits will be established based on values specified in the HWC MACT regulations, e.g., the maximum stack CO concentration, or manufacturer's recommendations, operational safety, and good operating practice considerations, e.g., minimum steam pressure for liquid waste feed atomization.

3.6 TEST OPERATING AND SAMPLING PROTOCOLS

The part of the test program for demonstrating compliance with the HWC MACT performance standards for HAPFs includes two test conditions. The available stack sampling ports and platform area limit the number and kinds of emissions sampling that can be concurrently performed. In collecting the risk assessment emissions data, OxyChem intends to maximize the overlaps between regulatory and risk assessment data requirements as much as possible during the two HWC MACT compliance test conditions. The balance of the risk assessment data collection required by the guidance will be conducted during a third test condition. The three test conditions are:

- Test 1, Minimum Combustion Temperature Destruction and Removal Efficiency (DRE) Test: The F-1 Furnace will be operated at conditions of minimum combustion temperature and maximum combustion gas velocity. This test will demonstrate compliance with the HWC MACT performance standards for DRE, carbon monoxide (CO), and total hydrocarbons (THC), while feeding hazardous waste and operating at minimum combustion temperature. Process vents routinely treated in the F-1 Furnace will be flowing to the unit during Test 1. This test will establish the minimum combustion temperature limit for the F-1 Furnace.
- Test 2, Maximum Waste Feed Rate Test: The F-1 Furnace will be operated at conditions of maximum waste feed rate and maximum combustion gas velocity. Test 2 will demonstrate compliance with the HWC MACT performance standards for DRE, CO, and HCl/Cl_2, while feeding liquid hazardous waste at maximum rates. Process vents routinely treated in the F-1 Furnace will be directed to the F-2 Furnace during Test 2 in order that the maximum liquid waste treatment capacity of the F-1 Furnace can be demonstrated. This test will establish the maximum waste feed rate and chloride feed rate limits for the F-1 Furnace.
- Test 3 will be conducted at normal to maximum waste feed rates and combustion air flow, conditions closely resembling Test 2 with process vents added. Test 3 is will include the collection of the balance of the usual risk assessment data to supplement or augment data from the other two test conditions.

The sampling and analyses during these three test conditions are summarized in Tables 3-2, 3-3, and 3-4. Table 3-5 is a matrix of the compliance and risk assessment data collection.

The F-1 Furnace destroys organic wastes via combustion, and controls HCl/Cl_2 emissions via wet scrubbing of the combustion gases. Test 1 and Test 2 of the CPT program are designed to demonstrate the range of worst-case operation of the F-1 Furnace, while Test 3 is more representative of normal operations. During all testing, the F-1 Furnace will be operated treating "hex" waste. The "hex" waste stream was selected for the CPT for the following reasons:

1. "Hex" contains native hexachlorobenzene (HCB), the target POHC, for allowing demonstration of the 99.99% DRE for HWC MACT compliance demonstration.
2. "Hex" is the most heavily chlorinated waste stream treated by the F-1 Furnace and will therefore provide the "worst case" indication of the system's capability to control HCl/Cl_2 emissions.

3. "Hex" contains chlorine, and a high percentage of cyclic and aromatic organic constituents including polychlorinated biphenyls (PCBs), all of which are potential precursors to PCDD/PCDF formation in combustion systems, and will therefore provide the "worst case" indication of the system's PCDD/PCDF and other organic emissions.

An additional waste stream, groundwater organic phase liquid (Dense Non-Aqueous Phase Liquid [DNAPL]), will be co-fired with hex waste. The DNAPL is an organic phase mixture containing high concentrations of chlorinated cyclic and aromatic constituents including PCBs. This stream will add to the demonstration of the "worst case" for HCl/Cl_2, PCDD/PCDF, and other organic emissions.

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Table 3-1. F-1 Furnace HWC MACT Standards Compliance

LIMIT	REGULATORY CITATION - 63.1209	HOW ESTABLISHED	AVERAGING TIME	ASSOCIATED STANDARD						
				DRE	Dioxins/ Furans	Hg	SVM	LVM	PM	HCl/ Cl_2
LIMITS ASSOCIATED WITH THE COMBUSTION SYSTEM										
Minimum combustion temperature	(j)(1), (k)(2)	Average of test run averages	Hourly rolling average	Low DRE Temp Test	Low DRE Temp Test					
Maximum combustion gas flow rate	(j)(2), (k)(3), (o)(2)	Average of the maximum hourly rolling averages	Hourly rolling average	Low DRE Temp Test	Low DRE Temp Test	Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Low DRE Temp Test
LIMITS ASSOCIATED WITH THE FEEDSTREAMS										
Maximum hazardous waste feed rate	(j)(3), (k)(4), Preamble 9/30/99 Rule, page 52937	Maximum pumpable and maximum total as the average of the maximum rolling hour averages	Hourly rolling average	Max FR DRE Test	Max FR DRE Test					
Maximum feed rate of total chlorine and chloride	(o)(1)	Average of the average hourly rolling averages	12-hour rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Max FR DRE Test
LIMITS ASSOCIATED WITH WET SCRUBBERS										
Minimum pressure drop across low energy wet scrubbers	(o)(3)(ii)	Manufacturer's specifications	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Mfr. Spec.
Minimum liquid feed pressure to a low energy wet scrubber	(o)(3)(iii)	Manufacturer's specifications	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Mfr. Spec.
Minimum scrubber water pH	(o)(3)(iv)	Average of the test run averages	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Max FR DRE Test
Minimum liquid to gas ratio (L/G)	(o)(3)(v)	Average of the test run averages	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Max FR DRE Test

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Table 3-2. F-1 Furnace Minimum Temperature DRE Test Sampling and Analysis (Test 1)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
Hex Liquid Waste	Tap on line	250 mL wide-mouth VOA jars	ASTM E-300-86	Grab samples taken at the beginning, middle and end (B-M-E) of each test run using 250 mL VOA jars. All three grab samples are collected as individual samples; Sample compositing will be performed in the laboratory.	HCB and SVOCs VOCs PCBs Heating Value Density Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056
Other Liquid Waste	Tap on line	250 mL wide-mouth bottle; 40 mL VOAs and 250 and 500 mL sample bottles	ASTM E-300-86	Collect a 250 mL grab sample at 30-minute intervals during each test run. The grab samples are transferred to a 4L jug to build a composite sample. The run composite is maintained on ice between sampling intervals. At the end of the test run, collect two 40mL VOAs, and 250 or 500 mL sample bottles from the homogenized composite sample.	HCB and SVOCs VOCs PCBs Heating Value Density Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056

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Table 3-2. F-1 Furnace Minimum Temperature DRE Test Sampling and Analysis (Test 1)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
HCl Product	Tap on line	250 mL bottle; 4 L glass jug; 1-liter sample bottles	ASTM E-300-86	At each 30-minute interval, collect a 250 mL grab sample. Transfer the grab samples to a 4 L glass jug maintained on ice to build run composite. At the end of the test run, collect one 1-liter sample of the homogenized composite sample.	HCB	SW846 8270C
Scrubber Purge Water	Tap on line	Same as HCl product	ASTM E-300-86	Same procedure as HCl product.	HCB	SW846 8270C
Stack Gas	Non-Isokinetic Port	VOST	SW846 0030 (VOST)	80 L integrated sample; 0.5 to 1.0 L/min, four tube set pairs, 20 L per Tube set pair	Volatile organic PICs	SW846 5041A/8260B
Stack Gas	Isokinetic Port	Method 0023A Sampling Train	SW846 0023A	Minimum of 3 hours and 3.0 dry standard cubic meters [b,c]	PCDD/PDCFs PCBs	SW846-8290 (PCDD/PDCFs) SW846 3542/EPA Method 1668A (PCBs)
Stack Gas	Isokinetic Port	Method 0010 Sampling Train	SW846 0010	Minimum of 3 dry standard cubic meters [b,c]	HCB; semivolatile organic PICs	SW846 3542/8270C
Stack Gas	CEMS Port	Installed CO and O_2 CEMS	40 CFR 60 Appendix B Specification 4B	Continuous	CO and O_2	40 CFR 60 Appendix B Specification 4B
Stack Gas	CEMS Port	Temporary HC CEMS	EPA Method 25A	Continuous	HC	40 CFR 60 Appendix A Method 25A

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Table 3-2. F-1 Furnace Minimum Temperature DRE Test Sampling and Analysis (Test 1)

Notes:

(a) Reference Method Sources:
"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series

"SW846" 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 1668A" refers to Method 1668A, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-821-R-00-002, December 1999.

(b)The exact volume of gas sampled will depend on the isokinetic sampling rate.

(c) Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3)
- 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).

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Table 3-3. F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling and Analysis (Test 2)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
Hex Liquid Waste	Tap on line	250 mL wide-mouth VOA jars	ASTM E-300-86	Grab samples taken at the beginning, middle and end (B-M-E) of each test run using 250 mL VOA jars. All three grab samples are collected as individual samples; Sample compositing will be performed in the laboratory.	HCB and SVOCs VOCs PCBs Heating Value Density Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056
Other Liquid Waste	Tap on line	250 mL wide-mouth bottle; 40 mL VOAs and 250 and 500 mL sample bottles	ASTM E-300-86	Collect a 250 mL grab sample at 30-minute intervals during each test run. The grab samples are transferred to a 4L jug to build a composite sample. The run composite is maintained on ice between sampling intervals. At the end of the test run, collect two 40mL VOAs, and 250 or 500 mL sample bottles from the homogenized composite sample.	HCB and SVOCs VOCs PCBs Heating Value Density Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056

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Table 3-3. F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling and Analysis (Test 2)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
HCl Product	Tap on line	250 mL bottle; 4 L glass jug; 1-liter sample bottles	ASTM E-300-86	At each 30-minute interval, collect a 250 mL grab sample. Transfer the grab samples to a 4 L glass jug maintained on ice to build run composite. At the end of the test run, collect one 1-liter sample of the homogenized composite sample.	HCB	SW846 8270C
Scrubber Purge Water	Tap on line	Same as HCl product	ASTM E-300-86	Same procedure as HCl product.	HCB	SW846 8270C
Stack Gas	Non-Isokinetic Port	VOST	SW846 0030 (VOST)	80 L integrated sample; 0.5 to 1.0 L/min, four tube set pairs, 20 L per Tube set pair	Volatile organic PICs	SW846 5041A/8260B
Stack Gas	Isokinetic Port	Method 0023A Sampling Train	SW846 0023A	Minimum of 3 hours and 3.0 dry standard cubic meters [b,c]	PCDD/PDCFs PCBs	SW846-8290 (PCDD/PDCFs) SW846 3542/EPA Method 1668A (PCBs)
Stack Gas	Isokinetic Port	Method 0010 Sampling Train	SW846 0010	Minimum of 3 dry standard cubic meters [b,c]	HCB; semivolatile organic PICs	SW846 3542/8270C
Stack Gas	Isokinetic Port	Method 26A	EPA Method 26A	Minimum of 60 minutes [b,c]	Particulate HCl/Cl_2	EPA Method 5 (Particulate) EPA Method 26A (HCl/Cl_2)
Stack Gas	CEMS Port	Installed CO and O_2 CEMS	40 CFR 60 Appendix B Specification 4B	Continuous	CO and O_2	40 CFR 60 Appendix B Specification 4B
Stack Gas	CEMS Port	Temporary HC CEMS	EPA Method 25A	Continuous	HC	40 CFR 60 Appendix A Method 25A

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Table 3-3. F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling and Analysis (Test 2)

Notes:

(a) Reference Method Sources:

"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series

"SW846" 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 1668A" refers to Method 1668A, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-821-R-00-002, December 1999.

(b) The exact volume of gas sampled will depend on the isokinetic sampling rate.

(c) Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3)
- 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).

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Table 3-4. F-1 Furnace Supplemental Risk Data Collection Test Sampling and Analysis (Test 3)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
Hex Liquid Waste	Tap on line	250 mL wide-mouth VOA jars	ASTM E-300-86	Grab samples taken at the beginning, middle and end (B-M-E) of each test run using 250 mL VOA jars. All three grab samples are collected as individual samples; Sample compositing will be performed in the laboratory.	SVOCs VOCs Heating Value Density Ash Content Total Chloride Metals: Al, Sb, As, Ba, Be, Cd, Cr (total), Co, Cu, Pb, Mn, Hg, Ni, Se, Ag, Tl, V, & Zn	SW846 8270C SW846 8260B ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056 ICAP (SW846 3010A/6010B/6020) Hg: CVAAS (SW846 7470A)
Other Liquid Waste	Tap on line	250 mL wide-mouth bottle; 40 mL VOAs and 250 and 500 mL sample bottles	ASTM E-300-86	Collect a 250 mL grab sample at 30-minute intervals during each test run. The grab samples are transferred to a 4L jug to build a composite sample. The run composite is maintained on ice between sampling intervals. At the end of the test run, collect two 40mL VOAs, and 250 or 500 mL sample bottles from the homogenized composite sample.	SVOCs VOCs Heating Value Density Ash Content Total Chloride Metals: Al, Sb, As, Ba, Be, Cd, Cr (total), Co, Cu, Pb, Mn, Hg, Ni, Se, Ag, Tl, V, & Zn	SW846 8270C SW846 8260B ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056 ICAP (SW846 3010A/6010B/6020) Hg: CVAAS (SW846 7470A)

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Table 3-4. F-1 Furnace Supplemental Risk Data Collection Test Sampling and Analysis (Test 3)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
Stack Gas	Non-Isokinetic Port	Tedlar Bag Samples	SW846 0040	25-50 L bag samples	Total Volatile Organics (C_1 through C_7 hydrocarbons)	SW846 0040; TOE Guidance
Stack Gas	Isokinetic Port	Method 0010 Sampling Train	SW846 0010 TOE Guidance	Minimum of 3 dry standard cubic meters [b,c]	Total Semivolatile and Non-volatile Organics	TOE Guidance
Stack Gas	Isokinetic Port	Method 29	EPA Method 29	Minimum 60 minutes [b,c]	Metals: Al, Sb, As, Ba, Be, Cd, Cr (total), Co, Cu, Pb, Mn, Hg, Ni, Se, Ag, Tl, V, & Zn	EPA Method 29 SW846 6010B/6020 and 7470A
Stack Gas	Isokinetic Port	Method 0061 Sampling Train	SW846 0061	Minimum of 60 minutes [b,c]	Chromium VI	SW846 7199
Stack Gas	Isokinetic Port	Method 5 Sampling Train	EPA Method 5	Approximately 20 min. [b,c]	Particle size distribution	Scanning electron microscope (SEM)
Stack Gas	CEMS Port	Installed CO and O_2 CEMS	40 CFR 60 Appendix B Specification 4B	Continuous	CO and O_2	40 CFR 60 Appendix B Specification 4B

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Table 3-4. F-1 Furnace Supplemental Risk Assessment Emissions Data Collection Test Sampling and Analysis (Test 3)

Notes:
[a] Reference Method Sources:
"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series

"SW846" 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.

"TOE Guidance" refers to Guidance for Total Organics, EPA/600/R-96/036, March, 1996.

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

[c] Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3)
- 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)

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Table 3-5. F-1 Furnace CPT and Risk Assessment Data Collection and Use

Sample	Sampling Method	Analysis Reference Method	Parameter	Test 1	Test 2	Test 3	Regulatory, Guidance or Policy Citation	HWC MACT	Risk Assess-ment
Liquid Waste Feeds	ASTM E-300-86	SW846 Method 8270C	HCB (POHC)	X	X		HCB (POHC) DRE 40 CFR 63.1218(c)(1)	X	
			SVOCs	X	X	X	RCRA Omnibus 270.32(b)(2)-(3)		X
		SW846 Method 8082	PCBs	X	X		RCRA Omnibus 270.32(b)(2)-(3); TSCA 40 CFR 761.70(a)(6)(iii)(g)		X
		SW846 Method 8260B	VOCs			X	RCRA Omnibus 270.32(b)(2)-(3)		X
		SW846 Methods 6020 & 7470	Metals			X	RCRA Omnibus 270.32(b)(2)-(3)		X
		ASTM D-240	Heating Value	X	X	X	40 CFR 63.1207(f)(1)(A),(B) and	X	
		ASTM D-891	Density	X	X	X		X	
		ASTM D-482	Ash Content	X	X	X	RCRA Omnibus 270.32(b)(2)-(3)	X	X
		ASTM D-808 or E-442; SW846 5050/9056	Total Chloride Content	X	X	X		X	X
HCl Product & Scrubber Purge	ASTM E-300-86	SW846 Method 8270C	HCB (POHC)	X	X		Fate of POHC Determination	X	
Stack Gas	SW846 Method 0023A	SW846 Method 8290	PCDD/PCDFs	X	X		40 CFR 63.1207(b)(3), 63.1218(a)(1) and RCRA Omnibus 270.32(b)(2)-(3)	X	X
		EPA Method 1668A	Total PCBs	X	X		RCRA Omnibus 270.32(b)(2)-(3)		X
	SW846 Method 0010	SW846 Methods 3542/8270C	HCB	X	X		HCB (POHC) DRE 40 CFR 63.1218(c)(1)	X	X
			SVOC PICs	X	X		RCRA Omnibus 270.32(b)(2)-(3)		X

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Table 3-5. F-1 Furnace CPT and Risk Assessment Data Collection and Use

Sample	Sampling Method	Analysis Reference Method	Parameter	Test 1	Test 2	Test 3	Regulatory, Guidance or Policy Citation	HWC MACT	Risk Assess-ment
Stack Gas (continued)	SW846 Method 0030	SW846 Methods 5041A/8260B	VOC PICs	X	X		RCRA Omnibus 270.32(b)(2)-(3)		X
	EPA Method 26A	EPA Method 5	Particulate		X		RCRA Omnibus 270.32(b)(2)-(3)		X
		EPA Method 26A	HCl/Cl_2		X		40 CFR 63.1218(a)(6), 63.1218(a)(1) & RCRA Omnibus 270.32(b)(2)-(3)	X	X
	EPA Method 5	Scanning Electron Microscope (SEM)	Particle Size Distribution (PSD)			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	EPA Method 29	EPA Method 29; SW846 Methods 6020 & 7470	Metals			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	SW846 Method 0061	SW846 Method 7199	Hexavalent Chromium			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	SW-846 Method 0010	TCO/GRAV	Total Semivolatile and Nonvolatile PICs			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	SW-846 Method 0040	Gas Chromato-graphy	Volatile PICs (C_1 through C_7)			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	Installed CEMS	40 CFR 60, Appendix B, Specification 4B	Carbon Monoxide	X	X	X	40 CFR 63.1218(a)(5)(i) and RCRA Omnibus 270.32(b)(2)-(3)	X	X
			Oxygen	X	X	X	40 CFR 63.1218(a)(5)(i), (ii) and RCRA Omnibus 270.32(b)(2)-(3)	X	X
	Temporary CEMS	40 CFR 60, Appendix A, Method 25A	Hydrocarbons	X	X		HC Compliance 40 CFR 63.1218(a)(5)(ii)	X	

4.0 ORGANIZATION OF PERSONNEL, RESPONSIBILITIES, AND QUALIFICATIONS

4.1 GENERAL

The project organization for this test is summarized in Figure 4-1. The OxyChem Plant Manager is responsible for oversight of all activities performed at the OxyChem site. The OxyChem Environmental, Health & Safety Manager and OxyChem Test Project Manager report to the OxyChem Plant Manager.

The OxyChem Environmental, Health & Safety Manager is responsible for all day-to-day environmental compliance activities related to the plant site. During the testing, the OxyChem Environmental, Health & Safety Manager and other environmental staff members will be available to lend support to the testing program where needed.

During the test, the OxyChem Test Project Manager, on behalf of the OxyChem Environmental, Health & Safety Manager, will be responsible for ensuring that the processes run properly and that the unit achieves the desired test conditions on each test day. As such, the OxyChem Test Project Manager, working through the OxyChem Production Manager, will assign responsibilities the unit operations. The OxyChem Test Project Manager will be responsible for ensuring that all of the applicable process data are collected during each of the test runs. The OxyChem Test Project Manager will also be responsible for supervising all of the contractors associated with the program and will serve as the official communication link between OxyChem and the respective contractors and regulatory observers.

The Test Coordinator and Quality Assurance Officer from the Test Management Contractor are experienced in the technical coordination and QA/QC associated with the testing of combustion systems similar to the F-1 Furnace. The Stack Sampling Contractor is experienced in conducting the stack sampling called for in the test plans and will conduct the stack sampling for this project. The analytical laboratory is experienced in the analysis of stack emissions and process samples, and will provide analytical services for this project.

Resumes of key individuals who will be implementing the test are presented in Attachment A. Louisiana Environmental Laboratory Accreditation Program (LELAP) approvals for the selected stack sampling and analytical contractors are presented in Attachment B.

4.2 TEST COORDINATOR

The Test Coordinator is responsible for the execution of the F-1 Furnace CPT Plan, Risk Assessment Data Collection Plan, 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 OxyChem Test Project Manager, OxyChem Production 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 plans 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 and the Process Sample Coordinator
- Assisting the OxyChem Test Project Manager in interfacing with the regulatory observers and/or oversight contractors during the test
- Providing coordination between the OxyChem Test Project Manager and the sampling team during the test, especially regarding decisions to start, stop, hold or 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 plans
- Providing field review of process operating logs, and completed sample collection sheets, stack sampling logs, COC forms, and RFA forms
- Interfacing with the Laboratory Analysis Coordinator 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 reports
- Certifying the overall test results and the final test reports
- Preparing operating specifications for the system based on the results of the test.

4.3 QUALITY ASSURANCE OFFICER

The Quality Assurance Officer's (QAO's) pre-test and on-site responsibilities will include the following:

- Assuring all individuals included in the QAPP Distribution List receive current copies of revisions as applicable
- Reviewing QA/QC activities and communicating the results of those activities to the appropriate personnel (refer to Figure 4-1)
- Making recommendations to the OxyChem Test Project Manager and Test Coordinator regarding any problems that may be detected
- Ensuring that the sample preservation and shipments are being properly monitored by the Sample Custodian and that any samples with preservation or holding time exceedances are reported to the Test Coordinator and OxyChem Test Project Manager immediately

- Ensuring that appropriate corrective actions are taken if problems are detected
- Conducting or coordinating any required audits of field or laboratory procedures to ensure compliance with the QAPP
- Verifying that test data are adequately recorded and maintained and that data are properly reduced, validated, and interpreted
- Reviewing sample documentation to include sample labels, RFAs and COCs against the sample checklists to ensure all required test samples are collected and properly documented

The QAO's post-test responsibilities will include the following:

- 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
- Ensuring the results of the above mentioned inspections will be documented in a written report, included in the final CPT Report
- 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 CPT report executive summary regarding if any of the test data are invalid or unusable.

4.4 PROCESS SAMPLING COORDINATOR/SAMPLE CUSTODIAN

A Process Sampling Coordinator/Sample Custodian will be appointed who will have overall responsibility for the collection and handling of all test samples. As Process Sampling Coordinator, this person has the following responsibilities:

- Coordinating the preparation and shipment of process sampling equipment to the test site
- Directing and/or participating in process sampling activities
- Recording field test data required by the test plans or process sampling methods
- Reviewing and approving process sample collection sheets and field data sheets prepared by others
- Overseeing recovery of process samples and preservation of process samples in the field
- Documenting all required process samples are collected
- Performing all QA activities required by the process sampling methods
- Preparing a draft and final report of process sampling activities.

As the Sample Custodian, this person has the following responsibilities:

- Controlling issuance of sample containers at the test site
- Packaging the process and stack gas samples for shipment to the laboratory

- Preparing COC and RFA forms for all samples or reviewing the same test documentation 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. Any discrepancies should be immediately reported to the QAO, Test Coordinator and OxyChem Test Project Manager.

The Process Sampling Coordinator/Sample Custodian will be an employee of the stack sampling contractor or test management contractor.

4.5 STACK SAMPLING TEAM LEADER

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
- Preparing and calibrating stack sampling equipment
- Directing and/or participating in stack sampling activities
- Recording field test data required by the test plans 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 OXYCHEM PROCESS OPERATIONS

The OxyChem Process Operations will be responsible for the operation of the F-1 Furnace. Their duties will include:

- Maintaining the F-1 Furnace within specified target limits
- Maintaining logs of process data as required
- Downloading and providing the F-1 Furnace one-minute operating data to the Test Coordinator in Microsoft Excel or ASCII format
- Assisting in the collection of waste feed and other process samples
- Transferring to the Sample Custodian all process samples collected.

4.7 LABORATORY ANALYSIS COORDINATOR

The Laboratory Analysis Coordinator will have overall responsibility for the analysis of all process and stack gas related samples. The Laboratory Analysis Coordinator has the following responsibilities:

- Receiving, verifying, and documenting that incoming field samples correspond to the sample chain of custody information
- Notifying the Sample Custodian, QAO, Test Coordinator and OxyChem 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 QAO and 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 CPT report executive summary regarding if any of the test data are invalid or unusable.

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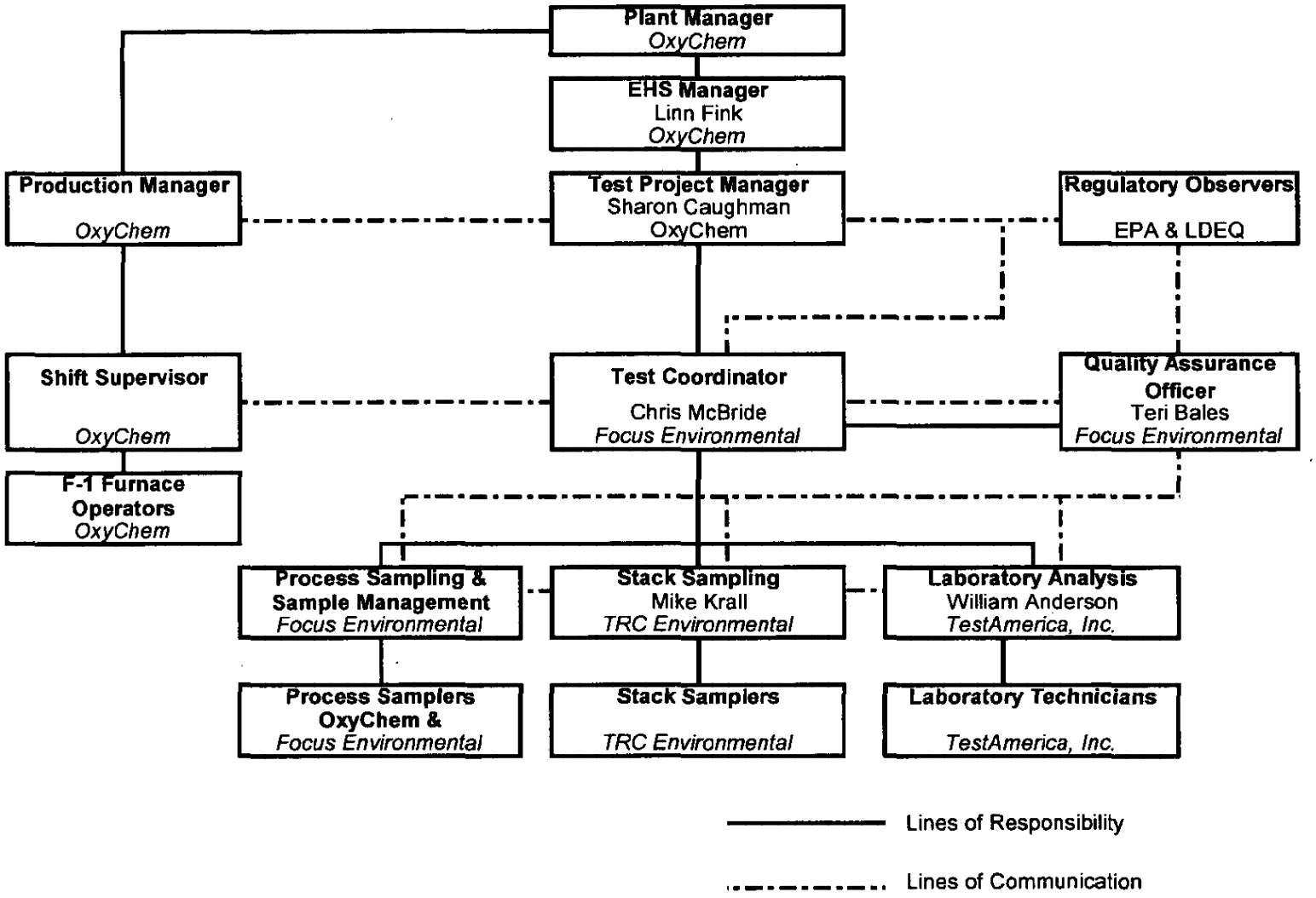

Figure 4-1. OxyChem F-1 Furnace Test Project Organization and Responsibility

5.0 QUALITY ASSURANCE OBJECTIVES AND QUALITY CONTROL OBJECTIVES

5.1 GENERAL

The project objectives, inclusive of the compliance and risk assessment data needs, are 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 and reporting limits for each analysis. The laboratory will provide the best and lowest detection limits for all testing parameters. Agency issued audit samples, as may be provided, will be included in the analysis scope as a third party check of the laboratory accuracy.

The overall quality assurance objective is to produce a complete data set that can be used to fully assess and validate the operation of F-1 Furnace relative to the HWC MACT emissions and performance standards, and to provide quality data for use in a site-specific risk assessment for the F-1 Furnace emissions. 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 QAO, and a complete assessment of the data quality indicators will be included in the final test report. The data quality will be discussed with respect to meeting each of the 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 F-1 Furnace's performance. The data evaluation and validation 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 can not 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 LELAP-approved 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 Project Coordinator and QAO are 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 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 Process Sample Properties

To demonstrate the precision (reproducibility) and accuracy of the analyses of heat content, density, ash content, viscosity and total chlorine in waste feeds samples, analyses will include a prescribed number of duplicate analyses. Where possible, laboratory standards will be used to demonstrate the accuracy of the analytical methods applied to the project samples.

5.2.2 Process Sample Metals

The waste feed metals analysis methods are inductively coupled argon plasma spectroscopy (ICP) for non-mercury (non-Hg) metals and cold vapor atomic adsorption spectroscopy (CVAA) for mercury (Hg). To demonstrate the precision (reproducibility) of metals analyses, a system matrix spike analyses are performed as part of waste feed metals analyses. Sample aliquots will be spiked with metal analytes at the greater of 2 times the sample's apparent native concentration or 10 times the MDL to demonstrate the recovery and reproducibility of the methods. The relative recoveries of the matrix spikes and analysis of laboratory standards will be used to demonstrate the accuracy of the analytical methods applied to the project samples.

5.2.3 Process Sample Organics

The waste feed organic analysis methods are gas chromatography/mass spectrometry (GC/MS) for volatile organics (SW-846, Method 8260B) and semivolatile organics (SW-846, Method 8270C), and gas chromatography/electron capture detector (GC/ECD) for polychlorinated biphenyls (PCBs) (SW-846, Method 8280). The HCL product and scrubber purge analysis methods are GC/MS for semivolatile organics (SW-846, Method 8270C). To demonstrate the precision (reproducibility) of organic analyses, duplicate analyses are performed as part of process 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.

5.2.4 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) products of incomplete combustion (PICs).

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/8260B 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 Audit

The VOST audit includes VOST sampling of a compressed gas cylinder containing a mixture of volatile organic compounds in nitrogen. During the VOST audit, the same technician who performed or will perform the VOST stack sampling operates the VOST. The VOST audit kit includes the audit cylinder, an electrically heated manifold and connecting glassware and adapters. Using the same VOST equipment and VOST tubes prepared for the test project, the technician will set up the audit cylinder per the accompanying directions and sample its contents. A minimum of four VOST tube set pairs will be collected. The VOST audit samples are then submitted for analysis along with the other test VOST samples. The VOST audit tubes will be analyzed for the a select target list of VOC analytes. The VOST audit sample analysis results are submitted for regulatory agency assessment.

Attachment C of this QAPP includes procedures for requesting a VOST audit kit and copy of the VOST audit kit instructions. The request for an audit cylinder will be made at least 60 days before of the actual test date. The cylinder will be sent directly to the facility to arrive by the requested test/audit date. The custody seal on the VOST audit cylinder must remain intact until the regulatory observers are present to observe its breaking at the time of the on-site audit. The regulatory observers must continually observe the VOST audit procedure. The auditee may only sample the audit cylinder using the VOST; NO OTHER SAMPLING OF THE CYLINDER SUCH AS BAG SAMPLES IS ALLOWED. At the end of the audit, the VOST kit must be secured for return by the auditee.

The VOST audit results will be provided to the Audit Cylinder Coordinator for review. The VOST audit is a pass/fail audit. The successful VOST audit will determine the concentration of each target VOCs within 50-150% of the known value. The Audit Cylinder Gas Coordinator will issue a pass/fail determination.

5.2.4.3 VOST Audit Considerations

Experience has shown that the VOST audit procedures must be modified slightly from the directions provided with the VOST audit kit. Specifically, the VOST audit kit directions suggest an audit sample volume of 10 liters of gas at a rate of 0.5 to 1.0 liters per minute. However, at the VOC concentrations in the audit cylinder, if this amount of audit gas is sampled, the VOC loadings can saturate the tubes and may exceed the normal linearly calibrated range of the Method 5041A/8260B analysis, typically 0-1,000 ηg. To reduce the potential for this situation occurring, the following sampling and analysis strategy will be taken:

- A VOST audit cylinder with the concentration of the target POHC(s) of less than 20 parts per billion (ppb) will be requested.
- The audit cylinder sampling shall be performed at a rate of 0.5 liters per minute or less to provide optimum contacting of the audit gas with the Tenax® resin.
- Four tube set pairs will be used to sample the audit gas.
- The first tube set pair will be used to sample 10 liters of audit gas as per the VOST audit kit directions. This first tube set pair will serve to condition the VOST sampling equipment.
- The subsequent tube set pairs will be used to sample 5 liters of audit gas. This lesser volume should provide sufficient loadings for good sampling and analysis precision and resolution, and reduce the potential for excessive loadings.

In the laboratory, one of the 5-liter tube set pairs will be analyzed first. The results of this initial analysis will be reviewed by the Laboratory Analysis Coordinator before proceeding with analysis of the balance of the VOST audit tubes. If the results of the analysis of the this first 5-liter tube set pair exceed the calibrated analysis range or any other analytical anomalies are noted, the Laboratory Analysis Coordinator will immediately contact the Test Project Coordinator and QAO to discuss the results/issues and possible options before proceeding further with the analysis of the remaining VOST audit samples. Corrective action is to be taken by the laboratory only after discussion and agreement as to the appropriate course with the Test Project Coordinator and QAO. Generally, when the tube loadings of the target VOCs exceed the calibrated analytical range, the linearly calibrated range of the target VOCs may be extended and re-calibrated to 0-2,000 ηg or 0-3,000 ηg so that analysis of the VOST audit tubes is possible without the need to estimate values that exceed the calibrated range. The balance of the tube set pairs will then be analyzed. The results of the VOST audit analyses will be submitted in accordance with the VOST audit kit directions for consideration by the Audit Cylinder Coordinator.

5.2.4.4 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 Method 0023A PCDD/PCDF and PCB Sampling Precision and Accuracy

A SW-846 Method 0023A will be used to sample the stack gas for emissions of PCDD/PCDFs and polychlorinated biphenyls (PCBs). Prior to use in the field, all of the XAD-2 resin traps for use in the Method 0023A sampling train are spiked with isotopically-labeled PCDD/PCDF and PCB sampling surrogate compounds as noted in Table 5-1. Two of the XAD-2 resin traps prepared for this project will also have PCDD/PCDF and PCB 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 PCDD/PCDF and PCB isotopically-labeled sampling surrogates and matrix spike compounds from these two retained XAD resin trap samples provide an accuracy assessment of the Method 0023A 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 0023A methodology.

The recoveries of the internal standard, alternate standard and recovery standard compounds applied during the preparation and analysis of the Method 0023A 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 0023A PCDD/PCDF and PCB analyses.

5.2.6 Method 0010 SVOC Sampling Precision and Accuracy

A SW-846 Method 0010 will be used to sample the stack gas for emissions of the target POHC HCB and semivolatile organic compound (SVOC) PICs. Prior to use in the field, all of the XAD-2 resin traps for use in the Method 0010 sampling train are spiked with an isotopically-labeled SVOC sampling surrogate compound as noted in Table 5-1. Two of the XAD-2 resin traps prepared for this project will also have 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 SVOC isotopically-labeled sampling surrogate and matrix spike compounds from these two retained XAD resin trap samples provide an accuracy assessment of the Method 0010 analytical methodology. The recovery of the isotopically-labeled sampling surrogates spiked to every field-use XAD resin sample provides a field through analysis accuracy assessment of the Method 0010 methodology.

The recoveries of the internal standard, alternate standard and recovery standard compounds applied during the preparation and analysis of the Method 0010 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 0010 SVOC analyses.

5.2.7 Stack Gas Method 0040 VOCs

SW-846 Method 0040 includes collection and analysis of Tedlar® bag samples of the stack gas for C_1 through C_7 hydrocarbons via gas chromatograph/flame ionization detector (GC/FID) analysis. The GC/FID instrument will be setup and calibrated in the field. Bag samples will be analyzed within 24 hours of collection for C_1 through C_7 hydrocarbons. The GC/FID will be calibrated in accordance with Method 0040 procedures before and after analysis of the bag samples. Method blank analysis includes nitrogen Tedlar® bag samples. The calibration and blank analysis results will demonstrate the required accuracy performance. Condensate samples recovered from the Method 0040 sampling will be collected in 40 ml VOA vials, topped off with organic free water (for zero head space) and submitted to the laboratory for analysis within 14 days of collection.

5.2.8 Stack Gas Method 0010 TCO/Grav

A variation of the SW-846 Method 0010 sampling train [Modified Method 5 (MM5)] sampling train will be used to sample the stack gas for total semivolatile organic compounds (Boiling Points from 100°C to 300°C) and non-volatile organic compounds (Boiling Points greater than 300°C). In accordance with the *EPA Guidance for Total Organics* (EPA/600/R-96/036), the XAD-2 resin traps used in this sampling train do not have isotopically labeled surrogates added before their use in the field. The sample extraction process also excludes the use of isotopically labeled surrogates. The separate extracts of the sampling train components are pooled. One-half of the pooled extracts are used to determine the Total Chromatographable Organics (TCO) via GC/FID analysis in the laboratory. For the GC/FID analysis, the analytical surrogate (marker) compounds added to the samples are n-heptane and n-heptadecane because their boiling points of 98°C and 302°C, respectively, span the analytical range of interest. The other half of the pooled extracts is used to determine the non-volatile organics by a gravimetric procedure known as Grav. Testing includes collection of a blank train sample that is prepared and analyzed in the same manner as the actual field samples. The TCO/Grav blank train results will be assessed against the test TCO/Grav results.

5.2.9 Method 29 Metals Samples

Non-detect results are expected for Method 29 stack gas samples for metals due to the relatively low feed rates of metals and the corresponding low concentrations of metals expected in the stack gas. The test program includes collection of a blank Method 29 train to assess blank contamination levels. The analysis program includes post-digestion spikes of actual Method 29 samples. The recovery and reproducibility of these spikes and analyses will be used to verify that any non-detect values for Method 29 stack gas samples are valid. The spiked samples will be spiked with metal analytes at 3X to 5X the MDL used for the ICP and CVAA to demonstrate the recovery and reproducibility of the preparation and analysis methods.

An additional accuracy check of the Method 29 methodology are metals audit samples. Metals audit samples are usually provided in the form of a spiked filter and an aqueous solution for non-mercury metals, and an aqueous solution for mercury. These samples serve as blind audit samples. Metals audit samples will be submitted for analysis along with the balance of the Method 29 test samples if provided by the regulatory agency.

5.2.10 Stack Gas Hexavalent Chromium

Matrix spikes to the Method 0061 samples at 3X-5X the reporting limit of the ion chromatography method (SW-846 Method 7199) will be performed to demonstrate hexavalent chromium recovery and reproducibility. Precision is assessed via duplicate analyses of field, field spike, reagent blank, and calibration standard samples. Accuracy is assessed via field spike, reagent blank, laboratory blank, and calibration standard samples.

The preservation of hexavalent chromium as hexavalent chromium is pH dependent. In acidic media, hexavalent chromium can readily reduce to the trivalent form. During stack gas sampling, acid gases and carbon dioxide absorbed by the potassium hydroxide (KOH) solution in the Method 0061 impingers reduce the pH of the solution. The Method 0061 sampling methodology includes mid- and post-test run pH checks of the KOH impinger solution in the first sampling train impinger. This pH must be 8.5 or greater for the sample to be valid. If the mid- or post-test run pH is less than 8.5, the sample is discarded and the Method 0061 sampling is repeated. Corrective action for repeating the Method 0061 sampling due to low pH may include: 1) increasing the concentration of the KOH used in the impingers to offset the impacts of acid gases and carbon dioxide absorbed by the solution, 2) increasing the initial charge volume of KOH solution in the first KOH impinger, and/or 3) decreasing the volume of stack gas sampled.

As part of the Method 0061 sampling, spiked samples will be prepared in the field and submitted for analysis. These field spikes serve to verify the preservation and stability of hexavalent chromium in the KOH sampling media. Two types of field spike samples will be prepared and submitted for analysis. One of these spikes is prepared using aliquots of KOH impinger liquid from a recovered sampling train used for actual stack sampling. During the test, after the volume of the KOH impinger liquid from the Method 0061 sampling train of a randomly selected sampling run is recovered and recorded, two volumetrically measured aliquots (e.g., 50 or 100 mL) are removed from the sample and placed into a separate sample containers. The removal of the aliquots is recorded on the sampling data sheet, request for analysis, and chain of custody for the stack gas sample so the analysis of the actual field sample can be appropriately corrected to the original sample volume. A spike of a hexavalent chromium standard, prepared by the analytical laboratory, is then applied to each aliquot at two different levels (e.g., 50 and 100 micrograms). The original field sample will be analyzed along with the field spike samples. The analytical result

(concentration) of the original field sample is used to calculate and subtract the native hexavalent chromium content from the results for the field spike samples. The difference is compared to the known spike level to assess the effectiveness of the caustic solution in preserving the hexavalent chromium. A similar field spike sample is prepared using an aliquot of the unused KOH reagent.

The evaluation of the hexavalent chromium field spikes applied to recovered sampling train liquid provides an indicator of the impacts of other stack gas constituents that may act as reducing agents (e.g., dissolved nitrogen oxides and sulfur oxides), on the stability of the hexavalent chromium in solution. The evaluation of the hexavalent chromium field spike to a reagent sample provides a check of the general stability of the hexavalent chromium in caustic media. In addition to the field spikes, the analysis of the Method 0061 samples for hexavalent chromium includes a system of matrix spike analyses to evaluate the precision and accuracy of the ion chromatography analytical methodology.

5.2.11 Method 5/26A Particulate Sampling Precision and Accuracy

The gravimetric analysis of the Method 26A samples for particulate analyses includes replicate weighings to assess analysis precision. The analytical balance accuracy is verified using Class S weights.

5.2.12 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. An additional accuracy check of the Method 26A methodology are chloride audit samples. Chloride audit samples in the form of spiked aqueous solutions are analyzed as blind audit samples. Chloride audit samples will be submitted for analysis along with the balance of the Method 26A test samples if provided by the regulatory agency.

Matrix spikes to Method 26A field samples and reagent blanks will be performed at the greater of 2 times the sample's apparent native concentration or 10 times 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.

5.2.13 Installed CO and O_2 CEMS Precision and Accuracy

The precision of the installed carbon monoxide and oxygen continuous emissions monitoring system (CEMS) analyzers will be assessed using the recommended calibration gases in accordance with 40 CFR 60, Appendix B, Specification 4B. 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.

The accuracy of oxygen and carbon monoxide CEMS analyzers will be evaluated in accordance with the CMS/CEMS Performance Evaluation Test Plan conducted prior to the test. The CEMS Performance Evaluation Test will include calibration drift tests, response time tests, calibration error tests, and relative accuracy tests per the 40 CFR 60, Appendix B, Specification 4B. During the test, the oxygen and carbon monoxide CEMS analyzers will be calibrated daily before the start of testing.

5.2.14 Temporary HC CEMS Precision and Accuracy

A temporary hydrocarbon (HC) analyzer will be used to demonstrate compliance with HWC MACT HC (or THC) emissions standard [40 CFR 63.1218(a)(5)(ii)], as allowed by 40 CFR 63.1206(b)(6). The temporary HC CEM will be calibrated and operated in accordance with 40 CFR 60, Appendix A, Method 25A. The precision and accuracy of the temporary HC analyzer will be assessed during the test using the recommended calibration gases in accordance with the procedures of Method 25A. During the test, the HC analyzers will be calibrated before, at the midpoint, and at the end of 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 either the Reliable Detection Limit (RDL) or the laboratory specified reporting limit (RL). The laboratory will maintain on records documenting the MDL, and the RDL or RL determinations. Generally, all non-detects for target analytes will be reported and assessed at the laboratory-determined MDL. If an analyte is detectable at some value between the MDL and the RDL or 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.

For isotope dilution organic analysis methods, the non-detects for the isotope dilution methods will be determined using the SW-846 Method 8290 definition of an estimated detection limit (EDL) without the use of empirical factors or other mathematical manipulations specific to the laboratory.

The analytical report of any target analyte that is non-detect shall include the MDL, and the RDL or RL, or the EDL, as appropriate.

5.3.1 Stack Gas VOST

Volatile PIC emissions will be assessed using the VOST. A target list of volatile organic compounds is included in this test program. Compounds on the target compound list will be reported per the standard SW-846 method using laboratory-determined MDLs. In addition to the target list of compounds, all non-target 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. Volatile TICs will be quantified based on nearest internal standard. Volatile TICs less than 10% of the nearest internal standard will not be reported or quantified.

5.3.2 Stack Gas Dioxin/Furans

Each 2,3,7,8-chlorinated dioxin and furan congener, and tetra- through octa- congener group has a sample-specific estimated detection limit (EDL). When Method 0023A stack gas samples for dioxins/furans are non-detect for a target dioxin/furan, a sample-specific EDL is calculated for that analyte. This is done by determining the high resolution gas chromatograph/high resolution mass

spectrometry (HRGC/HRMS) peak height of the noise or interferent in the expected region of the analyte signal. This value is typically multiplied by a factor of 2.5. The resulting signal response value is then reported as the EDL.

5.3.3 Stack Gas PCBs

Sampling for PCB emissions will be via use of the same Method 0023A sampling train being used for dioxins/furans. The Method 0023A sampling train XAD-2 resin traps will be pre-spiked with isotopically labeled sampling surrogate compounds for PCBs. The recoveries of the surrogate spikes will demonstrate the required accuracy performance.

The target list of the PCB compounds includes the 13 coplanar or "dioxin-like" PCB congeners, and the totals for each of the ten homologue groups. PCBs will be analyzed via HRGC/HRMS. The EDL will be reported for each specific PCB compound that is non-detect in stack gas samples.

5.3.4 Stack Gas SVOCs

Sampling for SVOC PIC emissions will be via a Method 0010 sampling train. The Method 0010 sampling train XAD-2 resin traps will be pre-spiked with isotopically labeled sampling surrogate compounds of SVOCs. The recoveries of the surrogate spikes will demonstrate the required accuracy performance.

The target list of the SVOC compounds for analysis via Method 8270 are noted in Section 9.0 of the QAPP. SVOCs will be analyzed via gas chromatograph/mass spectrometry (GC/MS). The MDL will be reported for each specific target SVOC compound that is non-detect in stack gas samples.

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
Hex Waste Feed (Solid)			
Heating value, ash, moisture, total chlorine, density	Duplicates	≤ 10% RPD	---
Heating value, ash, total chlorine, density	Reference Sample	---	± 10%
Metals	Duplicates	≤ 30% RPD	---
	Matrix Spikes	≤ 30% RPD	± 35%
Volatile Organics	Duplicates	≤ 30% RPD	---
	Surrogate spikes	≤ 30% RPD	Note 1
Semivolatile Organics	Duplicates	≤ 35% RPD	---
	Surrogate spikes	≤ 35% RPD	Note 3
Polychlorinated Biphenyls (PCBs)	Duplicates	≤ 35% RPD	---
	Surrogate spikes	≤ 35% RPD	Note 10
DNAPL Waste Feed (Organic Liquid)			
Heating value, ash, moisture, total chlorine, density, viscosity	Duplicates	≤ 10% RPD	---
Heating value, ash, total chlorine, density	Reference Sample	---	± 10%
Metals	Duplicates	≤ 30% RPD	---
	Matrix Spikes	≤ 30% RPD	± 35%
Volatile Organics	Duplicates	≤ 30% RPD	---
	Surrogate spikes	≤ 30% RPD	Note 1
Semivolatile Organics	Duplicates	≤ 35% RPD	---
	Surrogate spikes	≤ 35% RPD	Note 3
Polychlorinated Biphenyls (PCBs)	Duplicates	≤ 35% RPD	---
	Surrogate spikes	≤ 35% RPD	Note 10
HCl Product and Scrubber Purge (Aqueous)			
Semivolatile Organics	Duplicates	≤ 35% RPD	---
	Matrix Spikes	≤ 35% RPD	70-130%
	Surrogate spikes	≤ 35% RPD	Note 3
Method 0030 Sampling Train (VOST)			
VOST Tubes	Spiked Resin Blanks	≤ 25% RPD	75-125%
VOST Tubes	Surrogate Spikes	≤ 35% RSD	Note 1
VOST Condensate	Surrogate Spikes	≤ 35% RSD	Note 1
VOST Breakthrough Analysis	Breakthrough Analysis	---	Note 2
VOST Audit	Audit Sample	---	50-150%
Method 0023A Sampling Train (PCDD/PCDFs)			
Method 0023A PCDD/PCDFs	Spiked Resin Blanks	≤ 25% RPD	75-125%
Method 0023A PCDD/PCDFs	PCDD/PCDF C^{13} Labeled Sampling Surrogate Spike	≤ 35% RSD	Note 5
	PCDD/PCDF C^{13} Isotope Dilution Internal Standard Spikes	---	Note 6
	EPA Audit Sample	---	50-150%
Method 0023A Sampling Train (PCBs)			

Table 5-1 Test Analytical Data Quality Objectives

Parameter	QC type	Precision	Accuracy
Method 0023A PCBs	Spiked Resin Blanks	≤ 25% RPD	75-125%
	PCB C^{13} Labeled Sampling Surrogate Spikes	≤ 35% RSD	Note 7
	PCB C^{13} Labeled Cleanup Standard Spikes	---	Note 8
	PCB C^{13} Labeled Isotope Dilution Internal Standard Spikes	---	Note 9
Method 0010 Sampling Train, SVOCs			
Method 0010 SVOCs	Spiked Resin Blanks	≤ 25% RPD	75-125%
	C^{13} Labeled Sampling Surrogate Spike	≤ 35% RSD	Note 4
	Semivolatile Surrogate Spikes	≤ 35% RSD	Note 3
	Semivolatile Matrix Spikes	≤ 35% RSD	70-130%
Method 0010 Sampling Train, TCO/Grav			
Method 0010 Chromatographable Organics	Marker Compound Surrogate Spikes	≤ 35% RPD	Note 7
Method 0010 Gravimetric	Replicate Weighings	± 0.5 mg	± 0.5 mg
Method 0040 Sampling Train, C_1-C_7 Hydrocarbons			
Tedlar Bag Samples	Duplicates	±20%	---
	Field Spikes	±30%	80-120%
Condensate Samples	C_8 Surrogate Spikes	±30%	50-150%
Method 5/26A Sampling Train			
Particulate Matter	Replicate Weighings	± 0.5 mg	± 0.5 mg
Hydrogen Chloride/Chlorine	Duplicates	≤ 35% RPD	---
	Matrix Spikes	≤ 35% RPD	± 30%
	Reference Sample	---	± 10%
	EPA Audit Samples	---	70-130%
Method 29 Sampling Train			
Method 29 Metals	Duplicates	≤ 35% RPD	---
	Matrix Spike and Post-Digestion Spikes	≤ 35% RPD	---
	Reference Sample	---	70-130%
	EPA Audit Samples	---	70-130%
Method 0061 Sampling Train			
Method 0061 Hexavalent Chromium	Field Spikes	≤ 35% RPD	70-130%
	Matrix Spikes	≤ 30% RPD	75-125%
	Duplicates	≤ 35% RPD	---
	Reference Sample	---	70-130%
Method 5 Particle Size Distribution	Duplicates	≤ 35% RPD	
	Reference Sample	---	± 10%
Continuous Emissions Monitors			

Table 5-1 Test Analytical Data Quality Objectives

Parameter	QC type	Precision	Accuracy
Carbon Monoxide	Performance Specification 4B	± 3% of Span	± 5% of Span
Oxygen	Performance Specification 4B	± 0.5% Oxygen	± 0.5% Oxygen
Total Hydrocarbons	EPA Method 25A	± 3% of Span	± 5% of Certified Calibration Gas
Orsat Analyses			
Carbon Dioxide	Certified Calibration Gas	---	± 0.2% CO_2
Oxygen	Ambient Air	---	20.9% ± 0.5%

Note 1: 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 2: 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.

Note 3: Semivolatile 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 4: Method 0010 Semivolatile Sampling Surrogate Compound Recovery

Compound	Target Recovery
$^{13}C_3$-labeled Naphthalene	50 – 150%

Note 5: Method 0023A PCDD/PCDF Sampling Surrogate Compound Recoveries

Compound	Target Recovery
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	70 – 130%
$^{13}C_{12}$-2,3,4,7,8-PeCDF	70 – 130%
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	70 – 130%
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	70 – 130%
$^{37}Cl_4$-2,3,7,8-TCDD	70 – 130%

Note 6: Method 0023A PCDD/PCDF Isotope Dilution Internal Standard Compound Recoveries

Compound	Target Recovery
$^{13}C_{12}$-2,3,7,8-TCDD	40 – 130%
$^{13}C_{12}$-2,3,7,8-TCDF	40 – 130%
$^{13}C_{12}$-1,2,3,7,8-PeCDD	40 – 130%
$^{13}C_{12}$-1,2,3,7,8-PeCDF	40 – 130%
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	40 – 130%
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	40 – 130%
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	25 – 130%
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	25 – 130%

Note 7: Method 0023A PCB Sampling Surrogate Compound Recoveries

Compound	Target Recovery
$^{13}C_{12}$-2,4',5-Trichlorobiphenyl	40-160%
$^{13}C_{12}$-2,2',3,5',6-Pentachlorobiphenyl	40-160%
$^{13}C_{12}$-2,2',4,4',5,5'-Hexachlorobiphenyl	40-160%

Note 8: Method 0023A PCB Cleanup Surrogate Compound Recoveries

Compound	Target Recovery
$^{13}C_{12}$-3,4,4',5-Tetrachlorobiphenyl	40-160%
$^{13}C_{12}$-2,3,3',5,5'-Pentachlorobiphenyl	40-160%

Note 9: Method 0023A PCB Isotope Dilution Internal Standard Compound Recoveries

Compound	IUPAC Number	Target Recovery
$^{13}C_{12}$-4-Monochlorobiphenyl	PCB 3	20-180%
$^{13}C_{12}$-4,4'-Dichlorobiphenyl	PCB 15	20-180%
$^{13}C_{12}$-2,4,4'-Triochlorobiphenyl	PCB 28	20-180%
$^{13}C_{12}$-3,3',4,4'-Tetrachlorobiphenyl	PCB 77	24-169%
$^{13}C_{12}$-2,3,3',4,4'-Pentachlorobiphenyl	PCB 105	21-178%
$^{13}C_{12}$-2,3,4,4',5-Pentachlorobiphenyl	PCB 114	21-178%
$^{13}C_{12}$-2,3',4,4',5-Pentachlorobiphenyl	PCB 118	21-178%
$^{13}C_{12}$-2',3,4,4',5-Pentachlorobiphenyl	PCB 123	21-178%
$^{13}C_{12}$-3,3',4,4',5-Pentachlorobiphenyl	PCB 126	21-178%
$^{13}C_{12}$-2,3,3',4,4',5-Hexachlorobiphenyl	PCB 156	26-152%
$^{13}C_{12}$-2,3,3',4,4',5'-Hexachlorobiphenyl	PCB 157	26-152%
$^{13}C_{12}$-2,3',4,4',5,5'-Hexachlorobiphenyl	PCB 167	26-152%
$^{13}C_{12}$-3,3',4,4',5,5'-Hexachlorobiphenyl	PCB 169	26-152%
$^{13}C_{12}$-2,2',3,3',4,4',5-Heptachlorobiphenyl	PCB 170	23-143%
$^{13}C_{12}$-2,2',3,4,4',5,5'-Heptachlorobiphenyl	PCB 180	23-143%
$^{13}C_{12}$-2,3,3',4,4',5,5'-Heptachlorobiphenyl	PCB 189	23-143%
$^{13}C_{12}$-2,2',3,3',4,4',5,5'-Octachlorobiphenyl	PCB 194	20-180%
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	PCB 206	20-180%
$^{13}C_{12}$-Decachlorobiphenyl	PCB 209	20-180%

Note 10: PCB Surrogate Compound Recovery

Compound	Target Recovery
Tetrachloro-meta-xylene	45-139% for Solid Matrix
	39-150% for Liquid Matrix

6.0 SAMPLING AND MONITORING PROCEDURES

6.1 GENERAL

The objectives of this test program are the collection of representative feed, process, and stack gas samples that: 1) demonstrate compliance of F-1 Furnace with the HWC MACT performance and emissions standards, and 2) provide a quality data set for use in a site-specific risk assessment for the F-1 Furnace emissions. To meet these objectives 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 F-1 Furnace 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 plans, 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.

The sampling and analytical procedures to be used during the test program are located in Appendix C of the CPT Plan. Reference sampling and analytical methods are identified throughout the CPT Plan, the Risk Assessment Data Collection 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, SW846, 40 CFR 60 Appendix A, etc.) and/or the contractor-specific standard operating procedures (SOPs) as recognized by LELAP.

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 CPT Plan, Risk Assessment Data Collection 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 0023A for PCDD/PCDFs and PCBs), the proposed procedures for the sample extractions and splitting of extracts for the respective analyses are noted in the analytical procedure in Appendix C of the

CPT Plan and are discussed in this QAPP. The LELAP-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-designated Quality Assurance Officer (QAO). Regulatory observer approval 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 and disposed of by OxyChem.

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, F-1 Furnace will be operated and tested at the conditions specified in the CPT Plan. The following samples will be collected during the test:

- Waste Feed and Process Samples:
  - Hex Waste Feed for properties, HCB (POHC), SVOCs, VOCs and metals
  - DNAPL Waste Feed for properties, HCB (POHC), SVOCs, VOCs and metals
  - HCl Product for HCB (POHC)
  - Caustic Scrubber Purge Water for HCB (POHC)
- Stack Gas Samples
  - SW-846 Method 0030 VOST for volatile PICs
  - SW-846 Method 0023A for PCDD/PCDFs and PCBs
  - SW-846 Method 0010 for HCB (POHC) and SVOC PICs
  - EPA Method 26A for particulate, HCl and Cl_2
  - EPA Method 29 for metals
  - Method 0061 hexavalent chromium
  - Method 0010 TCO/Grav for unspeciated semivolatile and non-volatile PICs
  - Method 0040 unspeciated C_1-C_7 volatile PICs

- Method 5 for particle size distribution (PSD) of particulate emissions
- Temporary CEMS for hydrocarbons (HC or THC) (EPA Method 25A)
- Installed CEMS for carbon monoxide and oxygen.

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 FIELD SAMPLING METHODS

6.2.1 Waste Feed and Process Samples

Standard methods, procedures, and dedicated sampling equipment will be used for the collection of process samples associated with this test program. The Process Sampling Coordinator monitors the process sampling during the testing to assure that proper documentation is completed and that adherence to prescribed sampling procedures is observed. Sample tracking is documented using the sample numbering system, completed RFAs and COCs, the field sampling record, and sample collection checklist.

6.2.2 Stack Gas Samples

During the test program, the Stack Sampling Team Leader and the Sample Custodian 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 operation and recovery of the stack sampling equipment and stack gas samples. The Sample Custodian is 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. Documentation of Methods 1 and 2 will be included in the stack sampling report.

During each test run, Tedlar® bag samples of stack gas will be collected for determining the stack gas carbon dioxide and oxygen concentrations using EPA Method 3 (Orsat Analysis). The stack gas carbon dioxide and oxygen concentrations are used to determine the stack gas molecular weight. The Tedlar® bag samples may be collected from the exhaust of one of the isokinetic sampling trains or using a separate impinger and vacuum pump setup. 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 for the Orsat apparatus. Ambient air may be used as a reference standard for the oxygen portion of the Orsat apparatus.

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.

6.2.2.1 VOST

The VOST will be used to sample stack gas for volatile PICs. The test program includes a target list of VOCs 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 rate of 0.5 liters per minute for 40 minutes per tube set pair. Three of the four pairs will be analyzed by Method 5041A/8260B. 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.

In addition to the target list of VOCs, all GC/MS 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. Volatile TICs will be quantified based on nearest internal standard. Volatile TICs less than 10% of the nearest internal standard will not be reported or quantified.

6.2.2.2 Method 0023A for PCDD/PCDFs

A Method 0023A sampling train will be used to sample stack gas dioxin and furans (PCDD/PCDFs) and polychlorinated biphenyls (PCBs). The extracts from the Method 0023A sampling train will be split two ways. One set of extract fractions from the Method 0023A sampling train will be analyzed for PCDD/PCDFs via Method 8290 (HRGC/HRMS). The second set of extract fractions will be analyzed for PCBs via EPA Method 1668A (HRGC/HRMS).

The Method 0023A sampling train is a variant of Method 0010. At 40 CFR 63.1208(b)(1)(iii), the HWC MACT rule requires that the Method 0023A sampling train be operated for a minimum of 180 minutes (3 hours) to sample a minimum of 2.5 dry standard cubic meters of stack gas during each sampling run so that any PCDD/PCDF congener that is non-detect may be counted as zero in determining compliance. However during this test program, the Method 0023A sampling train will be operated for a minimum of 180 minute (3 hours) to sample a target volume of 3.0 dry standard cubic meters of stack gas during each sampling run.

Prior to each test run, the Method 0023A 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 PCDD/PCDFs and PCBs requires special considerations in the recovery of the sampling train components and their subsequent preparation for analysis.

6.2.2.2.1 Method 0023A Recovery

The Method 0023A sample recovery considerations are covered in the sampling procedure found in Appendix C of the CPT Plan. For the combined Method 0023A 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.
- Front Half 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 times each with acetone, and then rinsed three times with methylene chloride. The acetone and methylene chloride front-half rinses are collected in a single glass sample bottle (Container No.2). The final liquid level is marked on the sample container.
- Front Half Toluene Rinse -- The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or glassware are rinsed two times with toluene. The front half toluene rinses are collected in a glass sample bottle (Container No. 2A). The final liquid level is marked on the sample container.
- 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 (Container No. 3).
- Back Half Acetone/Methylene Chloride Rinses -- The back half of the filter holder, the filter support, transfer line (if used), and condenser (if separate from trap) are rinsed three times with acetone followed by two rinses with methylene chloride. The acetone and methylene chloride back-half rinses are placed into a single glass sample bottle (Container No. 4). The final liquid level is marked on the sample container.
- Back Half Toluene Rinse -- The back half of the filter holder, the filter support, transfer line (if used), and condenser (if separate from trap) are rinsed two times with toluene. The back half toluene rinses are placed into a glass sample bottle (Container No. 4A). The final liquid level is marked on the sample container.
- Condensate Knockout Impinger -- The impinger content is measured to the nearest milliliter or weighed to the nearest 0.5 g and transferred to a glass sample bottle (Container No. 5).

Any color or film observed is noted on the sample recovery sheet. Rinse the impinger three times with acetone followed by two rinses with methylene chloride, adding the rinses to Container No. 4.

- Impinger Liquids -- The contents of the impingers 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. If no color or film is present, the impinger water may be discarded. If color or film is observed, the impinger water is recovered and added to the condensate in Container No. 5, and the impingers are rinsed three times with acetone followed by two rinses with methylene chloride, with the rinses added to Container No. 4.
- 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.

The basis for this combined train recovery approach noted above is described in the following paragraphs.

Both Method 0010 and Method 0023A sample recovery procedures require separate recovery of the front-half components (filter element and probe rinses) and back-half components (XAD-2 resin trap and condenser rinses). For the front-half and back-half solvent rinses, Method 0023A requires a series of three solvent rinses: acetone, followed by methylene chloride and then toluene. The standard Method 0010 sample recovery procedure follows the same general procedure, but uses only two solvents: methanol and methylene chloride. For successive extractions for PCDD/PCDFs, the analytical laboratory prefers that the toluene solvent rinses of the combined Method 0023A sampling train to be collected in containers separate from the acetone and methylene chloride rinses, and labeled accordingly in the field.

To reconcile the distinctions between the Method 0010 and Method 0023A solvents, acetone will be substituted for methanol. Methanol is not being used for three reasons: 1) acetone provides better or equal performance as a solvent and is consistent with Method 0023A, 2) due to methanol's negative impact on the GC/MS analysis of some SVOC compounds, that being the tendency to cause splitting of GC/MS peaks, and 3) acetone is a better solvent for removing moisture from the sample. The analytical laboratory especially prefers the use of acetone over methanol to resolve the GC/MS peak splitting and sample moisture issues.

Method 0023A does not require recovery of the condensate fraction for the PCDD/PCDF analysis but, Method 0010 does. The condensate fraction from the Method 0023A sampling train will be recovered and labeled accordingly in the field for the PCB analyses.

6.2.2.2.2 Method 0023A Preparation for Analysis

When the Method 0023A samples arrive at the laboratory, special procedures are required again in the preparation of the samples for analysis. The sample preparation considerations are covered in the analysis procedure for the Method 0023A train found in Appendix C of the CPT Plan and are generally described in the following paragraphs.

Method 0023A requires the sampling train front-half and back-half components to be prepared and analyzed as two separate fractions. Surrogates compounds discussed below are applied to each fraction.

The first fraction, the front-half fraction, consists of the solvent probe rinses and the particulate filter. For the initial extraction of the front-half samples, the front-half particulate filter and acetone/methylene chloride solvent samples will be combined for extraction; the separate toluene rinse will not be included in the initial extraction. Isotope dilution internal standard compounds for the PCDD/PCDFs and PCBs are spiked directly onto the filter before the Soxhlet extraction. The sample is then Soxhlet extracted for 18 hours using methylene chloride. The methylene chloride front-half extract is removed from the Soxhlet extractor and is then blown down to 10 mL and split two ways: one 5 mL fraction for PCDD/PCDF analysis, and one 5 mL fraction for PCB analysis. The separate toluene front-half solvent rinses are then added to the particulate filter residue in the Soxhlet extractor, the sample is Soxhlet extracted a second time for 18 hours using toluene. The toluene front-half extract is removed from the Soxhlet extractor and is then blown down to 10 mL and split two ways: one 5 mL fraction for PCDD/PCDF analysis and one 5 mL archive fraction. The front-half methylene chloride fraction extract for PCDF/PDCF analysis is combined with the corresponding front-half toluene extract.

The second fraction consists of the XAD-2 resin and condenser solvent rinses. As with the front-half samples, the XAD-2 resin and condenser acetone/methylene chloride rinses samples will be combined for the initial extraction; the separate toluene rinse will not be included in the initial extraction. Isotope dilution internal standard compounds for the PCDD/PCDFs and PCBs are spiked directly onto the XAD-2 resin before the Soxhlet extraction. The sample is then Soxhlet extracted for 18 hours using methylene chloride. The methylene chloride back-half extract is removed from the Soxhlet extractor and is then blown down to 10 mL and split two ways: one 5 mL fraction for PCDD/PCDF analysis and one 5 mL fraction for PCB analysis. The separate toluene back-half solvent rinses are then added to the XAD-2 resin residue in the Soxhlet extractor, the sample is then Soxhlet extracted a second time for 18 hours using toluene. The toluene back-half extract is removed from the Soxhlet extractor and is then blown down to 10 mL and split two ways: one 5 mL fraction for PCDD/PCDF analysis and one 5 mL archive

fraction. The back-half methylene chloride fraction extract for PCDF/PDCF analysis is combined with the corresponding back-half toluene.

The third fraction consists of the Method 0023A condensate impinger catch and rinses. This fraction is only required for the PCB analyses and is not analyzed for PCDD/PCDFs. The third fraction consists of the condensate impinger catch and rinses. The condensate impinger catch is volumetrically or gravimetrically measured in the field, and this information is added to the stack sampling data sheet to calculate the moisture content of the stack gas. In the laboratory, the condensate impinger sample is placed in a continuous liquid-liquid extractor and surrogate compounds for the PCBs are added. The sample is then pH adjusted to acid (pH<2) or basic (pH>11), and is then 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 methylene chloride/water extraction is then repeated with the pH adjusted to either acid or basic, depending on the original adjustment. The second methylene chloride extract layer is then removed and combined with the earlier acid or basic methylene chloride extract. The combined acid and basic extracts are then blown down to 10 mL and split two ways: one 5 mL fraction for PCB analysis and one 5 mL archive fraction.

For PCDD/PCDFs and PCBs, a number of spiking materials are applied to the Method 0023A sampling train samples:

- Sampling Surrogate Spikes – Isotopically labeled compounds spiked directly on the XAD-2 resin in the laboratory during XAD tube preparation prior to stack sampling use. The recovery of these compounds provides a comprehensive accuracy indication (stack to final analysis) of the PCDD/PCDFs and PCBs found using the Method 0023A sampling method. Per Section 7.3.3 of Method 0023A, these same PCDD/PCDF and PCB surrogates are added to the Method 0023A filter after sampling just prior to Soxhlet extraction.
- Isotope Dilution Internal Standard Spikes - Isotopically labeled PCDD/PCDF and PCB compounds applied to the sample just prior to the Soxhlet extraction. The recoveries of these compounds reflect the overall relative accuracy of the sample handling preparation and analysis by the laboratory.
- Alternate Standard Spike- For PCDD/PCDFs, an isotopically labeled compound may be applied to the sample after Soxhlet extraction and before extract cleanup. The recovery of this compound reflects the impacts on the sample of the extract cleanup step of sample preparation.
- Cleanup Standards Spike- For PCBs, isotopically labeled compounds are applied to the sample after Soxhlet extraction and before extract cleanup. The recovery of this compound reflects the impacts on the sample of the extract cleanup step of sample preparation.
- PCDD/PCDF and PCB Recovery Standards- Isotopically labeled compounds applied to the Soxhlet extracts just before GC/MS analysis. These compounds are providing the relative response factors, which are used to calculate analyte concentrations.

As noted above, the Method 0023A sampling train will be operated a minimum of 180 minute (3 hours) to sample a volume of 3.0 dry standard cubic meters of stack gas during each sampling run. In accordance with 40 CFR 63.1208(b)(1)(iii), any PCDD/PCDF congener that is non-detect will be counted as zero in determining compliance.

6.2.2.3 Method 0010 for SVOCs

A Method 0010 sampling train will be used to sample stack gas for the target POHC hexachlorobenzene (HCB) and semivolatile organic (SVOC) PICs. This test program includes a target list of SVOCs. The sampling train will be operated to sample a minimum of 3 dry standard cubic meters (105.9 dry standard cubic feet) of stack gas during each sampling run. The Method 0010 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.

The recovery of the sampling train components will be as delineated in Method 0010 except that solvent used for sampling train recovery will be acetone and methylene chloride instead of methanol and methylene chloride. Acetone is preferred over methanol for the reasons noted in the preceding section.

For SVOCs, four types of spiking materials will be applied to the Method 0010 sampling train samples:

- Sampling Surrogate Spike – Isotopically labeled compound spiked directly on the XAD-2 resin in the laboratory during XAD-2 resin tube preparation and prior to stack sampling. The recovery of the sampling surrogate provides a comprehensive accuracy indication (stack to final analysis) of the SVOCs found using the Method 0010 sampling method.
- Surrogate Spikes - Isotopically labeled compounds applied to the sample just prior to the Soxhlet extraction. The recoveries of these compounds reflect the overall relative accuracy of the sample handling preparation and analysis by the laboratory.
- Semivolatile Internal Standard Compounds - These compounds are applied to the sample extract just prior to GC/MS analysis. These compounds are used to determine if the continuing calibration internal standards are still appropriate to use to calculate the associated compound concentrations.
- Matrix Spike Compounds - These compounds are spiked onto the condensate portion of the Method 0010 samples and onto a blank XAD resin. The matrix spike compounds are spiked onto an aliquot of the Method 0010 condensate and blank resin sample before GC/MS analysis. Recovery of the spikes provides an indicator of method accuracy for the sample matrix.

In addition to the target SVOCs, all GC/MS 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 semivolatile TICs that can be matched with 85% or greater confidence will be reported. SVOC TICs will be quantified

based on nearest internal standard. Semivolatile TICs less than 10% of the nearest internal standard will not be reported or quantified.

6.2.2.4 Method 29 for Metals

An EPA Method 29 sampling train will be used to sample stack gas for the project target metals. Samples are subjected to acid digestion using nitric and hydrofluoric acid per the methodology described in Method 29. Non-mercury metals will be analyzed by SW-846 Method 6020 [inductively coupled argon plasma/mass spectroscopy (ICP/MS or ICAP/MS)]. Mercury will be analyzed for by SW-846 Method 7470A [cold vapor atomic absorption spectroscopy (CVAA or CVAAS)]. Accuracy and precision are measured through the use of matrix spike analyses. The five Method 29 sampling train fractions will undergo seven separate analyses as follows:

- The nitric acid probe rinse and the particulate filter will be combined and digested in the laboratory as the front-half composite sample and analyzed for Hg and the non-Hg target metals.
- The combined condensate knockout impinger (impinger 1) and the HNO_3/H_2O_2 impingers (impingers 2-3) catches will be prepared in the laboratory and analyzed for Hg and the non-Hg target metals.
- The empty impinger (impinger 4) catch will be prepared in the laboratory and analyzed for Hg.
- The $KMnO_4/H_2SO_4$ impingers (impingers 5-6) catches will be prepared in the laboratory and analyzed for Hg.
- The 8N HCl rinse of impingers 5-6 will be prepared in the laboratory and analyzed for Hg.

6.2.2.5 EPA Method 26A for PM/HCl/Cl_2

An EPA Method 26A sampling train will be used to sample the stack gas for particulate matter (PM), HCl, and Cl_2. The stack gas HCl/Cl_2 is sampled by bubbling the 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^-). The analysis of the alkaline impinger includes the careful addition by the laboratory analyst of sodium thiosulfate ($Na_2S_2O_3$) to reduce 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. Thiosulfate addition is not necessary to preserve the Cl_2 captured by the alkaline impingers and should not be performed in the field as part of the sample recovery. The random addition of thiosulfate in the field could result in overdosing. Overdosing with thiosulfate can lead to the formation of a thiosulfate peak in the ion chromatography output that will mask the chloride peak during the analysis resulting in necessary sample dilutions and elevated chloride detection limits.

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.

The stack gas particulate emissions are determined by separate analysis of the Method 26A sampling train tare weighed filter and the front-half acetone probe rinses.

The tare weighed particulate filter PM catch is determined by the differential weight of the particulate collected by the Method 26A 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 analysis of the Method 26A include acetone reagent blank is used to assess blank contamination. Precision for the PM analyses is determined via replicate weighings. Accuracy is determined by using Class-S weight to verify the a scale accuracy.

6.2.2.6 Method 0061 for Hexavalent Chromium

Hexavalent chromium samples are in a KOH impinger solution matrix. To maintain greater than 8.5 pH during the course of sampling, the initial charge volume and/or concentration of the KOH used may be increased. According to Section 6.3 of Method 0061, the hexavalent chromium samples are stable in the alkaline matrix for the 14-day allowable holding time between sample collection and subsequent analysis. Field spikes as described in Section 5.0 will be used to assess the stability of the hexavalent chromium. As part of the hexavalent chromium sample analysis, an aliquot of the KOH impinger reagent will be spiked to assess hexavalent chromium recovery and method accuracy from the sample matrix.

6.2.2.7 Method 0010 for TCO/Grav

A Method 0010 sampling train will be used to sample stack gas total chromatographable organics (TCO and gravimetric organics (Grav). The Method 0010 sampling train will be assembled and leak checked. The sampling train will be operated to sample a minimum of three dry standard cubic meters of stack gas during each sampling run.

The TOC/Grav fractions are extracted using a slightly modified version of Method 3542. Since the sampling train extracts for total organics determinations are analyzed by GC/FID and gravimetric techniques, no sampling surrogate, isotopically-labeled standards, or internal standards are required to be added to the extractors or sample extracts. The front-half fraction (probe rinses and particulate filter) are combined and Soxhlet extracted for 18 hours with methylene chloride. The back-half fraction (XAD-2 resin and condenser solvent rinses) are combined and Soxhlet extracted for 18 hours with methylene chloride. The condensate fraction is acid/base separatory funnel extracted using methylene chloride. The separate extracts are then pooled. The final extract volume must be no less than 5 mL. The combined methylene chloride extracts are split into two portions and used as follows:

- One portion of the extract is used for semivolatile organic analysis using TCO GC/FID analysis according to EPA Guidance for Total Organics. Details of the method are described in Appendix C of the "TOE Guidance" [Guidance for Total Organics, EPA/600/R-96/036, March, 1996].

- One portion of the methylene chloride extract is used for nonvolatile organic analysis using gravimetric mass (Grav) method according to EPA Guidance for Total Organics. Details of the method are described in Appendix D of the "TOE Guidance".

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 Tenax® and Tenax®/charcoal blanks for VOST
- Spiked XAD-2 resin blanks for Method 0023A (PCDD/PCDFs & PCBs) and Method 0010 (SVOCs)
- Tenax® and Tenax®/charcoal field and trip blanks for VOST
- Reagent blanks for all sampling trains
- Blank trains for Method 0023A (PCDD/PCDFs & PCBs), Method 0010 (SVOCs), Method 0010 (TCO/Grav), Method 29 (metals).

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 0023A PCDD/PCDF and PCB sampling train will be spiked with a sampling surrogate and matrix spike compounds. These samples will be extracted and analyzed for PCDD/PCDF and PCBs 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.

Two XAD-2 resin traps prepared for the Method 0010 SVOC sampling train will be spiked with a sampling surrogate and matrix spike compounds. These samples will be extracted and analyzed for SVOCs by the XAD-2 trap preparation laboratory to demonstrate the accuracy of the analytical method (matrix spike), 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, blank trains will be collected:

- One Method 0023A PCDD/PCDF/PCB blank train
- One Method 0010 SVOC blank train
- One Method 0010 TCO/Grav blank train
- One Method 29 metals blank train .

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.

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Table 6-1. Sample Collection Locations, Equipment, and Methods
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Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Test 1	Test 2	Test 3	Field QC	Total Field Samples
Hex Waste	ASTM D-4057, E-300-86	250 mL glass VOA jars	VOCs/SVOCs/PCBs	Grab samples taken at the beginning, middle and end (B-M-E) of each test run using 250 mL glass VOA jars. All three grab samples are collected as individual samples; Sample compositing will be performed in the laboratory.	9	9	--	--	18
		250 mL glass VOA jars	VOCs/SVOCs		--	--	9	--	9
		250 mL glass VOA jars	Properties		9	9	9	--	27
		250 mL glass VOA jars	Metals		--	--	9	--	9
DNAPL Waste Feed	ASTM D-4057, E-300-86	250 mL glass sample bottle	SVOCs/PCBs	Collect a 250 mL grab sample at 30-minute intervals during each test run. The grab samples are transferred to a 4L jug to build a composite sample. The run composite is maintained on ice between sampling intervals. At the end of the test run, collect 40mL glass VOAs, and 250 or 500 mL glass	3	3	--	--	6
		250 mL glass sample bottle	SVOCs		--	--	3	--	3
		40 mL glass VOA	VOCs		3	3	3	--	9
		500 mL glass bottle	Properties		3	3	3	--	9
		250 mL glass sample bottle	Metals		--	--	3	--	3
HCl Product	ASTM D-4057, E-300-86	1-liter glass sample bottle	HCB	Collect ~ 250 grab sample at each 30-minute interval during each test run. Grab samples will be combined in 4 L glass jug maintained on ice to build run composite. Collect one 1-liter sample from the homogenized composite at the end of the test run; discard balance of composite sample.	3	3	--	--	6
Scrubber Purge Water	ASTM D-4057, E-300-86	1-liter glass sample bottle	HCB	Same procedure as HCl Product	3	3	--	--	6
VOST Resin Tubes	SW846 Method 0030	VOST Resin Tubes	VOC PICs	Collect four (4) tube set pairs per test run ~20 liters of stack gas sampled per tube set pair.	12	12	--	--	24
VOST Condensate		40 mL glass VOA	VOC PICs	Collect one (1) composite stack gas condensate for each test run.	3	3	--	--	6
VOST Field Blank Resin Tubes		VOST Resin Tubes	VOC PICs	Collect one (1) tube set pair per test run.	3	3	--	--	6
VOST Trip Blank Resin Tubes		VOST Resin Tubes	VOC PICs	Collect one (1) tube set pair per test condition.	1	1	--	--	2
VOST Condensate Trip/Field Blank		40 mL glass VOA	VOC PICs	Collect one (1) glass VOA per test condition.	1	1	--	--	2

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Table 6-1. Sample Collection Locations, Equipment, and Methods
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Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Test 1	Test 2	Test 3	Field QC	Total Field Samples
VOST Audit Resin Tubes	SW846 Method 0030; VOST Audit Directions	VOST Resin Tubes	Target VOCs	Collect four (4) tube set pairs at sampled volumes of 10, 5, 5, and 5 liters of audit gas sampled per tube set pair, respectively	--	--	--	4	4
Method 0023A Particulate Filter	SW846 Method 0023A	Petri Dish	PCDD/PCDFs, PCBs	Collect integrated sample for PCDD/PCDFs and PCBs during each test run. Sample for a minimum 180 minutes to sample a minimum of 3.0 dry standard cubic meters of stack gas.	3	3	--	1-blank train	7
Method 0023A Front Half Acetone and Methylene Chloride Rinses	SW846 Method 0023A	500 mL glass sample bottle	PCDD/PCDFs, PCBs		3	3	--	1-blank train	7
Method 0023A Front Half Toluene Rinses		250 mL glass sample bottle	PCDD/PCDFs only		3	3	--	1-blank train	7
Method 0023A XAD-2 Resin		Resin Trap	PCDD/PCDFs, PCBs		3	3	--	1-blank train	7
Method 0023A Back Half Acetone and Methylene Chloride Rinses		500 mL glass sample bottle	PCDD/PCDFs, PCBs		3	3	--	1-blank train	7
Method 0023A Back Half Toluene Rinses		250 mL glass sample bottle	PCDD/PCDFs only		3	3	--	1-blank train	7
Method 0023A Condensate		1-liter glass sample bottle	PCBs only		3	3	--	1-blank train	7
Method 0023A Acetone Reagent Blank	SW846 Method 0023A	250 mL glass sample bottle	PCDD/PCDFs, PCBs	Reagent Blank	--	--	--	1	1
Method 0023A Methylene Chloride Reagent Blank	SW846 Method 0023A	250 mL glass sample bottle	PCDD/PCDFs, PCBs	Reagent Blank	--	--	--	1	1
Method 0023A Toluene Reagent Blank	SW846 Method 0023A	250 mL glass sample bottle	PCDD/PCDFs only	Reagent Blank	--	--	--	1	1
PCDD/PCDF Audit Sample	SW846 Method 8290	Ampoule with spiked XAD-2 Resin	PCDD/PCDFs only	As provided by Agency	--	--	--	1	1

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Table 6-1. Sample Collection Locations, Equipment, and Methods
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Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Test 1	Test 2	Test 3	Field QC	Total Field Samples
Method 0010 Particulate Filter	SW846 Method 0010	Petri Dish	SVOCs including HCB	Collect integrated sample for SVOCs during each test run. Sample for a minimum 180 minutes to sample a minimum of 3.0 dry standard cubic meters of stack gas.	3	3	--	1-blank train	7
Method 0010 Front Half Acetone and Methylene Chloride Rinses		500 mL glass sample bottle	SVOCs including HCB		3	3	--	1-blank train	7
Method 0010 XAD-2 Resin		Resin Trap	SVOCs including HCB		3	3	--	1-blank train	7
Method 0010 Back Half Acetone and Methylene Chloride Rinses		500 mL glass sample bottle	SVOCs including HCB		3	3	--	1-blank train	7
Method 0010 Condensate		1-liter glass sample bottle	SVOCs including HCB		3	3	--	1-blank train	7
Method 0010 Acetone Reagent Blank	SW846 Method 0010	250 mL glass sample bottle	SVOCs including HCB	Reagent Blank	--	--	--	1	1
Method 0010 Methylene Chloride Reagent Blank	SW846 Method 0010	250 mL glass sample bottle	SVOCs including HCB	Reagent Blank	--	--	--	1	1
Method 0010 Particulate Filter	SW846 Method 0010	Petri Dish	TCO/Grav	Collect integrated sample for TCO/Grav during each test run. Sample for a minimum 180 minutes to sample a minimum of 3.0 dry standard cubic meters of stack gas.	--	--	3	1-blank train	4
Method 0010 Front Half Acetone and Methylene Chloride Rinses		500 mL glass sample bottle	TCO/Grav		--	--	3	1-blank train	4
Method 0010 XAD-2 Resin		Resin Trap	TCO/Grav		--	--	3	1-blank train	4
Method 0010 Back Half Acetone and Methylene Chloride Rinses		500 mL glass sample bottle	TCO/Grav		--	--	3	1-blank train	4
Method 0010 Condensate		1-liter glass sample bottle	TCO/Grav		--	--	3	1-blank train	4

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Table 6-1. Sample Collection Locations, Equipment, and Methods
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Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Test 1	Test 2	Test 3	Field QC	Total Field Samples
Method 0010 Acetone Reagent Blank	SW846 Method 0010	250 mL glass sample bottle	TCO/Grav	Reagent Blank	--	--	--	1	1
Method 0010 Methylene Chloride Reagent Blank	SW846 Method 0010	250 mL glass sample bottle	TCO/Grav	Reagent Blank	--	--	--	1	1
Method 0040 Tedlar Bag Samples	SW846 Method 0040	25-50 L Tedlar gas sample bag	C_1-C_7 Hydrocarbons	Collect two integrated bag sample for VOCs during each test run. Sample for a minimum 60 minutes per bag to sample a minimum of 20 liters of stack gas. Bag samples are analyzed on-site by field GC within 24 hours of collection, or within 72 hours of collection if shipped to an off-site	--	--	6	--	6
Method 0040 Condensate		40 mL glass VOA	C_1-C_7 Hydrocarbons		--	--	3	--	3
Method 0040 Tedlar Bag Reagent Blank		25-50 L Tedlar gas sample bag with organic free nitrogen	C_1-C_7 Hydrocarbons		--	--	3	--	3
Method 0040 Organic Free Water Reagent Blank		40 mL glass VOA	C_1-C_7 Hydrocarbons		--	--	1	--	1
Method 29 Particulate Filter	EPA Method 29	Petri Dish	Metals and Mercury	Collect integrated sample for metals and mercury during each test run. Sample for a minimum 120 minutes to sample approximately 1.5-2.0 dry standard cubic meters of stack gas.	--	--	3	1-blank train	4
Method 29 Front Half Nitric Acid Rinses		250 mL glass sample bottle	Metals and Mercury		--	--	3	1-blank train	4
Method 29 Acidified Peroxide Impingers and Rinses		1-liter glass sample bottle	Metals and Mercury		--	--	3	1-blank train	4
Method 29 Empty Impinger and Rinses		250 mL glass sample bottle	Mercury Only		--	--	3	1-blank train	4
Method 29 Acidified Permanganate Impingers and Rinses		500 mL glass sample bottle	Mercury Only		--	--	3	1-blank train	4
Method 29 Acidified Permanganate Impingers 8N HCl Rinses		250 mL glass sample bottle	Mercury Only		--	--	3	1-blank train	4

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Table 6-1. Sample Collection Locations, Equipment, and Methods
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Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Test 1	Test 2	Test 3	Field QC	Total Field Samples
Method 29 Particulate Filter Reagent Blank	EPA Method 29	Petri Dish	Metals and Mercury	Reagent Blank	--	--	--	1	1
Method 29 Nitric Acid Reagent Blank	EPA Method 29	250 mL glass sample bottle	Metals and Mercury	Reagent Blank	--	--	--	1	1
Method 29 Acidified Peroxide Reagent Blank	EPA Method 29	250 mL glass sample bottle	Metals and Mercury	Reagent Blank	--	--	--	1	1
Method 29 Acidified Permanganate Reagent Blank	EPA Method 29	250 mL glass sample bottle	Mercury Only	Reagent Blank	--	--	--	1	1
Method 29 8N HCl Reagent Blank	EPA Method 29	250 mL glass sample bottle	Mercury Only	Reagent Blank	--	--	--	1	1
Metals Audit Sample Filter	SW846 Method 6020	Filter in Petri Dish	Metals Only	As provided by Agency	--	--	--	1	1
Metals Audit Sample Liquid	SW846 Method 6020	Ampoule with spiked liquid	Metals Only	As provided by Agency	--	--	--	1	1
Mercury Audit Sample Liquid	SW846 Method 7470	Ampoule with spiked liquid	Mercury Only	As provided by Agency	--	--	--	1	1
Method 26A Particulate Filter	EPA Method 26A	Petri Dish	Particulate	Collect integrated sample for particulate and HCl/Cl_2 during each test run. Sample for a minimum 60 minutes to sample approximately 0.75-1.0 dry standard cubic meters of stack gas.	--	3	--	--	3
Method 26A Front Half Acetone Rinses		250 mL glass sample bottle	Particulate		--	3	--	--	3
Method 26 Sulfuric Acid Impingers and Rinses		1-liter glass sample bottle	Chloride Ion		--	3	--	--	3
Method 26A Sodium Hydroxide Impingers and Rinses		500 mL glass sample bottle	Chloride Ion		--	3	--	--	3

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Table 6-1. Sample Collection Locations, Equipment, and Methods
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Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Test 1	Test 2	Test 3	Field QC	Total Field Samples
Method 26A Particulate Filter Reagent Blank	Method 26A	Petri Dish	Particulate	Reagent Blank	--	--	--	1	1
Method 26A Acetone Reagent Blank	Method 26A	250 mL glass sample bottle	Particulate	Reagent Blank	--	--	--	1	1
Method 26 Deionized Water Reagent Blank	Method 26A	250 mL glass sample bottle	Chloride Ion	Reagent Blank	--	--	--	1	1
Method 26 Sulfuric Acid Reagent Blank	Method 26A	250 mL glass sample bottle	Chloride Ion	Reagent Blank	--	--	--	1	1
Method 26A Sodium Hydroxide Reagent Blank	Method 26A	250 mL glass sample bottle	Chloride Ion	Reagent Blank	--	--	--	1	1
Chloride in Acid Media Audit Sample	Method 26A	Ampoule with spiked liquid	Chloride Ion	As provided by Agency	--	--	--	1	1
Chloride in Basic Media Audit Sample	Method 26A	Ampoule with spiked liquid	Chloride Ion	As provided by Agency	--	--	--	1	1
Method 0061Potassium Hydroxide Impinger Solution and Rinses	SW846 Method 0061	1-liter polyethylene sample bottle	Hexavalent Chromium	Collect integrated sample for Hexavalent chromium during each test run. Sample for a minimum 60 minutes to sample approximately 0.75-1.0 dry standard cubic meters of stack gas.	--	--	3	--	3
Method 0061Potassium Hydroxide Solution Reagent Blank	SW846 Method 7199	250 mL polyethylene sample bottle	Hexavalent Chromium	Reagent Blank	--	--	--	1	1
Method 0061Deionized Water Reagent Blank	SW846 Method 7199	250 mL polyethylene sample bottle	Hexavalent Chromium	Reagent Blank	--	--	--	1	1
Method 0061Potassium Hydroxide Impinger Solution Field Spike	SW846 Method 7199	250 mL polyethylene sample bottle	Hexavalent Chromium	Field Spike	--	--	--	2	2
Method 26A Sodium Hydroxide Reagent Field Spike	SW846 Method 7199	250 mL polyethylene sample bottle	Hexavalent Chromium	Field Spike	--	--	--	1	1

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Table 6-1. Sample Collection Locations, Equipment, and Methods

Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Test 1	Test 2	Test 3	Field QC	Total Field Samples
Method 5 Smooth Surface Polycarbonate Particulate Filter	EPA Method 5	Petri Dish	Particle Size Distribution by SEM	Collect integrated sample for particle size distribution analysis during each test run. Sample for a maximum of 24 minutes (2-4 minutes per traverse point).	--	--	3	--	3
Method 5 Smooth Surface Polycarbonate Particulate Filter Reagent Blank		Petri Dish	Particle Size Distribution by SEM		--	--	--	1	1
Carbon Dioxide and Oxygen by Orsat	EPA Methods 3 and 3A	25-50 L Tedlar gas sample bag	Carbon Dioxide and Oxygen by Orsat	Collect two 1-hour integrated bag sample for on-site Orsat analysis.	6	6	6	--	18
Carbon Monoxide	EPA Method 10; Performance Specification 4B	Installed Continuous Emissions Monitor	Carbon Monoxide	Continuous during each test run	--	--	--	--	--
Oxygen	EPA Method 3A; Performance Specification 4B	Installed Continuous Emissions Monitor	Oxygen	Continuous during each test run	--	--	--	--	--
Total Hydrocarbons	EPA Method 25A	Temporary Continuous Emissions Monitor	Total Hydrocarbons as Propane Equivalents	Continuous for two 60-minute periods during each test run.	--	--	--	--	--
TOTAL SAMPLES									355

Notes:
ASTM - American Society for Testing and Materials
DNAPL - dense non-aqueous phase liquid
EPA Method - New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
Grav - gravimetric
HCB - hexachlorobenzene
mL - milliliter
PCB - Polychlorinated biphenyl
PCDD/PCDF - polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans
PIC - product of incomplete combustion
QC - quality control
SVOC - semivolatile organic compound
SW846 - Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.
TCO - total chromatographable organics
VOA - volatile organic analysis
VOC - volatile organic compound
VOST - Volatile Organic Sampling Train

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.

During the test, once the samples are transferred from the sampling technician to the Sample Custodian, sample custody becomes the responsibility of the Sample Custodian until the samples arrive at the analytical laboratory. When overnight couriers are utilized, the air bill will serve to document the transfer of custody from the Sample Custodian 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 0023A, etc.) will be kept on ice ($4 \pm 2^{o}C$) and shipped to the analytical laboratory in sealed, 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 in sealed shipping containers without ice.

7.2 SAMPLE IDENTIFICATION

Refer to Figure 7-1. In consultation with the Test Coordinator, the Laboratory Analysis Coordinator 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. From the master sample list, the analytical laboratory will prepare the pre-labeled EPA Class III clean sample containers for field use, and the Tenax®/ Tenax®-charcoal and XAD-2 resins according to the specifications of the methods as described in the test plans. 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 PROCESS SAMPLE COLLECTION FORMS

While a process sample is being taken in the field, the sampling technician will complete a field sampling record. An example field sampling record is presented as Figure 7-2. The field sampling record will be filled out in its entirety for every sample. This will provide information to be used in the final report. The sampling technician shall provide the completed field sampling record to the Sample Custodian with the associate sample.

7.4 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 7-3. 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.

7.5 SAMPLE LABELING

An example sample label format is presented in Figure 7-4. Each sample container will be labeled to show the source of the sample as OxyChem; 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).

7.6 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.

7.7 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 7-5 and 7-6 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.

7.8 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 Sample Custodian will verify the condition of the samples: 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. Before shipping the samples from the site, the Sample Custodian shall make a photocopy set of all the RFA/COCs to remain with the Test Coordinator or QAO.

7.9 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 Analysis Coordinator or his 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 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 Analysis Coordinator 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.

7.10 SAMPLE PRESERVATION

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

The on-site location of the VOST sample holding area is of special importance. The VOST tubes will be stored in a clean area away from where all other stack gas and process samples are handled both before and after sampling. High concentration volatile organic samples (recovered elements of other sampling trains, waste feed samples, etc.) must be segregated to prevent inadvertent contamination of the VOST samples. The VOST tube pairs and VOST condensate samples will be preserved after sampling by placing them on double bagged ice or blue ice in a clean, preferably previously unused, dedicated sample cooler. To preclude contamination from solvents and process samples, all VOST samples will be shipped in dedicated shipping containers separate from all other test samples except the Method 0040 condensate samples which may be included with the VOST samples.

XAD-2 traps and other train sample components for the Method 0023A PCDD/PCDF/PCB, Method 0010 SVOC, and Method 0010 TCO/Grav trains will be preserved after sampling by placing them in a cooler on double bagged ice or blue ice. Condensate and solvent samples from these sampling trains may be stored and shipped with the XAD-2 traps.

Other organic analysis samples (e.g., waste feed samples, process water samples for POHC, etc.) will be preserved after sample collection by placing them on double bagged ice or blue ice in a dedicated sample cooler. All waste feed and process samples, for organic or inorganic analyses, will be stored separately and away from the stack gas samples, and shipped in separate packages to preclude possible contamination of the stack gas samples.

For non-organic analysis stack gas samples (particulate, chloride, etc.), sample preservatives (if applicable, refer to Table 7-1) will be used as required by the target analyte. These samples will be stored in dedicated sample packaging or coolers. These samples do not require chilling.

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

Parameter	Sample Name/Matrix	Sample Containers	Preservation	Maximum Holding Time
Process semivolatile organics and PCBs	Hex waste	Glass wide-mouth VOA jar glass VOA jars with Teflon-lined caps	Chill to 4°C	14 days until extraction, 40 days after extraction
	DNAPL waste	Amber glass Boston round bottles with Teflon-lined caps	Chill to 4°C	14 days until extraction, 40 days after extraction
Process HCB	HCl product	Amber glass Boston round bottles with Teflon-lined caps	Chill to 4°C	14 days until extraction, 40 days after extraction
	Scrubber purge water	Amber glass Boston round bottles with Teflon-lined caps	Chill to 4°C	14 days until extraction, 40 days after extraction
Process volatile organics	Hex waste	Glass wide-mouth VOA jar glass VOA jars with Teflon-lined caps	Chill to 4°C	14 days
	DNAPL waste	Glass VOA vials with Teflon-lined caps or septum caps	Chill to 4°C	14 days
Process physical properties	Hex waste	Glass wide-mouth VOA jar glass VOA jars with Teflon-lined caps	NA	180 days
	DNAPL waste	Amber glass Boston round bottles with Teflon-lined caps	NA	180 days
Stack gas volatile organics	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
Stack gas PCDD/PCDFs, PCBs, SVOCs, & TCO/Grav	Stack gas Method 0010 & 0023A filter	Glass petri dish	Chill to 4°C	14 days until extraction, 40 days after extraction
	Stack gas Method 0010 & 0023A 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 0010 & 0023A solvents	Amber glass Boston round bottles with Teflon-lined caps	Chill to 4°C	14 days until extraction, 40 days after extraction
	Stack gas Method 0010 & 0023A condensate (for PCBs, SVOCs, & TCO/Grav only)	Amber glass Boston round bottles with Teflon-lined caps	Chill to 4°C	14 days until extraction, 40 days after extraction
Stack gas Method 0040 organics	Stack gas M0040 bags	Tedlar bag	Protect from sunlight	24 hours
	Stack gas M0040 condensate	Amber glass VOA vial, Teflon-lined caps or septum caps	Chill to 4°C	14 days
Stack gas metals	Method 29 filter	Glass or plastic Petri dish	NA	180 days/28 days for Hg
	Method 29 liquids	Amber glass Boston round bottles with Teflon-lined caps	NA	180 days/28 days for Hg
Stack gas particulate	Method 5/26A filter	Glass or plastic petri dish	NA	180 days
	Method 5/26A probe rinses	Amber glass Boston round bottles with Teflon-lined caps	NA	180 days
Stack gas chloride	Method 5/26A acid impinger liquids	Amber glass Boston round or with Teflon-lined caps or polyethylene bottles	NA	28 days
Stack gas hexavalent chromium	Method 0061 liquids	Polyethylene bottles	pH>8.5	14 days

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

Parameter	Sample Name/Matrix	Sample Containers	Preservation	Maximum Holding Time
Stack gas PSD	Method 5 filters	Glass or plastic petri dish	NA	180 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.

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Figure 7-1. Example Master Sample List

OxyChem Comprehensive Performance Test
Geismar, LA
Focus Project No. 050703

F-1 FURNACE CPT MASTER SAMPLE LIST

Test America, Knoxville, TN
January 17, 2008

Field Sample No.	Test No.	Run No.	RFA/COC No.	Sample Source	Sample Description	Sample Container	Analytical Parameters	Analytical Laboratory	QC Analysis
K- 3010	3	1	003	Hex Waste	Waste Feed	250 mL VOA jar	Metals & Hg	TA, Knoxville	DUP/MS/MSD
K- 3011	3	1	003	DNAPL Waste	Waste Feed	250 mL amber bottle	Metals & Hg	TA, Knoxville	DUP/MS/MSD
K- 3012	3	1	007	Method 29 Train	Particulate Filter	Petri dish	Metals & Hg	TA, Knoxville	PDS
K- 3013	3	1	007	Method 29 Train	0.1 N HNO_3 Probe Rinse	250 mL amber bottle	Metals & Hg	TA, Knoxville	
K- 3014	3	1	007	Method 29 Train	5% HNO_3/10% H_2O_2 Impingers	1-liter amber	Metals & Hg	TA, Knoxville	MS/MSD/PDS
K- 3015	3	1	007	Method 29 Train	Empty Impinger Rinses	250 mL amber bottle	Hg	TA, Knoxville	MS/MSD
K- 3016	3	1	007	Method 29 Train	4% $KMnO_4$/10% H_2SO_4 Impingers	500 mL amber bottle	Hg	TA, Knoxville	MS/MSD
K- 3017	3	1	007	Method 29 Train	8N HCl rinse	250 mL amber bottle	Hg	TA, Knoxville	MS/MSD
K- 3018	3	1	007	Method 29 Blank Train	Particulate Filter	Petri dish	Metals & Hg	TA, Knoxville	BT
K- 3019	3	1	007	Method 29 Blank Train	0.1 N HNO_3 Probe Rinse	250 mL amber bottle	Metals & Hg	TA, Knoxville	BT
K- 3020	3	1	007	Method 29 Blank Train	5% HNO_3/10% H_2O_2 Impingers	1-liter amber	Metals & Hg	TA, Knoxville	BT
K- 3021	3	1	007	Method 29 Blank Train	Empty Impinger Rinses	250 mL amber bottle	Hg	TA, Knoxville	BT
K- 3022	3	1	007	Method 29 Blank Train	4% $KMnO_4$/10% H_2SO_4 Impingers	500 mL amber bottle	Hg	TA, Knoxville	BT
K- 3023	3	1	007	Method 29 Blank Train	8N HCl rinse	250 mL amber bottle	Hg	TA, Knoxville	BT
K- 3024	3	1	010	Method 0061 Train	Hex Chromium Impinger Liquid	1-liter polyethylene	Cr+6	TA, Knoxville	
K- 3025	3	1	012	Method 0010 TCO/Grav	Particulate Filter	Petri dish	TCO/Grav	TA, Knoxville	
K- 3026	3	1	010	Method 0010 TCO/Grav	Front-half Acetone & MeCl Rinses	250 mL amber bottle	TCO/Grav	TA, Knoxville	
K- 3027	3	1	010	Method 0010 TCO/Grav	Back-half Acetone & MeCl Rinses	250 mL amber bottle	TCO/Grav	TA, Knoxville	
K- 3028	3	1	010	Method 0010 TCO/Grav	Condensate	1-liter amber	TCO/Grav	TA, Knoxville	

Figure 7-2. Example Process Sampling Record

PROCESS SAMPLE DATA COLLECTION SHEET

Client:	OxyChem		
Location:	Geismar, LA	**Sheet No.:**	1 of 1
Program:	CPT	**Run Start:**	0800
Stream:	DNAPL Waste	**Run End:**	1335
Sampler:	CHV	**Sample Frequency:**	30 minutes
Date:	18-Feb-08	**Sample Type:**	Grab/Composite
Test No.:	3	**Equip/Container:**	250 mL grab/ 4-L Composite
Run No.:	1	**Source:**	Tap on feed line

Sample No.	Sample Time	Comment	Sample No.	Sample Time	Comment
1	0800	Run Start 0800	26	:	
2	0830		27	:	
3	0900		28	:	
4	0930		29	:	
5	1000		30	:	
6	1030		31	:	
7	1100		32	:	
8	1130		33	:	
9	1200		34	:	
10	1230		35	:	
11	1330		36	:	
12	1330	Run End 1335	37	:	
13			38	:	
14	:		39	:	
15	:		40	:	
16	:		41	:	
17	:		42	:	
18	:		43	:	
19	:		44	:	
20	:		45	:	
21	:		46	:	
22	:		47	:	
23	:		48	:	
24	:		49	:	
25	:		50	:	

Total No. of Grabs:

Comments/Notes:

Samples for analysis were prepared at the end of the test run using aliquots of the homogenized composite sample.
The balance of the composite remaining was discarded.
1-500 mL for properties; 1-250 mL for metals, 1-250 ml for SVOCs; 1-40 mL VOA for VOCs

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Figure 7-3. Example Stack Sampling Record

Isokinetic Stack Sample Data Collection Sheet

Contract No.	116029	Method:	M29 (Metals + Hg)			Page 1 of 1	
Facility	OxyChem, Geismar, LA	Initial Leak Rate (ft^3 @ in.Hg)		<0.010 @ 10"		Operator	MJK
Source	F-1 Furnace	Final Leak Rate (ft^3 @ in.Hg)		<0.010 @ 10"		Pitot No.	K-004
Date	18-Feb-08	Start Time	0800	Meter No.	1442	PTCF	0.84
Condition No.	3	End Time	1015	DGMCF	1.004	Init. Pitot Leak Check	0.0
Run No.	1	Duration (min)	120	Δ H @	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 No.	Time (24 Hr)	Volume (ft^3)	Δ P (in. H_2O)	Δ H (in. H_2O)	Temperatures (°F) Flue Gas	Probe	Filter	Impingers	Meter in	Meter Out	Cond. Exit	Vacuum (in. Hg)
A-1	0800	704.25	0.78	1.79	294	225	258	68	103	105	NA	6.0
A-1	0805	707.88	0.78	1.79	294	260	257	67	105	104		6.0
A-2	0810	711.50	0.74	0.17	294	257	261	66	106	104		6.0
A-2	0815	714.96	0.74	1.7	294	261	258	66	107	104		6.0
A-3	0820	718.09	0.68	1.56	292	258	257	64	108	104		6.0
A-3	0825	721.50	0.68	1.56	292	257	258	63	109	104		6.0
A-4	0830	725.36	0.77	1.77	292	258	258	67	104	104		6.0
A-4	0835	729.35	0.77	1.77	292	258	256	67	109	103		6.0
A-5	0840	733.20	0.77	1.7	293	258	259	61	110	104		6.0
A-5	0845	737.10	0.77	1.7	289	256	258	61	108	104		6.0
A-6	0850	740.67	0.74	1.43	285	259	255	62	106	105		6.0
A-6	0855	744.12	0.74	1.43	290	258	255	62	105	103		6.0
STOP	0900	747.21										
B-1	0915	747.42	0.62	1.77	292	255	259	66	96	95		7.0
B-1	0920	750.94	0.62	1.77	292	259	257	65	96	95		7.0
B-2	0925	754.76	0.77	1.43	293	257	257	62	99	95		7.0
B-2	0930	758.21	0.77	1.29	289	257	258	62	102	95		6.0
B-3	0935	761.52	0.62	1.04	285	258	257	62	104	97		6.0
B-3	0940	764.52	0.56	1.1	290	257	253	61	106	99		7.0
B-4	0945	767.79	0.45	1.5	296	257	257	63	109	100		6.0
B-4	0950	767.92	0.56	1.5	296	253	258	64	111	101		6.0
B-5	0955	774.51	0.45	0.99	296	257	259	61	112	103		6.0
B-5	1000	777.52	0.44	0.94	297	258	258	60	112	104		5.5
B-6	1005	780.47	0.65	0.85	297	259	258	61	113	105		5.5
B-6	1010	783.17	0.65	0.85	294	258	257	61	112	105		5.5
END	1015	785.94										

Comments:

Figure 7-4 Example Sample Label Format

OxyChem Comprehensive Performance Test
Geismar, LA
Focus Project No. 050703

Sample Type:	Method 29 Filter	**Sample No.:**	**K-3012**
Test No. 3	**Run No.** 1	**Container(s):**	____ of ____
Analysis Required:	Metals: Al, Sb, As, Ba, Be, Cd, total Cr, Co, Cu, Pb, Mn, Hg, Ni, P, Se, Ag, Tl, V, Zn.		
Analysis Laboratory:	Test America, Knoxville, TN		
Date:	18-Feb-08	**Initials:**	MJK
Time:	1415	**Preservation:**	NA

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Figure 7-5. Example Request for Analysis

Request for Analysis/Chain of Custody No. 007
OxyChem Comprehensive Performance Test
Geismar, LA
Focus Project No. 050703

Test America-Knoxville Lot No. _H-XXXXXXXX_____
Test America-Knoxville Project No. ___XXXXXXX_____

Project Description:	F-1 Furnace CPT Program
Client Project No.:	050703
Test America Project No:	XXXXXXX
Client Project Mgr:	Chris McBride 865-694-7517 x3041
Test America Contact:	Patti Carswell 865-291-3010
Test America Project Mgr:	Dr. William C. Anderson 865-291-3080

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 for Mercury
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:
Laboratory Destination
Test America-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:	
Mercury	28 days to analysis
Metals (excluding Mercury)	180 days to analysis

Field Sample No.	Test No.	Run No.	Sample Collection Date/ Time	Sample Container	Sample Description	Analysis Specifications	Project QC Requirements
K- 3012	3	1	18-Feb-08 1415	Petri dish	Method 29 Train Particulate Filter	Combine this sample with the corresponding nitric acid probe rinse, Sample No. K-3013. Perform Method 29 digestion and analyze via Method 6020 for: Al, Sb, As, Ba, Be, Cd, total Cr, Co, Cu, Pb, Mn, Ni, P, Se, Ag, Tl, V, Zn. Analyze for Hg via Method 7040.	PDS
K- 3013	3	1	18-Feb-08 1415	250 mL amber bottle	Method 29 Train HNO_3 Probe Rinse	Combine this sample with the corresponding filter, Sample No. K-3012. Perform Method 29 digestion and analyze via Method 6020 for: Al, Sb, As, Ba, Be, Cd, total Cr, Co, Cu, Pb, Mn, Ni, P, Se, Ag, Tl, V, Zn. Analyze for Hg via Method 7040.	

Figure 7-6. Example Chain of Custody
Request for Analysis/Chain of Custody No. 007
OxyChem Comprehensive Performance Test
Geismar, LA
Focus Project No. 050703

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

Relinquished by: _____
Name Company Date/Time

Accepted by: _____
Name Company Date/Time

Relinquished by: _____
Name Company Date/Time

Accepted by: _____
Name Company Date/Time

Relinquished by: _____
Name Company Date/Time

Accepted by: _____
Name Company Date/Time

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. OxyChem 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 parameter continuous monitoring system (CMS) (thermocouples, flow meters, pressure transducers, etc.) will be calibrated in accordance with the CMS/CEMS Performance Evaluation Test Plan prepared in accordance with 40 CFR 63.8(e).

As required by Section 5.0 of Appendix to Subpart EEE of Part 63--Quality Assurance Procedures for Continuous Emissions Monitors Used for Hazardous Waste Combustors, the continuous emission monitoring system (CEMS) (installed CO and O_2 monitors) will be undergo a Relative Accuracy Test Audit (RATA) within 90 days prior to the test. The RATA will include calibration drift tests, response time tests, calibration error tests, and relative accuracy tests. During testing, the installed carbon monoxide and oxygen CEMS, the monitors will be calibrated daily before testing. The zero and span checks will be considered a verification of the data quality from these monitors.

CMS and CEMS data will be reported on 1-minute intervals and will be archived in the CMS data acquisition system.

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 8-1.

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 8-2. The calibrations performed and the results will be reported as appropriate to assure the quality of data in the laboratory sample analysis report.

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Table 8-1. 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.

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Table 8-1. 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 ≥ 10 inches Hg (250 mm Hg) before the start of stack sampling, and ≥ 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.
Tedlar bags	Any water manometer displacement after 10 minutes when inflated to 2 to 4 inches (5 to 10 cm) water column pressure	Every bag	Discard bag
Orsat analyzer leak check	Using bag or calibration gas, bring liquid level in each pipette to the reference mark and close stopcock. Burette meniscus changes < 0.2 mL after 4 minutes.	Before and after test	Replace leaking tubing or stopcock valves, or defective hose tubing clamps.
Viability of Orsat analyzer solutions	Using oxygen and carbon dioxide calibration gases, conduct Orsat analyses; ±0.5% of calibration standard	Before and after test	Replace spent absorbing solution with fresh solution.
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

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Table 8-1. Sampling Equipment Calibration Requirements

Stack Sampling Equipment	Acceptance Criteria	Measurement Frequency	Action If Criteria Are Not Met
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
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.

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Table 8-2. Summary of Laboratory Analytical 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 (SW846 8260B)	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.
Semivolatile organics GC/MS (SW846 8270C)	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

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Table 8-2. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
Semivolatile organics GC/MS (SW846 8270C) (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.
PCDD/PCDF and PCBs by High Resolution GC/High Resolution MS (SW846 8290 and CARB 428)	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 ± 20%, and those for the labeled reference compounds must not exceed ± 30%. PCB: Mean RRF %RSD must be no greater than 30% for both unlabeled analytes and internal standards	Recalibrate

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Table 8-2. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
PCDD/PCDFs and PCBs by HRGC/HRMS (continued)	Continuing Calibration	Midlevel standard	At the beginning and end of each 12 hour shift	PCDD/PCDF: RFs must be within ± 20% of the initial calibration mean RRF for unlabeled standards and ± 30% for labeled standards PCB: RRFs must be within ±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.
	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 8290 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
PCBs by GC/ECD	Initial calibration	Minimum of 3 standards	Prior to sample analysis	Correlation coefficient ≤ 0.97	Recalibrate
	Daily Calibration check	Midlevel standard	At least one per day	± 15% of true value	Reanalyze standard and if necessary recalibrate system
	Method Blank	Analysis of blanks	One with each batch	< 20% of sample results	Evaluate for possible contamination
Total Volatiles (Method 0040)	Initial calibration	Minimum of 3 standards bracketing expected concentrations analyzed in duplicate	Prior to sample analysis	Correlation coefficient of 0.97 or greater	N/A
	Daily Calibration check	Midlevel standard	At least one per day	± 10% of true value	Reanalyze standard and if necessary recalibrate system
	Blanks	Tedlar bag blanks and water blanks	One with each sample	Less than 20% of field sample	Evaluate for possible blank correction
TCO (Method 0010)	Initial calibration	Minimum of 3 standards	Prior to sample analysis	Correlation coefficient ≤ 0.97	Recalibrate
	Daily Calibration check	Midlevel standard	At least one per day	± 15% of true value	Reanalyze standard and if necessary recalibrate system

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Table 8-2. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
TCO (Method 0010) (continued)	Method Blank	Analysis of blanks	One with each batch	< 20% of sample results	Evaluate for possible contamination
Metals by ICP or AAS (SW846 6010B ICPES, SW846 6020 ICPMS and SW846 7470 CVAA)	Initial calibration	Multiple standards (AAS) or 1 standard (ICP) and a calibration blank, bracketing the expected concentrations. Critical level should be at least twice the lowest calibration standard.	Prior to sample analysis	Correlation coefficient of linear plot >0.995 (AAS). Not applicable for ICP.	Recalibrate
	Reagent blank	Analysis of blank	After every 10 samples and at end of analysis	Less than instrument detection limit (IDL)	Reanalyze if greater than the reporting limit and discuss in case narrative if greater than the IDL
	Calibration check	Analysis of independent calibration check standard	Once after initial calibration	90 - 110% of theoretical value	Reanalyze and recalibrate, if necessary
	Serial dilution	Analysis of serial dilution (DF=5)	Once per matrix for high level analytes (ICP only)	90 - 110% of undiluted sample value (ICP samples > 50 times the IDL)	Flag data; discuss in case narrative
	Post digestion spike	Analysis of post digest spike, spiked at 2 to 5 times the original sample value	One sample per test for ICP	85 - 115% of theoretical value	Flag data; discuss in case narrative
	Calibration accuracy (ICP only)	Reanalysis of high level standard	After every initial calibration	90 - 110% of theoretical value	Recalibrate and recheck
	Interference check (ICP only)	Analysis of interference sample	After every initial calibration and at the end of each run	80 - 120% of theoretical value	Recalibrate and recheck
	Continuing calibration	Midlevel standard and blank	Beginning and end of each analysis period and after every 10 samples	AAS – Midlevel standard 80 - 120% of theoretical value; blank <50% of lowest calibration standard. ICP – Midlevel standard 90 - 110% of theoretical value; blank <50% of lowest calibration standard or within 3 SD of average blank.	Identify and correct problems; reanalyze samples run since last acceptable continuing calibration check.

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Table 8-2. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
Hexavalent chromium by ion chromatography (SW846 7199)	Initial calibration	≥4 standards bracketing expected concentrations	Prior to and following sample analysis	RPD of response of the two standards at each concentration <10% RPD. Also the average of the standards must yield a relative accuracy of 93 - 107% when calculated versus the linear regression curve.	Reanalyze calibration standards and samples.
	Calibration check or LCS	Analyze independent check standard.	Once per test	90 - 110% of true value	Reanalyze standard. If second analysis does not meet criteria, recalibrate and reanalyze.
	Sample response	Analyze each sample in duplicate	Every sample	<10% RPD of instrument response	Reanalyze samples
Particulate and Gravimetric (EPA Method 5)	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	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.

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Table 8-2. Summary of Laboratory Analytical Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
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.
	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.
Particle Size Distribution via Scanning Electron Microscope (SEM)	Method blank	Analysis of blank	Analyze one with each analytical batch	Establish baseline for SEM analysis	NA

9.0 ANALYTICAL PROCEDURES

Analytical procedures and methods are summarized in Tables 9-1. Individual analytical methods are described in detail in Appendix C of the CPT Plan and are incorporated here by reference. The following is a list of the analytical reference methods for the procedures presented in Table 9-1:

- Test Methods for Evaluating Solid Waste, SW-846 (SW-846), Third Edition, November 1986 and Updates
- Sampling and Analysis Methods for Hazardous Waste Incineration, EPA 600/8-84-002.
- American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Philadelphia, Pennsylvania, Annual Series
- Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.
- Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020.
- Guidance for Total Organics, EPA/600/R-96/036, March, 1996
- Performance Specification 4B, Appendix B, 40 CFR 60.

Tables 9-2, 9-3 and 9-4 present the waste feed target volatile organic, semivolatile organic, and PCB analytes and expected detection limits.

Table 9-5 presents the waste feed target metals analytes and expected detection limits.

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

Tables 9-7 and 9-8 present the stack gas PCDD/PCDF and PCB target analytes for the Method 0023A samples and expected detection limits.

Table 9-9 presents the stack gas target semivolatile organic analytes for the Method 0010 samples and expected detection limits.

Table 9-10 presents the stack gas target metals analytes for the Method 29 samples and expected detection limits.

Table 9-11 presents expected detection limits for stack gas particulate, HCl, and Cl_2 for the Method 26A samples. These data show the expected resolution for particulate, HCl, and Cl_2 for emissions determinations.

In addition to the target volatile and semivolatile compounds, non-target GC/MS 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 compounds that can be matched with 85% or greater confidence will be reported, and will be quantified based on nearest internal standard. Tentatively identified compounds less than 10% of the nearest internal standard will not be reported.

The selected analytical laboratories are LELAP qualified for each type of sample analysis delineated in this test plan. Laboratory LELAP qualifications are included as Attachment B to this QAPP. The sampling and analytical procedures to be used during the test are located in Appendix C of the CPT Plan. Reference sampling and analytical methods are identified throughout the test plans 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, SW846, 40 CFR 60 Appendix A, etc.) and/or the contractor-specific standard operating procedures (SOPs) as recognized by the LELAP.

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 plans or this QAPP. The LELAP-approved laboratory SOPs, which include a number of procedures for special circumstance, will be followed. In cases where the laboratory finds it necessary to make adjustments to the analysis methods, the changes will be documented following the corrective action procedures noted in Section 14.0 of the QAPP. Any such changes must be approved by the test-designated Quality Assurance Officer (QAO).

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Table 9-1. Summary of Analytical Procedures and Methods
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Analysis	Sample Name	Sample Matrix	Analytical Procedure	Reference Method
		Process Samples		
Heating Value	Hex Waste	Organic solid	Bomb calorimeter	ASTM D-240
	DNAPL	Organic liquid	Bomb calorimeter	ASTM D-240
Density	Hex Waste	Organic solid	Volumetric/Gravimetric	ASTM D-891
	DNAPL	Organic liquid	Volumetric/Gravimetric	ASTM D-891
Viscosity	DNAPL	Organic liquid	Kinematic viscometer	ASTM D-445
Ash Content	Hex Waste	Organic solid	Muffle furnace	ASTM D-482
	DNAPL	Organic liquid	Muffle furnace	ASTM D-482
Chlorine Content	Hex Waste	Organic solid	Ion chromatography analysis of combustion residue	ASTM D-808 or E-442; SW846 5050/9056
	DNAPL	Organic liquid	Ion chromatography analysis of combustion residue	ASTM D-808 or E-442; SW846 5050/9056
Metals & Mercury	Hex Waste	Organic solid	Acid digestion, ICP/MS, CVAA	SW846 3010A, 3050B, 3051, 6020 & 7471A
	DNAPL	Organic liquid	Acid digestion, ICP/MS, CVAA	SW846 3010A, 3050B, 3051, 6020 & 7470A
Volatile Organics	Hex Waste	Organic solid	Dilution, purge & trap, GC/MS	SW846 3585, 8260B
	DNAPL	Organic liquid	Dilution, purge & trap, GC/MS	SW846 3585, 8260B
Semivolatile Organics	Hex Waste	Organic solid	Dilution, sonication extraction, GC/MS	SW846 3580A, 8270C
	DNAPL	Organic liquid	Dilution, liquid/liquid extraction, GC/MS	SW846 3580A, 8270C
	HCl Product	Aqueous liquid	Liquid/liquid extraction, GC/MS	SW846 3580A, 8270C
	Scrubber Purge Water	Aqueous liquid	Liquid/liquid extraction, GC/MS	SW846 3580A, 8270C

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Table 9-1. Summary of Analytical Procedures and Methods
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Analysis	Sample Name	Sample Matrix	Analytical Procedure	Reference Method
PCBs	Hex Waste	Organic solid	Dilution, sonication extraction, GC/ECD	SW846 3580A, 8082
	DNAPL	Organic liquid	Dilution, liquid/liquid extraction, GC/ECD	SW846 3580A, 8082
Stack Gas Samples				
Volatile PICs	VOST Tubes	Tenax®-Tenax®/Charcoal	Thermal desorption, purge & trap, GC/MS	SW846 3030, 5041A, 8260B
	VOST Condensate	Aqueous liquid	Purge & trap, GC/MS	SW846 8260B
Semivolatile PICs	Method 0010 train particulate filter & front half solvent rinses	Particulate filter & front half acetone/methylene chloride solvent rinses	Soxhlet extraction, GC/MS	SW846 3542, 8270C
	Method 0010 train XAD-2 resin & back half solvent rinses	XAD-2 resin & front half acetone/methylene chloride solvent rinses	Soxhlet extraction, GC/MS	SW846 3542, 8270C
	Method 0010 condensate	Aqueous liquid	Liquid/liquid extraction, GC/MS	SW846 3542, EPA 1668A
PCBs	Method 0023A train particulate filter & front half solvent rinses	Particulate filter & front half acetone/methylene chloride solvent rinses	Soxhlet extraction, HRGC/HRMS	SW846 3542, EPA 1668A
	Method 0023A train XAD-2 resin & back half solvent rinses	XAD-2 resin & front half acetone/methylene chloride solvent rinses	Soxhlet extraction, HRGC/HRMS	SW846 3542, EPA 1668A
	Method 0023A condensate	Aqueous liquid	Liquid/liquid extraction, HRGC/HRMS	SW846 3542, EPA 1668A

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Table 9-1. Summary of Analytical Procedures and Methods
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Analysis	Sample Name	Sample Matrix	Analytical Procedure	Reference Method
PCDD/PCDFs	Method 0023A train particulate filter & front half solvent rinses	Particulate filter & front half acetone/methylene chloride/toluene solvent rinses	Soxhlet extraction, HRGC/HRMS	SW846 0023A, 3542, 8290
	Method 0023A train XAD-2 resin & back half solvent rinses	XAD-2 resin & front half acetone/methylene chloride/toluene solvent rinses	Soxhlet extraction, HRGC/HRMS	SW846 0023A, 3542, 8290
Total chromatographable organics (TCO) [Semivolatile unspeciated mass]	Method 0010 train particulate filter & front half solvent rinses	Particulate filter & front half acetone/methylene chloride solvent rinses	Soxhlet extraction, purge and trap, GC/FID	SW846 3540C, 3542, 8015B
	Method 0010 train XAD-2 resin & back half solvent rinses	XAD-2 resin & front half acetone/methylene chloride solvent rinses	Soxhlet extraction, purge and trap, GC/FID	SW846 3540C, 3542, 8015B
	Method 0010 condensate	Aqueous liquid	Liquid/liquid extraction, purge and trap, GC/FID	SW846 3540C, 3542, 8015B
Gravimetric organics (Grav) [Nonvolatile unspeciated mass]	Method 0010 train particulate filter & front half solvent rinses	Particulate filter & front half acetone/methylene chloride solvent rinses	Soxhlet extraction, gravimetric	SW846 3540C, 3542; CWA 160.3
	Method 0010 train XAD-2 resin & back half solvent rinses	XAD-2 resin & front half acetone/methylene chloride solvent rinses	Soxhlet extraction, gravimetric	SW846 3540C, 3542; CWA 160.3
	Method 0010 condensate	Aqueous liquid	Liquid/liquid extraction, gravimetric	SW846 3540C, 3542; CWA 160.3

Table 9-1. Summary of Analytical Procedures and Methods
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Analysis	Sample Name	Sample Matrix	Analytical Procedure	Reference Method
Volatile unspeciated mass	Method 0040 Tedlar® bag samples	Dry stack gas	GC/FID	SW846 0040, 8015B
	Method 0040 condensate samples	Aqueous liquid	GC/FID	SW846 0040, 5030B, 8015B
Particulate	Method 26A filter and acetone probe rinses	Particulate filter and acetone probe rinses	Gravimetric	EPA Method 5
Hydrogen Chloride (HCl)	Method 26A sulfuric acid impinger solutions	0.1N sulfuric acid	Ion chromatography	EPA Method 26A; SW846 9056, 9057
Chlorine (Cl_2)	Method 26A sodium hydroxide impinger solutions	0.1N sodium hydroxide	Ion chromatography	EPA Method 26A; SW846 9056, 9057
Metals & Mercury	Method 29 filter and nitric acid probe rinses	Particulate filter & front half 0.1N nitric acid rinses	Acid digestion, ICP, CVAA	EPA Method 29; SW846 0060, 3010A, 3050B, 3051, 6020 & 7470A
	Method 29 acidified peroxide impinger solutions	5% nitric acid/10% hydrogen peroxide	Acid digestion, ICP, CVAA	EPA Method 29; SW846 0060, 3010A, 3050B, 3051, 6020 & 7470A
	Method 29 empty impinger rinse	0.1N nitric acid rinses	Acid digestion, CVAA	EPA Method 29; SW846 0060, 3010A, 3050B, 3051, 7470A
	Method 29 acidified permanganate impinger solutions	4% potassium permanganate/10% sulfuric acid	Acid digestion, CVAA	EPA Method 29; SW846 0060, 3010A, 3050B, 3051, 7470A
	Method 29 acidified permanganate impinger hydrochloric acid rinses	8N hydrochloric acid	Acid digestion, CVAA	EPA Method 29; SW846 0060, 3010A, 3050B, 3051, 7470A

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Table 9-1. Summary of Analytical Procedures and Methods
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Analysis	Sample Name	Sample Matrix	Analytical Procedure	Reference Method
Hexavalent Chromium	Method 0061 potassium hydroxide impinger solution and field spikes	0.1N potassium hydroxide	Ion chromatography/post-column reactor (IC/PCR) spectrophotometric detector	SW846 0061, 7199
Particle Size Distribution	Method 5 smooth surface polycarbonate filters	Polycarbonate particulate filters	Scanning electron microscope	MVA, Inc. SOP No. MVA-315

Notes:
ASTM - American Society for Testing and Materials
CVAA - cold vapor atomic absorption
CWA - Methods for Chemical Analysis of Water and Waste, EPA-600/4-79-020. EPA, Environmental Monitoring and Support Laboratory, Cincinnati, OH, 1979.

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

EPA Method 1668A - Method 1668A, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-821-R-00-002, December 1999.

GC - gas chromatography
HR - high resolution
IC - ion chromatography
ICP - inductively coupled argon plasma spectroscopy
MS - mass spectroscopy
N - normality
PCB - polychlorinated biphenyl
PCDD/PCDF - polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans
PCR - post-column reactor
PIC - product of incomplete combustion
QC - quality control
SOP - standard operating procedure
SVOC - semivolatile organic compound
SW846 - Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.

Table 9-2. Waste Feed Volatile Organic Target Analytes
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Compound	CAS No.	Method Detection Limit (mg/kg)	Reporting Limit (mg/kg)
Acetone	67-64-1	4800	22000
Acrylonitrile	107-13-1	17000	110000
Benzene	71-43-2	570	5300
Bromobenzene	108-86-1	1100	5300
Bromochloromethane	74-97-5	750	5300
Bromodichloromethane	75-27-4	530	11000
Bromoform	75-25-2	930	5300
Bromomethane	74-83-9	3100	11000
2-Butanone (MEK)	78-93-3	4400	22000
n-Butylbenzene	104-51-8	1700	5300
sec-Butylbenzene	135-98-8	1700	5300
tert-Butylbenzene	98-06-6	1500	5300
Carbon disulfide	75-15-0	660	5300
Carbon tetrachloride	56-23-5	530	5300
Chlorobenzene	108-90-7	570	5300
Chlorodibromomethane	124-48-1	530	5300
Chloroethane	75-00-3	1200	11000
Chloroform	67-66-3	530	5300
Chloromethane	74-87-3	4800	11000
2-Chlorotoluene	95-49-8	1300	5300
4-Chlorotoluene	106-43-4	1300	5300
1,2-Dibromo-3-chloro-propane	96-12-8	620	11000
1,2-Dibromoethane	106-93-4	840	5300
Dibromomethane	74-95-3	530	5300
1,2-Dichlorobenzene	95-50-1	1400	5300
1,3-Dichlorobenzene	541-73-1	1500	5300
1,4-Dichlorobenzene	106-46-7	1500	5300
Dichlorodifluoromethane	75-71-8	700	11000
1,1-Dichloroethane	75-34-3	530	5300
1,2-Dichloroethane	107-06-2	620	5300
cis-1,2-Dichloroethene	156-59-2	530	5300
trans-1,2-Dichloroethene	156-60-5	840	5300
1,1-Dichloroethene	75-35-4	1100	5300
1,2-Dichloropropane	78-87-5	790	5300
1,3-Dichloropropane	142-28-9	970	5300
2,2-Dichloropropane	594-20-7	530	5300
cis-1,3-Dichloropropene	10061-01-5	530	5300
trans-1,3-Dichloropropene	10061-02-6	660	5300
1,1-Dichloropropene	563-58-6	530	5300
Ethylbenzene	100-41-4	1000	5300
Hexachlorobutadiene	87-68-3	2400	5300

Table 9-2. Waste Feed Volatile Organic Target Analytes
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Compound	CAS No.	Method Detection Limit (mg/kg)	Reporting Limit (mg/kg)
2-Hexanone	591-78-6	3600	22000
Iodomethane	74-88-4	2200	5300
Isopropylbenzene	98-82-8	1200	5300
p-Isopropyltoluene	99-87-6	1900	5300
Methylene chloride	75-09-2	1900	5300
4-Methyl2-pentanone	108-10-1	3400	22000
Naphthalene	91-20-3	1100	5300
n-Propylbenzene	103-65-1	1500	5300
Styrene	100-42-5	1100	5300
1,1,1,2-Tetrachloroethane	630-20-6	700	5300
1,1,2,2-Tetrachloroethane	79-34-5	930	5300
Tetrachloroethene	127-18-4	930	5300
Toluene	108-88-3	790	5300
1,2,3-Trichlorobenzene	87-61-6	1600	5300
1,2,4-Trichlorobenzene	120-82-1	1500	5300
1,1,1-Trichloroethane	71-55-6	530	5300
1,1,2-Trichloroethane	79-00-5	840	5300
Trichloroethene	79-01-6	620	5300
Trichlorofluoromethane	75-69-4	1400	11000
1,2,3-Trichloropropane	96-18-4	1200	5300
1,2,4-Trimethylbenzene	95-63-6	1500	5300
1,3,5-Trimethylbenzene	108-67-8	1400	5300
Vinyl chloride	75-01-4	620	11000
m-Xylene & p-Xylene	108-38-3 (m-) 106-42-3 (p-)	2100	5300
o-Xylene	95-47-6	930	5300

[a] In addition to the target compounds listed above, all non-target compound list 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.

Table 9-3. Waste Feed Semivolatile Organic Target Analytes
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Compound	CAS No.	Method Detection Limit (mg/kg)	Reporting Limit (mg/kg)
Acenaphthene	83-32-9	500	1000
Acenaphthylene	208-96-8	500	1000
Acetophenone	98-86-2	500	1000
Aniline	62-53-3	500	1000
Anthracene	120-12-7	500	1000
Benzidine	92-87-5	5000	10000
Benzo(a)anthracene	56-55-3	500	1000
Benzo(b)fluoranthene	205-99-2	500	1000
Benzo(k)fluoranthene	207-08-9	500	1000
Benzoic acid	65-85-0	2500	5000
Benzo(ghi)perylene	191-24-2	500	1000
Benzo(a)pyrene	50-32-8	500	1000
Benzyl alcohol	100-51-6	500	1000
bis(2-Chloroethoxy)methane	111-91-1	500	1000
bis(2-Chloroethyl) ether	111-44-4	500	1000
bis(2-Ethylhexyl) phthalate	117-81-7	500	1000
4-Bromophenyl phenyl ether	101-55-3	500	1000
Butyl benzyl phthalate	85-68-7	500	1000
Carbazole	86-74-8	500	1000
4-Chloroaniline	106-47-8	500	1000
4-Chloro-3-methylphenol	59-50-7	500	1000
2-Chloronaphthalene	91-58-7	500	1000
2-Chlorophenol	95-57-8	500	1000
4-Chlorophenyl phenyl ether	7005-72-3	500	1000
Chrysene	218-01-9	500	1000
Dibenz(a,h)anthracene	53-70-3	500	1000
Dibenzofuran	132-64-9	500	1000
Di-n-butyl phthalate	84-74-2	500	1000
1,2-Dichlorobenzene	95-50-1	500	1000
1,3-Dichlorobenzene	541-73-1	500	1000
1,4-Dichlorobenzene	106-46-7	500	1000
3,3'-Dichlorobenzidine	91-94-1	2500	5000
2,4-Dichlorophenol	120-83-2	500	1000
Diethyl phthalate	84-66-2	500	1000
2,4-Dimethylphenol	105-67-9	500	1000
Dimethyl phthalate	131-11-3	500	1000
4,6-Dinitro-2-methylphenol	534-52-1	2500	5000
2,4-Dinitrophenol	51-28-5	2500	5000
2,4-Dinitrotoluene	121-14-2	500	1000
2,6-Dinitrotoluene	606-20-2	500	1000
Di-n-octyl phthalate	117-84-0	500	1000
1,2-Diphenylhydrazine	122-66-7	500	1000
Fluoranthene	206-44-0	500	1000
Fluorene	86-73-7	500	1000

Table 9-3. Waste Feed Semivolatile Organic Target Analytes
Page 2 of 2

Compound	CAS No.	Method Detection Limit (mg/kg)	Reporting Limit (mg/kg)
Hexachlorobenzene	118-74-1	500	1000
Hexachlorobutadiene	87-68-3	500	1000
Hexachlorocyclopentadiene	77-47-4	2500	5000
Hexachloroethane	67-72-1	500	1000
Indeno(1,2,3-cd)pyrene	193-39-5	500	1000
Isophorone	78-59-1	500	1000
2-Methylnaphthalene	91-57-6	500	1000
2-Methylphenol	95-48-7	500	1000
3-Methylphenol & 4-Methylphe	65794-96-9	500	1000
Naphthalene	91-20-3	500	1000
2-Nitroaniline	88-74-4	2500	5000
3-Nitroaniline	99-09-2	2500	5000
4-Nitroaniline	100-01-6	2500	5000
Nitrobenzene	98-95-3	500	1000
2-Nitrophenol	88-75-5	500	1000
4-Nitrophenol	100-02-7	2500	5000
N-Nitrosodimethylamine	62-75-9	500	1000
N-Nitrosodiphenylamine	86-30-6	500	1000
N-Nitrosodi-n-propylamine	621-64-7	500	1000
Pentachlorobenzene	608-93-5	500	1000
Pentachloronitrobenzene	82-68-8	500	1000
Pentachlorophenol	87-86-5	2500	5000
Phenanthrene	85-01-8	500	1000
Phenol	108-95-2	500	1000
2,2'-Oxybis(1-Chloropropane)	108-60-1	500	1000
Pyrene	129-00-0	500	1000
Pyridine	110-86-1	1000	2000
1,2,4-Trichlorobenzene	120-82-1	500	1000
2,4,5-Trichlorophenol	95-95-4	500	1000
2,4,6-Trichlorophenol	88-06-2	500	1000

[a] In addition to the target compounds listed above, all non-target compound list 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.

Table 9-4. Waste Feed PCB Target Analytes
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PCB Congener	Congener No. [a]	CAS No.	Aqueous (ug/L)	Aqueous, Low - Level (ug/L)	Solid (ug/kg)	Waste (ug/kg)
2-Chlorobiphenyl	1	2051-60-7	0.2	0.02	20	2000
4-Chlorobiphenyl	3	2051-62-9	0.2	0.02	20	2000
2,3-dichlorobiphenyl	5	16605-91-7	0.01	0.001	1	100
2,4'-Dichlorobiphenyl	8	34883-43-7	0.01	0.001	1	100
4,4'-Dichlorobiphenyl	15	2050-68-2	0.05	0.005	5	500
2,2',5-Trichlorobiphenyl	18	37680-65-2	0.01	0.001	1	100
2,4,4'-Trichlorobiphenyl	28	7012-37-5	0.01	0.001	10	100
2,4',5-trichlorobiphenyl	31	16606-02-3	0.01	0.001	10	100
3,4,4'-Trichlorobiphenyl	37	38444-90-5	0.01	0.001	1	100
2,2',3,5'-Tetrachlorobiphenyl	44	41464-39-5	0.01	0.001	1	100
2,2',3,6-Tetrachlorobiphenyl	45	70362-45-7	0.01	0.001	1	100
2,2',4,5'-Tetrachlorobiphenyl	49	41464-40-8	0.01	0.001	1	100
2,2',5,5'-Tetrachlorobiphenyl	52	35693-99-3	0.01	0.001	1	100
2,3,3',4'-Tetrachlorobiphenyl	56	41464-43-1	0.01	0.001	1	100
2,3',4,4'-Tetrachlorobiphenyl	66	32598-10-0	0.01	0.001	1	100
2,3',4',5-Tetrachlorobiphenyl	70	32598-11-1	0.01	0.001	1	100
2,4,4',5-Tetrachlorobiphenyl	74	32690-93-0	0.01	0.001	1	100
3,3',4,4'-Tetrachlorobiphenyl	77	32598-13-3	0.01	0.001	1	100
3,4,4',5-Tetrachlorobiphenyl	81	70362-50-4	0.01	0.001	1	100
2,2',3,4,5'-Pentachlorobiphenyl	87	38380-02-8	0.01	0.001	1	100
2,2',3,4',5-Pentachlorobiphenyl	90	68194-07-0	0.01	0.001	1	100
2,2',3,5',6-Pentachlorobiphenyl	95	38379-99-6	0.01	0.001	1	100
2,2',4,4',5-Pentachlorobiphenyl	99	38380-01-7	0.01	0.001	1	100
2,2',4,5,5'-Pentachlorobiphenyl	101	37680-73-2	0.01	0.001	1	100
2,3,3',4,4'-Pentachlorobiphenyl	105	32598-14-4	0.01	0.001	1	100
2,3,3',4',6-Pentachlorobiphenyl	110	38380-03-9	0.01	0.001	1	100
2,3,4,4',5-Pentachlorobiphenyl	114	74472-37-0	0.01	0.001	1	100
2,3,4,4',6-Pentachlorobiphenyl	115	74472-38-1	0.01	0.001	1	100
2,3',4,4',5-Pentachlorobiphenyl	118	31508-00-6	0.01	0.001	1	100
2,3',4,4',6-Pentachlorobiphenyl	119	56558-17-9	0.01	0.001	1	100
2,3',4,4',5'-Pentachlorobiphenyl	123	65510-44-3	0.01	0.001	1	100
3,3',4,4',5-Pentachlorobiphenyl	126	57465-28-8	0.01	0.001	1	100
2,2',3,3',4,4'-Hexachlorobiphenyl	128	38380-07-3	0.01	0.001	1	100
2,2',3,3',4,6'-Hexachlorobiphenyl	132	38380-05-1	0.01	0.001	1	100
2,2',3,4,4',5'-Hexachlorobiphenyl	138	35065-28-2	0.01	0.001	1	100
2,2',3,4,5,5'-Hexachlorobiphenyl	141	52712-04-6	0.01	0.001	1	100

Table 9-4. Waste Feed PCB Target Analytes
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PCB Congener	Congener No.[a]	CAS No.	Aqueous (ug/L)	Aqueous, Low - Level (ug/L)	Solid (ug/kg)	Waste (ug/kg)
2,2',3,3',4,5,6'-Heptachlorobiphenyl	174[b]	38411-25-5	0.01	0.001	1	100
2,2',3,3',4,5',6'-Heptachlorobiphenyl	177	52663-70-4	0.01	0.001	1	100
2,2',3,4,4',5,5'-Heptachlorobiphenyl	180	35065-29-3	0.01	0.001	1	100
2,2',3,4,4',5',6-Heptachlorobiphenyl	183	52663-69-1	0.01	0.001	1	100
2,2',3,4,4',6,6'-Heptachlorobiphenyl	184	74472-48-3	0.01	0.001	1	100
2,2',3,4',5,5',6-Heptachlorobiphenyl	187	52663-68-0	0.01	0.001	1	100
2,3,3',4,4',5,5'-Heptachlorobiphenyl	189	39635-31-9	0.01	0.001	1	100
2,3,3',4,4',5,6-Heptachlorobiphenyl	190	41411-64-7	0.01	0.001	1	100
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	194	35694-08-7	0.01	0.001	1	100
2,2',3,3',4,4',5,6-Octachlorobiphenyl	195	52663-78-2	0.01	0.001	1	100
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	200	40186-71-8	0.01	0.001	1	100
2,2',3,3',4,5,5',6'-Octachlorobiphenyl	201	52663-75-9	0.01	0.001	1	100
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	202[b]	2136-99-4	0.01	0.001	1	100
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	206	40186-72-9	0.01	0.001	1	100
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	207	52663-79-3	0.01	0.001	1	100
2,2',3,3',4',5,5',6,6'-Nonachlorobiphenyl	208	52663-77-1	0.01	0.001	1	100
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	209	2051-24-3	0.01	0.001	1	100

Notes:

[a] PCB congener number originally assigned by Ballschmiter & Zell ("BZ Number"), 1980. (K. Ballschmiter and M. Zell. Analysis of polychlorinated biphenyls (PCB) by glass capillary gas chromatography. Fresenius Z. Anal. Chem. 302:20-31, 1980.)

[b] PCB 174 and 202 coelute.

Table 9-5. Waste Feed Metal Target Analytes

Metal	Method Detection Limit (mg/kg)	Reporting Limit (mg/kg)
Enumerated MACT Metals		
Arsenic (As)	0.59	1.0
Beryllium (Be)	0.020	0.50
Total Chromium (Cr)	0.40	1.0
Total LVM (As+Be+Cr)	1.0	2.5
Cadmium (Cd)	0.080	0.50
Lead (Pb)	0.11	0.30
Total SVM (Cd+Pb)	0.19	0.80
Total Mercury (Hg)	0.010	0.033
Additional Risk Assessment Metals		
Aluminum (Al)	3.3	20
Antimony (Sb)	0.21	6.0
Barium (Ba)	0.11	5.0
Cobalt (Co)	0.19	5.0
Copper (Cu)	0.10	2.5
Manganese (Mn)	0.070	1.5
Nickel (Ni)	0.34	4.0
Selenium (Se)	0.31	0.50
Silver (Ag)	0.28	1.0
Thallium (Tl)	0.78	1.0
Vanadium (V)	0.21	5.0
Zinc (Zn)	0.21	2.0

Notes:

[a] Method detection limits (MDLs) and reporting limits are for Inductively Coupled Argon Plasma/Mass Spectrometry (ICAP/MS or ICP/MS) analysis SW-846 Method 6020 for all metal analytes except mercury. Mercury MDL is based on Cold Vapor Atomic Absorption

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Table 9-6. Stack Gas Volatile Organic Target Analytes [a]
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Compound	CAS No.	MDL per Tube (ug)	Tube Total at MDL (ug)[b]	Cond. MDL (ug/L)[c]	Cond. at MDL (ug)[c]	Train Total at MDL (ug/m^3)[d]	Reporting Limit per Tube (ug)	Tube Total at Reporting Limit (ug)[b]	Cond. Reporting Limit (ug/L)[c]	Cond. at Reporting Limit (ug)[c]	Train Total at Reporting Limit (ug/m^3)[d]
Acetone	67-64-1	0.024	0.14	1.4	0.056	3.3	0.10	0.60	10	0.40	17
Acrylonitrile	107-13-1	0.11	0.66	2.7	0.11	13	0.50	3.0	20	0.80	63
Benzene	71-43-2	0.0064	0.038	0.10	0.0040	0.71	0.025	0.15	1.0	0.040	3.2
Bromobenzene	108-86-1	0.0039	0.023	0.11	0.0044	0.46	0.025	0.15	1.0	0.040	3.2
Bromochloromethane	74-97-5	0.0056	0.034	0.24	0.0096	0.72	0.025	0.15	1.0	0.040	3.2
Bromodichloromethane	75-27-4	0.0042	0.025	0.10	0.0040	0.49	0.025	0.15	1.0	0.040	3.2
Bromoform	75-25-2	0.0074	0.044	0.14	0.0056	0.83	0.025	0.15	1.0	0.040	3.2
Bromomethane	74-83-9	0.0059	0.035	0.38	0.015	0.84	0.050	0.30	2.0	0.080	6.3
2-Butanone (MEK)	78-93-3	0.038	0.23	0.75	0.030	4.3	0.10	0.60	5.0	0.20	13
n-Butylbenzene	104-51-8	0.0061	0.037	0.10	0.0040	0.68	0.025	0.15	1.0	0.040	3.2
sec-Butylbenzene	135-98-8	0.0032	0.019	0.10	0.0040	0.39	0.025	0.15	1.0	0.040	3.2
tert-Butylbenzene	98-06-6	0.0062	0.037	0.24	0.0096	0.78	0.025	0.15	1.0	0.040	3.2
Carbon disulfide	75-15-0	0.0070	0.042	0.10	0.0040	0.77	0.025	0.15	1.0	0.040	3.2
Carbon tetrachloride	56-23-5	0.0069	0.041	0.12	0.0048	0.77	0.025	0.15	1.0	0.040	3.2
Chlorobenzene	108-90-7	0.0032	0.019	0.10	0.0040	0.39	0.025	0.15	1.0	0.040	3.2
Chlorodibromomethane	124-48-1	0.0056	0.034	0.20	0.0080	0.69	0.025	0.15	1.0	0.040	3.2
Chloroethane	75-00-3	0.0068	0.041	0.24	0.0096	0.84	0.050	0.30	2.0	0.080	6.3
Chloroform	67-66-3	0.0070	0.042	0.10	0.0040	0.77	0.025	0.15	1.0	0.040	3.2
Chloromethane	74-87-3	0.0048	0.029	0.12	0.0048	0.56	0.050	0.30	2.0	0.080	6.3
2-Chlorotoluene	95-49-8	0.0018	0.011	0.24	0.0096	0.34	0.025	0.15	1.0	0.040	3.2
4-Chlorotoluene	106-43-4	0.0018	0.011	0.21	0.0084	0.32	0.025	0.15	1.0	0.040	3.2
1,2-Dibromo-3-chloro-propane	96-12-8	0.011	0.066	0.45	0.018	1.4	0.050	0.30	2.0	0.080	6.3
1,2-Dibromoethane	106-93-4	0.0075	0.045	0.24	0.0096	0.91	0.025	0.15	1.0	0.040	3.2
Dibromomethane	74-95-3	0.0064	0.038	0.21	0.0084	0.78	0.025	0.15	1.0	0.040	3.2
1,2-Dichlorobenzene	95-50-1	0.0077	0.046	0.10	0.0040	0.84	0.025	0.15	1.0	0.040	3.2
1,3-Dichlorobenzene	541-73-1	0.0038	0.023	0.10	0.0040	0.45	0.025	0.15	1.0	0.040	3.2
1,4-Dichlorobenzene	106-46-7	0.0055	0.033	0.12	0.0048	0.63	0.025	0.15	1.0	0.040	3.2
Dichlorodifluoromethane	75-71-8	0.0051	0.031	0.15	0.0060	0.61	0.025	0.15	2.0	0.080	3.8
1,1-Dichloroethane	75-34-3	0.0064	0.038	0.10	0.0040	0.71	0.025	0.15	1.0	0.040	3.2
1,2-Dichloroethane	107-06-2	0.0066	0.040	0.10	0.0040	0.73	0.025	0.15	1.0	0.040	3.2

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Table 9-6. Stack Gas Volatile Organic Target Analytes [a]
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Compound	CAS No.	MDL per Tube (ug)	Tube Total at MDL (ug)[b]	Cond. MDL (ug/L)[c]	Cond. at MDL (ug)[c]	Train Total at MDL (ug/m^3)[d]	Reporting Limit per Tube (ug)	Tube Total at Reporting Limit (ug)[b]	Cond. Reporting Limit (ug/L)[c]	Cond. at Reporting Limit (ug)[c]	Train Total at Reporting Limit (ug/m^3)[d]
cis-1,2-Dichloroethene	156-59-2	0.0062	0.037	0.12	0.0048	0.70	0.025	0.15	1.0	0.040	3.2
trans-1,2-Dichloroethene	156-60-5	0.0074	0.044	0.10	0.0040	0.81	0.025	0.15	1.0	0.040	3.2
1,1-Dichloroethene	75-35-4	0.0067	0.040	0.10	0.0040	0.74	0.025	0.15	1.0	0.040	3.2
1,2-Dichloropropane	78-87-5	0.0049	0.029	0.10	0.0040	0.56	0.025	0.15	1.0	0.040	3.2
1,3-Dichloropropane	142-28-9	0.0073	0.044	0.17	0.0068	0.84	0.025	0.15	1.0	0.040	3.2
2,2-Dichloropropane	594-20-7	0.0070	0.042	0.11	0.0044	0.77	0.025	0.15	1.0	0.040	3.2
cis-1,3-Dichloropropene	10061-01-5	0.0046	0.028	0.10	0.0040	0.53	0.025	0.15	1.0	0.040	3.2
trans-1,3-Dichloropropene	10061-02-6	0.0059	0.035	0.11	0.0044	0.66	0.025	0.15	1.0	0.040	3.2
1,1-Dichloropropene	563-58-6	0.0077	0.046	0.10	0.0040	0.84	0.025	0.15	1.0	0.040	3.2
Ethylbenzene	100-41-4	0.0035	0.021	0.10	0.0040	0.42	0.025	0.15	1.0	0.040	3.2
Hexachlorobutadiene	87-68-3	0.012	0.072	0.12	0.0048	1.3	0.025	0.15	2.0	0.080	3.8
2-Hexanone	591-78-6	0.024	0.14	0.76	0.030	2.9	0.10	0.60	5.0	0.20	13
Iodomethane	74-88-4	0.014	0.084	0.12	0.0048	1.5	0.050	0.30	2.0	0.080	6.3
Isopropylbenzene	98-82-8	0.0024	0.014	0.10	0.0040	0.31	0.025	0.15	1.0	0.040	3.2
p-Isopropyltoluene	99-87-6	0.044	0.26	0.10	0.0040	4.5	0.025	0.15	1.0	0.040	3.2
Methylene chloride	75-09-2	0.016	0.096	0.23	0.0092	1.8	0.025	0.15	2.0	0.080	3.8
4-Methyl2-pentanone	108-10-1	0.027	0.16	0.40	0.016	3.0	0.10	0.60	5.0	0.20	13
Naphthalene	91-20-3	0.014	0.084	0.17	0.0068	1.5	0.025	0.15	1.0	0.040	3.2
n-Propylbenzene	103-65-1	0.0021	0.013	0.10	0.0040	0.28	0.025	0.15	1.0	0.040	3.2
Styrene	100-42-5	0.0026	0.016	0.10	0.0040	0.33	0.025	0.15	1.0	0.040	3.2
1,1,1,2-Tetrachloroethane	630-20-6	0.0037	0.022	0.12	0.0048	0.45	0.025	0.15	1.0	0.040	3.2
1,1,2,2-Tetrachloroethane	79-34-5	0.0097	0.058	0.15	0.0060	1.1	0.025	0.15	1.0	0.040	3.2
Tetrachloroethene	127-18-4	0.0062	0.037	0.10	0.0040	0.7	0.025	0.15	1.0	0.040	3.2
Toluene	108-88-3	0.0025	0.015	0.10	0.0040	0.3	0.025	0.15	1.0	0.040	3.2
1,2,3-Trichlorobenzene	87-61-6	0.014	0.084	0.23	0.0092	1.6	0.025	0.15	1.0	0.040	3.2
1,2,4-Trichlorobenzene	120-82-1	0.013	0.078	0.15	0.0060	1.4	0.025	0.15	1.0	0.040	3.2
1,1,1-Trichloroethane	71-55-6	0.0082	0.049	0.10	0.0040	0.89	0.025	0.15	1.0	0.040	3.2
1,1,2-Trichloroethane	79-00-5	0.0070	0.042	0.25	0.010	0.87	0.025	0.15	1.0	0.040	3.2
Trichloroethene	79-01-6	0.0065	0.039	0.10	0.0040	0.72	0.025	0.15	1.0	0.040	3.2

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Table 9-6. Stack Gas Volatile Organic Target Analytes [a]
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Compound	CAS No.	MDL per Tube (ug)	Tube Total at MDL (ug)[b]	Cond. MDL (ug/L)[c]	Cond. at MDL (ug)[c]	Train Total at MDL (ug/m^3)[d]	Reporting Limit per Tube (ug)	Tube Total at Reporting Limit (ug)[b]	Cond. Reporting Limit (ug/L)[c]	Cond. at Reporting Limit (ug)[c]	Train Total at Reporting Limit (ug/m^3)[d]
Trichlorofluoromethane	75-69-4	0.0068	0.041	0.12	0.0048	0.76	0.050	0.30	2.0	0.080	6.3
1,2,3-Trichloropropane	96-18-4	0.010	0.060	0.36	0.014	1.2	0.025	0.15	1.0	0.040	3.2
1,2,4-Trimethylbenzene	95-63-6	0.0029	0.017	0.11	0.0044	0.36	0.025	0.15	1.0	0.040	3.2
1,3,5-Trimethylbenzene	108-67-8	0.0019	0.011	0.10	0.0040	0.26	0.025	0.15	1.0	0.040	3.2
Vinyl chloride	75-01-4	0.025	0.15	0.24	0.010	2.7	0.025	0.15	1.0	0.040	3.2
m-Xylene & p-Xylene	108-38-3 (m-) 106-42-3 (p-)	0.025	0.15	0.20	0.0080	2.6	0.025	0.15	1.0	0.040	3.2
							0.050	0.30	1.0	0.040	5.7
o-Xylene	95-47-6	0.0025	0.015	0.14	0.0056	0.34	0.025	0.15	1.0	0.040	3.2

Notes:

[a] In addition to the target compounds listed above, all non-target compound list 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.

[b] 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.

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

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

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Table 9-7. Stack Gas Dioxin/Furan Target Analytes
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Compound	CAS No.	Per Analysis EDL (pg)	Front Half Detection Limit (ng)[a,b,d]	Back Half Detection Limit (ng)[a,b,d]	Train Detection Limit (ng)[a,b,d]	Train Detection Limit (ng/m^3)[c,d]	2,3,7,8-TCDD TEQ Factor	2,3,7,8-TCDD TEQ Limit (ng/m^3)[c,d]
2,3,7,8 - TCDD	1746-01-6	3.6	0.0036	0.0036	0.0072	0.0024	1	0.0024
Total TCDD	NA	3.6	0.0036	0.0036	0.0072	0.0024	NA	NA
2,3,7,8 - TCDF (DB225)	51207-31-9	3.8	0.0038	0.0038	0.0076	0.0025	0.1	0.00025
Total TCDF	NA	3.8	0.0038	0.0038	0.0076	0.0025	NA	NA
1,2,3,7,8 - PeCDD	40321-76-4	3.6	0.0036	0.0036	0.0072	0.0024	0.5	0.0012
Total PeCDD	NA	3.6	0.0036	0.0036	0.0072	0.0024	NA	NA
1,2,3,7,8 - PeCDF	57117-41-6	3.8	0.0038	0.0038	0.0076	0.0025	0.05	0.00013
2,3,4,7,8 - PeCDF	57117-31-4	3.8	0.0038	0.0038	0.0076	0.0025	0.5	0.0013
Total PeCDF	NA	3.8	0.0038	0.0038	0.0076	0.0025	NA	NA
1,2,3,6,7,8 - HxCDD	57653-85-7	4.4	0.0044	0.0044	0.0088	0.0029	0.1	0.00029
1,2,3,4,7,8 - HxCDD	39227-28-6	3.4	0.0034	0.0034	0.0068	0.0023	0.1	0.00023
1,2,3,7,8,9 - HxCDD	19408-74-3	4.0	0.0040	0.0040	0.0080	0.0027	0.1	0.00027
Total HxCDD	NA	3.8	0.0038	0.0038	0.0076	0.0025	NA	NA
1,2,3,6,7,8 - HxCDF	57117-44-9	3.8	0.0038	0.0038	0.0076	0.0025	0.1	0.00025
1,2,3,4,7,8 - HxCDF	70648-26-9	3.2	0.0032	0.0032	0.0064	0.0021	0.1	0.00021
1,2,3,7,8,9 - HxCDF	72918-21-9	4.2	0.0042	0.0042	0.0084	0.0028	0.1	0.00028
2,3,4,6,7,8 - HxCDF	60851-34-5	4.6	0.0046	0.0046	0.0092	0.0031	0.1	0.00031
Total HxCDF	NA	3.8	0.0038	0.0038	0.0076	0.0025	NA	NA
1,2,3,4,6,7,8 - HpCDD	35822-39-4	6.2	0.0062	0.0062	0.012	0.0041	0.01	0.000041
Total HpCDD	NA	6.2	0.0062	0.0062	0.012	0.0041	NA	NA
1,2,3,4,6,7,8 - HpCDF	67562-394	3.8	0.0038	0.0038	0.0076	0.0025	0.01	0.000025
1,2,3,4,7,8,9 - HpCDF	55673-89-7	4.4	0.0044	0.0044	0.0088	0.0029	0.01	0.000029
Total HpCDF	NA	4.0	0.0040	0.0040	0.0080	0.0027	NA	NA
Total OCDD	3268-87-9	24	0.024	0.024	0.048	0.0160	0.001	0.000016
Total OCDF	39001-02-0	8.4	0.0084	0.0084	0.017	0.0056	0.001	0.000006

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Table 9-7. Stack Gas Dioxin/Furan Target Analytes
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Compound	CAS No.	Per Analysis EDL (pg)	Front Half Detection Limit (ng)[a,b,d]	Back Half Detection Limit (ng)[a,b,d]	Train Detection Limit (ng)[a,b,d]	Train Detection Limit (ng/m^3)[c,d]	2,3,7,8-TCDD TEQ Factor	2,3,7,8-TCDD TEQ Limit (ng/m^3)[c,d]
TOTALS						0.043		0.0072

Notes:

[a] Detection limits based on analysis of the separate front-half and back-half extracts. The detection limits values represent approximate, relative limits using isotope dilution and HRGS/HRMS analysis which can result in detection limit variations.

[b] Based on separate front and back extract analyses.

[c] Based on 3.0 cubic meters of stack gas sampled.

[d] Detection limits based on analysis of the analysis extracts split two ways: one-half for PCDD/PCDFs and one-half for PCBs. The PCDD/PCDF detection limits values represent approximate, relative limits using isotope dilution and HRGC/HRMS analysis which can result in detection limit variations.

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Table 9-8. Stack Gas PCB Target Analytes [a]
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PCB Analyte	IUPAC Number	CAS Number	EDL (ng)	Front-Half Detection Limit (ug)b,d	Back-Half Detection Limit (ug)b,d	Condensate Detection Limit (ug)b,d	Train Total Detection Limit (ug)b,d	Train Detection Limit (ug/m3)c,d
Coplanar, Dioxin-like PCB Congeners								
3,4,3',4'-Tetrachlorobiphenyl	77	32598-13-3	0.028	0.000028	0.000028	0.000028	0.000084	0.000028
2,3,4,3',4'-Pentachlorobiphenyl	105	32598-14-4	0.028	0.000028	0.000028	0.000028	0.000084	0.000028
2,3,4,5,4'-Pentachlorobiphenyl	114	74472-37-0	0.028	0.000028	0.000028	0.000028	0.000084	0.000028
2,4,5,3',4'-Pentachlorobiphenyl	118	31508-00-6	0.030	0.000030	0.000030	0.000030	0.000090	0.000030
3,4,5,2',4'-Pentachlorobiphenyl	123	65510-44-3	0.030	0.000030	0.000030	0.000030	0.000090	0.000030
3,4,5,3',4'-Pentachlorobiphenyl	126	57465-28-8	0.034	0.000034	0.000034	0.000034	0.00010	0.000034
2,3,4,5,3',4'-Hexachlorobiphenyl	156	38380-98-4	0.052	0.000052	0.000052	0.000052	0.00016	0.000052
2,3,4,3',4',5'-Hexachlorobiphenyl	157	68782-90-7	0.052	0.000052	0.000052	0.000052	0.00016	0.000052
2,4,5,3',4',5'-Hexachlorobiphenyl	167	52663-72-6	0.038	0.000038	0.000038	0.000038	0.00011	0.000038
3,4,5,3',4',5'-Hexachlorobiphenyl	169	32774-16-6	0.050	0.000050	0.000050	0.000050	0.00015	0.000050
2,3,4,5,2',3',4'-Heptachlorobiphenyl	170	35065-30-6	0.074	0.000074	0.000074	0.000074	0.00022	0.000074
2,3,4,5,2',4',5'-Heptachlorobiphenyl	180	35065-29-3	0.064	0.000064	0.000064	0.000064	0.00019	0.000064
2,3,4,5,3',4',5'-Heptachlorobiphenyl	189	39635-31-9	0.038	0.000038	0.000038	0.000038	0.00011	0.000038
Total Homologue Groups (Sum to Determine total PCBs)								
Monochlorobiphenyls	N/A	N/A	0.038	0.000038	0.000038	0.000038	0.00011	0.000038
Dichlorobiphenyls	N/A	N/A	0.36	0.00036	0.00036	0.00036	0.0011	0.00036
Trichlorobiphenyls	N/A	N/A	1.1	0.0011	0.0011	0.0011	0.0033	0.0011
Tetrachlorobiphenyls	N/A	N/A	0.064	0.000064	0.000064	0.000064	0.00019	0.000064
Pentachlorobiphenyls	N/A	N/A	0.080	0.000080	0.000080	0.000080	0.00024	0.000080
Hexachlorobiphenyls	N/A	N/A	0.11	0.00011	0.00011	0.00011	0.00034	0.00011
Heptachlorobiphenyls	N/A	N/A	0.078	0.000078	0.000078	0.000078	0.00023	0.000078
Octachlorobiphenyls	N/A	N/A	0.094	0.000094	0.000094	0.000094	0.00028	0.000094
Nonachlorobiphenyls	N/A	N/A	0.12	0.00012	0.00012	0.00012	0.00037	0.00012
Decachlorobiphenyl	N/A	N/A	0.090	0.000090	0.000090	0.000090	0.00027	0.000090

Table 9-8. Stack Gas PCB Target Analytes [a]
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Notes:

[a] U.S. EPA, "Method 1668, Revision A: Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRGS", EPA-821-R-00-002, December ,1999.

[b] Detection limits based on analysis of the separate front-half, back-half and condensate extracts divided two ways for PCDD/PCDFs and PCBs. PCB detection limits using isotope dilution and HRGS/HRMS analysis method can vary. The detection limits values represent approximate, relative limits of detection.

[c] Based on three cubic meters of stack gas sampled.

[d] Detection limits based on analysis of the analysis extracts split two ways: one-half for PCDD/PCDFs and one-half for PCBs. The PCB detection limits values represent approximate, relative limits using isotope dilution and HRGC/HRMS analysis which can result in detection limit variations.

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Table 9-9. Stack Gas Semivolatile Organic Target Analytes [a]
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Compound	CAS No.	Front-Half MDL (ug)[b]	Back-Half MDL (ug)[b]	Cond. MDL (ug)[b]	Train Method Detection Limit (ug/m3)[c]	Front-Half Reporting Limit (ug)[b]	Back-Half Reporting Limit (ug)[b]	Cond. Reporting Limit (ug)[b]	Train Reporting Limit (ug/m3)[c]
Acenaphthene	83-32-9	0.50	1.0	0.74	0.75	10	10	10	10
Acenaphthylene	208-96-8	0.50	1.0	0.62	0.71	10	10	10	10
Acetophenone	98-86-2	0.75	4.9	0.50	2.0	10	10	10	10
Aniline	62-53-3	0.95	15	7.0	7.5	20	20	20	20
Anthracene	120-12-7	0.50	1.0	0.62	0.71	10	10	10	10
Benzidine	92-87-5	50	100	25	58	10	10	10	10
Benzo(a)anthracene	56-55-3	0.80	1.2	0.66	0.87	100	100	100	100
Benzo(b)fluoranthene	205-99-2	1.4	2.2	1.6	1.7	10	10	10	10
Benzo(k)fluoranthene	207-08-9	2.1	3.2	1.1	2.1	10	10	10	10
Benzoic acid	65-85-0	42	90	3.1	45	100	100	100	100
Benzo(ghi)perylene	191-24-2	2.8	1.3	0.81	1.6	10	10	10	10
Benzo(a)pyrene	50-32-8	1.0	1.0	0.67	0.89	10	10	10	10
Benzyl alcohol	100-51-6	35	70	0.76	35	100	100	100	100
bis(2-Chloroethoxy)methane	111-91-1	0.60	1.0	0.76	0.79	10	10	10	10
bis(2-Chloroethyl) ether	111-44-4	0.75	1.1	0.64	0.83	10	10	10	10
bis(2-Ethylhexyl) phthalate	117-81-7	3.3	20	1.6	8.3	20	20	20	20
4-Bromophenyl phenyl ether	101-55-3	0.55	1.0	0.54	0.70	10	10	10	10
Butyl benzyl phthalate	85-68-7	1.2	1.2	0.87	1.1	10	10	10	10
Carbazole	86-74-8	0.75	1.3	0.85	0.97	10	10	10	10
4-Chloroaniline	106-47-8	1.2	12	3.0	5.4	20	20	20	20
4-Chloro-3-methylphenol	59-50-7	1.0	1.3	2.5	1.6	10	10	10	10
2-Chloronaphthalene	91-58-7	0.50	1.0	0.53	0.68	10	10	10	10
2-Chlorophenol	95-57-8	1.0	1.0	0.63	0.88	10	10	10	10
4-Chlorophenyl phenyl ether	7005-72-3	0.50	1.0	1.2	0.90	10	10	10	10
Chrysene	218-01-9	0.90	1.3	0.51	0.90	10	10	10	10

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Table 9-9. Stack Gas Semivolatile Organic Target Analytes [a]
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Compound	CAS No.	Front-Half MDL (ug)[b]	Back-Half MDL (ug)[b]	Cond. MDL (ug)[b]	Train Method Detection Limit (ug/m3)[c]	Front-Half Reporting Limit (ug)[b]	Back-Half Reporting Limit (ug)[b]	Cond. Reporting Limit (ug)[b]	Train Reporting Limit (ug/m3)[c]
Dibenz(a,h)anthracene	53-70-3	2.0	1.2	1.1	1.4	10	10	10	10
Dibenzofuran	132-64-9	0.55	1.0	1.1	0.88	10	10	10	10
Di-n-butyl phthalate	84-74-2	0.70	20	0.86	7.2	20	20	20	20
1,2-Dichlorobenzene	95-50-1	0.85	1.0	0.66	0.84	10	10	10	10
1,3-Dichlorobenzene	541-73-1	1.2	1.2	0.54	0.96	10	10	10	10
1,4-Dichlorobenzene	106-46-7	1.1	1.1	0.77	0.97	10	10	10	10
3,3'-Dichlorobenzidine	91-94-1	2.7	15	3.0	6.9	50	50	50	50
2,4-Dichlorophenol	120-83-2	1.5	1.0	0.89	1.1	10	10	10	10
Diethyl phthalate	84-66-2	1.5	1.5	2.4	1.8	10	10	10	10
2,4-Dimethylphenol	105-67-9	2.9	13	0.59	5.3	10	10	10	10
Dimethyl phthalate	131-11-3	0.65	1.0	0.50	0.72	10	10	10	10
4,6-Dinitro-2-methylphenol	534-52-1	5.0	18	0.56	7.7	50	50	50	50
2,4-Dinitrophenol	51-28-5	0.6	44	1.5	15	50	50	50	50
2,4-Dinitrotoluene	121-14-2	1.6	1.0	1.0	1.2	10	10	10	10
2,6-Dinitrotoluene	606-20-2	1.3	1.0	0.79	1.0	10	10	10	10
Di-n-octyl phthalate	117-84-0	2.1	1.7	1.0	1.6	10	10	10	10
1,2-Diphenylhydrazine	122-66-7	0.65	1.0	0.56	0.74	10	10	10	10
Fluoranthene	206-44-0	0.50	1.1	0.67	0.76	10	10	10	10
Fluorene	86-73-7	0.50	1.0	1.0	0.83	10	10	10	10
Hexachlorobenzene	118-74-1	0.55	1.0	1.0	0.85	10	10	10	10
Hexachlorobutadiene	87-68-3	1.4	1.5	0.73	1.2	10	10	10	10
Hexachlorocyclopentadiene	77-47-4	10	20	2.5	11	50	50	50	50
Hexachloroethane	67-72-1	2.5	1.1	0.74	1.4	10	10	10	10
Indeno(1,2,3-cd)pyrene	193-39-5	2.1	1.1	0.86	1.4	10	10	10	10

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Table 9-9. Stack Gas Semivolatile Organic Target Analytes [a]
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Compound	CAS No.	Front-Half MDL (ug)[b]	Back-Half MDL (ug)[b]	Cond. MDL (ug)[b]	Train Method Detection Limit (ug/m3)[c]	Front-Half Reporting Limit (ug)[b]	Back-Half Reporting Limit (ug)[b]	Cond. Reporting Limit (ug)[b]	Train Reporting Limit (ug/m3)[c]
Isophorone	78-59-1	0.65	1.0	0.68	0.78	10	10	10	10
2-Methylnaphthalene	91-57-6	0.55	1.0	0.87	0.81	10	10	10	10
2-Methylphenol	95-48-7	2.3	6.0	0.80	3.0	10	10	10	10
3-Methylphenol & 4-Methylphenol	65794-96-9	2.3	4.0	0.85	2.4	10	10	10	10
Naphthalene	91-20-3	0.50	1.2	0.67	0.79	10	10	10	10
2-Nitroaniline	88-74-4	0.55	1.0	1.1	0.88	50	50	50	50
3-Nitroaniline	99-09-2	3.8	4.0	1.8	3.2	50	50	50	50
4-Nitroaniline	100-01-6	2.3	4.0	1.5	2.6	50	50	50	50
Nitrobenzene	98-95-3	0.75	1.2	0.63	0.84	10	10	10	10
2-Nitrophenol	88-75-5	3.2	1.0	1.0	1.7	10	10	10	10
4-Nitrophenol	100-02-7	3.3	6.5	1.5	3.8	50	50	50	50
N-Nitrosodimethylamine	62-75-9	0.70	1.0	0.83	0.84	10	10	10	10
N-Nitrosodiphenylamine	86-30-6	0.60	1.8	0.52	1.0	10	10	10	10
N-Nitrosodi-n-propylamine	621-64-7	0.75	1.0	0.88	0.88	10	10	10	10
Pentachlorobenzene	608-93-5	0.50	1.0	0.44	0.65	10	10	10	10
Pentachloronitrobenzene	82-68-8	0.75	1.0	0.5	0.75	10	10	10	10
Pentachlorophenol	87-86-5	25	50	1.3	25	50	50	50	50
Phenanthrene	85-01-8	0.50	1.0	0.72	0.74	10	10	10	10
Phenol	108-95-2	1.1	1.8	0.82	1.2	10	10	10	10
2,2'-Oxybis(1-Chloropropane)	108-60-1	1.0	1.5	0.67	1.1	10	10	10	10
Pyrene	129-00-0	0.75	1.1	0.55	0.78	10	10	10	10
Pyridine	110-86-1	0.90	1.5	2.0	1.5	20	20	20	20
1,2,4-Trichlorobenzene	120-82-1	0.75	1.2	0.82	0.92	10	10	10	10
2,4,5-Trichlorophenol	95-95-4	2.3	2.6	0.81	1.9	10	10	10	10
2,4,6-Trichlorophenol	88-06-2	1.4	1.5	0.96	1.3	10	10	10	10

Table 9-9. Stack Gas Semivolatile Organic Target Analytes [a]
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Notes:

[a] In addition to the target SVOC compounds listed above, all non-target SVOC compound list 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.

[b] Method detection limits (MDLs) are based on previous similar Method 0010 sampling and Method 8270C analysis. MDLs are based on analysis of the separate front-half, back-half and condensate extracts.

[c] Based on three cubic meters of stack gas sampled.

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Table 9-10. Stack Gas Metals Target Analytes

Metal	Front Half MDL (ug)	Back Half MDL(ug)				Train MDL (ug/m^3)[c]	Front Half Reporting Limit (ug)	Back Half Reporting Limit (ug)				Train Reporting Limit (ug/m^3)[c]
Enumerated MACT Metals												
Arsenic (As)[b]	0.35	0.33				0.45	1.0	1.0				1.3
Beryllium (Be)[b]	0.089	0.18				0.18	0.50	0.50				0.67
Total Chromium (Cr)[b]	0.25	0.28				0.35	1.0	1.0				1.3
Total LVM (As+Be+Cr)[b]	0.69	0.79				0.99	2.5	2.5				3.3
Cadmium (Cd)[b]	0.050	0.082				0.09	0.50	0.50				0.67
Lead (Pb)[b]	0.20	0.37				0.38	1.0	1.0				1.3
Total SVM (Cd+Pb)[b]	0.25	0.45				0.47	1.5	1.5				2.0
Total Mercury (Hg)[d]	0.060	0.12	0.12	0.047	0.072	0.28	0.20	0.40	0.40	0.16	0.14	0.87
Additional Risk Assessment Metals												
Aluminum (Al)[b]	5.2	3.1				6	20	20				27
Antimony (Sb)[b]	0.60	0.60				0.8	6.0	6.0				8.0
Barium (Ba)[b]	0.35	0.30				0	20	20				27
Cobalt (Co)[b]	0.50	0.50				0.7	5.0	5.0				6.7
Copper (Cu)[b]	0.25	0.70				0.6	2.5	2.5				3.3
Manganese (Mn)[b]	0.15	0.15				0.2	1.5	1.5				2.0
Nickel (Ni)[b]	0.44	0.40				0.6	4.0	4.0				5.3
Selenium (Se)[b]	0.35	0.22				0.4	1.0	1.0				1.3
Silver (Ag)[b]	0.71	0.25				0.6	2.0	2.0				2.7
Thallium (Tl)[b]	0.40	0.51				0.6	2.0	2.0				2.7
Vanadium (V)[b]	0.50	0.50				0.7	5.0	5.0				6.7
Zinc (Zn)[b]	0.23	0.45				0.5	2.0	2.0				2.7
Speciated Mercury												
Ionic Mercury (Hg^{+1} or Hg^{+2})[e]	0.060	0.12	NA	NA	NA	0.12	0.20	0.40	NA	NA	NA	0.40
Elemental Mercury (Hg^{+0})[f]	NA	NA	0.12	0.047	0.072	0.16	NA	NA	0.40	0.16	0.14	0.47
Hexavalent Chromium												
Hexavalent Chromium (Cr^{+6})[g]	0.12					0.16	0.42					0.56

Notes:

[a] Method detection limits (MDLs) and reporting limits are for Inductively Coupled Argon Plasma/Mass Spectrometry (ICAP/MS or ICP/MS) analysis SW-846 Method 6020 for all metal analytes except mercury. Mercury MDL is based on Cold Vapor Atomic Absorption Spectrometry (CVAAS or CVAA) SW-846 Method 7470A. MDLs and reporting limits are

[b] Sum of detection limits for probe rinse/filter and acidified peroxide impinger fractions from Multi-Metals Train.

[c] Based on 1.5 cubic meters of stack gas sampled.

[d] Sum of detection limits for the five fractions from Multi-Metals Train analyzed for mercury.

[e] Sum of detection limits for probe rinse/filter and acidified peroxide impinger fractions from Multi-Metals Train analyzed for mercury.

[f] Sum of detection limits for initially empty impinger, acidified permanganate impinger, and 8N HCl rinse fractions from Multi-Metals Train analyzed for mercury.

[g] Detection limit is for Ion Chromatography/Post Column Reactor (IC/PCR) analysis, SW-846 Method 7199. The stack gas concentration limit is based on 0.75 cubic meters of stack gas sampled using a Method 0061 Hexavalent Chromium sampling train. MDL and reporting limit are based on previous similar Method 0061 sampling and analysis. The total catch is dependent upon the final volume of the impinger solution.

Table 9-11. Stack Gas Particulate and HCl/Cl_2

Parameter	Probe Rinse (mg)	Filter (mg)	Train Detection Limit (mg/m3)[c]	Train Detection Limit (gr/dscf)[c]
Particulate				
Particulate Matter [b]	0.5	0.5	1.3	0.00058

Parameters	H_2SO_4 Impinger Method Detection Limit (ug)	NaOH Impinger Method Detection Limit (ug)	Train Method Detection Limit (ug/m^3)[c]	H_2SO_4 Impinger Reporting Limit (ug)	NaOH Impinger Reporting Limit (ug)	Train Reporting Limit (ug/m^3)[c]
HCl/Cl_2						
Hydrogen Chloride [b]	2000	NA	2667	3500	NA	4667
		ug/m^3 as HCl:	2742		ug/m^3 as HCl:	4798
		ppm as HCl:	1.8		ppm as HCl:	3.2
Chlorine [b]	NA	300	400	NA	525	700
		ug/m^3 as Cl_2:	400		ug/m^3 as Cl_2:	700
		ppm as Cl_2:	0.14		ppm as Cl_2:	0.24
Total as Cl^-	2000	300	3067	3500	525	5367
		ug/m^3 as Cl^-:	3067		ug/m^3 as Cl^-:	5367
		ppm as Cl^-:	2.1		ppm as Cl^-:	3.6

Notes:

[a] For particulate, the measurement is of differential weight, EPA Method 5. The detection limit accuracy for gravimetric is ±0.5 mg or ±50 ug for each of the two fractions, the filter and the probe rinse. The stack gas concentration limit is based on 0.75 cubic meters of stack gas sampled using a Method 5 or 26A sampling train.

[b] Detection limits are for chloride ion via Ion Chromatography (IC) analysis, SW-846 Method 9056/9057. The stack gas concentration limit is based on 0.75 cubic meters of stack gas sampled using a Method 26A sampling train. MDL and reporting limit are based on previous similar testing.

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 will be routinely submitted including audit (PE) samples, 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 audits/surveillance will be performed periodically by the QAO 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 8-2 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.

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Table 10-1. Summary of Test Program Analyses
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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
Total chloride	Hex Waste	9	9	9	–	Bomb or flask combustion (ASTM Method D-808; SW-846 Method 5050)	Ion chromatography of residue (SW-846 Method 9056)	Duplicate	One per test	3	12
Ash						NA	Residue after muffle furnace combustion (ASTM Method D-482/D-5865	Duplicate	One per test	3	12
Heat Content						NA	Bomb calorimeter (ASTM Method D-240)	Duplicate	One per test	3	12
Density						NA	Gravimetric/volumetric (ASTM Method D-891)	Duplicate	One per test	3	12
Total chloride						Bomb or flask combustion (ASTM Method D-808; SW-846 Method 5050)	Ion chromatography of residue (SW-846 Method 9056)	Duplicate	One per test	3	12
Ash	DNAPL Waste Feed	3	3	3	–	NA	Residue after muffle furnace combustion (ASTM Method D-482/D-5865	Duplicate	One per test	3	12
Heat Content						NA	Bomb calorimeter (ASTM Method D-240)	Duplicate	One per test	3	12
Density						NA	Gravimetric/volumetric (ASTM Method D-891)	Duplicate	One per test	3	12
Total chloride						Bomb or flask combustion (ASTM Method D-808; SW-846 Method 5050)	Ion chromatography of residue (SW-846 Method 9056)	Duplicate	One per test	3	12
Viscosity						NA	Viscometer (ASTM Method D-445)	Duplicate	One per test	3	12
Volatile Organics	Hex Waste	9	9	9	–	Waste Dilution (SW-846 Method 3585)	GC/MS (SW-846 Method 8260B)	Surrogate spikes	Every analysis [c]	9	11
								MS/MSD [d,e]	One set for test program	2	
	DNAPL Waste Feed	3	3	3	–	Waste Dilution (SW-846 Method 3585)	GC/MS (SW-846 Method 8260B)	Surrogate spikes	Every analysis [c]	9	11
								MS/MSD [d,e]	One set for test program	2	

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Analysis	Sample Matrix	Field Samples[a] Test 1	Test 2	Test 3	Field QC	Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
Semivolatile Organics	Hex Waste	9	9	9	--	Waste Dilution (SW-846 Method 3580A/8270C)	GC/MS (SW-846 Method 8270C)	Surrogate spikes incl. duplicates [c]	Every analysis [c]	9	11
								MS/MSD [d,e]	One set for test program	2	
	DNAPL Waste Feed	3	3	3	--	Waste Dilution (SW-846 Method 3580A/8270C)	GC/MS (SW-846 Method 8270C)	Surrogate spikes incl. duplicates [c]	Every analysis [c]	9	11
								MS/MSD [d,e]	One set for test program	2	
	HCl Product	3	3	--	--	Separatory funnel acid/base liquid-liquid extraction (SW-846 Method 3510C/8270C)	GC/MS (SW-846 Method 8270C)	Surrogate spikes incl. duplicates [c]	Every analysis [c]	6	8
								MS/MSD [d,e]	One set for test program	2	
	Scrubber Purge Water	3	3	--	--	Separatory funnel acid/base liquid-liquid extraction (SW-846 Method 3510C/8270C)	GC/MS (SW-846 Method 8270C)	Surrogate spikes incl. duplicates [c]	Every analysis [c]	6	8
								MS/MSD [d,e]	One set for test program	2	
	Analytical system QC	NA	NA	NA	NA	NA	GC/MS (SW-8270C)	LCS	One per batch/ matrix specific	2 or more	2
								Method Blank	One per batch/ matrix specific	2 or more	2
PCBs	Hex Waste	9	9	--	--	Waste Dilution (SW-846 Method 3580A/8082)	GC/ECD (SW-846 Method 8082)	Surrogate spikes incl. duplicates [c]	Every analysis [c]	6	8
								MS/MSD [d,e]	One set for test program	2	
	DNAPL Waste Feed	3	3	--	--	Waste Dilution (SW-846 Method 3580A/8082)	GC/ECD (SW-846 Method 8082)	Surrogate spikes incl. duplicates [c]	Every analysis [c]	6	8
								MS/MSD [d,e]	One set for test program	2	
	Analytical system QC	NA	NA	NA	NA	NA	GC/MS (SW-8082)	LCS	One per batch/ matrix specific	2 or more	2
								Method Blank	One per batch/ matrix specific	2 or more	2

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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
Metals by ICP	Hex Waste	--	--	9	--	Digestion (SW-846 Method 3010A)	ICP (SW-846 Method 6020)	MS/MSD [d]	One set for test program	2	5
	DNAPL Waste Feed	--	--	3	--	Digestion (SW-846 Method 3010A)	ICP (SW-846 Method 6020)	MS/MSD [d]	One set for test program	2	5
	Analytical system QC	NA	NA	NA	NA	Digestion (SW-846 Method 3010A)	ICP (SW-846 Method 6020)	LCS	One per batch/ matrix specific	2 or more	6
								Serial dilution	One per batch/ matrix specific	2 or more	
								Method Blank	One per batch/ matrix specific	2 or more	
Mercury by CVAA	Hex Waste	--	--	9	--	CVAA (SW-846 Method 7470A)	CVAA (SW-846 Method 7470A)	MS/MSD [d]	One set for test program	2	5
	DNAPL Waste Feed	--	--	3	--	CVAA (SW-846 Method 7470A)	CVAA (SW-846 Method 7470A)	MS/MSD [d]	One set for test program	2	5
	Analytical system QC	NA	NA	NA	NA	CVAA (SW-846 Method 7470A)	CVAA (SW-846 Method 7470A)	LCS	One per batch/ matrix specific	3 or more	5
								Method Blank	One per batch/ matrix specific	2 or more	
Method 0030 VOST for Volatile PICs	VOST stack sample tube pairs	12	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, 8260B); Each tube in each tube pair is analyzed separately.	Surrogate spikes[c]	Every sample	36	36
	VOST Condensate	3	3	--	--	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260B)	Surrogate spikes[c]	Every analysis [c]	6	6
	VOST field blank tube pairs	3	3	--	--	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260B); Tube pair is analyzed as a single sample.	Surrogate spikes[c]	Every analysis [c]	6	6

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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
Method 0030 VOST for Volatile PICs (continued)	VOST trip blank tube pairs	1	1	--	--	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260B); Tube pair is analyzed as a single sample.	Surrogate spikes[c]	Every analysis[c]	2	2
	VOST Cond. Trip Blanks	1	1	--	--	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260B)	Surrogate spikes[c]	Every analysis[c]	2	2
	VOST audit sample tube pairs	--	--	--	4	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260B); Each tube in each tube pair is analyzed separately.	Surrogate spikes[c]	Every analysis[c]	6	6
	Spiked resin blank tube pairs	--	--	--	2	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260B); Tube pair is analyzed as a single sample.	Surrogate spikes[c]	Every analysis[c]	2	2
	Analytical system QC	NA	NA	NA	NA	NA	Purge and trap, GC/MS (SW-846 Method 8260B)	LCS	1 per condensate batch	2 or more	2
								Method blank	1 per analytical run	2 or more	2
PCDD/PCDFs & PCBs by SW846 Method 0023A	Method 0023A front half composite; filter, and front half of filter holder and probe rinses.	3	3	--	1	Soxhlet extraction with MeCl2 (SW-846 Methods 0023A/3542, EPA Method 1668A)	HRGC/HRMS (Method 1668A)	PCB isotope dilution internal standard spike	Every sample	7	7
								PCB isotopically labeled surrogate spike	Every analysis[c]	7	
							HRGC/HRMS for PCDD/PDDFs (SW-846 Method 8290)	PCDD/PCDF isotope dilution internal standard spike	Every analysis[c]	7	7
								PCDD/PCDF recovery standard spike	Every analysis[c]	7	

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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency[a]	QC Analyses	Total Analyses[b]
		Test 1	Test 2	Test 3	Field QC						
PCDD/PCDFs & PCBs by SW846 Method 0023A (continued)	Method 0023A back half composite; XAD-2 resin, and back half of filter holder and condenser rinses.	3	3	--	1	Soxhlet extraction with MeCl2 (SW-846 Methods 0023A/3542, EPA Method 1668A)	HRGC/HRMS (Method 1668A)	PCB pre-sampling surrogate spikes	Every XAD-2 resin tube before sampling	7	7
								PCB isotope dilution internal standard spike	Every analysis[c]	7	
								PCB isotopically labeled surrogate spike	Every analysis[c]	7	
							HRGC/HRMS for PCDD/PCDFs (SW-846 Method 8290)	PCDD/PCDF pre-sampling surrogate spikes	Every XAD-2 resin tube before sampling	7	7
								PCDD/PCDF isotope dilution internal standard spike	Every analysis[c]	7	
								PCDD/PCDF recovery standard spike	Every analysis[c]	7	
	Method 0023A Condensate Impinger	3	3	--	1	Separatory funnel acid/base liquid-liquid extraction (SW-846 Method 3542, EPA Method 1668A)	HRGC/HRMS (Method 1668A)	PCB isotope dilution internal standard spike	Every analysis[c]	7	7
								PCB isotopically labeled surrogate spike	Every analysis[c]	7	

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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
PCDD/PCDFs & PCBs by SW846 Method 0023A (cont'd)	Method 0023A acetone reagent blank	--	--	--	1	NA	HRGC/HRMS (Method 1668A)	PCB isotope dilution internal standard spike	Every analysis [c]	1	1
								PCB isotopically labeled surrogate spike	Every analysis [c]	1	
							HRGC/HRMS for PCDD/PCDFs (SW-846 Method 8290)	PCDD/PCDF isotope dilution internal standard spike	Every analysis [c]	1	1
								PCDD/PCDF recovery standard spike	Every sample	1	
	Method 0023A methylene chloride reagent blank	--	--	--	1	NA	HRGC/HRMS (Method 1668A)	PCB isotope dilution internal standard spike	Every analysis [c]	1	1
								PCB isotopically labeled surrogate spike	Every analysis [c]	1	
							HRGC/HRMS for PCDD/PDDFs (SW-846 Method 8290)	PCDD/PCDF isotope dilution internal standard spike	Every analysis [c]	1	1
								PCDD/PCDF recovery standard spike	Every analysis [c]	1	
	Method 0023A toluene reagent blank	--	--	--	1	NA	HRGC/HRMS for PCDD/PDDFs (SW-846 Method 8290)	PCDD/PCDF isotope dilution internal standard spike	Every analysis [c]	1	1
								PCDD/PCDF recovery standard spike	Every analysis [c]	1	

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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
PCDD/PCDFs & PCBs by SW846 Method 0023A (cont'd)	Method 0023A spiked XAD-2 resin blank	--	--	--	2	Soxhlet extraction with MeCl2 (SW-846 Methods 0023A/3542, EPA Method 1668A)	HRGC/HRMS (Method 1668A)	PCB pre-sampling surrogate spikes	Every XAD-2 resin tube before sampling	2	2
								PCB isotope dilution internal standard spike	Every analysis [c]	2	
								PCB isotopically labeled surrogate spike	Every analysis [c]	2	
							HRGC/HRMS for PCDD/PDDFs (SW-846 Method 8290)	PCDD/PCDF pre-sampling surrogate spikes	Every XAD-2 resin tube before sampling	2	2
								PCDD/PCDF isotope dilution internal standard spike	Every analysis [c]	2	
								PCDD/PCDF recovery standard spike	Every analysis [c]	2	
PCDD/PCDFs by SW846 Method 0023A Audit Sample	Method 0023A spiked XAD-2 resin	--	--	--	1	Soxhlet extraction with MeCl2 (SW-846 Methods 0023A/3542)	HRGC/HRMS for PCDD/PDDFs (SW-846 Method 8290)	PCDD/PCDF pre-sampling surrogate spikes	Every XAD-2 resin	1	1
								PCDD/PCDF isotope dilution internal standard spike	Every analysis [c]	1	
								PCDD/PCDF recovery standard spike	Every analysis [c]	1	

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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
PCDD/PCDFs & PCBs by SW846 Method 0023A (cont'd)	Analytical system QC	NA				Soxhlet extraction with MeCl2 (SW-846 Methods 0023A/3542, EPA Method 1668A)	HRGC/HRMS (Method 1668A)	Method blank	1 per analytical batch	1 or more	1
								Blank spike	2 per analytical batch	2	2
							HRGC/HRMS for PCDD/PDDFs (SW-846 Method 8290)	Method blank	1 per analytical batch	1 or more	1
								Blank spike	2 per analytical batch	2	2
SVOCs by Method 0010	Method 0010 front half composite; filter, and front half of filter	3	3	--	1	Soxhlet extraction with MeCl2 (SW-846 Methods 0010/3542/8270)	GC/MS (SW-846 Method 8270C)	Semivolatile surrogate spikes	Every sample	7	7
								Semivolatile internal standard surrogate spikes	Every sample	7	
	Method 0010 back half composite; XAD-2 resin, and back half of filter holder and condenser rinses.	3	3	--	1	Soxhlet extraction with MeCl2 (SW-846 Methods 0010/3542/8270)	GC/MS (SW-846 Method 8270C)	^{13}C-labeled pre-sampling surrogate spikes	Every XAD-2 resin tube before sampling	7	7
								Semivolatile surrogate spikes	Every sample	7	
								Semivolatile internal standard surrogate spikes	Every sample	7	
	Method 0010 Condensate Impinger	3	3	--	1	Separatory funnel acid/base liquid-liquid extraction (SW-846 Methods 0010/3542/8270)	GC/MS (SW-846 Method 8270C)	Semivolatile surrogate spikes	Every sample	7	7
								Semivolatile internal standard surrogate spikes	Every sample	7	
	Method 0010 acetone reagent blank	--	--	--	1	NA	GC/MS (SW-846 Method 8270C)	Internal standards surrogate spike	Every sample	1	1
	Method 0010 methylene chloride reagent blank	--	--	--	1	NA	GC/MS (SW-846 Method 8270C)	Internal standards surrogate spike	Every sample	1	1

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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
SVOCs by Method 0010 (cont'd)	Method 0010 spiked XAD-2 resin blank	--	--	--	2	Soxhlet extraction with MeCl2 (SW-846 Methods 0010/3542/8270)	GC/MS (SW-846 Method 8270C)	^{13}C-labeled pre-sampling surrogate spikes	Every XAD-2 resin tube before sampling	2	2
								Semivolatile surrogate spikes	Every sample	2	
								Semivolatile internal standard surrogate spikes	Every sample	2	
	Analytical system QC	NA	NA	NA	NA		GC/MS (SW-8270C)	LCS	One per batch/ matrix specific	2 or more	2
								Method Blank	One per batch/ matrix specific	2 or more	2
Total semivolatile and nonvolatile organics by Method 0010 EPA TOE Guidance	Semivolatile front half composite: filter and solvent rinses	--	--	3	1	Soxhlet extraction (SW-846 Method 3540C/3542)	GC/FID analysis of one-half of extract (SW-846 Method 8015B) Gravimetric (Grav) analysis of one-half of extract (TOE Guidance)	Marker compounds added to TCO fraction for GC/FID analysis	Every sample	4	4
								Replicate weighing of Grav fraction to constant weight	Every sample	4	4
	Semivolatile back half composite: XAD-2 resin and condenser solvent rinses	--	--	3	1	Soxhlet extraction (SW-846 Method 3540C/3542)	GC/FID analysis of one-half of extract (SW-846 Method 8015B) Gravimetric (Grav) analysis of one-half of extract (TOE Guidance)	Marker compounds added to TCO fraction for GC/FID analysis	Every sample	4	4
								Replicate weighing of Grav fraction to constant weight	Every sample	4	4

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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
Total semivolatile and nonvolatile organics by Method 0010 EPA TOE Guidance (cont'd)	Semivolatile impinger liquid and rinses	--	--	3	1	Separatory funnel acid/base liquid-liquid extraction (SW-846 Methods 3540C/3542)	GC/FID analysis of one-half of extract (SW-846 Method 8015B) Gravimetric (Grav) analysis of one-half of extract (TOE Guidance)	Marker compounds added to TCO fraction for GC/FID analysis	Every sample	4	4
								Replicate weighing of Grav fraction to constant weight	Every sample	4	4
	Acetone reagent blank	--	--	--	1	NA	GC/FID analysis of one-half of extract (SW-846 Method 8015B) Gravimetric (Grav) analysis of one-half of extract (TOE Guidance)	Marker compounds added to TCO fraction for GC/FID analysis	Every sample	1	1
	Methylene chloride reagent blank	--	--	--	1			Replicate weighing of Grav fraction to constant weight	Every sample	1	1
Total volatile organics by M0040	Tedlar Bags	--	--	6	--	NA	GC/FID (SW-846 Method 0040/8015B)	Duplicate	Every sample	6	9
	Field Blank Bag	--	--	3	--	NA	GC/FID (SW-846 Method 0040/8015B)	Field blank	One per run	3	
	Condensate	--	--	3	--	NA	Purge and trap GC/FID (SW-846 Method 0040/8015B)	Duplicate	Every sample	3	4
	Condensate blank	--	--	1	--	NA	Purge and trap GC/FID (SW-846 Method 0040/8015B)	Field blank	One per run	1	
	Analytical system QC	NA	NA	NA	NA	NA	GC/FID (SW-846 Method 0040/8015B)	Zero gas	One per run	3	9
								Known gas	Two per run	6	
							Purge and trap GC/FID (SW-846 Methods 0040 and 5030)	Method blank (water)	One per analytical batch	1 or more	1

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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
Metals by Method 29	Method 29 front half: filter, and nitric acid probe and front	--	--	3	1	Method 29	ICP (SW-846 Method 6020)	PDS [d]	One per test	2	6
							CVAA (SW-846 Method 7470A)	PDS [d]	One per test	2	6
	Method 29 10%HNO3/5% H2 O2	--	--	3	1	Method 29	ICP (SW-846 Method 6020)	PDS [d]	One per test	2	6
							CVAA (SW-846 Method 7470A)	PDS [d]	One per test	2	6
	Method 29 initially empty contents and rinses	--	--	3	1	Method 29	CVAA (SW-846 Method 7470A)	PDS [d]	One per test	2	6
	Method 29 4%KMnO4/10 %H2SO4 impinger contents and rinses	--	--	3	1	Method 29	CVAA (SW-846 Method 7470A)	PDS [d]	One per test	2	6
	Method 29 4%KMnO4/10 %H2SO4 8N HCl rinses	--	--	3	1	Method 29	CVAA (SW-846 Method 7470A)	PDS [d]	One per test	2	6
	Method 29 filter reagent blank	--	--	--	1	Method 29	ICP (SW-846 Method 6020)	Reagent Blank	One for test program	1	1
							CVAA (SW-846 Method 7470A)	Reagent Blank	One for test program	1	1
	Method 29 HNO3 reagent blank	--	--	--	1	Method 29	ICP (SW-846 Method 6020)	Reagent Blank	One for test program	1	1
							CVAA (SW-846 Method 7470A)	Reagent Blank	One for test program	1	1
	Method 29 10%HNO3/5% H2O2 reagent blank	--	--	--	1	Method 29	ICP (SW-846 Method 6020)	Reagent Blank	One for test program	1	1
							CVAA (SW-846 Method 7470A)	Reagent Blank	One for test program	1	1

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Table 10-1. Summary of Test Program Analyses
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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
Metals by Method 29 (cont'd)	Method 29 4%KMnO4/10 %H2SO4 reagent blank	--	--	--	1	Method 29	CVAA (SW-846 Method 7470A)	Reagent Blank	One for test program	1	1
	Method 29 8N HCl reagent blank	--	--	--	1	Method 29	CVAA (SW-846 Method 7470A)	Reagent Blank	One for test program	1	1
	Spike filter audit sample for metals	--	--	--	1	Method 29	ICP (SW-846 Method 6020)	Audit Sample	One for test program	1	1
	Liquid audit sample for metals	--	--	--	1	Method 29	ICP (SW-846 Method 6020)	Audit Sample	One for test program	1	1
	Liquid audit sample for mercury	--	--	--	1	Method 29	CVAA (SW-846 Method 7470A)	Audit Sample	One for test program	1	1
	Analytical system QC	NA	NA	NA	NA	NA	ICP (SW-846 Methods 3010A, 6020)	LCS	One per batch/ matrix specific	1	1
								Serial dilution	One per batch/ matrix specific	1	1
								Method blank	One per batch/ matrix specific	1	1
	Analytical system QC	NA	NA	NA	NA	NA	CVAA (SW-846 Method 7470A)	LCS	One per batch/ matrix specific	1	1
								Serial dilution	One per batch/ matrix specific	1	1
								Method blank	One per batch/ matrix specific	1	1

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Table 10-1. Summary of Test Program Analyses
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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
Hexavalent Chromium by Method 0061	Method 0061 Impinger Solution and Rinses	--	--	3	--	NA	Ion chromatography post-column reactor (SW-846 Method 7199)	Duplicate	One per test	1	4
	Method 0061 Potassium Hydroxide Reagent Blank	--	--	--	1	NA	Ion chromatography post-column reactor (SW-846 Method 7199)	Reagent Blank	One for test program	1	1
	Method 0061 Deionized Water Reagent Blank	--	--	--	1	NA	Ion chromatography post-column reactor (SW-846 Method 7199)	Reagent Blank	One for test program	1	1
	Method 0061 Field Spiked to Impinger Solution Aliquot	--	--	--	2	NA	Ion chromatography post-column reactor (SW-846 Method 7199)	Field spike	One set for test program	2	2
	Method 0061 Field Spiked Potassium Hydroxide Solution	--	--	--	1	NA	Ion chromatography post-column reactor (SW-846 Method 7199)	Field spike	One for test program	1	1
	Analytical system QC	NA	NA	NA	NA	NA	Ion chromatography post-column reactor (SW-846 Method 7199)	LCS/LCSD	1 per batch following initial calibration (separate calibration for each matrix)	1	2
								Method Blank	One per batch/ matrix specific - analyzed in duplicate	1	

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Table 10-1. Summary of Test Program Analyses
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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
Particulate by Method 26A	Method 26A particulate filter	--	3	--	--	Desiccate to constant mass	Gravimetric (Method 5)	Replicate weighing to constant weight	Every sample	3	3
	Method 26A probe and filter holder acetone rinses	--	3	--	--	Evaporate/Desiccate to constant mass	Gravimetric (Method 5)	Replicate weighing to constant weight	Every sample	3	3
	Method 26A filter reagent blank	--	--	--	1	Desiccate to constant mass	Gravimetric (Method 5)	Replicate weighing to constant weight	Every sample	1	1
	Method 26A acetone reagent blank	--	--	--	1	Evaporate/Desiccate to constant mass	Gravimetric (Method 5)	Replicate weighing to constant weight	Every sample	1	1
HCl by Method 26A	Method 26A H2SO4 impingers	--	3	--	--	NA	Ion chromatography (EPA Method 26A)	Duplicate	One per test	1	6
								MS/MSD analyzed in duplicate [d]	1 per batch (assuming all samples batched together)	2	
	Method 26A H2SO4 reagent blank	--	--	--	1	NA	Ion chromatography (EPA Method 26A)	Reagent Blank	One for test program	1	1
Cl2 by Method 26A	Method 26A NaOH impingers	--	3	--	--	NA	Ion chromatography (EPA Method 26A)	Duplicate	One per test	1	6
								MS/MSD analyzed in duplicate [d]	1 per batch (assuming all samples batched together)	2	
	Method 26A NaOH reagent blank	--	--	--	1	NA	Ion chromatography (EPA Method 26A)	Reagent Blank	One for test program	1	1

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Table 10-1. Summary of Test Program Analyses
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Analysis	Sample Matrix	Field Samples[a]				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency [a]	QC Analyses	Total Analyses [b]
		Test 1	Test 2	Test 3	Field QC						
Cl^- ion by Method 26A	Method 26A deionized water reagent blank	--	--	--	1	NA	Ion chromatography (EPA Method 26A)	Reagent Blank	One for test program	1	1
Cl^- ion chromatography	Liquid audit sample	2				NA	Ion chromatography (EPA Method 26A)	Duplicate	One for test program	2	4
	Analytical system QC	2				NA	Ion chromatography (EPA Method 26A)	LCS/LCSD	1 per batch following initial calibration (separate calibration for each matrix)	2	4
								Method Blank	One per batch/ matrix specific - analyzed in duplicate	2	
Particle size distribution by SEM	Method 5, smooth surface, polycarbonate filters	--	--	3	--	NA	Scanning Electron Microscope (SEM)	Duplicate	One for test program	1	4
	Method 5, smooth surface, polycarbonate filter reagent blank	--	--	--	1	NA	Scanning Electron Microscope (SEM)	Reagent Blank	One for test program	1	1
TOTAL											**534**

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Table 10-1. Summary of Test Program Analyses
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Table 10-1 Notes:

[a] Each test condition is comprised of three replicate sampling runs.

[b] Total laboratory analyses includes field sample analyses and laboratory QC analyses

[c] Surrogate spikes are applied to all samples. Refer to Table 5-1 notes for the surrogate compounds.

[d] MS = Matrix spike
MSD = Matrix spike duplicate
PDS = Post-digestion spike

[e] Refer to Table 5-1 notes for the matrix spike compounds.

ASTM - American Society for Testing and Materials
CVAA - cold vapor atomic absorption
CWA - Methods for Chemical Analysis of Water and Waste, EPA-600/4-79-020. EPA, Environmental Monitoring and Support Laboratory, Cincinnati, OH, 1979.
EPA Method - New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.
EPA Method 1668A - Method 1668A, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency,
ECD - electron capture detector
FID - flame ionization detector
GC - gas chromatography
HR - high resolution
IC - ion chromatography
ICP - inductively coupled argon plasma spectroscopy
MS - mass spectroscopy
NA - not applicable
PCB - polychlorinated biphenyl
PCDD/PCDF - polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans
PCR - post-column reactor
PIC - product of incomplete combustion
QC - quality control
SVOC - semivolatile organic compound
SW846 - Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.

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 dilution performed, if such a dilution is practical given the sample preparation method. 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, the 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:

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

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 METALS ANALYSES

The analysis of metals also begins with an instrument calibration composed of 2 to 6 points, depending on the specific analytical method. For inductively coupled argon plasma spectroscopy (ICP) for non-mercury (non-Hg) metals analyses and cold vapor atomic adsorption spectroscopy (CVAA) for mercury (Hg) analyses, instruments are profiled and calibrated according to the instrument manufacturer's instructions. A calibration blank and a QC check standard are then analyzed to ensure appropriate instrument response. A percent recovery (%R) is calculated according to the following formula:

$$\%R = \frac{Found}{True} \times 100$$

Where: $\%R$ = Percent Recovery

$Found$ = The Result of the Analysis

$True$ = The Expected Result

The %R is expected to be within method specifications before analysis can begin. The calibration is verified periodically according to method specifications using the same technique.

Atomic absorption instruments are calibrated using 3 to 5 points. A linear regression is performed and a correlation coefficient is calculated to assess linearity of the curve. It is beyond the scope of this document to provide a detailed explanation of the statistics supporting linear regression and the calculation of the correlation coefficient. Reference can be made to any standard statistics text for additional information. Calibration checks are performed as above and periodically verified.

Analytical results for metals are read directly from the instrument in terms of concentration. Dilution factors must be used as discussed above if applicable. In order to combine the results of the sub-samples of a metals sampling train, the concentration is converted back to mass using the following formula:

$$M_{xs} = C_{xs} \times V_{xs}$$

Where: M_{xs} = Mass in the Sub-sample

C_{xs} = Concentration in the Sub-sample

V_{xs} = Volume of the Sub-sample

The concentration in the gas sample can then be calculated.

11.4 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.

11.5 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

11.6 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 Analysis Coordinator will certify via signature the contents of each analytical data package.

11.6.1 Organic Analyses

The organic analytical data packages will include the following:

- Sample Results
- Raw Sample Data
  - Sample Data
  - Tentatively Identified Compound Data for VOCs or SVOC s 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 VOCs or SVOC s 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

11.6.2 Metals Analyses

The metals analytical data packages will include the following:

- Sample Results
- Quality Control Summary
  - Method Blank Report
  - Sample Duplicate Report
  - MS/MSD/PDS Data and Evaluation Report
  - Laboratory Control Sample Data and Evaluation Report
- Quality Control Summaries
  - Initial Calibration Verification and Blank Results
  - Continuing Calibration Verification and Blank Results
  - Interference Check Sample
  - PDS Sample Recovery
  - Serial Dilutions Documentation for ICP
  - Instrument Detection Limits
  - ICP Correction Factors
  - ICP Linear Ranges
- Raw Data
  - Data Review Checklist
  - Sample, Standards, and Quality Control Data
  - Digestion/Extraction Sheets
  - Preparation Log
  - Analysis Run Log.

11.6.3 Other 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

11.7 DATA VALIDATION

The results of all sample analysis and all QA/QC sample analysis (100% of the laboratory data) will be compared to the specifications given in Tables 5-1 and 8-2. The data validation criteria outlined in: USEPA Contract Laboratory Program National Functional Guidelines for Low Concentration Organic Data Review, (2001) USEPA Analytical Operations/Data Quality Center (AOC) National Functional Guidelines for Chlorinated Dioxin/Furan Review (2002) and USEPA Contract Laboratory National Functional Guidelines for Inorganic Data Review, (2004); prepared by USEPA Data Review Work Group will be followed as applicable to the individual methods used. Any sample data associated with a QC check that fails to meet the target criteria established in these tables will be flagged in the final report, and an assessment of the impact, if any, of missing the target data quality objective will be provided. Additional guidance will be found in the analytical methods and EPA/625/6-89/023, Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration.

The method detection limit (MDL), and the reliable detection limits (RDL) or laboratory specified reporting limit (RL) will be reported for all non-isotope dilution method compounds. Results reported between the MDL and the RDL or RL will be flagged as estimated. Non-detects for the isotope dilution methods will be determined using the SW-846 Method 8290 definition of an estimated detection limit (EDL) without the use of empirical factors or other mathematical manipulations specific to the laboratory. The laboratory must include with each data package any calculations or statistical methods sample dilution corrections. The laboratory must maintain on file documentation for the reported detection limits.

Particular attention will be paid to the results of blank data. Analytical data will not be routinely corrected for contamination. They are however evaluated on a case-by-case basis for possible blank correction. Samples associated with contaminated blanks will be flagged so that this information may be assessed in the final report.

The output from the data validation process will be a summary comparison of the QA/QC results to the specified data quality objectives, a review and discussion of any deficiencies identified in the data assessments of laboratory performance, and, overall precision and accuracy, representativeness and completeness of the data set.

Detailed procedures for the internal review of data in the laboratory are found in the laboratories QA Manuals and related standard operating procedures (SOPs).

11.8 DATA REPORTING

11.8.1 Project Reporting Format

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

11.8.2 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 8290. The EDL is defined as follows:

> EDL (from SW-846 Method 8290) -*"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.

11.8.3 Detection Limits and Data Reduction

Analytical results for all analyses, except Method 0023A samples for PCDD/PCDFs, 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 0023A 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 will be counted as zero in determining compliance. For this test program, a sample volume of 3.0 dry standard cubic meters is targeted. For the front-half and back-half separate analyses of the Method 0023A samples, if a fraction is non-detect for a specific congener, the specific congener's EDL will reported. In subsequent compliance calculations, the congener concentration for a fraction that is reported as non-detect will be counted as zero for that fraction.

11.8.4 Other Quality Control Data Reporting

Other quality control data that are included in the analytical reports and may be discussed or commented on in the final test reports are:

- 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 reports.

11.8.5 Final Case Files

At a minimum, the following documents will be retained upon the completion of the project in the final case file, which must be maintained at the OxyChem facility for a period at least three years:

- 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.

Figure 11-1. Example F-1 Furnace CPT Report Outline

CERTIFICATION FORM *(LAC 33:V.513.)*
TABLE OF CONTENTS
LIST OF FIGURES
LIST OF TABLES
LIST OF APPENDICES
1.0 SUMMARY OF TEST RESULTS
- **1.1** Summary of HWC MACT Compliance Test Results
- **1.2** Deviations from the Approved CPT Plan and Their Impacts
  - **1.2.1** Actual vs. Planned Operations
  - **1.2.2** Data Quality Objectives
  - **1.2.3** Sampling and Sample Handling
- **1.3** Performance Evaluation (Audit) Results Summary

2.0 INTRODUCTION/PROCESS DESCRIPTION
- **2.1** Brief Unit Description
- **2.2** Test Objectives Overview
- **2.3** Test Responsible Parties
- **2.4** Test Chronology
- **2.5** Summary of HWC MACT Process Monitors

3.0 OPERATING DATA SUMMARY TARGET OPERATING CONDITIONS
- **3.1** Feed Rate Data
  - **3.1.1** Waste Feed Rates
  - **3.1.2** Other Feedstream Flow Rates
    - **3.1.2.1** Combustion Airflow Rates
    - **3.1.2.2** Auxiliary Fuel
    - **3.1.2.3** Process Vent Streams
- **3.2** Atomizing Pressure
- **3.3** Combustion Air Flow Rate (If measured by plant instrumentation)
- **3.4** Heat Recovery Boiler Steam Production Rate
- **3.5** Other Furnace Operating Data
- **3.6** Air Pollution Control Equipment (APCE) Operating Data Vs. Target Conditions

4.0 FEEDSTREAM SAMPLING AND ANALYSIS
- **4.1** Sampling Locations
- **4.2** Sampling and Analytical Methods
- **4.3** Characterizations
  - **4.3.1** Waste Feed Analysis
  - **4.3.2** Other Feedstream Analysis
- **4.4** Constituent Feedrates
  - **4.4.1** Chlorine Feedrate
  - **4.4.2** POHC Feedrate

5.0 HWC MACT EMISSIONS AND PERFORMANCE RESULTS
- **5.1** Stack Sampling Locations
- **5.2** Dioxin/Furan Sampling Train
  - **5.2.1** Sampling and Analytical Methods
  - **5.2.2** Dioxin/Furan Emission Results
  - **5.2.3** Toxicity Equivalency Results
- **5.3** HCl/Chlorine Sampling Train
  - **5.3.1** Sampling and Analytical Methods
  - **5.3.2** HCl/Cl_2 Emission Results
- **5.4** Destruction and Removal Efficiency (DRE)
  - **5.4.1** Sampling and Analytical Methods
  - **5.4.2** POHC Emission Rates

5.4.3 DRE Calculation
5.5 CEMS Monitoring Results for Carbon Monoxide, Oxygen, and Hydrocarbons
6.0 APCE RESIDUE SAMPLING AND ANALYSIS
6.1 Sampling Locations
6.2 Sampling and Analytical Methods
6.2.1 APCE blowdown
6.2.2 HCl Product
7.0 QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION
7.1 Summary of Data Validation and Verification
7.2 QAPP Deviations and Corrective Actions *(include QAPP deviations in Table 1.3)*
7.3 Project Personnel and Responsibilities
7.4 Quality Assurance/Quality Control Objective Results
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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

OxyChem Chemicals, Geismar, LA

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 Audits

The QAO assigned to the project will continuously evaluate the operations at the site 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 audit 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.

14.1.2 Performance Evaluations

The QAO and/or the regulatory agency may submit Performance Evaluation (PE) samples (referred to elsewhere as "audit samples") to the laboratory. PE samples provided will be submitted for analysis to demonstrate analytical performance on an as required basis.

Performance audit samples for each of the following analyses will be requested from the EPA Regions 6 audit sample program manager:

- Dioxins/Furans,
- HCl/Cl_2,
- Metals, and
- VOST.

Since the POHC for this test program is a semivolatile compound, OxyChem requests that EPA and/or LDEQ identify exactly which target compound(s) are to be evaluated as part of the VOST audit.

14.1.3 Laboratory Audits

OxyChem or its appointed representative may choose to audit the laboratories at any time during the course of the project on an as-required basis to assess the laboratory's ability to successfully perform the work and to ensure mutual agreement between OxyChem 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 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 CPT 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 and reported at a minimum to the employee's immediate supervisor.

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 plans identified in the CAR. The Test Coordinator then forwards the requested response to the QAO for follow-up and filing. The QAO maintains the log for status control of CARs and responses, confirms the adequacy of the intended corrective action(s) and verifies its implementation. The QAO will issue and distribute copies of completed CARs to the originator, Test Coordinator, OxyChem Test Project Manager, and the involved contractor(s) if any. CARs are transmitted to the project file for future reference, and are incorporated into the test reports.

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 and/or QAO when any analytical QC nonconformance occurs, so a mutually acceptable course of action can be pursued.

14.3 QAO REPORT

The QAO will provide a written report to be included as a section to the final test reports. The QAO report will address:

- Overview of activities and significant events related to QA/QC
- Summary of 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.

Corrective Action Request

Number:
Date:
File Name:
Client: Occidental Chemical Corporation, Geismar, LA

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 Quality Assurance Officer 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 Manager	Date
Quality Assurance Officer	Date
QAO Follow-up	Date

Figure 14-1. Example Corrective Action Request Form

ATTACHMENT A

RESUMES OF KEY INDIVIDUALS

CHRIS E. MCBRIDE, P.E.

Professional Qualifications

More than 22 years of experience in hazardous, toxic, explosive, and pathological waste operations, management and permitting. Experience is concentrated in the areas of hazardous waste incineration operations and material handling; incineration and gas cleaning system process design; Hazardous Waste Combustor Maximum Achievable Control Technology (HWC MACT), Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA) permitting of incineration and thermal treatment systems, trial burn and performance testing of incineration and thermal treatment systems, and performance evaluation and optimization of thermal treatment and gas cleaning system processes. Current employment is with Focus Environmental, Inc., a small, nationally recognized hazardous waste thermal treatment consulting firm. Experience prior to joining Focus was with IT Corporation (now part of Shaw Environmental, Inc.), a nationally recognized hazardous waste engineering design and remediation firm. Other experience includes the U.S. Army Chemical Weapons Demilitarization Program.

Education

B.S., Chemical Engineering, Rose-Hulman Institute of Technology, Terre Haute, Indiana; May 1985.

Chemical Officer Basic Course, U.S. Army Chemical Center & School, Ft. McClellan, Alabama; October, 1985.

Registration/Certification

Engineer-in-Training (EIT), Indiana (1985)
Professional Engineer (PE), Tennessee (2000)
OSHA 29 CFR 1910.120 40-hour Training & 8-hour Supervisor's Course

Experience

1998-Present: Senior Project Engineer/Consultant, Focus Environmental, Inc., Knoxville, Tennessee. Responsible for consulting and project management in the areas of hazardous waste incinerator performance testing, boiler and industrial furnace (BIF) certification of compliance testing, and HWC MACT/RCRA permitting and testing. Major project experience:

- Provided consulting services for implementation of the HWC MACT rule to numerous client companies:
  - Prepared incineration system comprehensive performance test (CPT) plans and other HWC MACT plans for: Eli Lilly and Company (3 sites, 5 units); Occidental Chemical Corporation ((3 sites, 5 units); Eastman-Kodak; Hxiion (formerly Resolution Performance Products[2 units]); Merck, Sharp & Dohme Quimica (MSDQ); G.D. Searle (now Pfizer), and Lyondell Chemical Company (2 sites, 4 units).
  - Managed incineration system CPTs for: Occidental Chemical Corporation; Lyondell Chemical, MSDQ, Eli Lilly, G.D Searle, and Hexion.
- Managed Resource Conservation and Recovery Act RCRA incineration system and BIF trial burn testing for: Occidental Chemical Corporation, General Electric; Elf-AtoChem (now ATOFINA), and Merichem-Sasol.
- Prepared trial burn plans for RCRA incineration units and BIFs for: Occidental Chemical Corporation; Lilly del Caribe; General Electric; Merichem-Sasol; Sterling Chemical; Merck & Co.; and ATOFINA.
- Provided independent technical and consulting oversight to the U.S. Army Corps of Engineers during the thermal treatment (remediation) of soils at the Drake Chemical Superfund Site, in Lockhaven, Pennsylvania. Also provided technical assistance in resolving

CHRIS E. MCBRIDE, P.E. (continued)

material handling problems associated with decontaminating miscellaneous, contaminated debris found at the site.

1990-1998: Project Engineer, IT Corporation, a subsidiary of International Technology Corporation (now part of Shaw Environmental, Inc.), Knoxville, Tennessee. Major project experience and assignments:

- Prepared the test plan and managed the performance test for the Aberdeen Pesticide Dumps Site (APDS) Thermal Desorber Unit (TDU), Aberdeen, North Carolina to demonstrate compliance with the substantive requirements of 40 CFR 264 Subpart O Incinerators.
- Performed heat and material balances computer modeling, provided metals emissions analysis and products of incomplete combustion (PIC) emissions information for input to the site specific health risk assessment; prepared contractor specifications; and prepared and submitted a NPDES permit application for the U.S. Army Corps of Engineers in support of the incineration of TNT contaminated soils and wooden pipeline at the Former Weldon Spring Ordnance Works, Weldon Spring, Missouri.
- One of four co-designers of patented system for treatment of energetic materials (missile propellants and explosives manufacturing residues) by ignition and subsequent off-gas management for the U.S. Navy at Indian Head, Maryland to replace the current open burning of these waste materials.
- Co-managed the trial burn testing and prepared the trial burn report for IT Corporation's Hybrid Thermal Treatment System (HTTSR) incinerator treating creosote contaminated soils from the Bayou Bonfouca Superfund Site, Slidell, Louisiana. Approximately two years later, managed a second performance test conducted on this same unit treating soils from the Southern Shipbuilders Superfund Site, Slidell, Louisiana.
- Prepared the first drafts of the waste characterization, trial burn plan and delisting plan sections of the RCRA permit application for IT Corporation's HTTSR incinerator at the dioxin contaminated Times Beach Site, Times Beach, Missouri. Assisted in preparing the trial burn and delisting test reports. The final RCRA permit was issued, the remediation completed and the facility closed.
- Prepared the demonstration test burn report for a six run test of the U.S. Army Chemical Agent/Munitions Disposal System (USACAMDS) metal parts furnace treating ton containers with nerve agent GB (sarin) heels. The test was performed as part of USACAMDS's RCRA R&D permit. No notices of deficiency (NODs) were received from the Utah Department of Environmental Quality on this test burn report.
- Prepared NOD responses and metals emissions test plans for Eli Lilly and Company related to the metals emissions compliance schedule in Lilly's RCRA Part B permit for the five incinerators located at the Clinton Laboratories. Also, performed heat and material balances modeling and consultation on the operation of the Bartlett-Snow rotary kiln incinerator at the Clinton Laboratories.
- Project manager for the preparation of the RCRA Part B permit renewal application for Merck Sharp & Dohme Quimica's (MSDQ's) liquid hazardous waste incinerator in Barceloneta, Puerto Rico (EPA Region II). Updates included the trial burn plan, process descriptions, waste characterization, sampling and analysis plan, personnel training, contingency plan, and closure plan for this unit.
- Project manager for the preparation of the RCRA Part B permit modification application work including process design, process descriptions, waste analysis plans, and trial burn plans for MSDQ's new rotary kiln incinerator at Barceloneta, Puerto Rico. IT Corporation later designed and installed the incineration system equipment for MSDQ. The trial burn was performed by others and the final RCRA permit received in 1996.

- Project manager for the permit level process design of a medical/pathological waste incinerator for Merck & Co., Inc.'s Rahway, New Jersey research facilities. This unit has been permitted and is operating.
- Prepared the waste characterization, trial burn plan, closure plan and operator training plan for the RCRA/TSCA permit application to treat PCB and dioxin wastes remediated from the former Hooker Chemical sites in Northwest New York using a rotary kiln incinerator.
- Numerous other projects involving RCRA/TSCA incineration process design, permitting and testing.

1988-1990: Assistant Project Manager/On-site Representative, US Army, Office of Program Manager for Chemical Demilitarization (PMCD), Aberdeen Proving Ground, MD. Served as one of two on-site personnel representing PMCD at the BZ Demilitarization Facility located at Pine Bluff Arsenal, Pine Bluff, AR. (BZ is the military designation for an incapacitating agent, similar to LSD but 10 times stronger, produced in the 1960's by the U.S. Army). Primary responsibility was construction and operational contract oversight for the shakedown, commissioning, and day-to-day operations and management of the BZ chemical agent and pyrotechnic munitions incineration project. Operable units included rotary kiln, liquid and batch type incinerators. Other responsibilities included interface with the Pine Bluff Arsenal commander and the local community.

1985-1988: Chemical Officer/Chemical Engineer, U. S. Army, Directorate of Material Management and Demilitarization (DMMD), Pine Bluff Arsenal, Pine Bluff, Arkansas. As a chemical engineer, primary responsibility was as the facility engineer for a multiple-type hazardous waste incineration facility (fluidized bed, rotary kiln, and moving grate incinerators) used for disposing of conventional ammunition items (i.e., fuzes, smoke grenades, blasting caps) and off-specification materials from the manufacture of smoke and incendiary munitions. Also planned and executed lethal nerve agent munitions sampling and draining operations as part of the chemical stockpile monitoring program. (Nerve agents are high purity organophosphates.) The lethal agent sampling operations included separating agent filled warheads from the rocket motors, drilling the warheads to remove a sample of the agent, and transferring the balance of the agent to a bulk storage unit. Agent and propellant samples taken during the chemical munitions sampling operation were used for evaluating the continued stability in storage of the propellant material and the continued integrity of the chemical warheads. As a chemical officer, duties included serving as assistant chemical agent incident control officer (ACAICO) for the Pine Bluff Arsenal, and training military and civilian chemical agent incident responders. Served as ACAICO on two separate incidents involving containerization of leaking chemical agent rockets.

Professional Affiliations

American Institute of Chemical Engineers (AIChE)

Publications and Presentations

Fleming, J. and Foster M., Eli Lilly and Company; McBride, C., Focus Environmental, Inc.; Clark, P., Airtech Environmental Services Inc.; Carswell, P. and Anderson, W., Severn Trent Laboratories; *"Successfully Demonstrating Incinerator Performance with a Problem POHC by Active Management of the Quality Assurance Program"*; International Conference on Incineration and Thermal Treatment Technologies; May 2007.

Schofield, W., Engineered Spiking Solutions, Inc.; Anderson, W., Severn Trent Laboratories; McBride, C. Focus Environmental, Inc.; *"Model QA/QC Program for the Spiking Function"*; International Conference on Incineration and Thermal Treatment Technologies; May 2007.

Schofield, W., Engineered Spiking Solutions, Inc.; Fleming, J., Eli Lilly and Company; McBride, C., Focus Environmental, Inc.; *"An Extended Analysis of Measurement Uncertainty in the Spiking Function"*; International Conference on Incineration and Thermal Treatment Technologies; May 2006.

McBride, C. and Schomer, T., Focus Environmental, Inc. *"Comprehensive Performance Test Strategies for Liquid-Fuel Fired Boilers under the HWC MACT Phase II Standards"*, International Conference on Incineration and Thermal Treatment Technologies; May 2006.

Moran, T., Solutia, Inc.; Eicher, A. and McBride, C., Focus Environmental, Inc.; *"Evaluating the Combustion Operational Parameters that Impact the Destruction and Removal Efficiency of Hydrogen Cyanide"*; International Conference on Incineration and Thermal Treatment Technologies; May 12, 1999.

Acharya, P., Fogo, D., McBride, C., *"Process Challenges in Rotary Kiln-Based Incinerators in Soil Remediation Projects"*, Environmental Progress, Vol. 15, No. 4. Winter 1996.

(Note: Have provided peer review to numerous other papers prepared by colleagues on numerous hazardous waste incineration related topics.)

Patents

United States Patent No. 5,881,654: Combustion Apparatus for Highly Energetic Materials; Fleming, J., Barkdoll, M., Westbrook, R. & McBride, C.; March 16, 1999.

TERESA L. BALES

Professional Qualifications

Ms. Bales has over 25 years of experience in the environmental industry. Her experience includes providing data validation services, working as a laboratory analyst, performing regulatory compliance inspections, and serving as a program manager for a state environmental regulatory agency. She has extensive experience in providing data validation services for large, multidisciplinary environmental projects. These projects have included site investigations and remedial actions at CERCLA sites and incineration and thermal desorption system performance tests. Data validation services have included reviewing analytical data to determine compliance with both U.S. EPA national and regional guidelines, including Contract Laboratory Program (CLP) Functional Guidelines and project specific quality objectives. Deviations from required quality control objectives found during these reviews have been evaluated as required to determine the affect on analytical results and the affect on project objectives including any corrective actions required. Data validation services have been provided for projects that have been conducted under a number of regulatory programs including CERCLA, RCRA, CAA, CWA, TSCA and various state regulatory programs. Ms. Bales also has experience in complying with waste transportation regulations and industry guidelines, including U.S. DOT regulations and IATA. Ms. Bales has also developed Field Sampling and Analysis Plans, Feedstream Analysis Plans, and Quality Assurance Project Plans for a variety of types of projects.

Education

B.S., Environmental Science, Livingston University, Livingston, Alabama; August, 1980

Experience and Background

1998 - Present <u>Data Validation Manager, Focus Environmental, Knoxville, TN.</u> Primary responsibilities include providing analytical data review (data validation) for compliance with project specific quality objectives and managing data validation projects. Data validation services for each project include providing a comprehensive data validation report with summary tables of deviations from the prescribed data quality objectives and their affect on the quality of the analytical data. Other responsibilities include development of Quality Assurance Project Plans, Field Sampling Plans, Sampling and Analysis Plans, Feedstream Analysis Plans, and Performance Test Plans. Ms. Bales also provides internal technical assistance to Project Managers as needed to address various types of sampling and analytical issues.

1991 - 1997 <u>Data Validation Project Manager, IT/Quanterra Field Analytical Services, Knoxville, TN.</u> Primary responsibility involved supervisory reviews of analytical data validation conducted by junior data validators for consistency and accuracy. Also responsible for management of personnel to meet project schedule and budget requirements. Projects included QA/QC review (data validation) of data from the U.S. Department of Energy Hazardous Waste Remedial Actions Program (HAZWRAP), validation of data for compliance with U.S. EPA Contract Laboratory Program (EPA-CLP) requirements, and validation of data and development of validation guidelines from project SOPs for non-CLP data. Other responsibilities include writing analytical data validation reports, developing sampling and quality assurance plans, and providing technical assistance to clients as necessary.

1989 - 1990 Environmental Quality Coordinator over the Water Quality Management Unit, Louisiana Department of Environmental Quality, Baton Rouge, Louisiana. Responsible for the overall coordination and supervision of the activities of the personnel in this unit. These activities included development and negotiation of work plans and applications to obtain federal grant money, managing state contracts including tracking invoices and submittal of deliverables, managing U.S. EPA grants to assure that all grant commitments were met and that moneys were spent appropriately, development and implementation of the states Non-point Source Pollution program, and the development and updating of Water Quality Management Plan Documents.

1987 - 1989 Environmental Quality Specialist, Biotoxicity Laboratory, Louisiana Department of Environmental Quality, Baton Rouge, Louisiana. Responsibilities included culturing test organisms (*Daphnia pules*, *Ceriodaphnia dubia*, *Pimnephales promelas*, *Cyprinodan variezatus*, and *Mysidopsis tabia*), performing acute and chronic toxicity test using these organisms and managing the wet chemistry lab for the regional office.

1985 - 1987 Environmental Quality Specialist, Louisiana Department of Environmental Quality, Baton Rouge, Louisiana. Responsibilities included inspection of state and federally permitted facilities for compliance with NPDES and state water regulations, inspection of un-permitted facilities to identify possible discharge sources, responding to citizens complaints, collecting water, fish, and sediment samples for analysis, setting up and managing a wet chemistry laboratory for the regional office, assisting in biotoxicity analysis, and assisting in stream surveys.

1983 - 1985 Environmental Specialist, Industrial Waste Division, Oklahoma State Department of Health, Oklahoma City, Oklahoma. Responsibilities included enforcing RCRA and State Industrial Waste Regulations. This included inspection of waste generators, transporters and treatment-storage-disposal facilities (TSD), providing technical assistance to facilities concerning industrial and hazardous waste issues, response to and follow-up monitoring of spills and clean-ups, and work with DOT regulations to provide assistance to facilities during the transition from using individual state manifests to the RCRA uniform manifest system.

1982 - 1983 Environmental Specialist, Oklahoma State Department of Health, Oklahoma City, Oklahoma. Responsibilities included all aspects of environmental health at the county level. Tasks included inspection and enforcement of state regulations for food establishments, lodging, public water supply and sewage treatment facilities, solid waste disposal sites, swimming pools, and private water supplies and sewage systems. Also worked rabies complaints, nuisance complaints, and provided technical assistance for environmentally related problems.

1982 Laboratory Technician, Champion Chemicals, Inc., Oklahoma City, Oklahoma. Responsibilities included performing a variety of types of chemical and physical analyses including water analysis for chlorides, calcium, magnesium, iron, barium, sulfate, phosphate, pH, alkalinity, oil carryover, and the calculation of scaling index; analysis of scale deposit samples to determine the existence and ratios of given constituents and insoluble materials; corrosion and scale coupon analysis; and paraffin dispersion and inhibition test.

1981 - 1982 Oil Well Logging Engineer, The Analyst/Schiumberger, Lafayette, Louisiana. Responsibilities included recording and drawing logs of drilling parameters, collection and description of cutting samples, calibration and maintenance of equipment and monitoring hydrocarbon GC readings for hydrocarbons in the well.

Selected Publications & Presentations

1. Holcomb, D.H., C. H. Vail, and T. M. White, Establishing Risk-Based Acceptable Ambient Air Concentrations and Offsite Ambient Air Monitoring, Remediation of Chlorinated and Recalcitrant Compounds Conference, Monterey, California, May, 2000.

2. Eicher, Anthony R., Teresa White, and Ron McLeod, Evaluation of the Recovery of Volatile Organic Compounds on Solids Sorbents Used in Stack Gas Sampling Systems, International Thermal Treatment Conference, New Orleans, Louisiana, May 2002.

William C. Anderson, Ph.D

Senior Chemical and Analytical Project Consultant

Qualifications Summary

Dr. Anderson is a senior chemical and analytical project consultant with particular expertise in analytical methodology and supporting quality assurance programs related to trial burn programs. He has extensive project experience regarding the analytical program design of incinerator and ambient air permitting activities. As an analytical chemist he directly participates in the design and implementation of new analytical methods developments, project specific testing, and supporting quality assurance protocols. Much of the work produced by Dr. Anderson and his staff is used to generate legally defensible performance demonstration test reports that are to be judged by various regulatory agencies including the EPA and state authorities. Dr. Anderson and his associates staff write detailed analytical project plans, quality assurance project plans (QAPPs), and final trial burn report publications. He currently serves as the division manager for TestAmerica Knoxville's Analytical Consulting Services (ACS) group. He has twenty (24) years of continuous service within the Analytical Services Division.

Background

Division Manager and Senior Project Consultant
Analytical Consulting Services (ACS) Division of TestAmerica Knoxville, formerly Severn Trent Services, Inc. Knoxville, TN—1997 to Present

Senior Chemical and Analytical Project Consultant
Severn Trent Services, Inc. Analytical Consulting Services
Knoxville, TN--1990 to 1997
Responsibilities include:

- Direct supervision of an analytical project management staff during the implementation of various analytical and quality assurance project activities.
- Acting as Analytical Program Manager for permitting activities associated with incineration and other thermal treatment permitting and environmental cleanup projects.
- Provision of Analytical Quality Assurance oversight for regulatory agencies (State and EPA) conducting waste incineration or thermal treatment at various commercial locations or Superfund sites.
- Acting as Analytical Program Quality Assurance Manager for permitting activities associated with incineration and other thermal treatment environmental cleanup projects.
- Supervision of an analytical project staff responsible for the completion of various technical projects including trial burns and quality assurance planning.

Some key project roles for Dr. Anderson include:

- Senior Analytical Project Manager for the New Waste Calciner Facility Off-gas Sample Characterization at Idaho National Engineering and Environmental Laboratories (INEEL) for Bechtel BWXT Idaho, LLC (formerly Lockheed Martin Idaho Technologies Company, LMITCO) possible permitting activities (1999-2000).
- Senior Analytical Project Manager for the Background Soils Investigation at the Umatilla Chemical Agent Disposal Facility (UMCDF) in Hermiston, Oregon, for Raytheon Demilitarization Company (1998).

- Senior Analytical Project Manager for the Chemical Agent Munitions Disposal System (CAMDS) Sampling and Characterization of GB Ton Containers at the Deseret Chemical Depot in Tooele, Utah, for Battelle Columbus (1998).
- Quality Assurance Manager and Analytical Project Manager for the Times Beach Remediation Project trial burn at St. Louis, Missouri (1996)
- Quality Assurance Manager and Analytical Project Manager for the Chemical Agent Munitions Disposal System (CAMDS) Trial Burn on the Metal Parts Furnace (MPF) at Tooele Army Depot in Tooele, Utah (1995)
- Analytical Project Manager for EPA Region VI Thermal Treatment Initiative that included the publication of Quality Assurance Project Plan (QAPjP) guidance document for trial burns. The guidance incorporated SW-846 Update III methods for trial burn samples (1997).
- Analytical Project manager for Schenectady Chemical International trial burn in EPA Region II and the State of New York DEC (1997).
- Analytical Project Manager for Aberdeen Pesticides Dumps Site in Aberdeen, North Carolina. Primacy oversight was conducted be EPA Region IV, and the State of North Carolina, (1997).
- Quality Assurance and Analytical Project Manager for trial burn incinerator performance testing at Bayou Bonfouca Superfund Site in Slidell, Louisiana.
- Quality Assurance consultant to the State of Arkansas and EPA Region VI for conducting oversight of contractor performance during trial burn testing at the Old Midland Superfund Site in Ola, Arkansas.
- Analytical Program Manager for the development of Quality Assurance Plans specifically designed to permit an onsite incinerator at the Times Beach Superfund Site in Times Beach, Missouri. This permit uniquely qualified the incinerator to process dioxin and furan soil and waste in the State of Missouri and EPA Region VII.

* Severn Trent Services was created in February 2000 when Severn Trent bought Quanterra, Inc.

* Quanterra Environmental Services was created in June 1994 when IT Corporation's Analytical Services Division merged with ENSECO's laboratory group.

Special Projects Coordinator and Analytical Program Manager
Field Analytical Services Division of IT Corporation--
Knoxville, TN--1987 to 1990
Responsibilities included:

Some key project roles for Dr. Anderson include:

- Direct supervision of analytical project staff during the planning and implementation of trial burn projects.
- Management of the execution of specialized laboratory testing during trial burn projects requiring legally defensible data.
- Management of analytical project designs including testing method requirements and project specific data quality objectives (DQO's).
- Analytical program manager on Resource Conversation and Recovery Act (RCRA) trial burn for Pfizer Chemicals, Inc. in Groton, Connecticut.
- Analytical program manger on trial burn for Department of Energy's Dual Purpose RCRA/Toxic Substance Control Act (TSCA) incinerator in Oak Ridge, Tennessee.
- Analytical program manger on RCRA trial burn at Schenectady Chemical Company in Schenectady, New York.

- Analytical program manager on RCRA trial burn at Searle Pharmaceuticals, Inc. in Augusta, Georgia.
- Direct participation in RCRA and TSCA trial burn projects in the role of Analytical Program Manager or Quality Assurance Manager.

Senior Field Analytical/Field Sampling Specialist
Field Analytical Services Division of IT Corporation--
Knoxville, TN--1983-1987
Responsibilities included:

- Analytical project management on U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) polychlorinated biphenyls (PCB) trial burn at Tooele Army Depot in Utah.
- Project Management of field sampling and analytical activities for Y-12's Bear Creek Valley field assessment program.
- Sampling and analysis coordination for conducting EPA's mobile incinerator dioxin trial burn in Missouri.
- Sampling and analysis coordination for pollution abatement testing and performance assessment at the Tooele Army Depot in Utah incinerator for agent munitions.
- Field supervision at Pine Bluff, Arkansas train derailment for sampling and analysis during site remediation activities.
- Project manager for a site assessment at Reichhold Chemicals, Inc. in Tacoma, Washington.
- In-house laboratory project manager for projects requiring specialized sampling handling. Included are special chemical preps, procurement of field operation supplies, data review, and nonroutine analyses.

Teaching and Laboratory Assistant, Graduate Research Assistant
University of Tennessee Chemistry Department
Knoxville, TN --1978-1983
As a student teaching and research assistant, taught undergraduate and upper-level graduate courses in chemistry for a research stipend. Concurrently executed an individual research project as part of the university graduate program.

Education

Ph.D., Analytical Chemistry--
University of Tennessee--Knoxville, TN--1988

B.A., Chemistry--
University of Tennessee--Knoxville, TN--1975

Professional Affiliations

American Chemical Society

Alpha Chi (Chemistry) Fraternity

Publications

J. C. Lodmell, W. C. Anderson, M. F. Hurley, and J. Q. Chambers, "High Performance Liquid Chromatography of Electrolysis Solutions: A Study of the Reduction of Carbon Disulfide in N,N-Dimethylformamide", Analytica Chemica Acta, 1981, 129, 49.

Hu-lin Li, W. C. Anderson, J. Q. Chambers, and D. T. Hobbs, "Electrocatalytic Reduction of Nitrate in Sodium Hydroxide Solution in the Presence of Low-Valance Cobalt Cyclam Species," Inorganic Chemistry, 1989, 28, 863.

R.G. Wilbourn, W.C. Anderson and M.L. Foster, "Planning and Implementing Effective Thermal Site Remediation Operations", IT Corporation Technology Exchange Symposium, June 1992.

M.L. Keever, R.L. McBride, and W.C. Anderson, "Demonstrated Stability of Hexavalent Chromium (Cr^{+6}) in Spiked Stack Gas Samples Analyzed by EPA Method 218.6", IT Corporation Technology Exchange Symposium, June 1993.

P. B. Carswell, D. C. Wasmund, and W. C. Anderson, "The Application of Traditional Data Quality Objectives (DQOs) to the Measurement of Stack Gas Unspeciated Mass: Techniques and Observations", presented at the 1999 International Conference on Incineration & Thermal Treatment Technologies (IT3), published in Elsevier Science Ltd., Waste Management Journal 20 (5-6) (2000) pp. 385-394.

P. B. Carswell, D. C. Wasmund, and W. C. Anderson, "The Derivation of Procedurally Corrected Method Detection Limits for Use in Source Emission Risk Assessment Evaluation", presented at the 2001 International Conference on Incineration & Thermal Treatment Technologies (IT3).

P. B. Carswell, D. C. Wasmund, and W. C. Anderson, "Preparation of Incinerator Organic Waste Feed Materials for the Determination of Low-Level Total Metals Content to Meet Compliance Data Quality Objectives", presented at the 2003 International Conference on Incineration & Thermal Treatment Technologies (IT3).

Patti Carswell, Kevin R. McGee, Donald C. Wasmund, and William C. Anderson, "The Combination of TCO/GRAV Unspeciated Mass Sampling Trains with Method 0010 Semivolatile Trains", presented at the IT3 Conference, May 9-13, 2005, Galveston, Texas.

TRC

MICHAEL J. KRALL

EDUCATION

B.S., Chemistry, State University of New York at Oswego, Oswego, NY, 1979
A.A.S., Chemical Technology, Broome Community College, Binghamton, NY, 1977

PROFESSIONAL REGISTRATIONS/CERTIFICATIONS

- DOT Certified (49 CFR Parts 382, 387, 391, 395, and 396), 2003 through Present

AREAS OF EXPERTISE

Mr. Michael J. Krall has over 27 years experience encompassing:

- Refinery and Petrochemical Measurements and Process Optimization
- Hazardous Waste Trial Burn and Comprehensive Performance Test Programs.
- Boilers and Industrial Furnace (BIF) Certification and Trial Burn Programs.
- Stationary Source Emissions Testing.
- Engineering Studies and Technology Design

REPRESENTATIVE EXPERIENCE

Mr. Krall serves as the Central Region Practice Leader for TRC's National Air Measurements Groups. His fields of experience include managing and actively participating in a variety of air measurements programs ranging from medium-size compliance demonstrations for regulatory air permitting of utility sources to large-scale, multi-condition trial burns for combustion sources. Due to his active involvement in the actual on-site testing efforts and subsequent analyses during his projects, Mr. Krall has remained knowledgeable in the most current versions of the organic and inorganic sampling and analysis methods that are applied within the air testing area. That knowledge has formed the basis for his ability to understand the issues of data quality throughout the entire measurement process: sample collection to final analytical result and interpretation within the applicable environmental regulations or industry process.

In addition to managing these types of testing programs, Mr. Krall has the capabilities to develop the test plans, trial burn plans, quality assurance project plans, and test reports that support the actual testing efforts. While developing these documents, Mr. Krall has frequently represented his clients during negotiations and settlements with federal and state regulatory agencies to provide those clients the most operating flexibility that has translated directly into cost effectiveness. His client list includes major chemical and petrochemical companies, tire production chemical companies, and hazardous waste-burning

facilities regulated by EPA's Boiler and Industrial Furnaces (BIF) rules, as well as major electric power companies.

His responsibilities have also included serving as project manager for projects involving non-point sources to develop emission factors. Mr. Krall is an expert in EPA reference protocols, the application of recognized "state-of-the-art" methods, and preparation of Trial Burn Plans, Quality Assurance Project Plans (QAPjP), and Risk Assessment/Air Dispersion Modeling Work Plans. He has directed and participated in several Trial Burns and emissions characterization programs for power generating plants, hazardous waste incinerators, and industrial units subject to EPA's Boiler and Industrial Furnace (BIF) regulations.

Hazardous Waste Trial Burn and Comprehensive Performance Test Programs

Eastman Kodak Company, MACT Comprehensive Performance Test - Rochester, NY (Field Supervisor: 2004-05)

Mr. Krall served as onsite Field Supervisor for a Maximum Achievable Control Technology (MACT) testing program on Building 218 Rotary Kiln Incinerator. Responsibilities included selection of qualified staff, on-site direction of testing activities, client interfacing, and operation of testing equipment.

Westinghouse Anniston Chemical Demil Group, Agent Trial Burn Program - Anniston, AL (Field Supervisor: 2003-05)

Mr. Krall participated in the Deactivation Furnace System (DFS) surrogate trial burn program and an Agent Trial Burn (ATB) program at the Anniston, Alabama Army Depot. His responsibilities included performing isokinetic sampling, maintaining isokinetic conditions, and related documentation.

The Dow Chemical Company, Trial Burn and Indirect Risk Assessment - Plaquemine, LA (Project Director/Field Supervisor: 1997-98)

Mr. Krall served as Project Director and onsite Field Supervisor for Trial Burns involving three BIF boiler units at the Dow Chemical Company in Plaquemine, Louisiana. Each Trial Burn consisted of multiple test conditions to establish permit limits and generate emission data for an indirect risk assessment. His responsibilities included direct interfacing with regulatory personnel, direction of all sampling activities (including solid and liquid samples), and developing the final reports for submittal to EPA and State of Louisiana agencies. The reports were all accepted and approved in 1998.

North Texas Cement Company, Waste-Derived Fuels - Midlothian, TX (Project Director: 1985-92)

Mr. Krall served as Project Manager, Project Director, and Field Supervisor for Trial Burn testing at North Texas Cement Company in Midlothian, Texas. For this major Portland cement producing facility, he oversaw a multi-faceted

program which included Trial Burn Plan, Test Plan, and QAPjP development, Trial Burn sampling and analysis, air dispersion modeling, BACT analysis, permitting issues, and communication with the client and their environmental attorneys, other contractors, and EPA and TACB regulatory personnel. The program enabled the cement facility to address all the regulatory requirements to burn waste derived fuel as a supplement with their fossil fuels.

Chemical Waste Management, Commercial Hazardous Waste Incinerator - Port Arthur, TX (Field Supervisor: 1989-92)
Mr. Krall served as an active participant in the sampling and analysis program for Chemical Waste Management's commercial hazardous waste incinerator in Port Arthur, Texas. His primary responsibilities included overseeing the daytime field test team, operating simultaneous organic sampling trains, and interfacing with the analytical laboratories during sample analyses.

Boilers and Industrial Furnace (BIF) Certification and Trial Burn Programs
Diversified Scientific Services, Inc., Mixed Waste BIF Trial Burn Program - Kingston, TN (Project Manager: 1992-Present)
Mr. Krall served as Project Manager for multiple-test-condition, Trial Burn for a mixed waste BIF boiler at Diversified Scientific Services, Inc. in Kingston, Tennessee. Responsibilities have included direct interfacing with regulatory agencies and the management and development of the Trial Burn Plan, QAPjP, and Risk Assessment/Air Dispersion Modeling Work Plan for submittal to EPA and State of Tennessee agencies. DRE of volatile and semivolatile POHCs were determined as well as emissions for particulate matter, particle sizing, HC1/Cl_2, dioxins/ furans, PAHs, aldehydes/ketones, total organic emissions, and continuous emission monitoring.

Rohm and Haas Company, BIF Trial Burn/Risk Burn Program - Louisville, KY (Field Supervisor: 2003-04)
Mr. Krall served as the Field Supervisor during the June 2003 BIF Trial Burn/Risk Burn of Boiler No. 100 at the Rohm and Haas chemical plant in Louisville, Kentucky. Responsibilities included staff selection, direction of testing activities, client interface, operation of testing equipment, and reporting of results.

Goodyear Tire and Rubber Company, BIF Trial Burn Program - Beaumont, TX (Project Manager: 1994-2000)
Mr. Krall served as Project Manager for a Trial Burn of a BIF boiler at the Goodyear Tire & Rubber Company in Beaumont, Texas. The Trial Burn was comprised of several test conditions and testing included DRE of a volatile POHC and emissions for particulate matter, particle sizing, HC1/Cl_2, dioxins/furans, PAHs, aldehydes/ketones, total organic emissions, and continuous emission monitoring. His responsibilities included the management and development of the Trial Burn Plan, QAPjP, and the Trial Burn Report.

Compliance Certification of RCRA BIF Regulations – Various Locations (Project Manager: 1991-Present)
Mr. Krall served as Project Manager and Project Director for several programs for industrial clients to support the Compliance Certification of the RCRA BIF Regulations. The program work scopes included Trial Burn Plan/QAPjP development, CEM system designs and certifications, source and process testing, and the preparation of the BIF Certifications of Compliance reports.

Stationary Source Emissions Testing

ExxonMobil Corporation, Air Quality Support Services, Refinery and Chemical Plant - Baytown, TX (Program Manager: 1995-Present)
Mr. Krall served as Program Manager for all source testing and air measurement projects conducted at the ExxonMobil Refining and Chemical Plant Complex in Baytown, Texas. Responsibilities include consultation with ExxonMobil environmental and process operations staff, schedule and budget management, the development of testing design to comply with required regulations, staff selection and direction of test activities, and reporting and reviewing results.

Engineering Studies and Technology Design

Dow Chemical USA, 40 CFR Part 63 Subpart MMM Comprehensive MACT Test -Midland,MI (Program Manager: 2003-Present)
Mr. Krall serves as Program Manager for 40 CFR Part 63 Subpart MM Comprehensive Performance Testing to satisfy the MACT requirements of The Dow Chemical Company in Midland, Michigan. The testing involves multiple sources and control devices using standard and non-standard methodologies. Responsibilities include overall program direction and budget management, participation in the on-site testing activities, testing direction, client interface, and reporting.

Power Generating Units, SCR Performance Measurement Test Programs - Various Locations (Program Manager: 1999-Present)
Mr. Krall served as Program Manager for several performance measurement test programs involving the installation of SCR technology at power generating units. The test programs include the determination of ammonia slip, NO_x reduction, SO_2 oxidation, and H_2SO_4 emission rates. Onsite analyses of several parameters were performed to provide near-real time results to assist in the successful tuning of the SCR systems.

American Petroleum Institute, High-Volume Air Sampling Equipment - Austin, TX (Project Director: 1984-86)
Mr. Krall provided project direction for the American Petroleum Institute (API) in the development of emission factors for particulate matter and heavy metals from non-point source coke handling operations related to petroleum refineries. Mr.

Krall directed the design and manufacturing of the high-air volume sampling equipment, directed the onsite testing and meteorological data gathering, and the subsequent analyses and reporting of the non-point source emission rates/factors.

SPECIALIZED TRAINING

- Project Manager Training, November 1991
- 40-Hour Hazardous Waste Site Training Course, OSHA 29 CFR 1910.120(e)(3), WESTON (1989)
- 8-hour Site Safety Supervisor, OSHA 29 CFR 1910.120
- Department Manager Training, November 1994
- 10 – hour OSHA Construction Safety, October 2005

PROFESSIONAL AFFILIATIONS

- Air and Waste Management Association, 2003 – Present

SELECTED PUBLICATIONS AND PRESENTATIONS

Krall, M., *Practical Experience Using the Emission Testing Methods Included in the Hazardous Waste Combustor MACT (Special Focus on Sample Handling and Shipping)*, Presented at the AWMA Hazardous Waste Combustors 2003: "Adopt A MACT" Specialty Conference and Exhibition in Charleston, SC, April 2003.

Krall, M., *FTIR and Advanced Gas Emissions Detection Techniques: They're Not Just for Breakfast (or Low-Level Emissions) Anymore*, Presented at the National Petroleum Refiners Environmental Conference in Austin, Texas, September 2007.

ATTACHMENT B
LELAP APPROVALS

TRC ENVIRONMENTAL, INC.

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DEQ LOUISIANA

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Is hereby granting a Louisiana Environmental Laboratory Accreditation to:

Louisiana Environmental Lab Accreditation Program LELAP

TRC Environmental Corporation
2100 Kramer Lane, Suite 800
Austin, TX 78758

Agency Interest No. 30783

According to the Louisiana Administrative Code, Title 33, Part I, Subpart 3, LABORATORY ACCREDITATION, the State of Louisiana formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed in the attachment.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part I, Subpart 3 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part I. Please contact the Department of Environmental Quality, Louisiana Environmental Laboratory Accreditation Program (LELAP) to verify the laboratory's scope of accreditation and accreditation status. Accreditation by the State of Louisiana is not an endorsement or a guarantee of validity of the data generated by the laboratory, and does not constitute an endorsement of the suitability of the listed methods for any specific application.

To be accredited initially and maintain accreditation, the laboratory agrees to participate in two single-blind, single-concentration PT studies, where available, per year for each field of testing for which it seeks accreditation or maintains accreditation as required in LAC 33:I.4711.

Melvin C. Mitchell Sr., Accreditation Officer
Louisiana Environmental Laboratory Accreditation Program

Certificate Number: 02094
Expiration Date: June 30, 2008
Issued On: July 1, 2007

Louisiana Environmental Laboratory
LELAP
Accreditation Program

Laboratory Scope of Accreditation

Organization

02094 (512) 684-3438
TRC Environmental Corporation
2100 Kramer Lane, Suite 800
Austin, TX 78758

Louisiana Stack Testing Program Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
1118	ALT-009	Alternative Method 5 Post-Test Calibration	Accredited	3/16/2004	STATE	LA
1120	ALT-011	Alt. Method 2 Thermocouple Calibration	Accredited	3/16/2004	STATE	LA
1178	CEMS PS 1 40 CFR 60 App. B	Opacity	Accredited	3/16/2004	STATE	LA
1180	CEMS PS 2 40 CFR 60 App. B	Nitrogen Oxides (NOx)	Accredited	3/16/2004	STATE	LA
1180	CEMS PS 2 40 CFR 60 App. B	Sulfur dioxide	Accredited	3/16/2004	STATE	LA
1181	CEMS PS 3 40 CFR 60 App. B	Carbon dioxide	Accredited	3/16/2004	STATE	LA
1181	CEMS PS 3 40 CFR 60 App. B	Oxygen	Accredited	3/16/2004	STATE	LA
1182	CEMS PS 4 40 CFR 60 App. B	Carbon monoxide (CO)	Accredited	3/16/2004	STATE	LA
1183	CEMS PS 4A 40 CFR 60 App. B	Carbon monoxide (CO)	Accredited	3/16/2004	STATE	LA
1185	CEMS PS 5 40 CFR 60 App. B	Total reduced sulfur	Accredited	3/16/2004	STATE	LA
1186	CEMS PS 6 40 CFR 60 App. B	Stack gas velocity volume flow rate	Accredited	3/16/2004	STATE	LA
1187	CEMS PS 7 40 CFR 60 App. B	Hydrogen sulfide	Accredited	3/16/2004	STATE	LA
1206	CTM-027	Ammonia as N	Accredited	6/11/2007	STATE	LA
1217	Method 1 40 CFR 60 App. A	Traverse Points	Accredited	7/1/2003	STATE	LA
1218	Method 10 40 CFR 60 App. A	Carbon monoxide (CO)	Accredited	7/1/2003	STATE	LA
1240	Method 15 40 CFR 60 App. A	Hydrogen sulfide	Accredited	6/11/2007	STATE	LA
1247	Method 19 40 CFR 60 App. A	Nitrogen Oxides (NOx)	Accredited	3/16/2004	STATE	LA
1247	Method 19 40 CFR 60 App. A	Particulates SO2 NOx sulfur removal efficiency	Accredited	3/16/2004	STATE	LA
1247	Method 19 40 CFR 60 App. A	Sulfur dioxide	Accredited	3/16/2004	STATE	LA
1249	Method 2 40 CFR 60 App. A	Stack gas velocity volume flow rate	Accredited	7/1/2003	STATE	LA
1250	Method 20 40 CFR 60 App. A	Nitrogen Oxides (NOx)	Accredited	3/16/2004	STATE	LA
1250	Method 20 40 CFR 60 App. A	Oxygen	Accredited	3/16/2004	STATE	LA
1250	Method 20 40 CFR 60 App. A	Sulfur dioxide	Accredited	3/16/2004	STATE	LA
1265	Method 25A 40 CFR 60 App. A	Gaseous Organic Emissions	Accredited	7/1/2003	STATE	LA
1272	Method 2B 40 CFR 60 App. A	Stack gas velocity volume flow rate	Accredited	7/1/2003	STATE	LA
1279	Method 3 40 CFR 60 App. A	Carbon dioxide oxygen dry molecular weight	Accredited	7/1/2003	STATE	LA
1296	Method 3A 40 CFR 60 App. A	Carbon dioxide	Accredited	7/1/2003	STATE	LA

Issue Date: July 1, 2007
Expiration Date: June 30, 2008

Louisiana Environmental Laboratory
LELAP
Accreditation Program

Laboratory Scope of Accreditation

Organization

02094 **(512) 684-3438**
TRC Environmental Corporation
2100 Kramer Lane, Suite 800
Austin, TX 78758

Louisiana Stack Testing Program Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
1296	Method 3A 40 CFR 60 App. A	Oxygen	Accredited	7/1/2003	STATE	LA
1302	Method 4 40 CFR 60 App. A	Moisture content	Accredited	7/1/2003	STATE	LA
1303	Method 5 40 CFR 60 App. A	Particulates	Accredited	3/16/2004	STATE	LA
1311	Method 5I 40 CFR 60 App. A	Particulates	Accredited	3/16/2004	STATE	LA
1315	Method 6C 40 CFR 60 App. A	Sulfur dioxide	Accredited	7/1/2003	STATE	LA
1321	Method 7E 40 CFR 60 App. A	Nitrogen Oxides (NOx)	Accredited	7/1/2003	STATE	LA
1813	Method 18 40 CFR 60 App. A (Sample Only)	Gaseous Organic Compound Emissions	Accredited	6/11/2007	STATE	LA
1857	Method 26 40 CFR 60 App. A (Sample Only)	Bromine (Br2)	Accredited	7/1/2003	STATE	LA
1857	Method 26 40 CFR 60 App. A (Sample Only)	Chlorine	Accredited	7/1/2003	STATE	LA
1857	Method 26 40 CFR 60 App. A (Sample Only)	Hydrochloric acid (Hydrogen chloride (gas only))	Accredited	7/1/2003	STATE	LA
1857	Method 26 40 CFR 60 App. A (Sample Only)	Hydrogen Bromide (HBr)	Accredited	7/1/2003	STATE	LA
1857	Method 26 40 CFR 60 App. A (Sample Only)	Hydrogen fluoride (Hydrofluoric acid)	Accredited	7/1/2003	STATE	LA
1859	Method 26A 40 CFR 60 App. A (Sample Only)	Bromine (Br2)	Accredited	3/16/2004	STATE	LA
1859	Method 26A 40 CFR 60 App. A (Sample Only)	Chlorine	Accredited	3/16/2004	STATE	LA
1859	Method 26A 40 CFR 60 App. A (Sample Only)	Hydrochloric acid (Hydrogen chloride (gas only))	Accredited	3/16/2004	STATE	LA
1859	Method 26A 40 CFR 60 App. A (Sample Only)	Hydrogen Bromide (HBr)	Accredited	3/16/2004	STATE	LA
1859	Method 26A 40 CFR 60 App. A (Sample Only)	Hydrogen fluoride (Hydrofluoric acid)	Accredited	3/16/2004	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Antimony	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Arsenic	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Barium	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Beryllium	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Cadmium	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Chromium	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Cobalt	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Copper	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Lead	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Manganese	Accredited	7/1/2003	STATE	LA

Issue Date: July 1, 2007
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Louisiana Environmental Laboratory
LELAP
Accreditation Program

Laboratory Scope of Accreditation

Organization

02094 (512) 684-3438
TRC Environmental Corporation
2100 Kramer Lane, Suite 800
Austin, TX 78758

Louisiana Stack Testing Program Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Mercury	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Nickel	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Phosphorus total	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Selenium	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Silver	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Thallium	Accredited	7/1/2003	STATE	LA
1861	Method 29 40 CFR 60 App. A (Sample Only)	Zinc	Accredited	7/1/2003	STATE	LA
1977	SW-846 0010 (Sample Only)	Modified Method 5 Sample Train	Accredited	7/1/2003	STATE	LA
1983	SW-846 0023A (Sample Only)	Dioxin & Furan Sampling System	Accredited	7/1/2003	STATE	LA
1985	SW-846 0030 (Sample Only)	Volatile Organic Sampling Train (VOST)	Accredited	7/1/2003	STATE	LA
1987	SW-846 0031 (Sample Only)	Sampling Method for VOCs (SMVOC)	Accredited	7/1/2003	STATE	LA
1989	SW-846 0040 (Sample Only)	PAH Sampling with Tedlar Bags	Accredited	7/1/2003	STATE	LA
1991	SW-846 0050 (Sample Only)	Isokinetic HCl/Cl2 Sampling Train	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Antimony	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Arsenic	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Barium	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Beryllium	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Cadmium	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Cobalt	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Copper	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Lead	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Manganese	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Mercury	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Nickel	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Particulates	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Phosphorus total	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Selenium	Accredited	7/1/2003	STATE	LA

Issue Date: July 1, 2007
Expiration Date: June 30, 2008

Print Date 6/20/2007 11:46:42 AM

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Louisiana Environmental Laboratory
LELAP
Accreditation Program

Laboratory Scope of Accreditation

Organization

02094 (512) 684-3438
TRC Environmental Corporation
2100 Kramer Lane, Suite 800
Austin, TX 78758

Louisiana Stack Testing Program Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
1995	SW-846 0060 (Sample Only)	Silver	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Thallium	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Total chromium	Accredited	7/1/2003	STATE	LA
1995	SW-846 0060 (Sample Only)	Zinc	Accredited	7/1/2003	STATE	LA
10064207	EPA 350.3	Ammonia as N	Accredited	6/11/2007	STATE	LA

Issue Date: July 1, 2007
Expiration Date: June 30, 2008

SEVERN TRENT LABORATORIES

KNOXVILLE, TN

(NOW TESTAMERICA)

DEPARTMENT OF ENVIRONMENTAL QUALITY
KATHLEEN BABINEAUX BLANCO
GOVERNOR
MIKE D. McDANIEL, Ph.D.
SECRETARY

CERTIFIED MAIL #7007 0710 0005 6108 0949
Return Receipt Requested

rec'd 07/05/07

June 30, 2007

AI #83979 **LELAP Certificate #03079**

Mr. Chris Rigell
TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

RE: Accreditation Certificate

Dear Mr. Rigell:

In accordance with Louisiana Administrative Code, Title 33, Part I, Subpart 3, Laboratory Accreditation, the State of Louisiana formally recognizes that this laboratory has successfully completed the accreditation process and is technically competent to perform the environmental analyses listed on the scope of accreditation detailed in the attachment. Accreditation does not constitute an endorsement of the suitability of the listed methods for any specific purpose. Parameters or analytes that the laboratory has applied for accreditation not included in the scope of accreditation attachment are not accredited.

NELAP accreditation is granted **only** for those methods/analytes for which "NELAP" is indicated as the type of accreditation. "STATE" is indicated as the type of accreditation for those methods/analytes for which NELAP accreditation is not available. Accreditation is dependent on the laboratory's successful ongoing compliance with regulations as outlined in the Louisiana Administrative Code, Title 33, Part I, Subpart 3, Laboratory Accreditation.

The enclosed accreditation certificate is property of the State of Louisiana. Should a change in accreditation status occur, the Department may recall the original accreditation certificate and attachments. The recalled certificate and attachments should be returned

ENVIRONMENTAL **ASSESSMENT**
LABORATORY SERVICES DIVISION
: PO BOX 4314, BATON ROUGE, LA 70821-4314
P:225-219-9800 F:225-219-9898
WWW.DEQ.LOUISIANA.GOV

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to: Office of Environmental Assessment, Louisiana Environmental Laboratory Accreditation Program, P.O. Box 4314, Baton Rouge, LA 70821-4314, Attention: Dr. David L. Boucher.

LAC 33:I.5313.A requires that the laboratory report must include all relevant information. Therefore, the certificate number shall be placed in the upper right corner of all laboratory reports. If the test report includes results of any test for which the laboratory is not accredited, the unaccredited results must be clearly identified as such.

Please be advised that it is your responsibility to examine the scope of accreditation attachment for accuracy and completeness. If you find that an analyte for which you expected to be accredited is not listed, please examine your records to ensure that:

1. You have met the requirements for successful participation in proficiency test studies as outlined in LAC 33:I.4711 and in the NELAC Standard 2.7.2.

2. In the case of accreditation by recognition, the requested analyte must be listed for the requested method and matrix on both the certificate issued by the Primary AA ***and*** on the Louisiana application form.

If you have any questions, please contact the Louisiana Environmental Laboratory Accreditation Program at (225) 219-9800.

Sincerely,

Dr. David L. Boucher, Acting Supervisor
Louisiana Environmental Laboratory Accreditation Program

db

Enclosure

LDEQ-EDMS Document 36480307, Page 270 of 540

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Is hereby granting a Louisiana Environmental Laboratory Accreditation to:

TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

Agency Interest No. 83979

According to the Louisiana Administrative Code, Title 33, Part I, Subpart 3, LABORATORY ACCREDITATION, the State of Louisiana formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed in the attachment.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part I, Subpart 3 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part I. Please contact the Department of Environmental Quality, Louisiana Environmental Laboratory Accreditation Program (LELAP) to verify the laboratory's scope of accreditation and accreditation status. Accreditation by the State of Louisiana is not an endorsement or a guarantee of validity of the data generated by the laboratory, and does not constitute an endorsement of the suitability of the listed methods for any specific application.

To be accredited initially and maintain accreditation, the laboratory agrees to participate in two single-blind, single-concentration PT studies, where available, per year for each field of testing for which it seeks accreditation or maintains accreditation as required in LAC 33:I.4711.

Melvin C. Mitchell Sr., Accreditation Officer
Louisiana Environmental Laboratory Accreditation Program

Certificate Number: 03079
Expiration Date: June 30, 2008
Issued On: July 1, 2007

Louisiana Environmental Laboratory
LELAP
Accreditation Program

Laboratory Scope of Accreditation

Organization

03079 (865) 291-3000
TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

Solid and Chemical Materials Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
658	ASTM D445	Viscosity	Accredited	11/20/2003	STATE	LA
868	ASTM D 482	% ash	Accredited	11/20/2003	STATE	LA
869	ASTM D 240	BTU	Accredited	11/20/2003	NELAP	LA
2031	SOP KNOX-GC-0010	Total Organic Emissions	Accredited	9/11/2003	STATE	LA
2042	SOP KNOX-ID-0016	1-Methylnaphthalene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	1-Methylphenanthrene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	2,3,5-Trimethylnaphthalene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	2,6-Dimethylnaphthalene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	2-Methylnaphthalene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Acenaphthene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Acenaphthylene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Anthracene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(a)anthracene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(a)pyrene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(b)fluoranthene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(e)pyrene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(g h i)perylene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(k)fluoranthene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Biphenyl	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Chrysene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Dibenz(a h) anthracene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Fluoranthene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Fluorene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Indeno(1,2,3-c,d)pyrene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Naphthalene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Perylene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Phenanthrene	Accredited	10/17/2003	STATE	LA

Issue Date: July 1, 2007
Expiration Date: June 30, 2008

Louisiana Environmental Laboratory
LELAP
Accreditation Program

Laboratory Scope of Accreditation

Organization

03079 **(865) 291-3000**
TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

Solid and Chemical Materials Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
2042	SOP KNOX-ID-0016	Pyrene	Accredited	10/17/2003	STATE	LA
2061	SOP KNOX-ID-0013	Total Decachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Dichlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Heptachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Hexachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Monochlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Nonachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Octachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Pentachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Tetrachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Trichlorobiphenyl	Accredited	2/9/2004	STATE	LA
2066	ASTM D 5865	BTU	Accredited	11/20/2003	STATE	LA
2087	SOP KNOX-WC-0015, Rev. 1, 11/14/03	Soil Density	Accredited	12/3/2003	STATE	LA
2087	SOP KNOX-WC-0015, Rev. 1, 11/14/03	Specific Gravity of Drying Oils, Varnishes, Resins and Related Materials	Accredited	12/3/2003	STATE	LA
10002809	EPA 0040	Tedlar Bag Sampling	Accredited	9/11/2003	STATE	LA
10129201	EPA 1668	2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,4',5,6,6'-NoCB (2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,4',5,6-OcCB (2,2',3,3',4,4',5,6-Octachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ196)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,4',5-Heptachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,4',6,6'-OcCB (2,2',3,3',4,4',6,6'-Octachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,4',6-HpCB (2,2',3,3',4,4',6-Heptachlorobiphenyl) (BZ 171)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,4'-Hexachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5,5',6,6'-NoCB (2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl)	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5,5',6'-OcCB (2,2',3,3',4,5,5',6'-Octachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL

Issue Date: July 1, 2007
Expiration Date: June 30, 2008

Louisiana Environmental Laboratory
LELAP
Accreditation Program

Laboratory Scope of Accreditation

Organization

03079 **(865) 291-3000**

TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

Solid and Chemical Materials Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
10129201	EPA 1668	2,2',3,3',4,5,5',6-OcCB (2,2',3,3',4,5,5',6-Octachlorobiphenyl) (BZ 198)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5,5'-HpCB (2,2',3,3',4,5,5'-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5',6,6'-OcCB (2,2',3,3',4,5',6,6'-Octachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5,6,6'-OcCB (2,2',3,3',4,5,6,6'-Octachlorobiphenyl) (BZ 199)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5',6-HpCB (2,2',3,3',4,5',6-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5,6'-HpCB (2,2',3,3',4,5,6'-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5,6-HpCB (2,2',3,3',4,5,6-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5',6'-HpCB (2,2',3,3',4,5',6'-Heptachlorobiphenyl) (BZ 177)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5'-HxCB (2,2',3,3',4,5'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,5-HxCB (2,2',3,3',4,5-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,6,6'-HpCB (2,2',3,3',4,6,6'-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,6'-HxCB (2,2',3,3',4,6'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4,6-HxCB (2,2',3,3',4,6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',4-PeCB (2,2',3,3',4-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',5,5',6,6'-OcCB (2,2',3,3',5,5',6,6'-Octachlorobiphenyl)	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',5,5',6-HpCB (2,2',3,3',5,5',6-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',5,5'-HxCB (2,2',3,3',5,5'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',5,6,6'-HpCB (2,2',3,3',5,6,6'-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',5,6'-HxCB (2,2',3,3',5,6'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',5,6-HxCB (2,2',3,3',5,6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',5-PeCB (2,2',3,3',5-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',6,6'-HxCB (2,2',3,3',6,6'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3',6-PeCB (2,2',3,3',6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,3'-TeCB (2,2',3,3'-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4',5,5',6-OcCB (2,2',3,4,4',5,5',6-Octachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4',5,5'-Heptachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4',5,6,6'-OcCB (2,2',3,4,4',5,6,6'-Octachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL

Issue Date: July 1, 2007
Expiration Date: June 30, 2008

Louisiana Environmental Laboratory
LELAP
Accreditation Program

Laboratory Scope of Accreditation

Organization

03079 **(865) 291-3000**
TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

Solid and Chemical Materials Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
10129201	EPA 1668	2,2',3,4,4',5',6-Heptachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4',5,6'-HpCB (2,2',3,4,4',5,6'-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4',5,6-HpCB (2,2',3,4,4',5,6-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4',5'-Hexachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4',5-HxCB (2,2',3,4,4',5-Hexachlorobiphenyl) (BZ 137)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4',6,6'-HpCB (2,2',3,4,4',6,6'-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4',6'-HxCB (2,2',3,4,4',6'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4',6-HxCB (2,2',3,4,4',6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,4'-PeCB (2,2',3,4,4'-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4',5,5',6-Heptachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,5,5',6-HpCB (2,2',3,4,5,5',6-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,5,5'-Hexachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4',5,5'-HxCB (2,2',3,4',5,5'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4',5,6,6'-HpCB (2,2',3,4',5,6,6'-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,5,6,6'-HpCB (2,2',3,4,5,6,6'-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4',5,6'-HxCB (2,2',3,4',5,6'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4',5,6-HxCB (2,2',3,4',5,6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,5',6-HxCB (2,2',3,4,5',6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,5,6-HxCB (2,2',3,4,5,6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,5,6'-HxCB (2,2',3,4,5,6'-Hexachlorobiphenyl) (BZ 143)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4',5',6-HxCB (2,2',3,4',5',6-Hexachlorobiphenyl) (BZ 149)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4',5-PeCB (2,2',3,4',5-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,5-PeCB (2,2',3,4,5-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4',5'-PeCB (2,2',3,4',5'-Pentachlorobiphenyl) (BZ 97)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,5'-Pentachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4',6,6'-HxCB (2,2',3,4',6,6'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,6,6'-HxCB (2,2',3,4,6,6'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL

Issue Date: July 1, 2007
Expiration Date: June 30, 2008

Louisiana Environmental Laboratory
LELAP
Accreditation Program

Laboratory Scope of Accreditation

Organization

03079 **(865) 291-3000**
TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

Solid and Chemical Materials Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
10129201	EPA 1668	2,2',3,4',6-PeCB (2,2',3,4',6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,6'-PeCB (2,2',3,4,6'-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4,6-PeCB (2,2',3,4,6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4',6'-PeCB (2,2',3,4',6'-Pentachlorobiphenyl) (BZ 98)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4'-TeCB (2,2',3,4'-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,4-TeCB (2,2',3,4-Tetrachlorobiphenyl) (BZ 41)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,5,5',6-Hexachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,5,5'-PeCB (2,2',3,5,5'-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,5,6,6'-HxCB (2,2',3,5,6,6'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,5',6-PeCB (2,2',3,5',6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,5,6'-PeCB (2,2',3,5,6'-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,5,6-PeCB (2,2',3,5,6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,5-TeCB (2,2',3,5-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,5'-Tetrachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,6,6'-PeCB (2,2',3,6,6'-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,6'-TeCB (2,2',3,6'-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3,6-TeCB (2,2',3,6-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',3-TrCB (2,2',3-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4,4',5,5'-Hexachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4,4',5,6'-HxCB (2,2',4,4',5',6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4,4',5-PeCB (2,2',4,4',5-Pentachlorobiphenyl) (BZ 99)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4,4',6,6'-HxCB (2,2',4,4',6,6'-Hexachlorobiphenyl)	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,2',4,4',6-PeCB (2,2',4,4',6-Pentachlorobiphenyl) (BZ 100)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4,4'-TeCB (2,2',4,4'-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4,5,5'-Pentachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4,5',6-PeCB (2,2',4,5',6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4,5,6'-PeCB (2,2',4,5,6'-Pentachlorobiphenyl) (BZ 102)	Accredited	7/5/2006	NELAP	FL

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10129201	EPA 1668	2,2',4,5-TeCB (2,2',4,5-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2,'4,5'-Tetrachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4,6,6'-PeCB (2,2',4,6,6'-Pentachlorobiphenyl)	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,2',4,6-TeCB (2,2',4,6-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4,6'-TeCB (2,2',4,6'-Tetrachlorobiphenyl) (BZ 51)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',4-TrCB (2,2',4-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',5,5'-Tetrachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',5,6'-TeCB (2,2',5,6'-Tetrachlorobiphenyl) (BZ 53)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',5-Trichlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,2',6,6'-TeCB (2,2',6,6'-Tetrachlorobiphenyl)	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,2',6-TrCB (2,2',6-Trichlorobiphenyl)	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,2'-DiCB (2,2'-Dichlorobiphenyl)	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,4',5,5',6-OcCB (2,3,3',4,4',5,5',6-Octachlorobiphenyl)	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,4',5,5'-Heptachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,4',5',6-HpCB (2,3,3',4,4',5',6-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,4',5,6-HpCB (2,3,3',4,4',5,6-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,4',5'-Hexachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,4',5-Hexachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,4',6-HxCB (2,3,3',4,4',6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,4'-Pentachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4',5,5',6-HpCB (2,3,3',4',5,5',6-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,5,5',6-HpCB (2,3,3',4,5,5',6-Heptachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4',5,5'-HxCB (2,3,3',4',5,5'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,5,5'-HxCB (2,3,3',4,5,5'-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4',5',6-HxCB (2,3,3',4',5',6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4',5,6-HxCB (2,3,3',4',5,6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,5',6-HxCB (2,3,3',4,5',6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL

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10129201	EPA 1668	2,3,3',4,5,6-HxCB (2,3,3',4,5,6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4',5-PeCB (2,3,3',4',5-Pentachlorobiphenyl) (BZ 107)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,5-PeCB (2,3,3',4,5-Pentachlorobiphenyl) (BZ 68)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,5'-PeCB (2,3,3',4,5'-Pentachlorobiphenyl) (BZ-108)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4',5'-Pentachlorobiphenyl (BZ 122)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4,6-PeCB (2,3,3',4,6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4',6-Pentachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4'-TeCB (2,3,3',4'-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',4-Tetrachlorobiphenyl (BZ 55)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',5,5',6-HxCB (2,3,3',5,5',6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',5,5'-PeCB (2,3,3',5,5'-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',5',6-PeCB (2,3,3',5',6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',5,6-PeCB (2,3,3',5,6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',5'-TeCB (2,3,3',5'-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',5-TeCB (2,3,3',5-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3',6-TeCB (2,3,3',6-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,3'-TrCB (2,3,3'-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4,4',5,5'-Hexachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,3',4,4',5',6-HxCB (2,3',4,4',5',6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4,4',5,6-HxCB (2,3,4,4',5,6-Hexachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4,4',5'-PeCB (2,3',4,4',5'-Pentachlorobiphenyl) (BZ 123)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4,4',5-Pentachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,3',4,4',5-Pentachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4,4',5-Pentachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	2,3',4,4',6-PeCB (2,3',4,4',6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4,4',6-PeCB (2,3,4,4',6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4,4'-TeCB (2,3,4,4'-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL

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10129201	EPA 1668	2,3',4,4'-Tetrachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4,5,5'-PeCB (2,3',4,5,5'-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4',5,5'-Pentachlorobiphenyl (BZ 124)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4,5',6-PeCB (2,3',4,5',6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4',5,6-PeCB (2,3,4',5,6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4,5,6-PeCB (2,3,4,5,6-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4',5',6-Pentachlorobiphenyl (BZ 125)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4,5-TeCB (2,3',4,5-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4',5-TeCB (2,3,4',5-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4,5-TeCB (2,3,4,5-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4,5'-TeCB (2,3',4',5'-Tetrachlorobiphenyl) (BZ 68)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4',5-Tetrachlorobiphenyl (BZ 70)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4',5'-Tetrachlorobiphenyl (BZ 76)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4',6-TeCB (2,3',4',6-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4',6-TeCB (2,3,4',6-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4,6-TeCB (2,3,4,6-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4,6-Tetrachlorobiphenyl (BZ 69)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4-TrCB (2,3',4-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4'-TrCB (2,3,4'-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,4-TrCB (2,3,4-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',4'-Trichlorobiphenyl (BZ 33)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',5,5'-TeCB (2,3',5,5'-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,5,6-TeCB (2,3,5,6-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',5',6-Tetrachlorobiphenyl (BZ 73)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',5'-TrCB (2,3',5'-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,5-TrCB (2,3,5-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3',5-Trichlorobiphenyl	Accredited	7/5/2006	NELAP	FL

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10129201	EPA 1668	2,3',6-TrCB (2,3',6-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3,6-Trichlorobiphenyl (BZ 24)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3'-DiCB (2,3'-Dichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,3-Dichlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,4,4',5-TeCB (2,4,4',5-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,4,4',6-TeCB (2,4,4',6-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,4,4'-Trichlorobiphenyl (BZ 28)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,4',5-Trichlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,4,5-Trichlorobiphenyl (BZ 29)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,4',6-TrCB (2,4',6-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,4,6-TrCB (2,4,6-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,4'-DiCB (2,4'-Dichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,4-DiCB (2,4-Dichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,5-DiCB (2,5-Dichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2,6-DiCB (2,6-Dichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	2-Chlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,3',4,4',5,5'-Hexachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	3,3',4,4',5-Pentachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	3,3',4,4'-Tetrachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	3,3',4,5,5'-PeCB (3,3',4,5,5'-Pentachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,3',4,5'-TeCB (3,3',4,5'-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,3',4,5-TeCB (3,3',4,5-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,3',4-TrCB (3,3',4-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,3',5,5'-TeCB (3,3',5,5'-Tetrachlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,3',5-TrCB (3,3',5-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,3'-Dichlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,4,4',5-Tetrachlorobiphenyl	Accredited	2/13/2006	NELAP	FL

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10129201	EPA 1668	3,4,4'-trichlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	3,4',5-TrCB (3,4',5-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,4,5-TrCB (3,4,5-Trichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,4-DiCB (3,4-Dichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,4'-Dichlorobiphenyl (BZ 13)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3,5-DiCB (3,5-Dichlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	3-MoCB (3-Monochlorobiphenyl)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	4,4'-Dichlorobiphenyl (BZ 15)	Accredited	2/13/2006	NELAP	FL
10129201	EPA 1668	4-Chlorobiphenyl (BZ 3)	Accredited	7/5/2006	NELAP	FL
10129201	EPA 1668	Decachlorobiphenyl	Accredited	7/5/2006	NELAP	FL
10135203	EPA 3050	Acid Digestion of Solids	Accredited	2/13/2006	NELAP	FL
10135805	EPA 3051	Microwave Acid Digestion	Accredited	8/22/2003	STATE	LA
10136206	EPA 3052	Microwave Digestion of Solids (HNO3 + HF)	Accredited	8/22/2003	STATE	LA
10139603	EPA 3540	Soxhlet Extraction	Accredited	2/13/2006	NELAP	FL
10141409	EPA 3550	Ultrasonic Extraction	Accredited	2/13/2006	NELAP	FL
10142800	EPA 3580	Waste Dilution	Accredited	9/17/2004	STATE	LA
10148002	EPA 3660	Sulfur Clean-up	Accredited	2/13/2006	NELAP	FL
10148604	EPA 3665	Sulfuric acid/permanganate clean-up	Accredited	2/13/2006	NELAP	FL
10154004	EPA 5035	Closed System Purge & Trap	Accredited	2/13/2006	NELAP	FL
10155007	EPA 5050	Bomb Preparation	Accredited	11/4/2003	NELAP	LA
10155201	EPA 6010	Aluminum	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Antimony	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Arsenic	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Barium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Beryllium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Boron	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Cadmium	Accredited	5/8/2003	NELAP	FL

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10155201	EPA 6010	Calcium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Chromium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Cobalt	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Copper	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Iron	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Lead	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Lithium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Magnesium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Manganese	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Molybdenum	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Nickel	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Phosphorus total	Accredited	10/6/2003	STATE	LA
10155201	EPA 6010	Potassium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Selenium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Silicon	Accredited	2/13/2006	NELAP	FL
10155201	EPA 6010	Silver	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Sodium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Strontium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Thallium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Tin	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Titanium	Accredited	10/6/2003	STATE	LA
10155201	EPA 6010	Vanadium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Zinc	Accredited	5/8/2003	NELAP	FL
10165603	EPA 7470	Mercury	Accredited	5/8/2003	NELAP	FL
10166004	EPA 7471	Mercury	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	4 4`-DDD	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	4 4`-DDE	Accredited	5/8/2003	NELAP	FL

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10178402	EPA 8081	4 4'-DDT	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Aldrin	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	alpha-BHC (alpha-Hexachlorocyclohexane)	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	alpha-Chlordane	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	beta-BHC (beta-Hexachlorocyclohexane)	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Chlordane (tech.)	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	delta-BHC	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Dieldrin	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Endosulfan I	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Endosulfan II	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Endosulfan sulfate	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Endrin	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Endrin aldehyde	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Endrin ketone	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	gamma-BHC (Lindane gamma-Hexachlorocyclohexane)	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	gamma-Chlordane	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Heptachlor	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Heptachlor epoxide	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Methoxychlor	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	Toxaphene (Chlorinated camphene)	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',3,3',4,4',5,5'-Octachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10179007	EPA 8082	2,2',3,3',4,4',5-Heptachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',3,3',4,4'-Hexachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10179007	EPA 8082	2,2',3,4,4',5,5'-Heptachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',3,4,4',5',6-Heptachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',3,4,4',5'-Hexachlorobiphenyl	Accredited	5/8/2003	NELAP	FL

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10179007	EPA 8082	2,2',3,4',5,5',6-Heptachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',3,4,5,5'-Hexachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',3,4,5'-Pentachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',3,5,5',6-Hexachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',3,5'-Tetrachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10179007	EPA 8082	2,2',4,4',5,5'-Hexachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',4,5,5'-Pentachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2,'4,5'-Tetrachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10179007	EPA 8082	2,2',5,5'-Tetrachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,2',5-Trichlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,3,3',4',6-Pentachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,3',4,4',5-Pentachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10179007	EPA 8082	2,3',4,4'-Tetrachlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,3',5-Trichlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10179007	EPA 8082	2,3-Dichlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2,4',5-Trichlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	2-Chlorobiphenyl	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	3,3'-Dichlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10179007	EPA 8082	Aroclor-1016 (PCB-1016)	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	Aroclor-1221 (PCB-1221)	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	Aroclor-1232 (PCB-1232)	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	Aroclor-1242 (PCB-1242)	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	Aroclor-1248 (PCB-1248)	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	Aroclor-1254 (PCB-1254)	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	Aroclor-1260 (PCB-1260)	Accredited	5/8/2003	NELAP	FL
10179007	EPA 8082	Decachlorobiphenyl	Accredited	2/13/2006	NELAP	FL
10184404	EPA 8260	1 1 1 2-Tetrachloroethane	Accredited	5/8/2003	NELAP	FL

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10184404	EPA 8260	1 1 1-Trichloroethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 1 2 2-Tetrachloroethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 1 2-Trichloro-1 2 2-trifluoroethane (Freon-113)	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	1 1 2-Trichloroethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 1-Dichloroethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 1-Dichloroethylene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 1-Dichloropropene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 2 3-Trichlorobenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 2 3-Trichloropropane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 2 4-Trichlorobenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 2 4-Trimethylbenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 2-Dibromo-3-chloropropane (DBCP)	Accredited	2/13/2006	NELAP	FL
10184404	EPA 8260	1 2-Dibromoethane (EDB Ethylene dibromide)	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 2-Dichlorobenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 2-Dichloroethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 2-Dichloropropane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 3 5-Trimethylbenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 3-Butadiene	Accredited	10/17/2003	STATE	LA
10184404	EPA 8260	1 3-Dichlorobenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 3-Dichloropropane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	1 4-Dichlorobenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	2 2-Dichloropropane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	2-Butanone (Methyl ethyl ketone MEK)	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	2-Chloropropane	Accredited	10/17/2003	STATE	LA
10184404	EPA 8260	2-Chlorotoluene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	2-Hexanone	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	4-Chlorotoluene	Accredited	5/8/2003	NELAP	FL

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10184404	EPA 8260	4-Methyl-2-pentanone (MIBK)	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Acetone	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Acetonitrile	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Acrylonitrile	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Benzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Bromobenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Bromochloromethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Bromodichloromethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Bromoform	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Carbon disulfide	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Carbon tetrachloride	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Chlorobenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Chloroethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Chloroform	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	cis & trans-1 2-Dichloroethene	Accredited	2/13/2006	NELAP	FL
10184404	EPA 8260	cis-1 2-Dichloroethylene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	cis-1 3-Dichloropropene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	cis-1 4-Dichloro-2-butene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Dibromochloromethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Dibromomethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Dichlorodifluoromethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Ethylbenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Hexachlorobutadiene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Hexane	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Iodomethane (Methyl iodide)	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Isopropylbenzene (cumene)	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Methyl bromide (Bromomethane)	Accredited	5/8/2003	NELAP	FL

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10184404	EPA 8260	Methyl chloride (Chloromethane)	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Methyl tert-butyl ether (MTBE)	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Methylene chloride	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	m-Xylene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Naphthalene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	n-Butylbenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Nitrobenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	n-Propylbenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	o-Xylene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	p-Isopropyltoluene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	p-Xylene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Pyridine	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	sec-Butylbenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Styrene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	tert-Butylbenzene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Tetrachloroethylene (Perchloroethylene)	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Toluene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	trans-1 2-Dichloroethylene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	trans-1 3-Dichloropropylene	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	trans-1 4-Dichloro-2-butene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Trichloroethene (Trichloroethylene)	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Trichlorofluoromethane	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Vinyl bromide	Accredited	10/17/2003	STATE	LA
10184404	EPA 8260	Vinyl chloride	Accredited	5/8/2003	NELAP	FL
10184404	EPA 8260	Xylene (total)	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	1 2 4 5-Tetrachlorobenzene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	1 2 4-Trichlorobenzene	Accredited	5/8/2003	NELAP	FL

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10185203	EPA 8270	1 2-Dichlorobenzene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	1 2-Diphenylhydrazine	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	1 3 5-Trinitrobenzene (1 3 5-TNB)	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	1 3-Dichlorobenzene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	1 3-Dinitrobenzene (1 3-DNB)	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	1 4-Dichlorobenzene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	1-Chloronaphthalene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	2 3 4 6-Tetrachlorophenol	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	2 4 5-Trichlorophenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2 4 6-Trichlorophenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2 4-Dichlorophenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2 4-Dimethylphenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2 4-Dinitrophenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2 4-Dinitrotoluene (2 4-DNT)	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2 6-Dichlorophenol	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	2 6-Dinitrotoluene (2 6-DNT)	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2-Acetylaminofluorene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	2-Chloronaphthalene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2-Chlorophenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2-Methyl-4 6-dinitrophenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2-Methylnaphthalene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2-Methylphenol (o-Cresol)	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2-Nitroaniline	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2-Nitrophenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	2-Sec-butyl-4 6-dinitrophenol (DNBP Dinoseb)	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	3 3'-Dichlorobenzidine	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	3-Methylcholanthrene	Accredited	10/6/2003	STATE	LA

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10185203	EPA 8270	3-Methylphenol (m-Cresol)	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	3-Nitroaniline	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	4-Bromophenyl phenyl ether	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	4-Chloro-3-methylphenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	4-Chloroaniline	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	4-Chlorophenyl phenylether	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	4-Methylphenol (p-Cresol)	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	4-Nitroaniline	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	4-Nitrophenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	5-Nitro-o-toluidine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	7 12-Dimethylbenz(a) anthracene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Acenaphthene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Acenaphthylene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Acetophenone	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Aniline	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Anthracene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Benzidine	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Benzo(a)anthracene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Benzo(a)pyrene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Benzo(b)fluoranthene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Benzo(g h i)perylene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Benzo(k)fluoranthene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Benzoic acid	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Benzyl alcohol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	bis(2-Chloroethoxy)methane	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	bis(2-Chloroethyl) ether	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	bis(2-Chloroisopropyl) ether	Accredited	5/8/2003	NELAP	FL

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10185203	EPA 8270	bis(2-Ethylhexyl) phthalate (DEHP)	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Butyl benzyl phthalate	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Carbazole	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Chrysene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Dibenz(a h) anthracene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Dibenzofuran	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Diethyl phthalate	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Dimethyl phthalate	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Di-n-butyl phthalate	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Di-n-octyl phthalate	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Diphenylamine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Ethyl methanesulfonate	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Fluoranthene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Fluorene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Hexachlorobenzene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Hexachlorobutadiene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Hexachlorocyclopentadiene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Hexachloroethane	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Hexachloropropene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Indeno(1,2,3-c,d)pyrene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Isophorone	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Isosafrole	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Methyl methanesulfonate	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Naphthalene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Nitrobenzene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	N-Nitrosodiethylamine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	N-Nitrosodimethylamine	Accredited	5/8/2003	NELAP	FL

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10185203	EPA 8270	N-Nitroso-di-n-butylamine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	N-Nitrosodi-n-propylamine	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	N-Nitrosodiphenylamine	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	N-Nitrosomethylethylamine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	N-Nitrosomorpholine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	N-Nitrosopiperidine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	N-Nitrosopyrrolidine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	o-Toluidine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	p-Dimethylaminoazobenzene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Pentachlorobenzene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Pentachloroethane	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Pentachloronitrobenzene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Pentachlorophenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Phenacetin	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Phenanthrene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Phenol	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Pyrene	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Pyridine	Accredited	5/8/2003	NELAP	FL
10185203	EPA 8270	Safrole	Accredited	10/6/2003	STATE	LA
10187209	EPA 8290	1 2 3 4 6 7 8 9-Octachlorodibenzofuran (OCDF)	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 4 6 7 8 9-Octachlorodibenzo-p-dioxin (OCDD)	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 4 6 7 8-Heptachlorodibenzofuran (1 2 3 4 6 7 8-hpcdf)	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 4 6 7 8-Heptachlorodibenzo-p-dioxin (1 2 3 4 6 7 8-hpcdd)	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 4 7 8 9-Heptachlorodibenzofuran (1 2 3 4 7 8 9-hpcdf)	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 4 7 8-Hxcdd	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 4 7 8-Hxcdf	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 6 7 8-Hxcdd	Accredited	5/8/2003	NELAP	FL

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10187209	EPA 8290	1 2 3 6 7 8-Hxcdf	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 7 8 9-Hxcdd	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 7 8 9-Hxcdf	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 7 8-Pecdd	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	1 2 3 7 8-Pecdf	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	2 3 4 6 7 8-Hxcdf	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	2 3 4 7 8-Pecdf	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	2 3 7 8-TCDD	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	2 3 7 8-TCDF	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	2 3 7 8-Tetrachloro dibenzo- p-dioxin	Accredited	5/8/2003	NELAP	FL
10187209	EPA 8290	Total Heptachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Heptachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Hexachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Hexachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Pentachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Pentachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Tetrachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Tetrachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL
10189807	EPA 8330	1 3 5-Trinitrobenzene (1 3 5-TNB)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	1 3-Dinitrobenzene (1 3-DNB)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	2 4 6-Trinitrotoluene (2 4 6-TNT)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	2 4-Dinitrotoluene (2 4-DNT)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	2 6-Dinitrotoluene (2 6-DNT)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	2-Amino-4 6-dinitrotoluene (2-am-dnt)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	2-Nitrotoluene	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	3-Nitrotoluene	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	4-Amino-2 6-dinitrotoluene (4-am-dnt)	Accredited	5/25/2004	NELAP	FL

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10189807	EPA 8330	4-Nitrotoluene	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	Nitrobenzene	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	Octahydro-1 3 5 7-tetranitro-1 3 5 7-tetrazocine (HMX)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	RDX (hexahydro-1 3 5-trinitro-1 3 5-triazine)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	Tetryl (methyl-2 4 6-trinitrophenylnitramine)	Accredited	5/25/2004	NELAP	FL
10193201	EPA 9012	Total cyanide	Accredited	7/31/2002	NELAP	FL
10199005	EPA 9056	Chloride	Accredited	8/20/2003	NELAP	FL
10199005	EPA 9056	Fluoride	Accredited	8/20/2003	NELAP	FL
10199005	EPA 9056	Nitrate	Accredited	8/20/2003	NELAP	FL
10199005	EPA 9056	Nitrite	Accredited	8/20/2003	NELAP	FL
10199005	EPA 9056	Orthophosphate as P	Accredited	8/20/2003	NELAP	FL
10199005	EPA 9056	Sulfate	Accredited	8/20/2003	NELAP	FL

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Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
10013408	EPA 200.7	Aluminum	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Antimony	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Arsenic	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Barium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Beryllium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Boron	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Cadmium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Calcium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Chromium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Cobalt	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Copper	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Iron	Accredited	5/8/2003	NELAP	FL

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Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
10013408	EPA 200.7	Lead	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Magnesium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Manganese	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Molybdenum	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Nickel	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Potassium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Selenium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Silicon	Accredited	5/25/2004	NELAP	FL
10013408	EPA 200.7	Silver	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Sodium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Thallium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Tin	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Titanium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Vanadium	Accredited	5/8/2003	NELAP	FL
10013408	EPA 200.7	Zinc	Accredited	5/8/2003	NELAP	FL
10036201	EPA 245.1	Mercury	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 4 6 7 8 9-Octachlorodibenzofuran (OCDF)	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 4 6 7 8 9-Octachlorodibenzo-p-dioxin (OCDD)	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 4 6 7 8-Heptachlorodibenzofuran (1 2 3 4 6 7 8-hpcdf)	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 4 6 7 8-Heptachlorodibenzo-p-dioxin (1 2 3 4 6 7 8-hpcdd)	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 4 7 8 9-Heptachlorodibenzofuran (1 2 3 4 7 8 9-hpcdf)	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 4 7 8-Hxcdd	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 4 7 8-Hxcdf	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 6 7 8-Hxcdd	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 6 7 8-Hxcdf	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 7 8 9-Hxcdd	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 7 8 9-Hxcdf	Accredited	5/8/2003	NELAP	FL

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10120204	EPA 1613	1 2 3 7 8-Pecdd	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	1 2 3 7 8-Pecdf	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	2 3 4 6 7 8-Hxcdf	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	2 3 4 7 8-Pecdf	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	2 3 7 8-TCDD	Accredited	5/8/2003	NELAP	FL
10120204	EPA 1613	2 3 7 8-TCDF	Accredited	5/8/2003	NELAP	FL
10133003	EPA 3005	Preconcentration under Acid	Accredited	2/13/2006	NELAP	FL
10133401	EPA 3010	Hot Plate Acid Digestion (HNO3 + HCl)	Accredited	2/13/2006	NELAP	FL
10138406	EPA 3520	Continuous Liquid-Liquid Extraction	Accredited	2/13/2006	NELAP	FL
10153001	EPA 5030	Aqueous-phase Purge & Trap	Accredited	2/13/2006	NELAP	FL
10155201	EPA 6010	Aluminum	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Antimony	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Arsenic	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Barium	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Beryllium	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Boron	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Cadmium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Calcium	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Chromium	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Cobalt	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Copper	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Iron	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Lead	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Lithium	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Magnesium	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Manganese	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Molybdenum	Accredited	5/8/2003	NELAP	FL

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10155201	EPA 6010	Nickel	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Potassium	Accredited	2/13/2006	NELAP	FL
10155201	EPA 6010	Selenium	Accredited	5/8/2003	NELAP	FL
10155201	EPA 6010	Silicon	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Silver	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Sodium	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Strontium	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Thallium	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Tin	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Vanadium	Accredited	5/25/2004	NELAP	FL
10155201	EPA 6010	Zinc	Accredited	5/8/2003	NELAP	FL
10165603	EPA 7470	Mercury	Accredited	5/8/2003	NELAP	FL
10178402	EPA 8081	4 4`-DDD	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	4 4`-DDE	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	4 4`-DDT	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Aldrin	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	alpha-BHC (alpha-Hexachlorocyclohexane)	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	alpha-Chlordane	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	beta-BHC (beta-Hexachlorocyclohexane)	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Chlordane (tech.)	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	delta-BHC	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Dieldrin	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Endosulfan I	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Endosulfan II	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Endosulfan sulfate	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Endrin	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Endrin aldehyde	Accredited	5/25/2004	NELAP	FL

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10178402	EPA 8081	Endrin ketone	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	gamma-BHC (Lindane gamma-Hexachlorocyclohexane)	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	gamma-Chlordane	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Heptachlor	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Heptachlor epoxide	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Methoxychlor	Accredited	5/25/2004	NELAP	FL
10178402	EPA 8081	Toxaphene (Chlorinated camphene)	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',3,3',4,4',5-Heptachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',3,4,4',5,5'-Heptachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',3,4,4',5',6-Heptachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',3,4,4',5'-Hexachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',3,4',5,5',6-Heptachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',3,4,5,5'-Hexachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',3,4,5'-Pentachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',3,5,5',6-Hexachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',3,5'-Tetrachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',4,4',5,5'-Hexachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',4,5,5'-Pentachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',5,5'-Tetrachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,2',5-Trichlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,3,3',4',6-Pentachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,3',4,4'-Tetrachlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,3-Dichlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2,4',5-Trichlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	2-Chlorobiphenyl	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	Aroclor-1016 (PCB-1016)	Accredited	5/25/2004	NELAP	FL

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10179007	EPA 8082	Aroclor-1221 (PCB-1221)	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	Aroclor-1232 (PCB-1232)	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	Aroclor-1242 (PCB-1242)	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	Aroclor-1248 (PCB-1248)	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	Aroclor-1254 (PCB-1254)	Accredited	5/25/2004	NELAP	FL
10179007	EPA 8082	Aroclor-1260 (PCB-1260)	Accredited	5/25/2004	NELAP	FL
10184404	EPA 8260	1 1 1 2-Tetrachloroethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 1 1-Trichloroethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 1 2 2-Tetrachloroethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 1 2-Trichloroethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 1-Dichloroethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 1-Dichloroethylene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 1-Dichloropropene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 2 3-Trichlorobenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 2 3-Trichloropropane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 2 4-Trichlorobenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 2 4-Trimethylbenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 2-Dibromo-3-chloropropane (DBCP)	Accredited	2/13/2006	NELAP	FL
10184404	EPA 8260	1 2-Dibromoethane (EDB Ethylene dibromide)	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 2-Dichlorobenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 2-Dichloroethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 2-Dichloropropane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 3 5-Trimethylbenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 3-Dichlorobenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 3-Dichloropropane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	1 4-Dichlorobenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	2 2-Dichloropropane	Accredited	2/25/2004	NELAP	FL

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10184404	EPA 8260	2-Butanone (Methyl ethyl ketone MEK)	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	2-Chlorotoluene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	2-Hexanone	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	4-Chlorotoluene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	4-Methyl-2-pentanone (MIBK)	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Acetone	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Benzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Bromobenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Bromochloromethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Bromodichloromethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Bromoform	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Carbon disulfide	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Carbon tetrachloride	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Chlorobenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Chloroethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Chloroform	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	cis-1 2-Dichloroethylene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	cis-1 3-Dichloropropene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Dibromochloromethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Dibromomethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Dichlorodifluoromethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Ethylbenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Hexachlorobutadiene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Isopropylbenzene (cumene)	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Methyl bromide (Bromomethane)	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Methyl chloride (Chloromethane)	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Methyl tert-butyl ether (MTBE)	Accredited	2/25/2004	NELAP	FL

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10184404	EPA 8260	Methylene chloride	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Naphthalene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	n-Butylbenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Nitrobenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	n-Propylbenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	p-Isopropyltoluene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Pyridine	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	sec-Butylbenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Styrene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	tert-Butylbenzene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Tetrachloroethylene (Perchloroethylene)	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Toluene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	trans-1 2-Dichloroethylene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	trans-1 3-Dichloropropylene	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Trichloroethene (Trichloroethylene)	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Trichlorofluoromethane	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Vinyl chloride	Accredited	2/25/2004	NELAP	FL
10184404	EPA 8260	Xylene (total)	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	1 2 4-Trichlorobenzene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	1 2-Dichlorobenzene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	1 2-Diphenylhydrazine	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	1 3-Dichlorobenzene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	1 4-Dichlorobenzene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2 4 5-Trichlorophenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2 4 6-Trichlorophenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2 4-Dichlorophenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2 4-Dimethylphenol	Accredited	2/25/2004	NELAP	FL

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10185203	EPA 8270	2 4-Dinitrophenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2 4-Dinitrotoluene (2 4-DNT)	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2 6-Dinitrotoluene (2 6-DNT)	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2-Chloronaphthalene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2-Chlorophenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2-Methyl-4 6-dinitrophenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2-Methylnaphthalene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2-Methylphenol (o-Cresol)	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2-Nitroaniline	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	2-Nitrophenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	3 3`-Dichlorobenzidine	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	3-Nitroaniline	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	4-Bromophenyl phenyl ether	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	4-Chloro-3-methylphenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	4-Chloroaniline	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	4-Chlorophenyl phenylether	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	4-Methylphenol (p-Cresol)	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	4-Nitroaniline	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	4-Nitrophenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Acenaphthene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Acenaphthylene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Aniline	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Anthracene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Benzidine	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Benzo(a)anthracene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Benzo(a)pyrene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Benzo(b)fluoranthene	Accredited	2/25/2004	NELAP	FL

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10185203	EPA 8270	Benzo(g h i)perylene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Benzo(k)fluoranthene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Benzoic acid	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Benzyl alcohol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	bis(2-Chloroethoxy)methane	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	bis(2-Chloroethyl) ether	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	bis(2-Chloroisopropyl) ether	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	bis(2-Ethylhexyl) phthalate (DEHP)	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Butyl benzyl phthalate	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Carbazole	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Chrysene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Dibenz(a h) anthracene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Dibenzofuran	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Diethyl phthalate	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Dimethyl phthalate	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Di-n-butyl phthalate	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Di-n-octyl phthalate	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Fluoranthene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Fluorene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Hexachlorobenzene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Hexachlorobutadiene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Hexachlorocyclopentadiene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Hexachloroethane	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Indeno(1,2,3-c,d)pyrene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Isophorone	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Naphthalene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Nitrobenzene	Accredited	2/25/2004	NELAP	FL

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10185203	EPA 8270	N-Nitrosodimethylamine	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	N-Nitrosodi-n-propylamine	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	N-Nitrosodiphenylamine	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Pentachlorophenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Phenanthrene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Phenol	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Pyrene	Accredited	2/25/2004	NELAP	FL
10185203	EPA 8270	Pyridine	Accredited	2/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 6 7 8 9-Octachlorodibenzofuran (OCDF)	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 6 7 8 9-Octachlorodibenzo-p-dioxin (OCDD)	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 6 7 8-Heptachlorodibenzofuran (1 2 3 4 6 7 8-hpcdf)	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 6 7 8-Heptachlorodibenzo-p-dioxin (1 2 3 4 6 7 8-hpcdd)	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 7 8 9-Heptachlorodibenzofuran (1 2 3 4 7 8 9-hpcdf)	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 7 8-Hxcdd	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 7 8-Hxcdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 6 7 8-Hxcdd	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 6 7 8-Hxcdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 7 8 9-Hxcdd	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 7 8 9-Hxcdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 7 8-Pecdd	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 7 8-Pecdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	2 3 4 6 7 8-Hxcdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	2 3 4 7 8-Pecdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	2 3 7 8-TCDD	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	2 3 7 8-TCDF	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	Total Heptachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Heptachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL

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10187209	EPA 8290	Total Hexachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Hexachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Pentachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Pentachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Tetrachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Tetrachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL
10189807	EPA 8330	1 3 5-Tnb (1 3 5-trinitrobenzene)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	1 3-Dinitrobenzene (1 3-DNB)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	2 4 6-Trinitrotoluene (2 4 6-TNT)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	2 4-Dinitrotoluene (2 4-DNT)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	2 6-Dinitrotoluene (2 6-DNT)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	2-Amino-4 6-dinitrotoluene (2-am-dnt)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	2-Nitrotoluene	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	3-Nitrotoluene	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	4-Amino-2 6-dinitrotoluene (4-am-dnt)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	4-Nitrotoluene	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	Nitrobenzene	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	Octahydro-1 3 5 7-tetranitro-1 3 5 7-tetrazocine (HMX)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	RDX (hexahydro-1 3 5-trinitro-1 3 5-triazine)	Accredited	5/25/2004	NELAP	FL
10189807	EPA 8330	Tetryl (methyl-2 4 6-trinitrophenylnitramine)	Accredited	5/25/2004	NELAP	FL
10193201	EPA 9012	Amenable cyanide	Accredited	7/1/2005	NELAP	FL
10193201	EPA 9012	Total cyanide	Accredited	5/25/2004	NELAP	FL
10199005	EPA 9056	Chloride	Accredited	5/25/2004	NELAP	FL
10199005	EPA 9056	Fluoride	Accredited	5/25/2004	NELAP	FL
10199005	EPA 9056	Nitrate	Accredited	5/25/2004	NELAP	FL
10199005	EPA 9056	Nitrite	Accredited	5/25/2004	NELAP	FL
10199005	EPA 9056	Orthophosphate as P	Accredited	5/25/2004	NELAP	FL

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Biological Tissue Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
10199005	EPA 9056	Sulfate	Accredited	5/25/2004	NELAP	FL

Biological Tissue Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
2042	SOP KNOX-ID-0016	1-Methylnaphthalene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	1-Methylphenanthrene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	2,3,5-Trimethylnaphthalene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	2,6-Dimethylnaphthalene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	2-Methylnaphthalene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Acenaphthene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Acenaphthylene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Anthracene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(a)anthracene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(a)pyrene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(b)fluoranthene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(e)pyrene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(g h i)perylene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(k)fluoranthene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Biphenyl	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Chrysene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Dibenz(a h) anthracene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Fluoranthene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Fluorene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Indeno(1,2,3-c,d)pyrene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Naphthalene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Perylene	Accredited	5/25/2004	STATE	LA
2042	SOP KNOX-ID-0016	Phenanthrene	Accredited	5/25/2004	STATE	LA

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Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
2042	SOP KNOX-ID-0016	Pyrene	Accredited	5/25/2004	STATE	LA
10187209	EPA 8290	1 2 3 4 6 7 8 9-Octachlorodibenzofuran (OCDF)	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 6 7 8 9-Octachlorodibenzo-p-dioxin (OCDD)	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 6 7 8-Heptachlorodibenzofuran (1 2 3 4 6 7 8-hpcdf)	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 6 7 8-Heptachlorodibenzo-p-dioxin (1 2 3 4 6 7 8-hpcdd)	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 7 8 9-Heptachlorodibenzofuran (1 2 3 4 7 8 9-hpcdf)	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 7 8-Hxcdd	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 4 7 8-Hxcdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 6 7 8-Hxcdd	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 6 7 8-Hxcdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 7 8 9-Hxcdd	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 7 8 9-Hxcdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 7 8-Pecdd	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	1 2 3 7 8-Pecdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	2 3 4 6 7 8-Hxcdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	2 3 4 7 8-Pecdf	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	2 3 7 8-TCDD	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	2 3 7 8-TCDF	Accredited	8/3/2004	NELAP	FL
10187209	EPA 8290	2 3 7 8-Tetrachloro dibenzo- p-dioxin	Accredited	5/25/2004	NELAP	FL
10187209	EPA 8290	Total Heptachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Heptachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Hexachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Hexachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Pentachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Pentachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Tetrachlorodibenzofuran	Accredited	2/13/2006	NELAP	FL
10187209	EPA 8290	Total Tetrachlorodibenzo-p-dioxin	Accredited	2/13/2006	NELAP	FL

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Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
833	TO-14A	1 1 1-Trichloroethane	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 1 2 2-Tetrachloroethane	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 1 2-Trichloroethane	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 1-Dichloroethane	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 1-Dichloroethylene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 2 4-Trichlorobenzene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 2 4-Trimethylbenzene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 2-Dichlorobenzene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 2-Dichloroethane	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 2-Dichloropropane	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 3 5-Trimethylbenzene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 3-Dichlorobenzene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	1 4-Dichlorobenzene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Benzene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Benzyl chloride	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Carbon tetrachloride	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Chlorobenzene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Chloroethane	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Chloroform	Accredited	8/22/2003	NELAP	FL
833	TO-14A	cis-1 2-Dichloroethylene	Accredited	2/13/2006	NELAP	FL
833	TO-14A	cis-1 3-Dichloropropene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Ethylbenzene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Freon-11 (Trichlorofluoromethane)	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Freon-113 (1,1,2-trichloro-1,2,2-trifluoroethane)	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Freon-114 (1,2-dichloro-1,1,2,2-tetrafluoroethane)	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Freon-12 (dichlorodifluoromethane)	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Hexachlorobutadiene	Accredited	8/22/2003	NELAP	FL

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833	TO-14A	Methyl chloride (Chloromethane)	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Methylene chloride	Accredited	8/22/2003	NELAP	FL
833	TO-14A	o-Xylene	Accredited	2/13/2006	NELAP	FL
833	TO-14A	Styrene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Tetrachloroethylene (Perchloroethylene)	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Toluene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	trans-1 3-Dichloropropylene	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Trichloroethene (Trichloroethylene)	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Vinyl chloride	Accredited	8/22/2003	NELAP	FL
833	TO-14A	Xylene (total)	Accredited	8/22/2003	NELAP	FL
834	TO-15	1 1 1-Trichloroethane	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 1 2 2-Tetrachloroethane	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 1-Dichloroethane	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 1-Dichloroethylene	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 2 4-Trichlorobenzene	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 2-Dibromoethane (EDB Ethylene dibromide)	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 2-Dichlorobenzene	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 2-Dichloroethane	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 2-Dichloropropane	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 3-Butadiene	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 3-Dichlorobenzene	Accredited	9/2/2003	NELAP	FL
834	TO-15	1 4-Dichlorobenzene	Accredited	9/2/2003	NELAP	FL
834	TO-15	2-Butanone (Methyl ethyl ketone MEK)	Accredited	9/2/2003	NELAP	FL
834	TO-15	Acetonitrile	Accredited	9/2/2003	NELAP	FL
834	TO-15	Acrolein (Propenal)	Accredited	9/2/2003	NELAP	FL
834	TO-15	Acrylonitrile	Accredited	9/2/2003	NELAP	FL
834	TO-15	Benzene	Accredited	9/2/2003	NELAP	FL

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834	TO-15	Benzyl chloride	Accredited	9/2/2003	NELAP	FL
834	TO-15	Bromoform	Accredited	9/2/2003	NELAP	FL
834	TO-15	Carbon disulfide	Accredited	9/2/2003	NELAP	FL
834	TO-15	Carbon tetrachloride	Accredited	9/2/2003	NELAP	FL
834	TO-15	Chlorobenzene	Accredited	9/2/2003	NELAP	FL
834	TO-15	Chloroethane	Accredited	9/2/2003	NELAP	FL
834	TO-15	Chloroform	Accredited	9/2/2003	NELAP	FL
834	TO-15	Chloroprene	Accredited	9/2/2003	NELAP	FL
834	TO-15	cis & trans-1 2-Dichloroethene	Accredited	9/2/2003	NELAP	FL
834	TO-15	cis-1 3-Dichloropropene	Accredited	9/2/2003	NELAP	FL
834	TO-15	Ethylbenzene	Accredited	9/2/2003	NELAP	FL
834	TO-15	Hexachlorobutadiene	Accredited	9/2/2003	NELAP	FL
834	TO-15	Hexane	Accredited	9/2/2003	NELAP	FL
834	TO-15	Methanol	Accredited	9/2/2003	NELAP	FL
834	TO-15	Methyl bromide (Bromomethane)	Accredited	9/2/2003	NELAP	FL
834	TO-15	Methyl chloride (Chloromethane)	Accredited	9/2/2003	NELAP	FL
834	TO-15	Methyl isobutyl ketone (Hexone)	Accredited	9/2/2003	NELAP	FL
834	TO-15	Methyl tert-butyl ether (MTBE)	Accredited	9/2/2003	NELAP	FL
834	TO-15	Methylene chloride	Accredited	9/2/2003	NELAP	FL
834	TO-15	Styrene	Accredited	9/2/2003	NELAP	FL
834	TO-15	trans-1 3-Dichloropropylene	Accredited	9/2/2003	NELAP	FL
834	TO-15	Trichloroethene (Trichloroethylene)	Accredited	9/2/2003	NELAP	FL
834	TO-15	Vinyl acetate	Accredited	9/2/2003	NELAP	FL
834	TO-15	Vinyl chloride	Accredited	9/2/2003	NELAP	FL
834	TO-15	Xylene (total)	Accredited	9/2/2003	NELAP	FL
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Antimony	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Arsenic	Accredited	9/13/2004	STATE	LA

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Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Barium	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Beryllium	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Cadmium	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Chromium	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Cobalt	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Copper	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Lead	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Manganese	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Mercury	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Nickel	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Phosphorus total	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Selenium	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Silver	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Thallium	Accredited	9/13/2004	STATE	LA
1862	Method 29 40 CFR 60 App. A (Analysis Only)	Zinc	Accredited	9/13/2004	STATE	LA
1928	Method 5 40 CFR 60 App. A (Analysis Only)	Particulates	Accredited	11/6/2003	STATE	LA
2027	SOP KNOX-MS-0011	Desorption of Sorbent Cartridges	Accredited	9/5/2003	STATE	LA
2031	SOP KNOX-GC-0010	Total Organic Emissions	Accredited	9/11/2003	STATE	LA
2041	SOP KNOX WC-0005	Chlorine	Accredited	10/17/2003	STATE	LA
2041	SOP KNOX WC-0005	Hydrochloric acid (Hydrogen chloride (gas only))	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	1-Methylnaphthalene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	1-Methylphenanthrene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	2,3,5-Trimethylnaphthalene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	2,6-Dimethylnaphthalene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	2-Methylnaphthalene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Acenaphthene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Acenaphthylene	Accredited	10/17/2003	STATE	LA

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Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
2042	SOP KNOX-ID-0016	Anthracene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(a)anthracene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(a)pyrene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(b)fluoranthene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(e)pyrene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(g h i)perylene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Benzo(k)fluoranthene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Biphenyl	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Chrysene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Dibenz(a h) anthracene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Fluoranthene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Fluorene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Indeno(1,2,3-c,d)pyrene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Naphthalene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Perylene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Phenanthrene	Accredited	10/17/2003	STATE	LA
2042	SOP KNOX-ID-0016	Pyrene	Accredited	10/17/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2',3,3',4,4',5-Heptachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2',3,3',5,5',6,6'-Octachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2',3,4,4',5,5'-Heptachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2',3,4',5,6,6'-Heptachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2',4,4',6,6'-Hexachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2',4,6,6'-pentachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2',6,6'-tetrachlorobiphenyl	Accredited	11/4/2003	STATE	LA

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2081	SOP KNOX-ID-0013	2,2',6-trichlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,2'-dichlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,3,3',4,4',5,5',6-Octachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,3,3',4,4',5,5'-Heptachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,3,3',4,4',5'-Hexachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,3,3',4,4',5-Hexachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,3,3',4,4'-Pentachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,3',4,4',5,5'-Hexachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,3',4,4',5'-Pentachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,3',4,4',5-Pentachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2,3,4,4',5-pentachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	2-Monochlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	3,3',4,4',5,5'-Hexachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	3,3',4,4',5-Pentachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	3,3',4,4'-Tetrachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	3,4,4',5-Tetrachlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	3,4,4'-trichlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	4,4'-Dichlorobiphenyl (BZ 15)	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	4-monochlorobiphenyl	Accredited	11/4/2003	STATE	LA
2061	SOP KNOX-ID-0013	Total Decachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Dichlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Heptachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Hexachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Monochlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Nonachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Octachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Pentachlorobiphenyl	Accredited	2/9/2004	STATE	LA

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2061	SOP KNOX-ID-0013	Total Tetrachlorobiphenyl	Accredited	2/9/2004	STATE	LA
2061	SOP KNOX-ID-0013	Total Trichlorobiphenyl	Accredited	2/9/2004	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 4 6 7 8 9-Octachlorodibenzofuran (OCDF)	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 4 6 7 8 9-Octachlorodibenzo-p-dioxin (OCDD)	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 4 6 7 8-Heptachlorodibenzofuran (1 2 3 4 6 7 8-hpcdf)	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 4 6 7 8-Heptachlorodibenzo-p-dioxin (1 2 3 4 6 7 8-hpcdd)	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 4 7 8 9-Heptachlorodibenzofuran (1 2 3 4 7 8 9-hpcdf)	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 4 7 8-Hxcdd	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 4 7 8-Hxcdf	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 6 7 8-Hxcdd	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 6 7 8-Hxcdf	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 7 8 9-Hxcdd	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 7 8 9-Hxcdf	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 7 8-Pecdd	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	1 2 3 7 8-Pecdf	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	2 3 4 6 7 8-Hxcdf	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	2 3 4 7 8-Pecdf	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	2 3 7 8-TCDD	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	2 3 7 8-TCDF	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	Total Hexachlorodibenzofuran	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	Total HpCDD	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	Total HpCDF	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	Total HxCDD	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	Total PeCDD	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	Total Pentachlorodibenzofuran	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	Total TCDD	Accredited	11/13/2003	STATE	LA
2067	SOP KNOX-ID-0004	Total TCDF	Accredited	11/13/2003	STATE	LA

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10002207	EPA 0023	Dibenzo-p-dioxins & Dibenzofurans	Accredited	2/13/2006	NELAP	FL
10002605	EPA 0031	Sampling Method for Volatile Organic Compounds in Gaseous Emission (-15 C to 121 C)	Accredited	9/10/2003	STATE	LA
10002809	EPA 0040	Tedlar Bag Sampling	Accredited	7/1/2005	STATE	LA
10003404	EPA 0060	Metals Sampling Train	Accredited	2/13/2006	NELAP	FL
10135805	EPA 3051	Microwave Acid Digestion	Accredited	9/11/2003	STATE	LA
10136206	EPA 3052	Microwave Digestion of Solids (HNO3 + HF)	Accredited	9/11/2003	STATE	LA
10140600	EPA 3542	Extraction from Air Sampling Train	Accredited	2/13/2006	NELAP	FL
10153001	EPA 5030	Aqueous-phase Purge & Trap	Accredited	2/13/2006	NELAP	FL
10155201	EPA 6010	Aluminum	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Antimony	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Arsenic	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Barium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Beryllium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Boron	Accredited	10/6/2003	STATE	LA
10155201	EPA 6010	Cadmium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Calcium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Chromium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Cobalt	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Copper	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Iron	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Lead	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Lithium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Magnesium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Manganese	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Molybdenum	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Nickel	Accredited	5/9/2003	STATE	LA

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10155201	EPA 6010	Phosphorus total	Accredited	10/6/2003	STATE	LA
10155201	EPA 6010	Potassium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Selenium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Silicon	Accredited	10/6/2003	STATE	LA
10155201	EPA 6010	Silver	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Sodium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Strontium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Thallium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Tin	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Titanium	Accredited	10/6/2003	STATE	LA
10155201	EPA 6010	Vanadium	Accredited	5/9/2003	STATE	LA
10155201	EPA 6010	Zinc	Accredited	5/9/2003	STATE	LA
10163005	EPA 7199	Chromium VI	Accredited	7/5/2006	STATE	LA
10165603	EPA 7470	Mercury	Accredited	5/9/2003	STATE	LA
10166004	EPA 7471	Mercury	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',3,3',4,4',5-Heptachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',3,3',4,4'-Hexachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',3,4,4',5,5'-Heptachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',3,4,4',5',6-Heptachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',3,4,4',5'-Hexachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2;2',3,4,5,5'-Hexachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',3,4,5'-Pentachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',3,5,5',6-Hexachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',3,5'-Tetrachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',4,4',5,5'-Hexachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',4,5,5'-Pentachlorobiphenyl	Accredited	5/9/2003	STATE	LA

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10179007	EPA 8082	2,2,'4,5'-Tetrachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',5,5'-Tetrachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,2',5-Trichlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,3,3',4',6-Pentachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,3',4,4',5-Pentachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,3',4,4'-Tetrachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,3',5-Trichlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,3-Dichlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2,4',5-Trichlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	2-Chlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	3,3'-Dichlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	Aroclor-1016 (PCB-1016)	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	Aroclor-1221 (PCB-1221)	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	Aroclor-1232 (PCB-1232)	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	Aroclor-1242 (PCB-1242)	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	Aroclor-1248 (PCB-1248)	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	Aroclor-1254 (PCB-1254)	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	Aroclor-1260 (PCB-1260)	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	Decachlorobiphenyl	Accredited	5/9/2003	STATE	LA
10179007	EPA 8082	PCBs as congeners	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 1 1 2-Tetrachloroethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 1 1-Trichloroethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 1 2 2-Tetrachloroethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 1 2-Trichloro-1 2 2-trifluoroethane (Freon-113)	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	1 1 2-Trichloroethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 1-Dichloroethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 1-Dichloroethylene	Accredited	5/9/2003	STATE	LA

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10184404	EPA 8260	1 1-Dichloropropene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 2 3-Trichlorobenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 2 3-Trichloropropane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 2 4-Trichlorobenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 2 4-Trimethylbenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 2-Dibromo-3-chloropropane (DBCP)	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 2-Dibromoethane (EDB Ethylene dibromide)	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 2-Dichlorobenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 2-Dichloroethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 2-Dichloropropane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 3 5-Trimethylbenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 3-Butadiene	Accredited	10/17/2003	STATE	LA
10184404	EPA 8260	1 3-Dichlorobenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 3-Dichloropropane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	1 4-Dichlorobenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	2 2-Dichloropropane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	2-Butanone (Methyl ethyl ketone MEK)	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	2-Chloropropane	Accredited	10/17/2003	STATE	LA
10184404	EPA 8260	2-Chlorotoluene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	2-Hexanone	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	4-Chlorotoluene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	4-Methyl-2-pentanone (MIBK)	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Acetone	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Acetonitrile	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Acrylonitrile	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Benzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Bromobenzene	Accredited	5/9/2003	STATE	LA

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10184404	EPA 8260	Bromochloromethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Bromodichloromethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Bromoform	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Carbon disulfide	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Carbon tetrachloride	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Chlorobenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Chloroethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Chloroform	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	cis & trans-1 2-Dichloroethene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	cis-1 2-Dichloroethylene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	cis-1 3-Dichloropropene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	cis-1 4-Dichloro-2-butene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Dibromochloromethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Dibromomethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Dichlorodifluoromethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Ethylbenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Hexachlorobutadiene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Hexane	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Iodomethane (Methyl iodide)	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Isopropylbenzene (cumene)	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Methyl bromide (Bromomethane)	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Methyl chloride (Chloromethane)	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Methyl tert-butyl ether (MTBE)	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Methylene chloride	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	m-Xylene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Naphthalene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	n-Butylbenzene	Accredited	5/9/2003	STATE	LA

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10184404	EPA 8260	Nitrobenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	n-Propylbenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	o-Xylene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	p-Isopropyltoluene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	p-Xylene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Pyridine	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	sec-Butylbenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Styrene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	tert-Butylbenzene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Tetrachloroethylene (Perchloroethylene)	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Toluene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	trans-1 2-Dichloroethylene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	trans-1 3-Dichloropropylene	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	trans-1 4-Dichloro-2-butene	Accredited	10/6/2003	STATE	LA
10184404	EPA 8260	Trichloroethene (Trichloroethylene)	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Trichlorofluoromethane	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Vinyl bromide	Accredited	10/17/2003	STATE	LA
10184404	EPA 8260	Vinyl chloride	Accredited	5/9/2003	STATE	LA
10184404	EPA 8260	Xylene (total)	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	1 2 4 5-Tetrachlorobenzene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	1 2 4-Trichlorobenzene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	1 2-Dichlorobenzene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	1 2-Diphenylhydrazine	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	1 3 5-Trinitrobenzene (1 3 5-TNB)	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	1 3-Dichlorobenzene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	1 3-Dinitrobenzene (1 3-DNB)	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	1 4-Dichlorobenzene	Accredited	5/9/2003	STATE	LA

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10185203	EPA 8270	1-Chloronaphthalene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	2 3 4 6-Tetrachlorophenol	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	2 4 5-Trichlorophenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2 4 6-Trichlorophenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2 4-Dichlorophenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2 4-Dimethylphenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2 4-Dinitrophenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2 4-Dinitrotoluene (2 4-DNT)	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2 6-Dichlorophenol	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	2 6-Dinitrotoluene (2 6-DNT)	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2-Acetylaminofluorene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	2-Chloronaphthalene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2-Chlorophenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2-Methyl-4 6-dinitrophenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2-Methylnaphthalene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2-Methylphenol (o-Cresol)	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2-Nitroaniline	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2-Nitrophenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	2-Sec-butyl-4 6-dinitrophenol (DNBP Dinoseb)	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	3 3'-Dichlorobenzidine	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	3-Methylcholanthrene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	3-Methylphenol (m-Cresol)	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	3-Nitroaniline	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	4-Bromophenyl phenyl ether	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	4-Chloro-3-methylphenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	4-Chloroaniline	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	4-Chlorophenyl phenylether	Accredited	5/9/2003	STATE	LA

Issue Date: July 1, 2007
Expiration Date: June 30, 2008

Louisiana Environmental Laboratory
LELAP
Accreditation Program

Laboratory Scope of Accreditation

Organization

03079 **(865) 291-3000**
TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

Air and Emissions Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
10185203	EPA 8270	4-Methylphenol (p-Cresol)	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	4-Nitroaniline	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	4-Nitrophenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	5-Nitro-o-toluidine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	7 12-Dimethylbenz(a) anthracene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Acenaphthene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Acenaphthylene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Acetophenone	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Aniline	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Anthracene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Benzidine	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Benzo(a)anthracene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Benzo(a)pyrene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Benzo(b)fluoranthene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Benzo(g h i)perylene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Benzo(k)fluoranthene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Benzoic acid	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Benzyl alcohol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	bis(2-Chloroethoxy)methane	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	bis(2-Chloroethyl) ether	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	bis(2-Chloroisopropyl) ether	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	bis(2-Ethylhexyl) phthalate (DEHP)	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Butyl benzyl phthalate	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Carbazole	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Chrysene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Dibenz(a h) anthracene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Dibenzofuran	Accredited	5/9/2003	STATE	LA

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Air and Emissions Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
10185203	EPA 8270	Diethyl phthalate	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Dimethyl phthalate	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Di-n-butyl phthalate	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Di-n-octyl phthalate	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Diphenylamine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Ethyl methanesulfonate	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Fluoranthene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Fluorene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Hexachlorobenzene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Hexachlorobutadiene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Hexachlorocyclopentadiene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Hexachloroethane	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Hexachloropropene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Indeno(1,2,3-c,d)pyrene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Isophorone	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Isosafrole	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Methyl methanesulfonate	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Naphthalene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Nitrobenzene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	N-Nitrosodiethylamine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	N-Nitrosodimethylamine	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	N-Nitroso-di-n-butylamine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	N-Nitrosodi-n-propylamine	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	N-Nitrosodiphenylamine	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	N-Nitrosomethylethylamine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	N-Nitrosomorpholine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	N-Nitrosopiperidine	Accredited	10/6/2003	STATE	LA

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Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
10185203	EPA 8270	N-Nitrosopyrrolidine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	o-Toluidine	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	p-Dimethylaminoazobenzene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Pentachlorobenzene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Pentachloroethane	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Pentachloronitrobenzene	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Pentachlorophenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Phenacetin	Accredited	10/6/2003	STATE	LA
10185203	EPA 8270	Phenanthrene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Phenol	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Pyrene	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Pyridine	Accredited	5/9/2003	STATE	LA
10185203	EPA 8270	Safrole	Accredited	10/6/2003	STATE	LA
10187209	EPA 8290	1 2 3 4 6 7 8 9-Octachlorodibenzofuran (OCDF)	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 4 6 7 8 9-Octachlorodibenzo-p-dioxin (OCDD)	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 4 6 7 8-Heptachlorodibenzofuran (1 2 3 4 6 7 8-hpcdf)	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 4 6 7 8-Heptachlorodibenzo-p-dioxin (1 2 3 4 6 7 8-hpcdd)	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 4 7 8 9-Heptachlorodibenzofuran (1 2 3 4 7 8 9-hpcdf)	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 4 7 8-Hxcdd	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 4 7 8-Hxcdf	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 6 7 8-Hxcdd	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 6 7 8-Hxcdf	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 7 8 9-Hxcdd	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 7 8 9-Hxcdf	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 7 8-Pecdd	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	1 2 3 7 8-Pecdf	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	2 3 4 6 7 8-Hxcdf	Accredited	7/18/2003	STATE	LA

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03079
TestAmerica Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947
(865) 291-3000

Air and Emissions Certification

Method Code	Method Ref	Analyte	Status	Date Effective	Type	AA
10187209	EPA 8290	2 3 4 7 8-Pecdf	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	2 3 7 8-TCDD	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	2 3 7 8-TCDF	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	2 3 7 8-Tetrachloro dibenzo- p-dioxin	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	Dibenzo-p-dioxins & Dibenzofurans	Accredited	5/9/2003	STATE	LA
10187209	EPA 8290	Total Heptachlorodibenzofuran	Accredited	10/6/2003	STATE	LA
10187209	EPA 8290	Total Heptachlorodibenzo-p-dioxin	Accredited	10/6/2003	STATE	LA
10187209	EPA 8290	Total Hexachlorodibenzofuran	Accredited	10/6/2003	STATE	LA
10187209	EPA 8290	Total Hexachlorodibenzo-p-dioxin	Accredited	10/6/2003	STATE	LA
10187209	EPA 8290	Total Pentachlorodibenzofuran	Accredited	10/6/2003	STATE	LA
10187209	EPA 8290	Total Pentachlorodibenzo-p-dioxin	Accredited	10/6/2003	STATE	LA
10187209	EPA 8290	Total Tetrachlorodibenzofuran	Accredited	10/6/2003	STATE	LA
10187209	EPA 8290	Total Tetrachlorodibenzo-p-dioxin	Accredited	10/6/2003	STATE	LA

ATTACHMENT C

AUDIT SAMPLE REQUESTS

METALS, CHLORIDE, AND DIOXIN/FURAN AUDIT REQUEST

Request for Audit Samples

1. **Audits Requestor**
   Sharon D. Caughman
   Occidental Chemical Company
   P.O. Box 227
   8318 Ashland Road
   Geismar, LA 70734
   (225) 474-2695
   Sharon_D._Caughman@oxy.com

2. **Ship Audits To (Organization Being Audited):** Same as above.

3. **Date of Audits/Date of Test:** February 11-15, 2008

4. **Target Compound(s) (POHCs):**
   Chloride ion for HCl/Cl_2
   Metals for multi-metals (see attached table)
   Dioxins/Furans

5. **Name of individual or organization conducting sampling and analysis:**

   Focus Environmental Inc. (Test Management Contractor)
   Attn: Chris E. McBride
   9050 Executive Park Drive, Suite A-202
   Knoxville, TN 37923
   (865) 694-7517 x3041
   (865) 531-8854 (Fax)
   (865) 271-7776 (Cell)
   cemcbride@focusenv.com

   TRC Environmental Corporation (Stack Sampling Contractor)
   Attn: Mike Krall
   2100 Kramer Lane, Suite 800
   Austin, TX 78758
   (512) 684-3417
   (512) 684-3409 (Fax)
   (512) 809-8507 (Cell)
   mkrall@trcsolutions.com

   TestAmerica, Inc. (Analytical Laboratory)
   Attn: Dr. William C. Anderson
   5815 Middlebrook Pike
   Knoxville, TN 37921
   (865) 291-3080
   (865) 584-4315 (Fax)

6. **Type of Combustion Units:** Hydrochloric Acid Production Furnace (HAPF)

7. **Audit Activity:** HWC MACT Comprehensive Performance Test (CPT)

8. **Methods Being Audited:**
   EPA Method 26A for HCl/Cl_2 (liquid ampules)
   SW-846 Method 0060/EPA Method 29 for Multi-Metals (liquid ampules & spiked filter)
   SW-846 Method 0023A for Dioxins/Furans (spiked XAD-2 resin)

Suggested Stack Gas Multi-Metals Audit Target Levels

Metal	Spiked Filter		Liquid Ampule	
	Target Range Available (µg)	Suggested Audit Sample Level (µg)	Target Range Available (µg/mL) (ppm)	Suggested Audit Sample Level (µg/mL) (ppm)
Antimony (Sb)	0 to 300	230	0 to 20	5
Arsenic (As)	0 to 425	320	0 to 25	5
Barium (Ba)	NA	NA	0 to 20	5
Beryllium (Be)	0 to 100	80	0 to 12	5
Cadmium (Cd)	0 to 330	250	0 to 18	5
Total Chromium (Cr)	0 to 310	230	0 to 25	5
Cobalt (Co)	0 to 150	110	0 to 8	5
Copper (Cu)	0 to 220	170	0 to 12	5
Lead (Pb)	0 to 500	380	0 to 150	5
Manganese (Mn)	0 to 250	190	0 to 18	5
Mercury (Hg)	NA	NA	0 to 400 ηg/L (ppb)	5.0
Nickel (Ni)	0 to 330	250	0 to 40	5
Selenium (Se)	0 to 350	260	0 to 18	5
Silver (Ag)	0 to 240	180	0 to 12	5
Thallium (Tl)	0 to 250	190	0 to 14	5
Zinc (Zn)	NA	NA	0 to 40	5

Suggested Stack Gas HCl/Cl_2 Audit Target Level

Parameter	Target Range Available (mg/L)	Suggested Audit Sample (mg/L)
Chloride Ion (Cl^-)	0 to 550	50-100

Suggested Stack Gas Dioxin/Furan Audit Target Level

Parameter	Target Range Available (ηg)	Suggested Audit Sample (ηg)
PCDD/PDCFs	15 to 60	15

VOST AUDIT REQUEST

VOST Audit Request Form

1. **Audit Requestor**
   Sharon D. Caughman
   Occidental Chemical Company
   P.O. Box 227
   8318 Ashland Road
   Geismar, LA 70734
   (225) 474-2695
   Sharon_D._Caughman@oxy.com

2. **Ship Audit To (Organization Being Audited):** Same as above.

3. **Date of Audit/Date of Test:** February 11-15, 2008

4. **Target Compound(s) (Target POHCs):** To be Determined.

   Target Compound(s) Expected Concentration(s) (ppb):
   Approximately 10 ppb (~ 50 $\mu g/m^3$) (See attached sheet)

5. **Name of individual or organization conducting sampling and analysis:**

   Focus Environmental Inc. (Test Management Contractor)
   Attn: Chris E. McBride
   9050 Executive Park Drive, Suite A-202
   Knoxville, TN 37923
   (865) 694-7517 x3041
   (865) 531-8854 (Fax)
   (865) 271-7776 (Cell)
   cemcbride@focusenv.com

   TRC Environmental Corporation (Stack Sampling Contractor)
   Attn: Mike Krall
   2100 Kramer Lane, Suite 800
   Austin, TX 78758
   (512) 684-3417
   (512) 684-3409 (Fax)
   (512) 809-8507 (Cell)
   mkrall@trcsolutions.com

   TestAmerica, Inc. (Analytical Laboratory)
   Attn: Dr. William C. Anderson
   5815 Middlebrook Pike
   Knoxville, TN 37921
   (865) 291-3080
   (865) 584-4315 (Fax)

6. **Type of Combustion Units:** Hydrochloric Acid Production Furnace (HAPF)

7. **Audit Activity:** HWC MACT Comprehensive Performance Test (CPT)

8. **Method Being Audited:** Volatile Organic Sampling Train (VOST, SW-846 Method 0030)

Suggested VOST Audit Cylinder Concentrations

Maximum Tenax Loading for Any VOC	2,000 ηg
Sampled Volume	10 Liters
Concentration at Maximum Loading	200 ηg/L
	200 μg/m^3
Suggested Concentration in Cylinder	50 ηg/L
	50 μg/m^3

EPA REGION 6 AUDIT SOP

Attachment 1

SOP for Use of Performance Audits During Comprehensive Performance Tests

This Standard Operating Procedure (SOP) has been developed to provide guidance on the requirements for use of performance audits during trial burns or MACT comprehensive performance tests.

EPA Point of Contact. U.S. EPA Region 6 Audit Coordinator is Esther Coleman. Contact information: (214) 665-8517 or by e-mail at coleman.esther@epa.gov.

I. VOST (Method 0030)

The method for collection of volatile principle organic hazardous constituents (POHCs) from the stack gas effluents of hazardous wastes incinerators is the Volatile Organic Sampling Train (VOST). The VOST audit is specifically required by the EPA manual SW-846, and is described in Method 0030. When a permit applicant submits their Comprehensive Performance Test Plan (CPT), it must include the following:

a. A narrative in the QAPP which outlines specific details of their planned approach. The QAPP should be in accordance with the *Quality Assurance/Quality Control Procedures for Hazardous Waste Incineration (EPA/625/6-89/023)*. If the permit applicant does not have this EPA document, they should contact the Region 6 staff to acquire one.

b. A detailed discussion of the permit applicants' proposed procedures, describing the sampling and analysis methods to be used, and any deviations from the standard method that may be planned. This is done so that the regulatory agency can assess and make determinations as to whether the procedures, as planned, are acceptable.

c. The POHC(s) identified by the permit applicant and the expected concentration.

d. The approximate time frame for which the VOST kit and audit cylinder is needed should be indicated.

Audit Cylinder Requests. The auditee should request an audit cylinder from the Region 6 Audit Cylinder Coordinator via the VOST Audit Request Form (SOP Enclosure 1). Upon notification that a cylinder is required, the Audit Cylinder Coordinator can provide this form electronically to the permit applicant. The Audit Cylinder Request Form allows several pieces of information to be collected. Importantly, it is where the POHC(s) and its' expected concentration is identified, and it also indicates the sampling and analytical methods to be used. When a definite test date is set, the request for an audit cylinder should be made within ten (10) days of the actual test date.

The cylinder will be sent to the facility, to arrive on the requested date, so that it can be available for the auditor and the sampling crew.

Breaking the Audit Cylinder Seal. Custody seals have been placed on the cylinder. The cylinder seal should be broken only in the presence of a government representative. If a government representative is not present, the auditor may not use the cylinder.

Audit Cylinder Sampling. The cylinder should be sampled in the presence of the auditor before the test begins or immediately afterwards. A standard letter (SOP Enclosure 2) stating these instructions accompanies the VOST kit and audit cylinder when it is sent. Also, a set of detailed instructions (SOP Enclosures 3, 4 and 5) are included in the kit suitcase and the audit cylinder, respectively.

Sample Analysis Results. All sample analysis results should be supported by data from the comprehensive performance test, which is presented in the Comprehensive Performance Test Report (CPT). Justification for any problems or deficiencies should be included and addressed with the submittal of the audit results, and in the CPT. The sample analysis results should be sent to the EPA Audit Cylinder Coordinator, so that analysis of the results can be done in a timely manner. Address and telephone numbers are also included in the standard letter with the audit kit and cylinder.

II. Dioxins/Furans (Method 23); HCl/Cl2 (Method 26/26A); and Metals (Method 29)

These methods recommend the use of performance audits on the laboratory analysis.

Audit Requests. The facility should request audit materials from the EPA audit coordinator. Research Triangle Park (RTP) has an electronic database which must be used to order audit samples.

* The requested sample concentration for **Method 23** must be within the following range(s): 15 to 60 ng/sample.

* The requested sample concentration for **Method 26A** must be within the following range(s): 0 to 550 mg/L. Indicate the number of samples needed at this concentration.

* Audit samples for **Method 29** can be provided in one of two containers: Ampule or Filter. Indicate the container you wish to receive. Requested concentrations **for all compounds you want included in the audit sample** should be provided **(on SOP Enclosures 6 and 7)**, along with the number of samples required at these concentrations.

Sample Analysis Results. After the audit test has been performed, and the results analyzed, the results will be reported to the EPA audit coordinator so that it can be input into the electronic database to determine if the sample has passed or failed the audit test. All sample analysis results should be supported by data from the comprehensive performance test, which is presented in the

Comprehensive Performance Test Report (CPT). Justification for any problems or deficiencies should be included and addressed with submittal of the audit results, and in the CPT. The sample analysis results should be sent to the EPA Audit Coordinator, so that analysis of the results can be done in a timely manner.

Required information: After analysis, the following detailed list of information is required from the facility for input into the database:

a. Measured concentrations for each compound in the sample, in the units specified
c. Collection firm name
d. Collection firm address
e. Collection firm telephone number
f. Analyzing laboratory name
g. Analyzing laboratory address
h. Analyzing laboratory telephone number
i. Audit test site address
j. Audit start date
k. Audit end date (optional)

SOP Enclosure 1

AUDIT CYLINDER REQUEST FORM

Date:

1. **Requestor (Permit Writer)**

   _____ Tel. #_____

   _____

   _____

   _____

2. **Ship To (Organization Being Audited):** Tel. # _____

3. **Date of Audit:** **Date Needed** _____

4. **Target Compound(s):**
   Target compound(s) range of concentration required (ppb):

5. **Name of individual or organization conducting sampling:**

6. **Type of Combustion Unit:** _____

7. **Audit Activity:** _____

   Sampling Method: _____ Analytical Method: _____

   [ ] VOST method for RCRA pre-trial burn
   [ ] VOST method during actual RCRA trial burn
   [ ] VOST method during actual MACT performance test
   [ ] other (explain) _____

SOP Enclosure 2

Address

Dear Auditee:

TechLaw, Inc. has been requested by the United States Environmental Protection Agency (U.S. EPA), Region 6, to provide you with one cylinder of micrograms-per-cubic-meter ($\mu g/m^3$) levels of one or more compounds in nitrogen for a **regulatory audit.** A Volatile Organics Sampling Train (VOST) kit is provided with the cylinder. Custody seals have been placed on the cylinder. Do not remove these seals until a government representative is present. If a government representative is not present, the auditee may not use the cylinder.

The U.S. EPA urges you to use only the amount of gas required to conduct the audit of your analytical system and to be certain the cylinder valve is properly closed to prevent slow loss of the contents. **The government representative is to have the cylinder and VOST kit returned as soon as possible so that other organizations may also participate in the audit program.**

You are responsible for the cylinder and kit until they are returned to TechLaw, Inc. U.S. EPA requires that you insure the cylinder and the VOST kit for $2600 and $1700, respectively, upon return shipment to TechLaw, Inc. The cylinder and VOST kit should be sent back **within 15 days of the audit date, at your cost** (prepaid, not collect) to:

ATTN: Mr. Mohamed Nur
TechLaw, Inc.
14500 Avion Parkway, Suite 300
Chantilly, VA 20151

If you are unable to return the cylinder and the kit within the duration specified, please contact Ms. Esther Coleman. **Important: Please note that the cylinder is Dangerous Goods by virtue of its pressure and should be shipped in accordance with IATA/ICAO or U.S. DOT regulations as Dangerous Goods. Not to do so may result in a fine of $25,000 at a minimum.**

The audit results are to be reported in $\mu g/m^3$ and submitted to:

Ms. Esther Coleman
U.S. EPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75201

U.S. EPA would appreciate your cooperation in this regard. If you have any questions regarding the audit cylinder and kit, please feel free to call Ms. Esther Coleman at 214/665-8517.

Sincerely,

Mohamed Nur
TechLaw Project Manager

cc: E. Coleman, USEPA Region 6
D. Pandak/Dallas Files, TechLaw

SOP Enclosure 3

To: Auditee
From: TechLaw, Inc.

This suitcase kit is provided in conjunction with an audit cylinder which is packaged separately.

A letter accompanying the audit cylinder describes their purpose and origin.

The audit gas from the cylinder running through the kit's manifold simulates the ambient emission from the stack through your probe. Follow instructions attached to use the kit's materials for your audit.

Please return the suitcase at your cost to the following address:

TechLaw, Inc.
ATTN: Mohamed Nur
14500 Avion Parkway, Suite 300
Chantilly, VA 20151

Insure the suitcase kit for $1700.

Thank you!

INSTRUCTIONS FOR USE OF VOST AUDIT KIT

1. Assemble the support stand (base and rod). Using the clamps supplied, secure the manifold and rotometer vertically to the stand. The larger end of the manifold should be temporarily up, so that the thermometer can be inserted.

2. Connect the heat controller to the tape and adjust the dial to heat the manifold to approximately 100°C.

   On assemblies with 1" tape (closely wrapped), a setting of 5 is sufficient to attain 100°C.

   On assemblies with 1/2" tape (loosely wrapped), a setting of 7 - 7 1/2 is required.

3. After the manifold temperature has become stable, remove the thermometer, invert the manifold (larger end down) and attach the shorter 3/8" OD tubing by sliding the end with tygon piece over the glass.

4. Attach the 1/8" tubing (union end) to the 1/4" Teflon nut with the Teflon ferrules on the opposite end of the manifold.

5. Attach regulator to cylinder and then attach output of cylinder regulator to 1/8" Teflon tubing.

6. Attach long piece of 3/8" Teflon tubing to output side of rotometer and vent this to a suitable place (i.e. - exhaust hood).

7. Adjust the regulator to start the gas flow. The audit kit supplied rotometer is downstream of the manifold and is used to monitor excess gas flow.

8. The rotometer will present negligible back pressure to the manifold. ΔP for 5 L/min is 1 inch of water column.

9. After sampling is completed, allow the manifold to cool, disassemble and repackage the audit kit into the case. Remember to include the Teflon nut on the end of the manifold. Loosely coil the tubing and place it on top of the repackaged kit.

10. Ship the case back at your cost.

VOST AUDIT KIT INVENTORY

QUANTITY	DESCRIPTION
1	Glass manifold with Teflon nut and Teflon ferrules
1	Heating tape (wrapped around manifold)
1	1/8" Teflon tubing (about 3 ft) with 1/8" brass nut on each end and 1/4" to 1/8" reducing union on one end
1	Regulator, single stage, high purity, 350 CGA fitting
1	3/8" teflon tubing, "short" with 3/8" brass Swagelok nut on one end and tygon tubing on the other end
1	Rotometer, 3/8" Swagelok male connectors on both ends
1	3/8" Teflon tubing, "long" with 3/8" brass Swagelok nut
1	1/4" Ultra-torr fitting
1	Dial thermometer, °C
2	Two-prong extension clamps
2	Right-angle clamp holders, aluminum thumbscrew type
1	Base support, 4" x 6"
1	Rod for base support, 1/16" diameter, 18" long
1	Cylinder clamp support with nylon strap
1	Heat tape controller
1	Fiberbuilt shipping case

Please notify me at once if an item is missing or defective.

Thank you for carefully repackaging all items!

Mohamed Nur (703) 818-3244

SOP Enclosure 4

INSTRUCTIONS FOR THE SAMPLING AND ANALYSIS OF VOLATILE POHC FROM QUALITY ASSURANCE AUDIT CYLINDERS USING THE BAG TECHNIQUE

1.0 PURPOSE

This audit is intended to assess and document the accuracy and precision of the principle organic hazardous constituents (POHC) using the bag technique during regulatory audits at hazardous waste burning facilities. The audit can also be used to determine the proficiency of the source testing organization prior to the actual performance tests.

2.0 PRINCIPLE

A gas sample containing POHC is drawn from an audit gas cylinder into a bag. The collected POHC are analyzed by gas chromatography according to the method specifications and procedures.

3.0 AUDIT MATERIAL (GAS CYLINDERS)

The audit material is contained in gas cylinders. A maximum of 5 L of audit gas is to be used for each test run. A single-stage gas regulator, 1/4" male/female glass joints, and Teflon tubing are supplied for use with the gas cylinder.

4.0 PROCEDURES

The following step-by-step procedures should be used for sample collection and analysis using the bag technique:

Step A. Evacuate the bag with a vacuum pump and fill the bag with approximately 5 L of organic-free nitrogen from a gas cylinder. Tedlar bags are recommended. Determine the hazardous constituents of interest by gas chromatography. Report the concentrations determined a Blank Value 1. The blank value must be not more than twice the detection limit. If it is higher, the bag cleaning procedure should be repeated.

Step B. After the blank analysis, evacuate the bag with a vacuum pump and fill the bag with approximately 5 L of gas from the audit cylinder. The 1/4" male/female glass joints that are supplied should be used as connections to the bag and the audit cylinder. Minimum Teflon tubing should be used. Determine the POHC of interest by gas chromatography. Report the concentrations of each constituent as Analysis Result 1.

Step C. Evacuate the bag contents and fill the bag with organic -0free nitrogen. After three minutes, evacuate the bag contents and fill the bag again with nitrogen. After three minutes, repeat the evacuation procedure and fill the bag with 5 L of nitrogen. Determine the concentration of the bag contents by gas chromatography and report the measured concentration as Blank Value 2. The blank value must not be more than twice the detection limit. If it is higher, the bag cleaning procedure should be repeated.

Step D. Evacuate the bag contents and fill the bag with approximately 5 L of gas from the audit cylinder. Determine the POHC of interest by gas chromatography. Report the concentrations determined as Analysis Result 2.

Step E. Repeat Step C and report the measured concentration of the bag contents as Blank Value 3. The blank value must not be more than twice the detection limit. If it is higher, the bag cleaning procedure should be repeated.

Step F. Evacuate the bag contents and fill the bag with approximately 5 L of gas from the audit cylinder. Determine the POHC of interest by gas chromatography. Report the concentrations determined as Analysis Result 3.

5.0 SAMPLE ANALYSIS

Follow the procedures described in the method used for sample analysis, calibration, and calculations. Submit the results to the Project Officer and to the audit supervisor for evaluation.

SOP Enclosure 5

INSTRUCTIONS FOR THE SAMPLING AND ANALYSIS OF VOLATILE POHC FROM QUALITY ASSURANCE AUDIT CYLINDERS USING THE VOLATILE ORGANIC SAMPLING TRAIN

1.0 PURPOSE

This audit is intended to assess and document the accuracy and precision of the volatile organic sampling train (VOST) when used during comprehensive performance tests at hazardous waste burning facilities. This audit also can be used to determine the proficiency of source testing organizations prior to the actual performance tests.

2.0 PRINCIPLE

A gas sample containing principle organic hazardous constituents (POHC) is passed from an audit gas cylinder into a glass manifold and is used in place of the test site stack sample. While the POHC gas is being passed in to the glass manifold, a major portion of the gas is drawn through a VOST according to the method specifications and procedures. The collected POHC are analyzed by thermal desorption, purge and trap, and gas chromatography/mass spectrometry (GC/MS) (see Method 5040).

3.0 APPARATUS

3.1 Glass Manifold

A glass manifold is supplied. One side of the glass manifold is connected with Teflon tubing to the audit cylinder. The other end of the glass manifold should be connected with Teflon tubing to a rotometer and the excess gas from the rotometer should be vented into a hood. The glass manifold is heated to 100°C with heat tape. The heat tape, rotometer, and Teflon tubing are also supplied. One port of the glass manifold should be connected to the VOST probe with 1/4" male/female glass joints (see the enclosed diagram).

3.2 VOST Components

The sampling train component parts, except for the glass manifold, are the same as those used for VOST.

3.3 Analysis

Refer to the method specifications and procedures for the VOST method.

4.0 AUDIT MATERIAL (GAS CYLINDER)

The audit material is supplied in gas cylinders. A maximum of 50 L of gas is to be used for each test run. A single-stage gas regulator is supplied for use with the gas cylinder.

5.0 PROCEDURES

5.1 Sampling

5.1.1 Preparation of VOST

All train components should be cleaned and assembled as described in the VOST method use.

5.1.2 Sample generation

The gas sample from the audit cylinder is passed through the glass manifold at a flow rate of 2 L/min for 3 minutes to condition the glass system. A glass rotometer is supplied to measure the flow rate at the end of the glass manifold. The VOST probe then should be connected to one port of the glass manifold with 1/4" male/female joints and the probe should be purged with audit gas for an additional 2 minutes so that the probe is purges of ambient air before initiation of sample collection. This can be accomplished either by attaching a pump to a three-way stop-cock above the first condenser and drawing audit gas through the probe via the three-way stop-cock or by any other suitable method.

5.2 SAMPLE COLLECTION

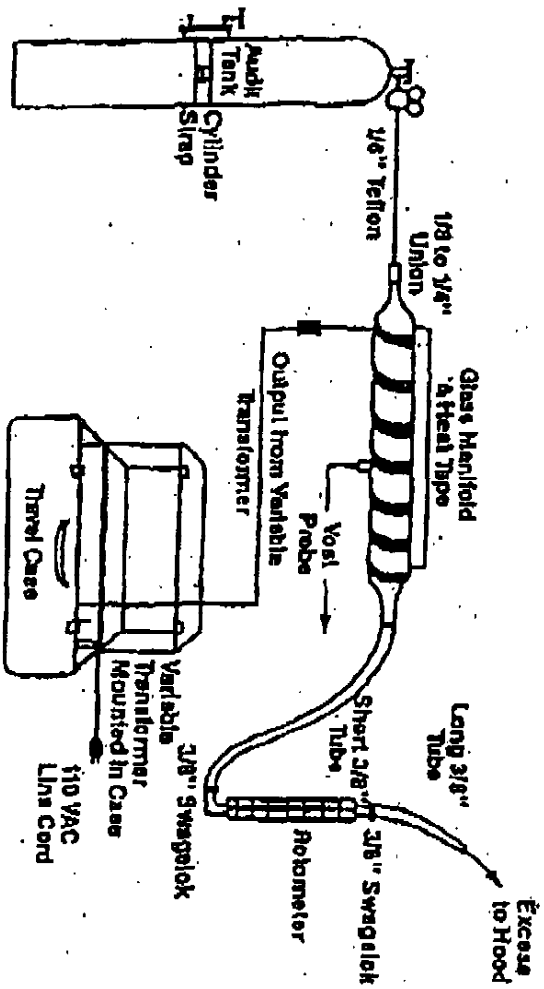
After leak-checking and conditioning the glass probe, sample collection is accomplished by opening the valve at the inlet to the first condenser, turning on the pump and sampling at a rate of 0.5 L/min for 20 minutes or 1.0 L/min for 10 minutes. The sampling rate is measured with the rotometer which is part of the VOST. The volume of sample for any pair of the traps should not exceed 10 L. The temperature of the gas stream at the inlet to the first sorbent cartridge must be maintained at 20°C during sample collection.

After the collection of 10 L of sample, the train is leak-tested using the procedures described in the method used. If leak-test criteria as described in the method are not met, the samples should not be analyzed. If leak-test criteria are met, the train is returned to atmospheric pressure, the two sorbent cartridges are removed, the end caps are replaced, and analysis of cartridges is performed.

Repeat the sample collection procedure two more times with two new pairs of sample cartridges in the VOST, collect 10 L of sample each time, and perform the analysis.

5.3 SAMPLE ANALYSIS

Follow the procedures described in the method for sample analysis, calibration, and calculations. Report the amount of each constituent in the three samples and the blank values to the EPA Audit Coordinator for evaluation.



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SOP Enclosure 6

Available concentration ranges for compounds included in the ampule for the audit sample for Method 29. A default sample container has been set for each compound.

Compound	Target Range Available	Requested Concentration
antimony(Sb)	0 to 20 µg/mL (ppm)	
arsenic(As)	0 to 25 µg/mL (ppm)	
barium(Ba)	0 to 20 µg/mL (ppm)	
beryllium(Be)	0 to 12 µg/mL (ppm)	
cadmium(Cd)	0 to 18 µg/mL (ppm)	
chromium(Cr)	0 to 25 µg/mL (ppm)	
cobalt(Co)	0 to 8 µg/mL (ppm)	
copper(Cu)	0 to 12 µg/mL (ppm)	
lead(Pb)	0 to 150 µg/mL (ppm)	
manganese(Mn)	0 to 18 µg/mL (ppm)	
mercury(Hg)	0 to 400 ng/mL (ppb)	
nickel(Ni)	0 to 40 µg/mL (ppm)	
selenium(Se)	0 to 18 µg/mL (ppm)	
silver(Ag)	0 to 12 µg/mL (ppm)	
thallium(Tl)	0 to 14 µg/mL (ppm)	
zinc(Zn)	0 to 40 µg/mL (ppm)	

Indicate the number of samples required at these concentrations: _____

SOP Enclosure 7

Available concentration ranges for compounds included in the filter for the audit sample for **Method 29.** A default sample container has been set for each compound.

Compound	Target Range Available	Requested Concentration
Silver	0 to 240 µg	
antimony(Sb)	0 to 300 µg	
arsenic(As)	0 to 425 µg	
beryllium(Be)	0 to 100 µg	
cadmium(Cd)	0 to 330 µg	
chromium(Cr)	0 to 310 µg	
cobalt(Co)	0 to 150 µg	
copper(Cu)	0 to 220 µg	
lead(Pb)	0 to 500 µg	
manganese(Mn)	0 to 250 µg	
nickel(Ni)	0 to 330 µg	
selenium(Se)	0 to 350 µg	
thallium(Tl)	0 to 250 µg	

Indicate the number of samples required at these concentrations: _____

APPENDIX B

RISK ASSESSMENT DATA COLLECTION PLAN

F-1 INDUSTRIAL FURNACE
RISK ASSESSMENT DATA COLLECTION PLAN
OCCIDENTAL CHEMICAL CORPORATION
EPA I.D. NO. LAD 092 681 824

PREPARED FOR:

OxyChem

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NOVEMBER 2007
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ENGINEERING SOLUTIONS TO ENVIRONMENTAL PROBLEMS

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List of Acronyms

acfm	actual cubic feet per minute
APC	air pollution control
ASTM	American Society for Testing and Materials
AWFCO	automatic waste feed cutoff
Btu	British thermal unit
CEM	continuous emissions monitoring
CEMS	continuous emissions monitoring system
CFR	Code of Federal Regulations
cm	centimeter
CMS	continuous monitoring system
cP	centipoises
CPT	comprehensive performance test
cSt	centistokes
CVAA or CVAAS	cold vapor atomic absorption spectrometry
DCBP	decachlorobiphenyl
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
FID	flame ionization detector
FRP	fiber reinforced plastic
ft	foot
g	gram
g/cc	grams per cubic centimeter
GC	gas chromatography
GC/MS	gas chromatograph/mass spectrometry
GFAAS	graphite furnace atomic absorption spectrometry
gpm	gallons per minute
gr	grain
HAP	hazardous air pollutant
HC or THC	total hydrocarbons
HCB	hexachlorobenzene
HCC	HydroChloroCarbon
hr	hour
HON	Hazardous Organic NESHAP
HRGC/HRMS	high resolution gas chromatography/high resolution mass spectrometry
HWC	hazardous waste combustor
ICP or ICAP	inductively coupled argon plasma spectroscopy
ICP-MS or ICAP-MS	Inductively coupled argon plasma spectroscopy/mass spectroscopy
in	inch
inwc	inches water column
kg	kilogram
l	liter
lb	pound
LDEQ	Louisiana Department of Environmental Quality
LELAP	Louisiana Environmental Laboratory Accreditation Program
LVM	low volatility metals
MACT	Maximum Achievable Control Technology
mg	milligram
ml	milliliter

MM Btu/hr	million British thermal units per hour
MS	mass spectroscopy
mscfm	thousand cubic feet per minute
MSL	mean sea level
NDIR	non-dispersive infrared
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIST	National Institute for Standards and Testing
NO_X	Oxides of Nitrogen
NO_2	Nitrogen Dioxide
OTS	Office of Toxic Substances
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
pg	picogram
POHC	principal organic hazardous constituent
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
scfm	standard cubic feet per minute
sec	second
SRE	system removal efficiency
SVM	semivolatile metals
TBP	trial burn plan
TBP	TriButylPhosphate
TCDD	tetrachlorinated dibenzo-p-dioxin
TEQ	toxicity equivalents
THC or HC	total hydrocarbons
VOA	volatile organic analysis
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
5CP	1,1,1,3,3-pentachloropropane

1.0 EXECUTIVE SUMMARY

Occidental Chemical Corporation (OxyChem) operates an industrial furnace, the F-1 Furnace, at its Geismar Plant located in Ascension Parish, Geismar, Louisiana. The F-1 Furnace is currently permitted under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA). Phase II of the Hazardous Waste Combustor (HWC) Maximum Achievable Control Technology (MACT) rule promulgated October 2005 is applicable to the F-1 Furnace.

A risk assessment has never been performed related to the emissions from the F-1 Furnace. Under the RCRA Omnibus Provisions at 40 CFR 270.32(b)(2)-(3), Environmental Protection Agency (EPA) Region 6 and Louisiana Department of Environmental Quality (LDEQ) have indicated that the comprehensive performance test (CPT) program needs to include risk assessment data collection.

The CPT program for demonstrating compliance with the HWC MACT performance standards for hydrochloric acid production furnaces (HAPFs) includes two test conditions. The available stack sampling ports and platform area limit the number and kinds of emissions sampling that can be concurrently performed. In collecting the risk assessment emissions data, OxyChem intends to maximize the overlaps between regulatory and risk assessment data requirements as much as possible during the two HWC MACT compliance test conditions. The balance of the risk assessment data collection required by the guidance will be conducted during a third test condition. The three test conditions are:

- Test 1, Minimum Combustion Temperature Destruction and Removal Efficiency (DRE) Test: The F-1 Furnace will be operated at conditions of minimum combustion temperature and maximum combustion gas velocity. This test will demonstrate compliance with the HWC MACT performance standards for DRE, carbon monoxide (CO), and total hydrocarbons (THC), while feeding hazardous waste and operating at minimum combustion temperature. Process vents routinely treated in the F-1 Furnace will be flowing to the unit during Test 1. This test will establish the minimum combustion temperature limit for the F-1 Furnace.
- Test 2, Maximum Waste Feed Rate Test: The F-1 Furnace will be operated at conditions of maximum waste feed rate and maximum combustion gas velocity. Test 2 will demonstrate compliance with the HWC MACT performance standards for DRE, CO, and HCl/Cl_2, while feeding liquid hazardous waste at maximum rates. Process vents routinely treated in the F-1 Furnace will be directed to the F-2 Furnace during Test 2 in order that the maximum liquid waste treatment capacity of the F-1 Furnace can be demonstrated. This test will establish the maximum waste feed rate and chloride feed rate limits for the F-1 Furnace.
- Test 3 will be conducted at normal to maximum waste feed rates and combustion air flow, conditions closely resembling Test 2 with process vents added. Test 3 is will include the collection of the balance of the usual risk assessment data to supplement or augment data from the other two test conditions.

Table 1-1 is a matrix of the compliance and risk assessment data collection.

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Table 1-1. F-1 Furnace CPT and Risk Assessment Data Collection and Use

Sample	Sampling Method	Analysis Reference Method	Parameter	Test 1	Test 2	Test 3	Regulatory, Guidance or Policy Citation	HWC MACT	Risk Assess-ment
Liquid Waste Feeds	ASTM E-300-86	SW846 Method 8270C	HCB (POHC)	X	X		HCB (POHC) DRE 40 CFR 63.1218(c)(1)	X	
			SVOCs	X	X	X	RCRA Omnibus 270.32(b)(2)-(3)		X
		SW846 Method 8082	PCBs	X	X		RCRA Omnibus 270.32(b)(2)-(3); TSCA 40 CFR 761.70(a)(6)(iii)(g)		X
		SW846 Method 8260B	VOCs			X	RCRA Omnibus 270.32(b)(2)-(3)		X
		SW846 Methods 6020 & 7470	Metals			X	RCRA Omnibus 270.32(b)(2)-(3)		X
		ASTM D-240	Heating Value	X	X	X	40 CFR 63.1207(f)(1)(A),(B) and	X	
		ASTM D-891	Density	X	X	X		X	
		ASTM D-445	Viscosity (Liquid)	X	X			X	
		ASTM D-482	Ash Content	X	X	X	RCRA Omnibus 270.32(b)(2)-(3)	X	X
		ASTM D-808 or E-442; SW846 5050/9056	Total Chloride Content	X	X	X		X	X
HCl Product & Scrubber Purge	ASTM E-300-86	SW846 Method 8270C	HCB (POHC)	X	X		Fate of POHC Determination	X	
Stack Gas	SW846 Method 0023A	SW846 Method 8290	PCDD/PCDFs	X	X		40 CFR 63.1207(b)(3), 63.1218(a)(1) and RCRA Omnibus 270.32(b)(2)-(3)	X	X
		EPA Method 1668A	Total PCBs	X	X		RCRA Omnibus 270.32(b)(2)-(3)		X
	SW846 Method 0010	SW846 Methods 3542/8270C	HCB	X	X		HCB (POHC) DRE 40 CFR 63.1218(c)(1)	X	X
			SVOC PICs	X	X		RCRA Omnibus 270.32(b)(2)-(3)		X
	SW846 Method 0030	SW846 Methods 5041A/8260B	VOC PICs	X	X		RCRA Omnibus 270.32(b)(2)-(3)		X

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Table 1-1. F-1 Furnace CPT and Risk Assessment Data Collection and Use

Sample	Sampling Method	Analysis Reference Method	Parameter	Test 1	Test 2	Test 3	Regulatory, Guidance or Policy Citation	HWC MACT	Risk Assess-ment
Stack Gas (continued)	EPA Method 26A	EPA Method 5	Particulate		X		RCRA Omnibus 270.32(b)(2)-(3)		X
		EPA Method 26A	HCl/Cl_2		X		40 CFR 63.1218(a)(6), 63.1218(a)(1) & RCRA Omnibus 270.32(b)(2)-(3)	X	X
	EPA Method 5	Scanning Electron Microscope (SEM)	Particle Size Distribution (PSD)			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	EPA Method 29	EPA Method 29; SW846 Methods 6020 & 7470	Metals			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	SW846 Method 0061	SW846 Method 7199	Hexavalent Chromium			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	SW-846 Method 0010	TCO/GRAV	Total Semivolatile and Nonvolatile PICs			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	SW-846 Method 0040	Gas Chromatograp hy	Volatile PICs (C_1 through C_7)			X	RCRA Omnibus 270.32(b)(2)-(3)		X
	Installed CEMS	40 CFR 60, Appendix B, Specification 4B	Carbon Monoxide	X	X	X	40 CFR 63.1218(a)(5)(i) and RCRA Omnibus 270.32(b)(2)-(3)	X	X
			Oxygen	X	X	X	40 CFR 63.1218(a)(5)(i), (ii) and RCRA Omnibus 270.32(b)(2)-(3)	X	X
	Temporary CEMS	40 CFR 60, Appendix A, Method 25A	Hydrocarbons	X	X		HC Compliance 40 CFR 63.1218(a)(5)(ii)	X	

Notes:

"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series
"SW846" 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 1668A" refers to e Method 1668A, "Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS", US Environmental Protection Agency, EPA-821-R-00-002, December 1999.

CEMS - Continuous Emissions Monitoring System
DCBP-decachlorobiphenyl
DRE - Destruction and Removal Efficiency
HCB - hexachlorobenzene
OTS-Office of Toxic Substances
PCB-polychlorinated biphenyls
POHC - Principal Organic Hazardous Constituent

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2.0 INTRODUCTION

2.1 FACILITY OVERVIEW

The F-1 Furnace treats a number chlorinated liquid hydrocarbon waste and vapor vent streams generated from manufacturing units at the Geismar Plant. The F-1 Furnace treats a number of chlorinated liquid hydrocarbon waste and vapor vent streams generated from manufacturing units at the Geismar Plant. The F-1 Furnace consists of a thermal oxidizer, energy recovery boiler, hydrochloric acid (HCl) recovery system, and caustic scrubber. Refer to Figure 2-1.

Liquid chlorinated hydrocarbon wastes and vapor vents are combusted in the oxidizer. Heat is removed from the resulting combustion gas by the fire-tube energy recovery boiler (B-3). The steam produced by the system's boiler is secondary benefit. The steam generation is relatively small compared to the facility's overall steam demand. However, the heat removal provided by the boiler is necessary to produce the high concentration HCl. Without the boiler, the high HCl concentration product would not be possible.

The combustion gas from the energy recovery boiler enters the HCl recovery system that includes the quenching and scrubber sections Tower T-10 and the lower two sections of Tower T-11. The recovered aqueous HCl is typically 10-25 weight percent HCl and is used in the facility's wastewater treatment system.

Following the HCl recovery section, the caustic scrubber section of T-11 removes residual HCl and molecular chlorine (Cl_2) before the combustion gas is discharged to the atmosphere via the integrated stack. The F-1 Furnace includes a process control system inclusive of continuous monitoring system (CMS) (measurement of flows, temperatures, pressures, etc., to assure compliant operation) and a continuous emissions monitoring system (CEMS) for stack gas carbon monoxide (CO) and oxygen (O_2).

More detailed engineering information for the F-1 Furnace can be found in Section 2.0 of the HWC MACT CPT plan.

2.2 RISK BURN PROGRAM SUMMARY AND OBJECTIVES

The risk burn program is designed to collect organic and inorganic emissions data from the F-1 Furnace for use in performing a site-specific risk assessment. The focus is collection of constituent emissions data consistent with the F-1 Furnace operations and the wastes and vapors treated.

The F-1 Furnace treats a number of highly chlorinated organic wastes and vapor streams. The matrices include a broad spectrum of organic compounds classified as volatile and semivolatile. There are aliphatic, aromatic, cyclic, and polyaromatic compounds. Some waste streams contain greater than 50 mg/kg polychlorinated biphenyls (PCBs), which are regulated under TSCA. The organic emissions program is focused on sampling to identify and quantify, to the maximum extent possible, the volatile and semivolatile products of incomplete combustion (PICs). The program also includes sampling for unspeciated volatile and semivolatile organics for use in the risk assessment uncertainty analysis.

The most significant inorganic emissions from the F-1 Furnace are the HCl and Cl_2. The matrices generally exhibit non-detect to very low concentrations of metals and ash. The inorganic emissions data collection includes particulate, metals, and HCl/Cl_2 emissions data. The particle size distribution (PSD) of the particulate emissions will measured for use in the deposition portion of the emissions modeling.

To maximum extent possible, the collection of the risk assessment emissions data is integrated with the existing CPT program. The additional data are collected where such can be most easily and readily obtained, e.g., adding particulate sampling and analysis to the Method 26A sampling train used for HCl/Cl_2 emissions determination, the splitting of the Method 0023A sampling train extracts for both dioxin/furan and PCB analyses, etc. The emissions data collection is logistically limited as well. These limits require spreading the data collection process over three different test conditions spanning about eight working days of testing. The operating conditions for each test condition are described in the Section 1.0 *Executive Summary*. The planned sampling and analyses are summarized in Table 1-1.

2.3 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 – Executive Summary
- Section 2.0 - Introduction
- Section 3.0 - Characterization of Waste Feed Stream
- Section 4.0 - Compounds of Potential Concern
- Section 5.0 - Test Burn Operating Conditions
- Section 6.0 – Sampling and Analysis
- Section 7.0 – Building Downwash Analysis Plan
- Section 8.0 - Schedule
- Section 9.0 – Risk Burn Report.

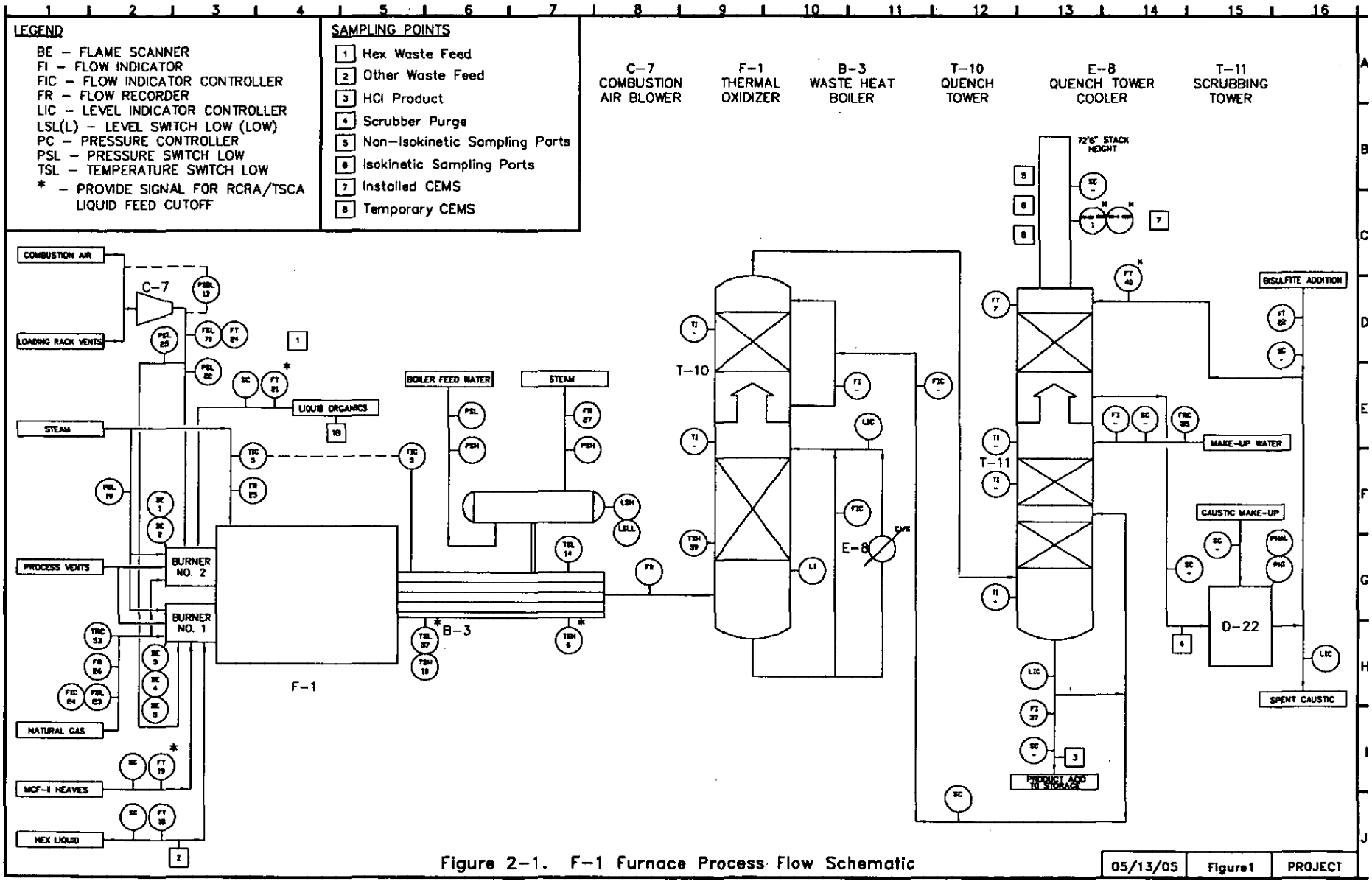

Figure 2-1. F-1 Furnace Process Flow Schematic

05/13/05 | Figure1 | PROJECT

3.0 CHARACTERIZATION OF WASTE FEED STREAM

3.1 LIQUID WASTE FEED ANALYSIS

The primary liquid waste streams treated in F-1 Furnace include:

- Hex Waste (Carbon Tetrachloride [CCl4] Heavy Ends) (D-228)
- Waste Solvents (D-40)
- Recovered Groundwater Organic Phase (Dense Non-Aqueous Phase Liquid [DNAPL])(D-2009)
- Brominated Organic Liquid Purge (D-163)
- Laboratory Organic Sample Waste (included with D-40)
- Lube Oil (DR-73A/B).

The only liquid waste streams treated in F-1 Furnace are those generated by OxyChem operations and site activities. The HWC MACT constituent characterizations for the liquid waste streams are presented in Table 3-1.

3.2 PROCESS VENT ANALYSIS

The vapor vent system, which captures vapors from various reactors, distillation columns, process vessels, transfer, and storage operations, is ducted directly to F-1 Furnace, and the vapors are burned in the combustion zone. Vapor vents are from the following sources:

- Ethylene dichloride (EDC) distillation vents and perchloroethylene (Perc) feedstock tanks vents (D-9)
- EDC MCI Reactor Vent (D-35)
- Utilities vents (hazardous waste tanks and groundwater system vent) and shipping loading vents (D-42)
- Chlorine process adsorber (D-76)
- EDC wastewater vent (D-398)
- Methyl chloride loading, storage and process vents (D-559)
- 5CP vents (D-2180).

The vapor vents are mostly air and/or nitrogen with trace amounts of the same organic constituents present in the liquid waste streams. Organic constituent characterizations for the vapor vent streams are presented in Table 3-2.

The vents treated in the F-1 Furnace are regulated under the facility Title V permit, and their treatment is subject to compliance with other MACT rule standards. These vents are not hazardous wastes per 40

CFR 261.21(a)(3). Vent flows to the F-1 Furnace and may continue after an automatic waste feed cutoff (AWFCO) occurs. Alternatively, the vents may be diverted to the F-2 Furnace.

3.3 OTHER PROCESS FEEDS

Natural gas is used as auxiliary fuel to bring the F-1 Furnace temperature to the liquid waste feed permissive minimum temperature to start liquid waste feed.

Combustion air is always supplied to the combustion zone when the F-1 Furnace is operating to provide sufficient oxygen for proper combustion. Ambient air is used for combustion air in F-1 Furnace. Combustion air is introduced to the combustion zone via a combustion air blower. Combustion air flow is monitored, and is controlled based on controlling stack gas carbon monoxide and oxygen concentrations.

The F-1 Furnace is equipped with steam atomizing burner nozzles. Plant-produced steam is used for atomizing the liquid wastes in the F-1 Furnace burner nozzles. Atomizing steam pressure and flow are continuously monitored.

Table 3-1. Liquid Waste Feed Characterization

Parameter	Hex Waste (D-228)	Waste Solvents (D-40)	DNAPL (D-2009)	Brominated Organic Liquid (D-163)	Laboratory Organic Sample Waste	Lube Oil (D-73A/B)	Lube Oil (DR-73)
Average Heating Value, Flash Point, Ash and Total Halogens							
Average Annual Amount Treated, 2001-2006	lbs	6,730,748	333,264	719,826	470,918	Ltd. Qty.	15,297
	gal	576,487	32,021	59,490	43,758	Varies	1,869
Density	g/cc	1.40	1.24	1.47	1.29	Varies	1.02
Heating Value	Btu/lb	2,554	2,959	2,143	4,480	2,285	16,167
Viscosity	cSt	0.24-0.50 cP @ 420 deg F (Note a)	ND @ 1.0	1.50	1.27	NA	50.76
Flash Point	°F	Freezes	47	59	53	53	54
Ash	wt%	0.12	ND	0.43	0.060	ND	0.65
Chlorine	mg/kg	24,780	271,600	123,955	118,929	176,076	39,379
Bromine	mg/kg	ND	ND	36	2,660	ND	15
Total Halogens	mg/kg	502,333	595,000	388,373	571,000	771,000	64,767
Average Metal Constituent Concentrations (Note b)							
Antimony (Sb)	mg/kg	ND	ND	ND	ND	ND	ND
Arsenic (As)	mg/kg	ND	ND	ND	ND	0.0250	ND
Barium (Ba)	mg/kg	ND	ND	0.97	ND	1.5	ND
Beryllium (Be)	mg/kg	ND	ND	ND	ND	ND	ND
Cadmium (Cd)	mg/kg	ND	ND	0.032	ND	0.036	ND
Chromium (Cr)	mg/kg	2.9	6.1	1.3	1.8	1.3	ND
Lead (Pb)	mg/kg	ND	ND	0.11	0.41	0.048	0.55
Mercury (Hg)	mg/kg	ND	0.155	0.087	ND	0.087	ND
Silver (Ag)	mg/kg	ND	ND	ND	ND	34	ND
Thallium (Tl)	mg/kg	ND	ND	ND	ND	ND	0.96
Average Organic Constituent Concentrations (Note c)							
Acetone	mg/kg	ND	ND	ND	ND	170	ND
1-bromo-2-chloroethane	mg/kg	ND	ND	ND	96,333	890	ND
Carbon tetrachloride	mg/kg	9,900	190,800	44,800	28,000	155,911	2,615
Chloroethane	mg/kg	ND	35,801	ND	ND	1,377	ND
Chloroform	mg/kg	18,100	124,503	26,208	31,000	181,498	57,538
1,1-Dichloroethane (1,1-Di)	mg/kg	ND	ND	ND	ND	28,595	ND
1,2-Dichloroethane (EDC)	mg/kg	88,800	326,817	124,050	353,333	160,980	14,315
1,1-Dichloroethene (Vinylidene Chloride)	mg/kg	ND	7,640	ND	ND	3,411	ND
Hexachlorobutadiene	mg/kg	246,633	2,853	411,679	ND	ND	55
Methylene chloride	mg/kg	ND	2,957	ND	ND	92,151	14,168

Table 3-1. Liquid Waste Feed Characterization

Parameter	Hex Waste (D-228)	Waste Solvents (D-40)	DNAPL (D-2009)	Brominated Organic Liquid (D-163)	Laboratory Organic Sample Waste	Lube Oil (D-73A/B)	Lube Oil (DR-73)
1,1,1,2-Tetrachloroethane	mg/kg	ND	ND	ND	35,900	ND	ND
1,1,2,2-Tetrachloroethane	mg/kg	ND	ND	ND	21,640	ND	ND
Tetrachloroethene (Perchloroethylene)	mg/kg	138,367	98,333	91,040	19,900	145,948	24,825
1,1,1-Trichloroethane	mg/kg	ND	54,000	6,282	ND	75,183	3,934
1,1,2-Trichloroethane	mg/kg	ND	31,100	ND	596,000	10,716	ND
Vinyl chloride	mg/kg	ND	ND	ND	ND	640	ND
Total PCBs	mg/kg	507	ND	340	ND	ND	ND
Total Decachlorobiphenyl	mg/kg	656	ND	155	ND	ND	ND
Hexachlorobenzene	mg/kg	50,232	56	5,270	ND	ND	51
Hexachlorobutadiene	mg/kg	95,683	1,153	436,600	ND	ND	55
Hexachloroethane	mg/kg	20,118	392	83,680	9,400	360	ND

Notes:

[a] The hex waste stream is a solid at ambient conditions and therefore its viscosity estimated. According to the instrument specification sheets, the hex stream viscosity is 0.5 cP at 420°F. Chemcad® calculates a viscosity of 0.24 cP at 420°F using the following composition: 20% Perchloroethylene, 20% Hexachloroethane, 58% Hexachlorobutadiene, 2% Hexachlorobenzene.

[b] Averages are based on detectable levels only; the detection limit from non-detect results is not averaged with the detectable values. Therefore, if there is only one, two or three, etc. detectable values from multiple analyses, the average of the detectable values is noted. For a stream where there is only one detectable value, that single value is reported as the average for the stream. For parameters noted as non-detect (ND), this parameter was non-detect in all analyses. The organic compounds listed are those identified in one or more waste streams.

[c] The waste streams organic analyses included volatile and semivolatile organic compounds. The organic compounds listed are only those identified in one or more of the waste streams.

cP – centipoises
cSt - centistokes
ND – non-detect
NA – not applicable

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Table 3-2. Vent Vapor Characterization

Organic Constituents	D-9	D-35	D-42	D-64	D-76	D-398	D-559	DR-2180	Weighted Organics (Note c)	Mole Percent Chlorine	Weighted Chlorine (as Cl) (Note c)
	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Average (ppmv)	Mole %	Average (ppmv)
	ND	ND	ND	ND	ND	100	ND	ND	2	50%	1
1,1,1-Trichloroethane	129	1,591	2,756	120	1	97	ND	ND	329	38%	123
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	0	50%	0
1,1,2-Trichloroethane	94	160	129	ND	ND	ND	ND	8	15	38%	6
1,1-Dichloroethane	997	16,279	1,246	ND	1	49	24	39	793	25%	198
1,1-Dichloroethene	3,298	13,475	153	ND	ND	431	ND	ND	613	33%	204
1,2, Dichloropropane	22,459	ND	9,175	111	ND	19,678	ND	4,064	989	22%	220
1,2-Dichloroethane	16,260	716	32,757	110	29	20,339	1,237	744	2,436	25%	609
1-Bromo-2-Chloroethane	68	ND	32	ND	ND	ND	ND	ND	2	13%	0
Carbon Tetrachloride	13,412	178	3,297	2,602	2,022	521	611	3,235	2,320	80%	1,856
Chloroethane	68,120	94	1,064	16	0	6,802	519	713	260	13%	33
Chloroform	12,326	195	8,993	6,679	1	3,625	580	340	5,807	60%	3,484
Chloromethane	10,401	631	39	116,156	23	1,719	219,480	2,476	92,045	20%	18,409
Cis-1,2-Dichloroethene	764	147	39	4	ND	51	ND	ND	14	33%	5
Methylene Chloride	1,080	109	5,999	18,447	23	408	16,340	724	14,827	40%	5,931
Ethylene	ND	ND	ND	ND	ND	ND	ND	ND	0	0%	0
Propylene	ND	ND	110	105	6	ND	ND	ND	88	0%	0
Tetrachloroethene	115	220	919	122	136	373	832	231	177	67%	118
Trans-1,2-Dichloroethene	1,133	1,068	6	ND	ND	2,555	ND	ND	92	33%	31
Trichloroethylene	38	ND	24	ND	ND	16	ND	964	2	50%	1
Vinyl Chloride	9,097	7,564	96	142	14	2,028	2,400	157,864	512	17%	85
Total Composition									**121,321**		**31,313**
Average Flow, 2006 (scfm) (Note b)	**56.4**	**0.83**	**42**	**56.6**	**740.5**	**33.13**	**16.4**	**7.7**	**954**		**246**

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Table 3-2. Vent Vapor Characterization

Parameter	Value (Note c)
Total Vent Flow (scfm)	954
Total Vent Flow (scfh)	57,214
Total Vent Flow (lb-mol/hr)	151
Total Vent Flow Organics (lb-mol/hr)	18.29
Total Vent Chlorine (lb-mol/hr as Cl)	4.72
Total Vent Chlorine (lb/hr as Cl)	168

Notes:

[a] Average of analyses performed 2001-2006.

[b] Calendar year 2006 average flow rates.

[c] Calculated based three-year rolling average 2001-2006 composition data and 2006 average flow rates.

Vent No.	Identification
D-9	Ethylene dichloride (EDC) distillation vents and perchloroethylene (Perc) feedstock tanks vents
D-35	EDC MCI reactor vent
D-42	Utilities vents (hazardous waste tanks and groundwater system vent) and shipping loading vents
D-64	Methyl chloride high pressure vent
D-76	Chlorine process adsorber
D-398	EDC wastewater vent
D-559	Methyl chloride low pressure loading, storage and process vents
DR-2180	5CP vents (D-2180)

4.0 COMPOUNDS OF POTENTIAL CONCERN

4.1 SEMIVOLATILE AND VOLATILE ORGANIC COMPOUNDS

The liquid wastes treated in the F-1 Furnace are mixtures of chlorinated volatile and semivolatile organic compounds. The process vents include mixtures of chlorinated volatile organic compound vapors.

The liquid waste feeds used during all three test conditions will be sampled and analyzed via SW846 Method 8260B for volatile organic compounds and Method 8270C for semivolatile organic compounds. The GC/MS analyses include the target analytes identified in Tables 9-2 and 9-3 of the Quality Assurance Project Plan (QAPP). In addition to the target compounds, non-target compound peaks greater than 10% of the nearest internal standard and that can be identified with 85% or greater confidence will be tentatively identified using a library search for all Method 8260B and Method 8270C analytes will be reported.

The process vents will not be sampled and analyzed during the testing.

The compliance part of the test program, Test 1 and Test 2, includes sampling of the stack gas for the destruction and removal efficiency (DRE) assessment of the target principal organic hazardous constituent (POHC), hexachlorobenzene (HCB) via SW-846 Method 0010. The Method 3542/8270C analyses of the sampling train components will be expanded to include the target compounds noted in Table 9-9 of the QAPP. In addition to the target compounds, up to the ten (10) largest non-target compound peaks greater than 10% of the nearest internal standard and that can be identified with 85% or greater confidence will be tentatively identified using a library search for all Method 8270C analytes will be reported.

For risk assessment data collection purposes, as SW-846 Method 0030 Volatile Organic Sampling Train (VOST) is included during the Test 1 and Test 2. The Method 5041A/8260B analyses will be expanded to include the target compounds noted in Table 9-6 of the QAPP. In addition to the target compounds, up to the twenty (20) largest non-target compound peaks greater than 10% of the nearest internal standard and that can be identified with 85% or greater confidence will be tentatively identified using a library search for all Method 8260B analytes will be reported.

4.2 DIOXINS/FURANS

The compliance part of the test program, Test 1 and Test 2, includes sampling of the stack gas for the

polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDFs) emissions via SW-846 Method 0023A. The Method 0023A sampling train component extracts will be analyzed via SW-846 Method 8290. The target PCDD/PCDF compounds are noted in Table 9-7 of the QAPP.

4.3 POLYNUCLEAR AROMATIC HYDROCARBONS

Refer to Tables 9-3 and 9-9 of the QAPP. The Method 8270C analyses of the liquid waste feeds and stack gas Method 0010 samples include a significant number of polynuclear aromatic hydrocarbons (PAHs).

4.4 POLYCHLORINATED BIPHENYLS

Refer to Tables 9-4 and 9-8 of the QAPP. The analyses of the liquid waste feeds and stack gas Method include PCBs.

The compliance part of the test program, Test 1 and Test 2, includes analysis of the waste feeds for 64 target PCB compounds commonly of risk assessment interest. This list includes decachlorobiphenyl, the primary PCB congener in the OxyChem waste feeds.

The compliance part of the test program, Test 1 and Test 2, includes sampling of the stack gas for the PCDD/PCDFs emissions via SW-846 Method 0023A. The Method 0023A sampling train resin will be prepared for both PCDD/PCDF and PCB sampling and analysis. The Method 0023A sampling train component extracts will be spilt for the respective analyses. The Method 0023A sampling train component extracts will be analyzed for PCBs via Method 1668A. The target PCB compounds are noted in Table 9-8 of the QAPP. PCBs will be quantified by totals for each of the ten homologue and the 13 co-planer (dioxin-like) compounds.

4.5 METALS

Metals emissions are not a performance standard for HAPFs under HWC MACT. Therefore, the compliance part of the test program, Test 1 and Test 2, does not include sampling and analyses for metals. Metals sampling analyses for risk assessment purposes are included in Test 3.

The liquid waste feeds used during the Test 3 will be sampled and analyzed for 17 metals of risk assessment interest. The stack gas will be sampled for metals via EPA Method 29 during Test 3. The target metal analytes are identified in Table 9-10 of the QAPP. The analysis for the 16 non-mercury metals will be via SW-846 Method 6010B or 6020. Mercury will be analyzed for via SW-846 Methods 7470 and 7471.

4.6 HEXAVALENT CHROMIUM

The risk assessment analysis distinguishes between the emitted forms of chromium. Hexavalent chromium (Cr^{+6} or Cr^{VI}) is the carcinogenic form of chromium that is of primary interest in the risk assessment analyses. Therefore, during Test 3 a Method 0061 sampling train will be used to measure the fraction of chromium emitted in hexavalent form. Samples will be analyzed for hexavalent chromium by SW-846 Method 7199. Data from the Method 29 sampling train will be used for determining the total chromium emissions.

4.7 CHLORINE

HCl and Cl_2 emissions are a performance standard for HAPFs under HWC MACT. Therefore, Test 2 of the compliance part of the test program already includes sampling and analyses for chlorine in the liquid waste feeds and HCl/Cl_2 in the stack gas. The liquid waste feeds used during the Test 2 will be sampled and analyzed for total chlorine. The stack gas will be sampled for HCl and Cl_2 via EPA Method 26A.

4.8 PARTICULATE

Particulate emissions are not a performance standard for HAPFs under HWC MACT. However, Test 2 of the compliance part of the test program does include sampling and analyses for HCl/Cl_2 emissions via Method 26A. HCl/Cl_2 emissions analyses only include the impinger portions of Method 26A. Recovery and use of the Method 26A acetone probe rinse and filter for assessing particulate emissions via EPA Method 5 is an allowable variation per Section 2.1 of Method 26A. Particulate emissions measurement is included as part of the Test 2 Method 26A sampling and analyses.

The particle size distribution (PSD) of the particulate emissions will be measured using a Method 5 sampling train during Test 3. This EPA Method 5 sampling train will utilize smooth surface polycarbonate filters. The filters will be analyzed via scanning electron microscope (SEM) for particle counts and sizing. The PSD data are for use in the particle deposition portion of the emissions modeling.

The liquid waste feeds used during the all three tests will be sampled and analyzed for total ash content.

4.9 ACCOUNTING OF UNIDENTIFIED COMPOUNDS

To account for unidentified organic compounds for the risk assessment analysis, Test 3 includes determining the Total Organic Emissions (TOE) using the procedures in "*Guidance for Total Organics*" EPA/600/R-96/036, March 1996.

The stack gas will be sampled using a SW-846 Method 0010 sampling train for total semivolatile organic compounds (Boiling Points from 100°C to 300°C) and non-volatile organic compounds (Boiling Points greater than 300°C) using a SW-846 Method 0010 sampling train. One portion of the dichloromethane extracts of the pooled components of the sampling train will be used to determine the Total Chromatographable Organics (TCO) via Gas Chromatography/Flame Ionization Detector (GC/FID). The marker compounds are n-heptane and n-heptadecane because their boiling points are 98°C and 302°C, respectively. The other portion of the dichloromethane extracts will be used to determine the nonvolatile organics by a gravimetric procedure known as GRAV.

For the risk assessment analysis, stack gas will be sampled for total volatile organic compounds (Boiling Points <100°C) during Test 2. Tedlar® bag samples of stack gas will be collected and measured for the target analytes by field gas chromatograph (GC) according to SW-846 Method 0040. Emphasis will be made on the identification of n-C_1 - C_7 hydrocarbons. In addition, the volatile organics collected in the condensate trap of the SW-846 Method 0040 will be analyzed by purge and trap GC/FID.

5.0 TEST BURN OPERATING CONDITIONS

5.1 NORMAL OPERATING CONDITIONS

The F-1 Furnace normally operates treating liquids waste at 4-5 gpm. Process vents can and are routinely treated in the F-1 Furnace, but may be diverted for treatment in the F-2 Furnace.

5.2 RISK BURN TEST CONDITIONS

The risk assessment data collection is integrated with the HWC MACT compliance testing program. The risk assessment data collection will encompass three operating conditions as described below. The F-1 Furnace operating conditions for these three tests are summarized in Table 5-1. The recommended AWFCO interlock set points during testing periods are presented in Table 5-2.

Test 1 is the low temperature DRE test. The Test 1 organic emissions are representative of worst-case for organic destruction. Collection of speciated volatile and semivolatile organic compound emissions for risk assessment data purposes is included as part of Test 1.

Test 2 is the maximum waste feed rate test. The Test 2 inorganic emissions are representative of worst-case for these emissions, especially HCl/Cl_2. The Test 2 is also likely worst-case for mass emissions of organics. Particulate emissions sampling, not required for HWC MACT compliance, is added to Test 2 for risk assessment data purposes. Like Test 1, the collection of speciated volatile and semivolatile organic compound emissions for risk assessment data purposes is also included as part of the Test 2 DRE testing.

Test 3 is a normal to high waste feed rate condition that includes process vents. Test 3 is more representative of normal operations. Test 3 is designed to collect other inorganic emissions data and to quantify the degree to which the organic emissions have not been speciated in the other two test conditions. Waste feed metals concentrations and metals emissions, data not collected during the previous two test conditions, are measured during this test condition. Additionally, PSD and corresponding total particulate emissions data are also collected. For risk assessment modeling purposes, the data collected during Test 3 may be prorated based on stack flow and measured emissions from Test 1 or Test 2.

5.3 RISK BURN WASTE FEED STREAMS AND QUANTITIES

The F-1 Furnace destroys organic wastes via combustion, and controls HCl/Cl_2 emissions via wet scrubbing of the combustion gases. Test 1 and Test 2 of the CPT program are designed to demonstrate

the range of worst-case operation of the F-1 Furnace, while Test 3 is more representative of normal operations. During all testing, the F-1 Furnace will be operated treating "hex" waste. The "hex" waste stream was selected for the CPT for the following reasons:

1. "Hex" contains native HCB, the target POHC for demonstration of the 99.99% DRE for HWC MACT compliance.
2. "Hex" is the most heavily chlorinated waste stream treated by the F-1 Furnace and will therefore provide the "worst case" indication of the system's capability to control HCl/Cl_2 emissions.
3. "Hex" contains chlorine, and a high percentage of cyclic and aromatic organic constituents including PCBs, all of which are potential precursors to PCDD/PCDF formation in combustion systems, and will therefore provide the "worst case" indication of the system's PCDD/PCDF and other organic emissions.

An additional waste stream, groundwater organic phase (Dense Non-Aqueous Phase Liquid [DNAPL]), will be co-fired with hex waste. The DNAPL is an organic phase mixture containing high concentrations of chlorinated cyclic and aromatic constituents including PCBs. This stream will add to the demonstration of the "worst case" for HCl/Cl_2, PCDD/PCDF, and other organic emissions.

Refer to Table 8-1 for the quantities of waste required for testing.

Table 5-1. F-1 Furnace Test Target Operating Conditions

Operational Parameter	Units	Test Targets (Note a)			AWFCO	Averaging Period
		Minimum Temperature DRE Test, Test 1	Maximum Waste Feed Rate DRE Test, Test 2	Supplemental Risk Data Collection Test, Test 3		
Group 1 Parameters						
Maximum total liquid waste feed rate	lb/hr	NA	4,604	3,684	Yes	HRA
	gpm	NA	5.5	4.4	Yes	HRA
Hex waste feed	lb/hr	NA	3,349	2,679	NA	NA
Hex waste feed	gpm	NA	4.0	3.2	NA	NA
Solvent waste feed (DNAPL)	lb/hr	NA	1,256	1,005	NA	NA
Solvent waste feed (DNAPL)	gpm	NA	1.5	1.2	NA	NA
Maximum total chloride feed rate	lb/hr	NA	1,612	1,289	Yes	THRA
Minimum combustion temperature	° F	1,650	>1,650	> 1,650	Yes	HRA
Maximum combustion air flow	scfm	4,000	4,000	< 4,000	Yes	HRA
Minimum caustic scrubber pH	pH units	>9.0	9.0	> 9.0	Yes	HRA
Minimum caustic scrubber L/G	gpm/scfm	>0.060	0.060	> 0.060	Yes	HRA
Group 2 Parameters						
Maximum stack gas CO	ppmv, dry @ 7% O_2	50			Yes	HRA
Group 3 Parameters						
Minimum hex waste atomization steam pressure	psig	50			Yes	HRA
Minimum solvent waste atomization steam pressure	psig	50			Yes	HRA
Minimum caustic scrubber recycle pressure	psig	30			Yes	HRA

Notes

a Refer to Table 5-2 for testing setpoints for AWFCO parameters.

AWFCO - automatic waste feed cutoff
HRA - hourly rolling average
N/A - not applicable
THRA - 12-hour rolling average

Table 5-2. Recommended F-1 Furnace AWFCO Set Points during Testing

Operational Parameter	Units	Limit	Basis	AWFCO	Averaging Period
Group 1 Parameters					
Maximum total liquid waste feed rate	lb/hr	5,065	Target +10%	Yes	HRA
	gpm	6.1		Yes	HRA
Minimum combustion temperature	° F	1,600	Target -50 °F	Yes	HRA
Maximum combustion air flow	scfm	4,400	Target +10%	Yes	HRA
Minimum caustic scrubber pH	pH units	8.0	Target -1.0 pH units	Yes	HRA
Minimum caustic scrubber L/G	gpm/scfm	0.045	Target -25%	Yes	HRA
Group 2 Parameters					
Maximum stack gas CO	ppmv, dry @ 7% O2	100	N/A	Yes	HRA
Group 3 Parameters					
Minimum hex waste atomization steam pressure	psig	50	N/A	Yes	HRA
Minimum solvent waste atomization steam pressure	psig	50	N/A	Yes	HRA
Minimum caustic scrubber recycle pressure	psig	30	N/A	Yes	HRA

Notes:

AWFCO - automatic waste feed cutoff
HRA - hourly rolling average
N/A - not applicable

6.0 SAMPLING AND ANALYSIS

6.1 LIQUID WASTE SAMPLING AND ANALYSIS

Table 6-1, 6-2, and 6-3 summarize the planned liquid waste sampling and analysis for Test 1, Test 2, and Test 3 respectively.

6.2 PROCESS VENT SAMPLING AND ANALYSIS

The process vents will not be sampled and analyzed during the testing. Historical vent stream analysis data are provided in Section 3.0.

6.3 STACK GAS SAMPLING AND ANALYSIS

Table 6-1, 6-2, and 6-3 summarize the planned stack gas sampling and analysis for Test 1, Test 2, and Test 3 respectively.

6.4 PARTICLE SIZE DISTRIBUTION SAMPLING AND ANALYSIS

PSD sampling will be performed during Test 3 via EPA Method 5. The smooth surface polycarbonate filters will be analyzed via scanning electron microscope (SEM).

6.5 VOST AND OTHER AUDIT SAMPLING AND ANALYSIS

Audits for the following items will be requested from the EPA Region 6 audit sample program manager approximately 60 days before the scheduled test date.

- Dioxins/Furans
- HCl/Cl_2
- Metals, and
- VOST.

Audit samples will be analyzed as may be provided.

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Table 6-1. F-1 Furnace Minimum Temperature DRE Test Sampling and Analysis (Test 1)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
Hex Liquid Waste	Tap on line	250 mL wide-mouth VOA jars	ASTM E-300-86	Grab samples taken at the beginning, middle and end (B-M-E) of each test run using 250 mL VOA jars. All three grab samples are collected as individual samples; Sample compositing will be performed in the laboratory.	HCB and SVOCs VOCs PCBs Heating Value Density Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056
Other Liquid Waste	Tap on line	250 mL wide-mouth bottle; 40 mL VOAs and 250 and 500 mL sample bottles	ASTM E-300-86	Collect a 250 mL grab sample at 30-minute intervals during each test run. The grab samples are transferred to a 4L jug to build a composite sample. The run composite is maintained on ice between sampling intervals. At the end of the test run, collect two 40mL VOAs, and 250 or 500 mL sample bottles from the homogenized composite sample.	HCB and SVOCs VOCs PCBs Heating Value Density Viscosity Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-445 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056

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Table 6-1. F-1 Furnace Minimum Temperature DRE Test Sampling and Analysis (Test 1)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
HCl Product	Tap on line	250 mL bottle; 4 L glass jug; 1-liter sample bottles	ASTM E-300-86	At each 30-minute interval, collect a 250 mL grab sample. Transfer the grab samples to a 4 L glass jug maintained on ice to build run composite. At the end of the test run, collect one 1-liter sample of the homogenized composite sample.	HCB	SW846 8270C
Scrubber Purge Water	Tap on line	Same as HCl product	ASTM E-300-86	Same procedure as HCl product.	HCB	SW846 8270C
Stack Gas	Non-Isokinetic Port	VOST	SW846 0030 (VOST)	80 L integrated sample; 0.5 to 1.0 L/min, four tube set pairs, 20 L per Tube set pair	Volatile organic PICs	SW846 5041A/8260B
Stack Gas	Isokinetic Port	Method 0023A Sampling Train	SW846 0023A	Minimum of 3 hours and 3.0 dry standard cubic meters [b,c]	PCDD/PDCFs PCBs	SW846-8290 (PCDD/PDCFs) SW846 3542/EPA Method 1668A (PCBs)
Stack Gas	Isokinetic Port	Method 0010 Sampling Train	SW846 0010	Minimum of 3 dry standard cubic meters [b,c]	HCB; semivolatile organic PICs	SW846 3542/8270C
Stack Gas	CEMS Port	Installed CO and O_2 CEMS	40 CFR 60 Appendix B Specification 4B	Continuous	CO and O_2	40 CFR 60 Appendix B Specification 4B
Stack Gas	CEMS Port	Temporary HC CEMS	EPA Method 25A	Continuous	HC	40 CFR 60 Appendix A Method 25A

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Table 6-1. F-1 Furnace Minimum Temperature DRE Test Sampling and Analysis (Test 1)

Notes:

(a) Reference Method Sources:
"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series

"SW846" 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 1668A" refers to Method 1668A, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-821-R-00-002, December 1999.

(b)The exact volume of gas sampled will depend on the isokinetic sampling rate.

(c) Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3)
- 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).

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Table 6-2. F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling and Analysis (Test 2)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
Hex Liquid Waste (Solid)	Tap on line	250 mL wide-mouth VOA jars	ASTM E-300-86	Grab samples taken at the beginning, middle and end (B-M-E) of each test run using 250 mL VOA jars. All three grab samples are collected as individual samples; Sample compositing will be performed in the laboratory.	HCB and SVOCs VOCs PCBs Heating Value Density Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056
Other Liquid Waste	Tap on line	250 mL wide-mouth bottle; 40 mL VOAs and 250 and 500 mL sample bottles	ASTM E-300-86	Collect a 250 mL grab sample at 30-minute intervals during each test run. The grab samples are transferred to a 4L jug to build a composite sample. The run composite is maintained on ice between sampling intervals. At the end of the test run, collect two 40mL VOAs, and 250 or 500 mL sample bottles from the homogenized composite sample.	HCB and SVOCs VOCs PCBs Heating Value Density Viscosity Ash Content Total Chloride	SW846 8270C SW846 8260B SW846 8082 ASTM D-240 ASTM D-891 ASTM D-445 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056

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Table 6-2. F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling and Analysis (Test 2)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
HCl Product	Tap on line	250 mL bottle; 4 L glass jug; 1-liter sample bottles	ASTM E-300-86	At each 30-minute interval, collect a 250 mL grab sample. Transfer the grab samples to a 4 L glass jug maintained on ice to build run composite. At the end of the test run, collect one 1-liter sample of the homogenized composite sample.	HCB	SW846 8270C
Scrubber Purge Water	Tap on line	Same as HCl product	ASTM E-300-86	Same procedure as HCl product.	HCB	SW846 8270C
Stack Gas	Non-Isokinetic Port	VOST	SW846 0030 (VOST)	80 L integrated sample; 0.5 to 1.0 L/min, four tube set pairs, 20 L per Tube set pair	Volatile organic PICs	SW846 5041A/8260B
Stack Gas	Isokinetic Port	Method 0023A Sampling Train	SW846 0023A	Minimum of 3 hours and 3.0 dry standard cubic meters [b,c]	PCDD/PDCFs PCBs	SW846-8290 (PCDD/PDCFs) SW846 3542/EPA Method 1668A (PCBs)
Stack Gas	Isokinetic Port	Method 0010 Sampling Train	SW846 0010	Minimum of 3 dry standard cubic meters [b,c]	HCB; semivolatile organic PICs	SW846 3542/8270C
Stack Gas	Isokinetic Port	Method 26A	EPA Method 26A	Minimum of 60 minutes [b,c]	Particulate HCl/Cl_2	EPA Method 5 (Particulate) EPA Method 26A (HCl/Cl_2)
Stack Gas	CEMS Port	Installed CO and O_2 CEMS	40 CFR 60 Appendix B Specification 4B	Continuous	CO and O_2	40 CFR 60 Appendix B Specification 4B
Stack Gas	CEMS Port	Temporary HC CEMS	EPA Method 25A	Continuous	HC	40 CFR 60 Appendix A Method 25A

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Table 6-2. F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling and Analysis (Test 2)

Notes:

(a) Reference Method Sources:

"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series

"SW846" 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 1668A" refers to Method 1668A, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-821-R-00-002, December 1999.

(b) The exact volume of gas sampled will depend on the isokinetic sampling rate.

(c) Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3)
- 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).

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Table 6-3. F-1 Furnace Supplemental Risk Data Collection Test Sampling and Analysis (Test 3)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
Hex Liquid Waste	Tap on line	250 mL wide-mouth VOA jars	ASTM E-300-86	Grab samples taken at the beginning, middle and end (B-M-E) of each test run using 250 mL VOA jars. All three grab samples are collected as individual samples; Sample compositing will be performed in the laboratory.	SVOCs VOCs Heating Value Density Ash Content Total Chloride Metals: Al, Sb, As, Ba, Be, Cd, Cr (total), Co, Cu, Pb, Mn, Hg, Ni, Se, Ag, Tl, V, & Zn	SW846 8270C SW846 8260B ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056 ICAP (SW846 3010A/6010B/6020) Hg: CVAAS (SW846 7470A)
Other Liquid Waste	Tap on line	250 mL wide-mouth bottle; 40 mL VOAs and 250 and 500 mL sample bottles	ASTM E-300-86	Collect a 250 mL grab sample at 30-minute intervals during each test run. The grab samples are transferred to a 4L jug to build a composite sample. The run composite is maintained on ice between sampling intervals. At the end of the test run, collect two 40mL VOAs, and 250 or 500 mL sample bottles from the homogenized composite sample.	SVOCs VOCs Heating Value Density Ash Content Total Chloride Metals: Al, Sb, As, Ba, Be, Cd, Cr (total), Co, Cu, Pb, Mn, Hg, Ni, Se, Ag, Tl, V, & Zn	SW846 8270C SW846 8260B ASTM D-240 ASTM D-891 ASTM D-482 ASTM D-808 or E-442; SW846 5050/9056 ICAP (SW846 3010A/6010B/6020) Hg: CVAAS (SW846 7470A)

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Table 6-3. F-1 Furnace Supplemental Risk Data Collection Test Sampling and Analysis (Test 3)

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [a]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [a]
Stack Gas	Non-Isokinetic Port	Tedlar Bag Samples	SW846 0040	25-50 L bag samples	Total Volatile Organics (C_1 through C_7 hydrocarbons)	SW846 0040; TOE Guidance
Stack Gas	Isokinetic Port	Method 0010 Sampling Train	SW846 0010 TOE Guidance	Minimum of 3 dry standard cubic meters [b,c]	Total Semivolatile and Non-volatile Organics	TOE Guidance
Stack Gas	Isokinetic Port	Method 29	EPA Method 29	Minimum 60 minutes [b,c]	Metals: Al, Sb, As, Ba, Be, Cd, Cr (total), Co, Cu, Pb, Mn, Hg, Ni, Se, Ag, Tl, V, & Zn	EPA Method 29 SW846 6010B/6020 and 7470A
Stack Gas	Isokinetic Port	Method 0061 Sampling Train	SW846 0061	Minimum of 60 minutes [b,c]	Chromium VI	SW846 7199
Stack Gas	Isokinetic Port	Method 5 Sampling Train	EPA Method 5	Maximum of 24 minutes [b,c]	Particle size distribution	Scanning electron microscope (SEM)
Stack Gas	CEMS Port	Installed CO and O_2 CEMS	40 CFR 60 Appendix B Specification 4B	Continuous	CO and O_2	40 CFR 60 Appendix B Specification 4B

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Table 6-3. F-1 Furnace Supplemental Risk Assessment Emissions Data Collection Test Sampling and Analysis (Test 3)

Notes:
[a] Reference Method Sources:
"ASTM" refers to American Society for Testing Materials, Annual Book of ASTM Standards, Annual Series

"SW846" 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.

"TOE Guidance" refers to Guidance for Total Organics, EPA/600/R-96/036, March, 1996.

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

[c] Isokinetic sampling trains include:

- Collecting one set of bag samples (or using CEM) for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3)
- 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)

7.0 BUILDING DOWN WASH ANALYSIS PLAN

The following information required for performing the required risk assessment dispersion modeling will be provided with the risk burn report.

Stack Information:

- UTM Coordinates
- Height
- Inside diameter at the discharge
- Discharge velocity
- Discharge Temperature

Building Down Wash Data:

- Facility Plot Plan
- List buildings greater than 40% of stack height within 50 stack heights radius
- UTM coordinates of each corner and heights of these buildings.

8.0 SCHEDULE

8.1 OVERALL PROJECT SCHEDULE

Testing of the F-1 Furnace is currently scheduled to occur in February 2008. The test will be performed by this date or as soon thereafter that an agency approved test plan is obtained.

8.2 RISK BURN TEST SCHEDULE

The anticipated order of testing is as follows:

Week 1:

- 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; conduct Test 1, Run 1.
- Wednesday-Conduct Test 1, Runs 2 and 3.
- Thursday-Conduct Test 2, Runs 1 and 2.
- Friday-Conduct Test 2, Run 3.
- Weekend-off

Week 2:

- Monday- Conduct Test 3, Run 1.
- Tuesday-Conduct Test 3, Run 2.
- Wednesday- Conduct Test 3, Run 3.
- Thursday-Contingency Day/Recover Equipment/Return Travel.

The proposed sequencing of the stack sampling is outlined in Figures 8-1, 8-2, and 8-3.

The estimated hours of operation to complete testing and the amount of liquid waste feed that will be used are summarized in Table 8-1.

The process and stack sampling may begin once the F-1 Furnace has stabilized at the target test conditions for at least one hour to establish rolling average values.

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Table 8-1. F-1 Furnace Quantity of Feed Materials for Testing

Test Condition	Waste Feed Hours						Waste Rate (lb/hr)	Waste (lbs)	Waste Rate (gpm)	Waste (gallons)
	Ramp Up	Run 1	Run 2	Run 3	Contingency	Total				
Minimum Temp Test (Test 1)	2	6	6	6	6	**26**	**2,763**	**71,829**	**3.3**	**5,148**
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Hex	2,009	52,239	2.4	3,744
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Other	753	19,590	0.9	1,404
Maximum Feed Rate Test (Test 2)	2	6	6	6	6	**26**	**4,604**	**119,715**	**5.5**	**8,580**
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Hex	3,349	87,065	4.0	6,240
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Other	1,256	32,649	1.5	2,340
Supplemental Risk Data Collection Test (Test 3)	3	6	6	6	6	**27**	**3,684**	**99,455**	**4.4**	**7,128**
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Hex	2,679	69,652	3.2	5,184
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Other	1,005	26,120	1.2	1,944
TOTALS	**7**	**18**	**18**	**18**	**18**	**79**	**N/A**	**290,999**	**N/A**	**20,856**

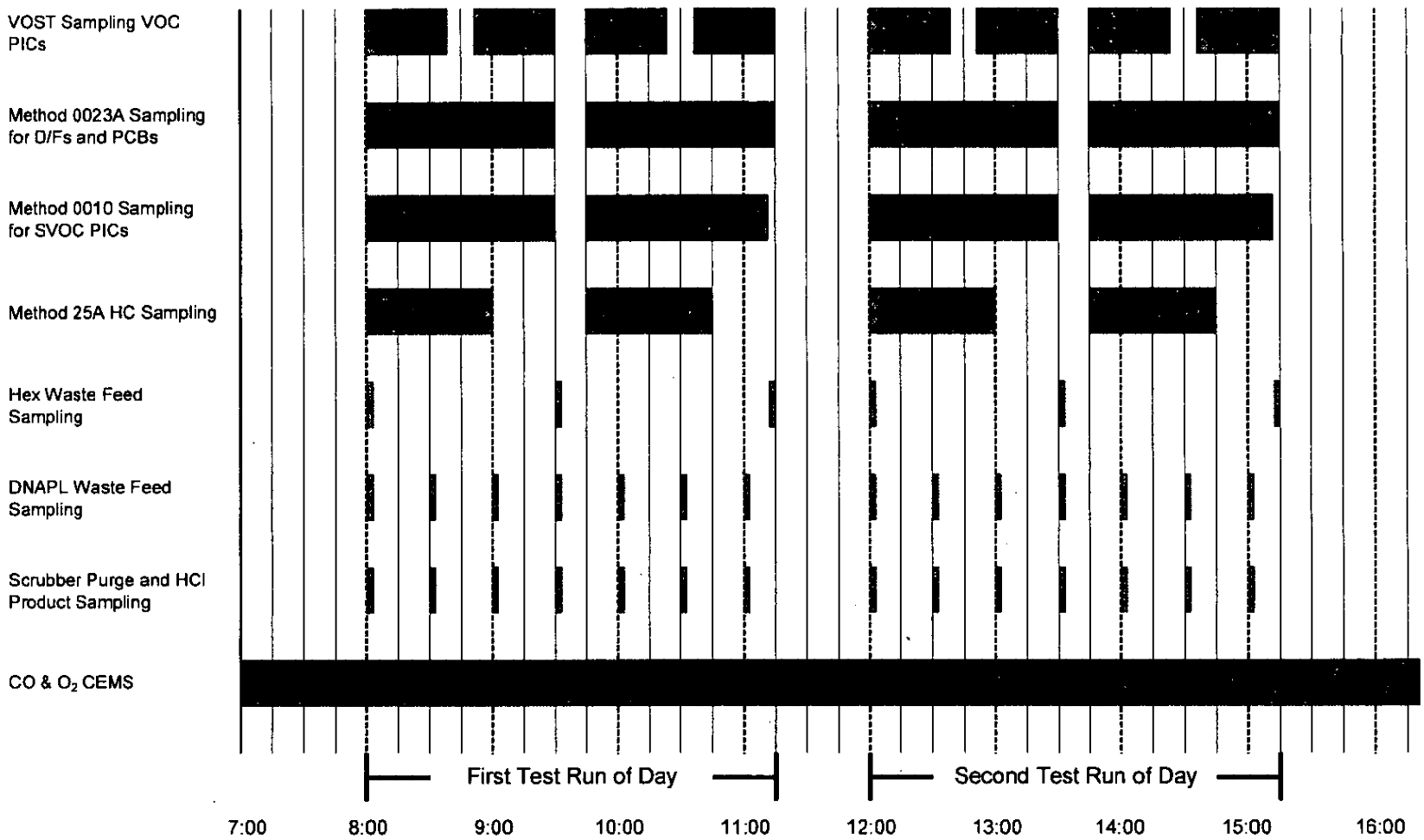

Figure 8-1. F-1 Furnace Minimum Temperature DRE Test Sampling Activities (Test 1)

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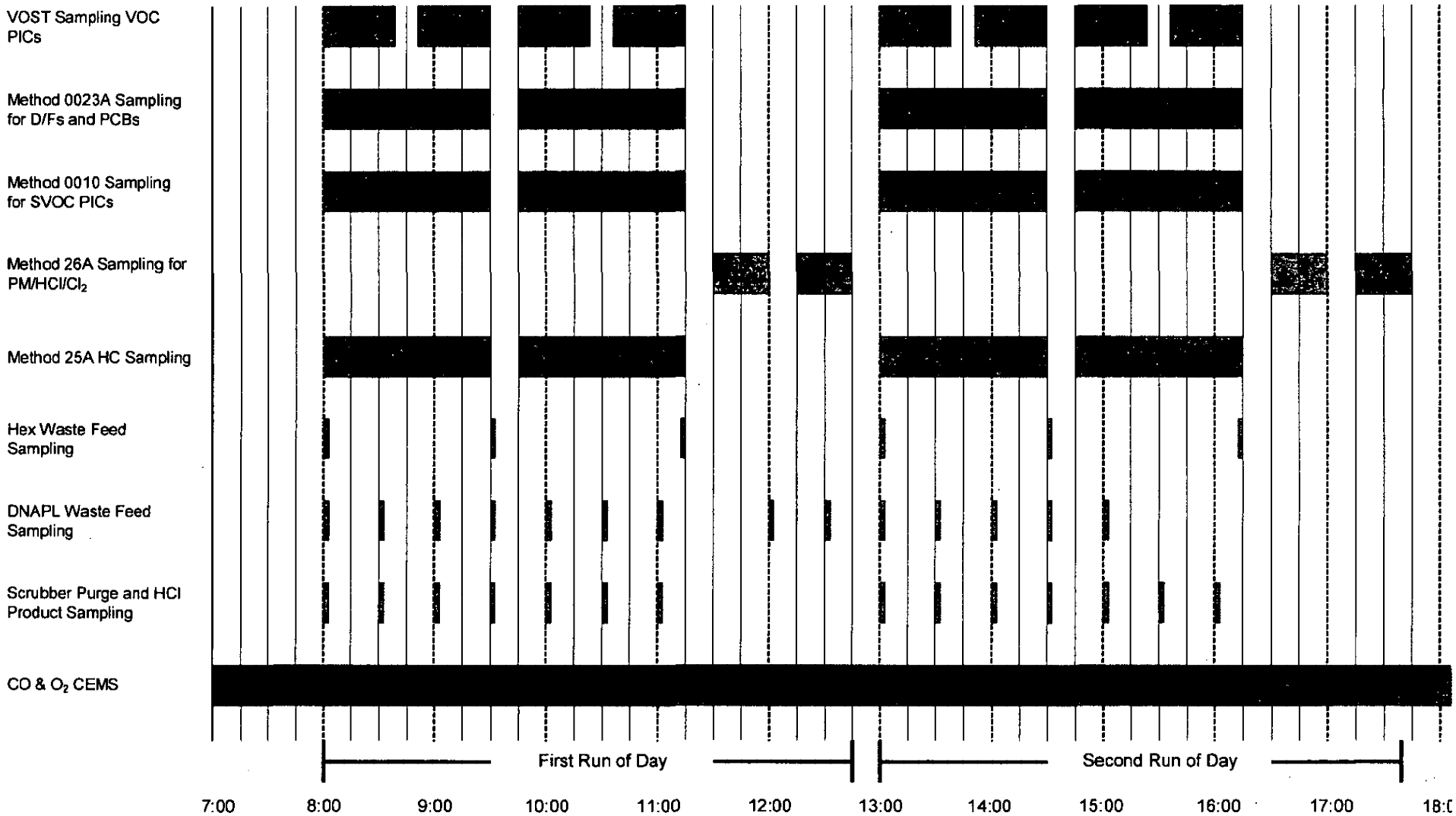

Figure 8-2. F-1 Furnace Maximum Waste Feed Rate DRE Test Sampling Activities (Test 2)

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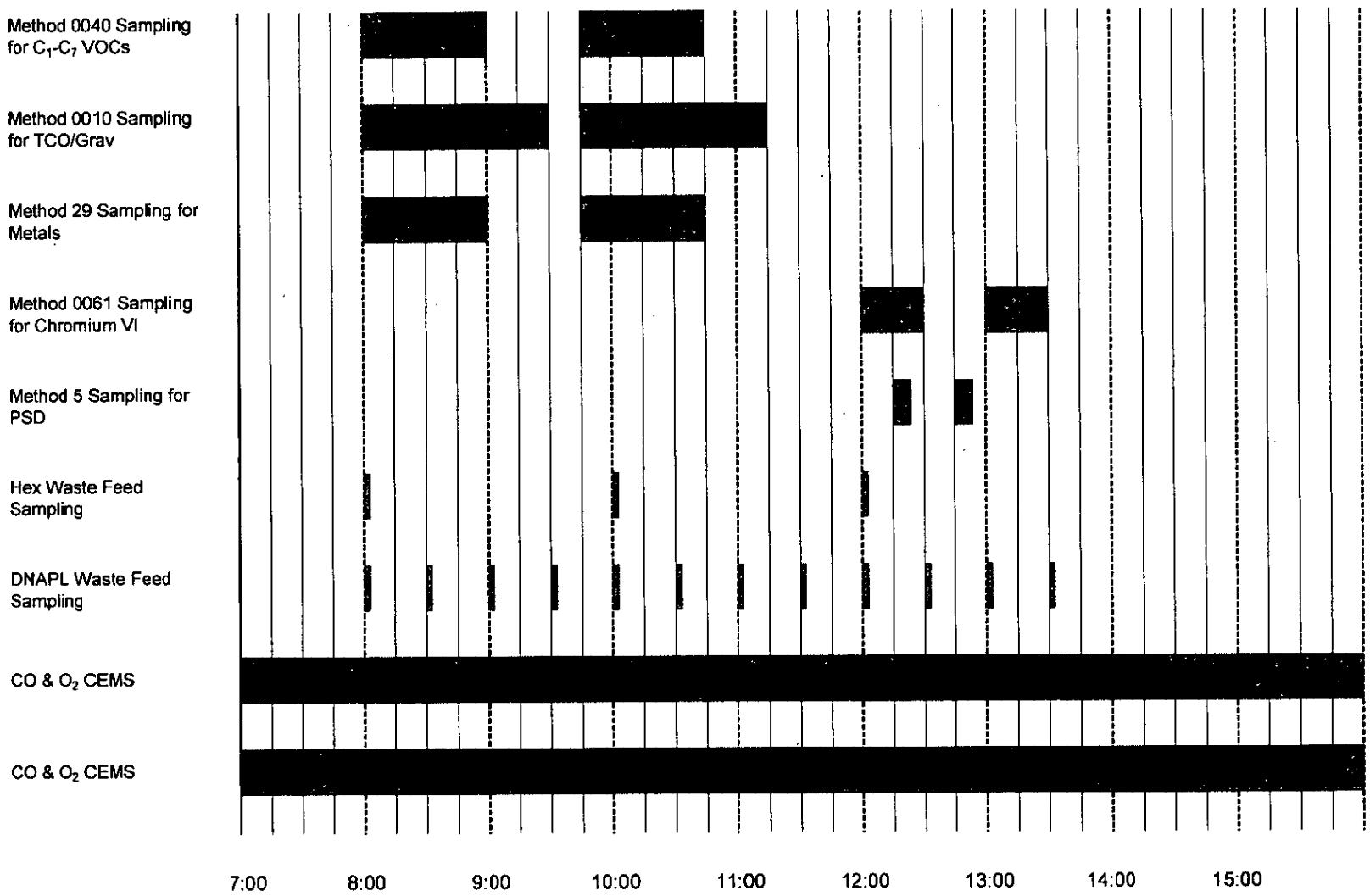

Figure 8-3. F-1 Furnace Supplemental Risk Data Collection Test Sampling Activities (Test 3)

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9.0 RISK BURN REPORT

The final risk burn test report will be postmarked before the close of business on the 120th day after completion of the test unless a time extension must be requested. The final test report will be a comprehensive test report that contains 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. The planned outline of the test report is shown in Table 9-1.

Table 9-1. Example F-1 Furnace Risk Burn Data Collection Report Outline

CERTIFICATION FORM *(LAC 33:V.513.)*
TABLE OF CONTENTS
LIST OF FIGURES
LIST OF TABLES
LIST OF APPENDICES
1.0 SUMMARY OF TEST RESULTS
- **1.1** Summary of Risk Assessment Data Collection Results
- **1.2** Deviations from the Approved Test Plan and Their Impacts
  - **1.2.1** Actual vs. Planned Operations
  - **1.2.2** Data Quality Objectives
  - **1.2.3** Sampling and Sample Handling
- **1.3** Performance Evaluation (Audit) Results Summary

2.0 INTRODUCTION/PROCESS DESCRIPTION
- **2.1** Brief Unit Description
- **2.2** Test Objectives Overview
- **2.3** Test Responsible Parties
- **2.4** Test Chronology
- **2.5** Process Monitors
- **2.6** Process Flow Diagram

3.0 OPERATING DATA SUMMARY TARGET OPERATING CONDITIONS
- **3.1** Feed Rate Data
  - **3.1.1** Waste Feed Rates
  - **3.1.2** Other Feedstream Flow Rates
    - **3.1.2.1** Combustion Airflow Rates
    - **3.1.2.2** Auxiliary Fuel
    - **3.1.2.3** Process Vent Streams
- **3.2** System Operating Data

4.0 FEEDSTREAM SAMPLING AND ANALYSIS
- **4.1** Sampling Locations
- **4.2** Sampling and Analytical Methods
- **4.3** Characterizations
  - **4.3.1** Waste Feed Analysis
  - **4.3.2** Other Feedstream Analysis
- **4.4** Constituent Feedrates
  - **4.4.1** Metals Feedrate
  - **4.4.2** Chlorine Feedrate
  - **4.4.3** Ash Feedrate
  - **4.4.4** Speciated Organics Feedrate

5.0 EMISSIONS RESULTS
- **5.1** Dioxin/Furan Emissions
- **5.2** PCB Emissions
- **5.3** Semivolatile PIC Emissions
- **5.4** Volatile PIC Emissions
- **5.5** Unspeciated Organic Emissions
- **5.6** Metals Emissions
- **5.7** HCl/Cl_2 Emissions
- **5.8** Particulate Sampling
- **5.9** Particle Size Distribution of Particulate
- **5.10** CEMS Monitoring Carbon Monoxide, Oxygen, and Hydrocarbons

6.0 APCE RESIDUE SAMPLING AND ANALYSIS
- **6.1** Sampling Locations
- **6.2** Sampling and Analytical Methods
- **6.3** Characterizations *(Any use of process knowledge must be indicated)*
  - **6.3.1** Ash

6.3.2 APCE blowdown
6.3.3 Other APCE Residues
7.0 QUALITY ASSURANCE/QUALITY CONTROL DOCUMENTATION
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7.2 QAPP Deviations and Corrective Actions
7.3 Project Personnel and Responsibilities
7.4 Quality Assurance/Quality Control Objective Results
7.4.1 Evaluation of Precision
7.4.2 Evaluation of Accuracy
7.4.3 Evaluation of Completeness
7.5 Performance Evaluation (Audit) Results (Detailed)
7.6 Sample Handling, Traceability, and Holding Time Results
7.7 Calibration Procedures, Frequency, and Results
7.7.1 Process Monitoring Equipment
7.7.2 Stack Sampling Equipment
7.7.3 Continuous Emission Monitoring Equipment
7.8 Analytical Procedures and Internal QC Check Results

APPENDICES

APPENDIX A PROCESS OPERATING DATA
APPENDIX B STACK SAMPLING REPORT
APPENDIX C PROCESS SAMPLING REPORT
APPENDIX D PROCESS INSTRUMENT CALIBRATIONS
APPENDIX E SAMPLE CALCULATIONS
APPENDIX F FIELD NOTES AND LIST OF SAMPLES
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APPENDIX H SUMMARY ANALYTICAL DATA REPORT
APPENDIX I VENT STREAM CHARACTERISTICS DATA
APPENDIX J LELAP APPROVALS
APPENDIX K AUDIT SAMPLE RESULTS

APPENDIX C

SAMPLING PROCEDURES AND ANALYSIS METHODS

Sampling and Analysis Procedures

Table	Title
Sampling Methods	
C-1	Process Streams Sampling Procedure
C-2	Method 0023A Stack Gas PCDD/PCDF and PCB Sampling Procedure
C-3	Method 0010 Stack Gas Semivolatile Organic Sampling Procedure
C-4	Method 0030 Stack Gas Volatile Organic Sampling Procedure
C-5	Method 26A Stack Gas Particulate Matter, Hydrogen Halide, and Halogen Sampling Procedure
C-6	Method 5 Stack Gas Particle Size Distribution Sampling Procedure
C-7	Method 29/Method 0060 Stack Gas Multiple Metals Sampling Procedure
C-8	Method 0061 Stack Gas Hexavalent Chromium Sampling Procedure
C-9	Method 0010 Stack Gas Total Semivolatile and Nonvolatile Organic Sampling Procedure
C-10	Method 0040 Stack Gas Volatile Organic Compound Sampling Procedure
C-11	Method 25A for Total Hydrocarbons using Continuous Emissions Monitor Procedure
Analysis Methods	
C-12	Heating Value Analysis
C-13	Density Analysis
C-14	Ash Content Analysis
C-15	Total Chloride Analysis
C-16	Organics Analysis
C-17	Metals Analysis
C-18	Analysis of PCDD/PCDFs and PCBs in Method 0023A Samples
C-19	Analysis of Semivolatile Organics in Method 0010 Samples
C-20	Analysis of Volatile Organics in VOST Samples
C-21	Analysis of Particulate Matter in Method 26A Samples
C-22	Analysis of Chloride in Method 26A Samples
C-23	Analysis of Particle Size Distribution from Method 5 Filter Samples Using SEM
C-24	Analysis of Stack Gas Multiple Metals Samples
C-25	Analysis of Method 0061 Stack Gas Samples for Hexavalent Chromium
C-26	Analysis of Total Semivolatile and Nonvolatile Organics in Method 0010 Samples
C-27	Analysis of Total Volatile Organics in Method 0040 Samples

Table C-1. Process Streams Sampling Procedure

Sample name: Hex Waste Feed
DNAPL Waste Feed
HCl Product
Scrubber Water Purge

Sampler: Process sampling team/OxyChem operators

Locations: Sample taps on waste feed lines
Sample taps on acid product and scrubber purge discharge lines

Equipment: 4 - liter amber glass jug
500 mL and 1-liter amber glass bottles with Teflon-lined screw lids
250 mL wide-mouth glass VOA jars with Teflon-lined screw lids
Heat-resistant rubber gloves or leather gloves
Respiratory protection
Rubber gloves, acid splash goggles, and acid splash apron

Frequency: Hex Waste Feed: Beginning, middle and end of each test run.
DNAPL Waste Feed: 30-minute intervals during each test run.
HCl Product and Scrubber Water Purge Streams: 30-minute intervals during each test run.

Procedures: Hex Waste Feed Grab Samples: Due to toxic and physical hazards, only an experienced OxyChem operator will collect the hex waste feed samples. The operator will wear safety goggles, rubber apron, respirator and heat resistant gloves.

The hex waste is circulated continuously from the dedicated process tank to the F-1 Furnace area and back to the storage tank by the waste circulation pumps. The hex waste feed to F-1 Furnace is a side stream taken from the circulation line. Because the hex waste is circulated continuously, it is always well mixed. The hex waste is typically maintained at approximately 475°F for pumpability (melting point is approximately 400°F). The hex waste rapidly solidifies upon cooling which does not allow for homogenization of the composited waste feed sample. For this reason, grab samples of the well-mixed liquid waste stream will be collected three (3) times during each test run (beginning, middle and end [B-M-E]). Three hex waste feed grab samples will be collected per test run, one at each sampling interval. In the laboratory, equal size aliquots from the three run samples will be composited to produce a single run sample for the various analyses.

The sample will be collected from a valved tap on the recycle leg of the waste feed line. At each sampling interval, the operator will purge the tap by allowing a small amount of liquid to flow into a waste container. The operator will then fill a 250 mL VOA sample jar. The grab sample will be capped and allowed to cool naturally at ambient temperature. When the sampled has cooled sufficiently to be handled wearing only latex gloves, a label with the sample number and identification, and the date and time the sample was collected, will be attached to the sample jar. The date and time the sample was collected will be recorded on the chain of custody form. Samples for organic analysis sample will be stored on ice in a cooler. Samples for other analyses may be stored at ambient temperatures.

DNAPL Waste Feed Composite Samples: Due to toxic and physical hazards, only an experienced OxyChem operator will collect the liquid waste feed samples. The operator will wear safety glasses or goggles, respirator and rubber gloves. The sample will be collected from a valved tap on the waste feed line. At each sampling interval, the

operator will purge the tap by allowing a small amount of liquid to flow into a waste container. Using a dedicated glass sample bottle, the operator will collect approximately a 250 mL grab sample. The grab sample is transferred to a dedicated 4-liter amber glass jug to build the run composite sample. Between grab samples, the glass jug in which the run sample is being composited will be capped and maintained on ice in a cooler. The time each grab sample is taken will be recorded on the sample collection sheet along with the approximate volume of final sample.

At the end of the run, the composite sample in the 4-liter amber glass bottle will be shaken to thoroughly homogenize the sample. The test plan prescribed number of 40 NI VOA vials, and 250 and 500 mL amber glass sample bottles will be filled from the well-mixed composite sample. (Note: If the sample volume is not sufficient to fully fill the samples required for a particular test run, the volume available should be proportionally divided among the required sample containers for the various analyses.) Sample numbers will be attached to the samples with the sample name, date, run number and time. The sample numbers and time the samples were collected from the composite sample will be recorded on the sample collection sheet and the chain of custody form.

Scrubber Water Purge and HCl Product Samples: At each time interval, purge the tap by allowing a small amount of liquid to flow into a waste container. Using a dedicated sampling bottle, collect a 250 mL grab sample. Transfer the grab sample to a dedicated 4-liter amber glass jug to build the run composite sample. Between grab samples, the glass jug in which the run sample is being composited will be capped and maintained on ice in a cooler. The time each grab sample is taken will be recorded on the sample collection sheet along with the approximate volume of final sample.

At the end of the run, the composite sample in the 4-liter amber glass bottle will be shaken to thoroughly homogenize the sample. The test plan prescribed number of 1-liter amber glass sample bottles will be filled from the well-mixed composite sample. Sample numbers will be attached to the samples with the sample name, date, run number and time. The sample numbers and time the samples were collected from the composite sample will be recorded on the sample collection sheet and the chain of custody form.

All Samples: The Sample Custodian accepts custody of all samples and records the samples numbers in a field log.

Samples are placed in shipping containers, which are stored in the sample holding area separate from the container supply area and stack gas samples. Samples requiring chilling will be stored in coolers on ice. All other samples may be stored at ambient temperature.

References: ASTM E 300-86, Section 23 and 24, American Society for Testing and Materials, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, Annual Series.

Table C-2. Method 0023A Stack Gas PCDD/PCDF and PCB Sampling Procedure

Sample name: Stack Gas Method 0023A (DF, PCB)

Sampler: Stack sampling team

Locations: Exhaust stack

Equipment: Method 0023A sampling train as shown in Figure 1 of this table; tare weighed glass fiber particulate filters (without organic binders) sealed in glass petri dishes; prepared XAD-2 adsorbent resin traps; aluminum foil; amber glass bottles with Teflon-lined lids; scale balance; glass graduated cylinder.

Frequency: Continuously for a minimum of 180 minutes (3 hours) to sample a minimum of 105.9 dry standard cubic feet (3 dry standard cubic meters) of stack gas during each sampling run.

Procedure Summary: Stack gases are sampled isokinetically to collect polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzo-p-furans (PCDFs), and polychlorinated biphenyls (PCBs) on a particulate filter and on adsorbent resin, and PCBs in impinger solutions. The PCDD/PCDF masses are determined by HRGC/HRMS analysis of extracts from the, particulate filter, front half and back half rinses, and adsorbent resin. The PCB masses are determined by HRGC/HRMS analysis of extracts from the particulate filter, front and back half rinses, adsorbent resin, and the impinger solutions. [Note: The train component recovery procedures are based on SW-846 Methods 0010 and 0023A]

> NOTE: The "modified' aspect of this method is the recovery of the front half and back half toluene rinses in a separate container instead of adding them to the front half and back half acetone and methylene chloride rinses. The separate collection of the acetone and methylene chloride rinses allows the PCB analyses without the analytical interference caused by toluene. The toluene rinse is included in the sample preparation and analysis for PCDD/PCDF as required by the Method 0023A.

The Method 0023A train includes a glass probe nozzle, a heated sample probe with a borosilicate or quartz glass probe liner, heated particulate filter holder with Teflon frit filter support, a water cooled condenser, a water cooled adsorbent resin trap, a condensate knockout impinger, two water impingers, an empty impinger (optional), and a silica gel impinger. A water pump is provided to circulate ice bath water through the condenser and around the adsorbent trap. All of the impingers are placed in an ice bath. An air tight gas pump, dry gas flow meter, and flow rate meter complete the train.

All train components, reagents, and cleaning solutions are prepared according to the procedures specified in the methods referenced below. The pretest preparations include soaking the train glassware in hot (≥50°C) soapy (Alconox or equivalent) water, rinsing it three times each with hot water, distilled/deionized water, and drying in an oven for 2 hours at 400 °C. After cooling, the glassware is rinsed 3 times each with pesticide grade methylene chloride and pesticide grade toluene. When glassware is dry, all openings are covered with clean aluminum foil or clean glass plugs until sample train assembly.

The particulate filters and the XAD-2 adsorbent resin are prepared according to Method 0023A procedures summarized as follows:

- The filters are cleaned by soxhlet extraction using toluene. Following extraction, each filter is dried in a stream of clean dry inert gas and stored in a glass petri dish sealed with Teflon tape.

Table C-2. Method 0023A Stack Gas PCDD/PCDF and PCB Sampling Procedure (Continued)

- XAD-2 resin is cleaned by rinsing twice with organic-free (HPLC) water followed by soxhlet extractions with HPLC water, acetone and methylene chloride, and then dried using a flow of clean dry inert gas. An extract from a portion of the prepared XAD-2 resin is analyzed to confirm that it is free of significant background contamination. As an alternate to in-house preparation, resin that is certified clean by laboratory analysis may be purchased.
- The adsorbent trap is loaded with approximately 40 g of the XAD-2 resin and the open end of the trap is packed with clean glass wool. The adsorbent traps are spiked with isotopically labeled PCDD/PCDF and PCB surrogate standards. The ends of the adsorbent trap are capped and the traps are wrapped in aluminum foil, sealed in a plastic bag, and stored in an insulated cold chest.
- A sample of the XAD-2 resin used in preparing the traps is collected as a laboratory method blank. The method blank is retained in the laboratory for analysis with the field samples.

The sampling train is assembled in a clean area at the test site and the train components are handled in a manner that minimizes the potential for contamination from air or by direct contact. The train glassware may be rinsed before using with acetone and methylene chloride. A particulate filter is placed in the filter holder. Before each sampling run, the Sample Coordinator supplies an XAD-2 adsorbent trap to the sampling team, who measures and records the weight of the trap to the nearest 0.5 g and installs the trap in the train. Impingers 1 and 4 are initially empty, impingers 2 and 3 each contain 100 mL of organic free (HPLC) water, and impinger 5 contains 200 to 300 g of indicating silica gel. All impingers are weighed separately to nearest 0.5 g and installed in the sample train. No sealant grease is used in assembling the train.

Stack sampling point locations are determined in accordance with Method 1. An initial traverse is made with a pitot tube at each sample point following Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow is checked only on the first day of testing). An Orsat apparatus or a continuous emission monitoring system (CEMS) is used to determine stack gas oxygen, carbon dioxide, and dry molecular weight according to Method 3, 3A, or 3C procedures. The stack gas moisture content is determined according to Method 4.

A sample train leak check is performed before each test run according to Methods 0010 and 0023A. The probe inlet is plugged, the probe and filter holder heaters are set to maintain 248 °F, and a vacuum of 15 inches Hg is applied to the system. A lower vacuum may be used, but must not be exceeded during the test run. The leak rate must be ≤0.02 cfm or less than 4% of the average sampling rate before starting the test run.

The stack gas sampling is conducted following the procedures given in Methods 0010 and 0023A. The sample probe exit and filter assembly temperatures are maintained at 248°F ± 25°F, and the gas sample entering the adsorbent module is maintained less than 68 °F. The sampling rate is adjusted during the test to maintain isokinetic conditions at the probe nozzle within ± 10% of 100%. A leak check is conducted during the test run whenever the sampling probe is removed from a sample port, such as during the stack traverse port change.

After sampling, the probe is removed from the stack and a post-test leak check is conducted. The test run is voided if the leak rate exceeds 0.02 cfm or 4% of the average sampling rate (whichever is less).

Table C-2. Method 0023A Stack Gas PCDD/PCDF and PCB Sampling Procedure (Continued)

The probe nozzle is wiped to remove PM and covered with aluminum foil. After cooling, the probe is wiped to remove external PM, disconnected from the train, and both ends are capped. The probe and filter box-impinger assemblies are transported to the sample recovery area. The sample recovery and sample train cleanup procedures are summarized below.

- 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.
- Front Half 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 times each with acetone, and then rinsed three times with methylene chloride. All rinses are collected in a glass sample bottle (Container No.2). The final liquid level is marked on the sample container.
- Front Half Toluene Rinse -- The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or glassware are rinsed two times with toluene. The front half toluene rinses are collected in a glass sample bottle (Container No. 2A). The final liquid level is marked on the sample container.
- 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 (Container No. 3).
- Back Half Acetone/Methylene Chloride Rinses -- The back half of the filter holder, the filter support, transfer line (if used), and condenser (if separate from trap) are rinsed three times with acetone followed by two rinses with methylene chloride. The back half rinses are placed into a glass sample bottle (Container No. 4). The final liquid level is marked on the sample container.
- Back Half Toluene Rinse -- The back half of the filter holder, the filter support, transfer line (if used), and condenser (if separate from trap) are rinsed two times with toluene. The back half toluene rinses are placed into a glass sample bottle (Container No. 4A). The final liquid level is marked on the sample container.
- Condensate Knockout Impinger -- The impinger content is measured to the nearest milliliter or weighed to the nearest 0.5 g and transferred to a glass sample bottle (Container No. 5). Any color or film observed is noted on the sample recovery sheet. Rinse the impinger three times with acetone followed by two rinses with methylene chloride, adding the rinses to Container No. 4. The final liquid level is marked on the sample container.
- Impinger Liquids -- The contents of the impingers 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. If no color or film is present, the impinger water may be discarded. If color or film is observed, the impinger water is recovered and added to the condensate in Container No. 5, and the

impingers are rinsed three times with acetone followed by two rinses with methylene chloride, with the rinses added to Container No. 4.

- 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.

A schematic diagram of the above sample train recovery and cleanup procedures is provided in Figure 2. Following sample recovery, the sample train may be used at the same sampling location.

Field blank samples are collected from a blank sampling train once during the test program. A complete train is assembled from glassware that has not been used to collect any field samples. The train is placed in the sampling area, brought up to operating temperature, leak tested, and the nozzle is capped with aluminum foil or Teflon tape and the exit end of the last impinger is sealed with a glass cap. The train remains idle (no sample gas flow) for the duration of the test run and the leak test is repeated. The field blank samples are recovered using the same procedures described above for the stack gas samples.

Reagent blank samples are collected from each of the acetone, methylene chloride, and toluene wash bottles used in the recovery of the stack gas samples. (Note: The reagent blank samples are archived for analysis in the event that a field blank analytical result indicates a potential contamination problem.)

A glassware blank sample (proof blank) may be recovered once during the test program from a set of sampling train glassware that has not been used to collect any field samples. A probe liner, filter holder, condenser coil, and impinger set are assembled as if for sampling and then recovered using the same procedures described above for the stack gas samples. (Note: The collection of this sample is optional because its purpose is to check the effectiveness of the glassware cleaning procedure. The proof blank samples are archived for analysis in the event that a field blank analytical result indicates a potential contamination problem.)

All of the sample containers are assigned numbers and labeled with the date and test-run number. The samples are turned over to the Sample Coordinator who records the appropriate data in the field logbook and pack the samples in insulated cold chests. Samples are stored in the sample holding area separate from the container supply area.

References:

SW-846 Method 0023A, "Sampling Method for Polychlorinated Dibenzo-p-Dioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Emissions from Stationary Sources", Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

"Method 0010 - Modified Method 5 Sampling Train", Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

CARB Method 428, "Determination of Polychlorinated Dibenzo-p-dioxin (PCDD), Polychlorinated Dibenzofurans (PCDF), and Polychlorinated Biphenyle (PCB) Emissions from Stationary Sources", California Environmental Protection Agency Air Resources Board (CARB), Adopted: March 23, 1988, Amended: September 12, 1990.

"Method 1 - Sample and Velocity Traverses for Stationary Sources"

Table C-2. Method 0023A Stack Gas PCDD/PCDF and PCB Sampling Procedure (Continued)

"Method 2 – Determination of stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"

"Method 3 – Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight"

"Method 3A – Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrument Analyzer Procedure)"

"Method 3C – Determination of Carbon Dioxide, Methane, Nitrogen, and Oxygen from Stationary Sources"

"Method 4 – Determination of Moisture Content in Stack Gases"

"Method 5 – Determination of Particulate Emissions from Stationary Sources"

Reference for Methods 1 through 5: Appendix A - Test Methods, New Source Performance Standards, 40 CFR 60.

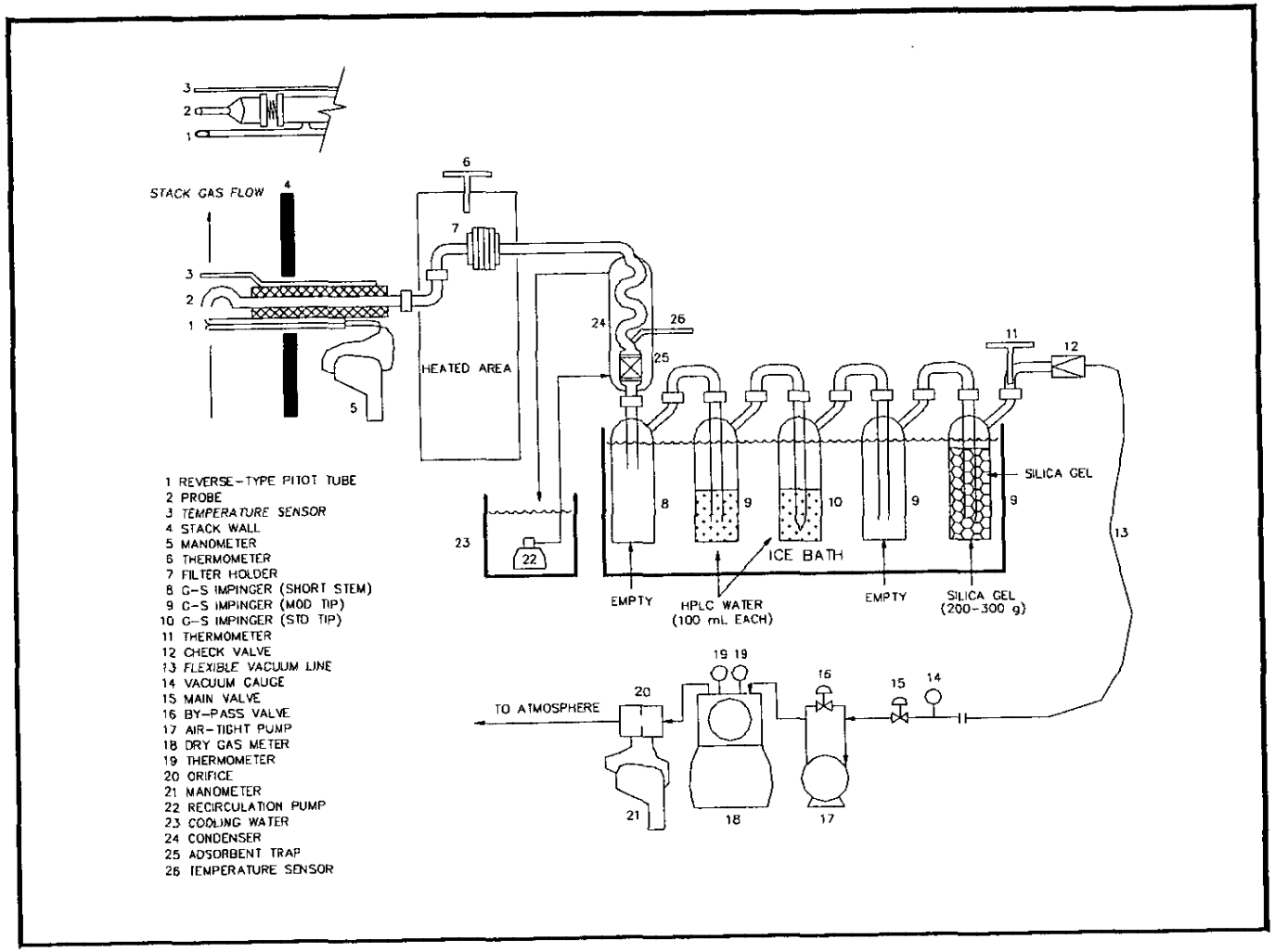

Figure 1. Method 0023A Sample Train for PCDD/PCDF/PCB

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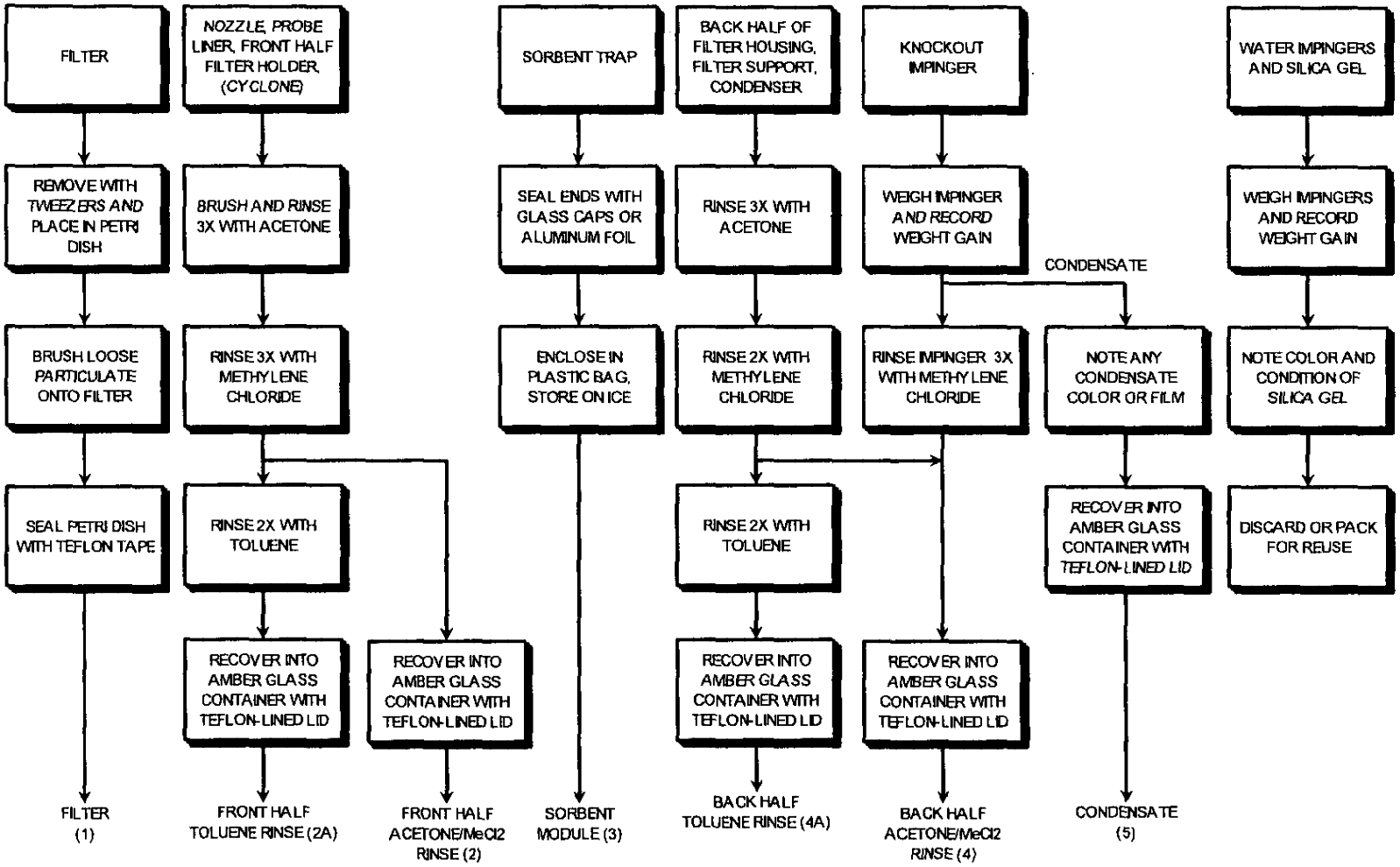

Figure 2. Method 0023A PCDD/PCDF/PCB Sample Recovery

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Table C-3. Method 0010 Stack Gas Semivolatile Organic Sampling Procedure

Sample name: Stack Gas Method 0010 (SVOC)

Sampler: Stack sampling team

Locations: Exhaust stack

Equipment: Method 0010 sampling train as shown in Figure 1 of this table; aluminum foil; amber glass sample bottles with Teflon-lined lids; tare weighed particulate filters in sealed petri dishes; balance; glass graduated cylinder.

Frequency: Continuous to sample a minimum of 105.9 dry standard cubic feet (3 dry standard cubic meters) of stack gas during each sampling run.

Procedure Summary: Stack gases are sampled isokinetically to collect semivolatile organics on a particulate filter, adsorbent resin, and in impinger solutions. The train component samples are recovered in the field and shipped to an analytical laboratory where the mass amounts of semivolatile organics present are determined by extraction, concentration, and analysis by GC/MS.

> NOTE: The Method 0010 specified recovery solvents are methanol and methylene chloride. In this method, acetone is substituted for methanol for three reasons: 1) acetone provides better or equal performance as a solvent and is one of the solvents specified by Method 0023A, a Method 0010 variant, 2) due to methanol's negative impact on the GC/MS analysis, that being the tendency to cause splitting of the GC/MS peaks, and 3) acetone is a better solvent for removing moisture from the sample. The analytical laboratory especially prefers use of acetone over methanol to resolve the GC/MS peak splitting and sample moisture issues.

The Method 0010 train includes a heated probe and particulate filter, a water-cooled condenser with an integral adsorbent resin trap, a condenser cooling water system, a condensate knockout impinger, two deionized water impingers, an empty impinger, and a silica gel impinger. All impingers are placed in an ice bath.

All train components, reagents, and cleaning solutions are prepared according to the procedures specified in the methods referenced below. The pretest preparations include soaking the train glassware in hot (≥50°C) soapy (Alconox or equivalent) water, rinsing it three times each with hot water, distilled/deionized water, and drying in an oven for 2 hours at 450 °C. After cooling, the glassware is rinsed 3 times each with pesticide grade methylene chloride and pesticide grade toluene. When glassware is dry, all openings are covered with cleaned aluminum foil or clean glass plugs until sample train assembly.

The XAD-2 adsorbent resin is prepared according to the procedures specified in Appendix A of Method 0010, which are summarized as follows:

- XAD-2 resin is cleaned by water rinses followed by soxhlet extractions with water, acetone, and methylene chloride, then dried using a flow of clean inert gas. An extract is prepared from a portion of the XAD-2 resin and analyzed to confirm that it is free of significant background contamination. As an alternate to in-house preparation, resin that is certified clean by laboratory analysis may be purchased. The resin is stored at less than 120°F at all times.
- The adsorbent trap is loaded with approximately 40 g of the XAD-2 resin. The resin is spiked with an isotope labeled surrogate for the semivolatile

organic analysis and the open end of the resin trap is packed with clean glass wool. The ends of the adsorbent trap are capped and the traps are wrapped in aluminum foil, sealed in a plastic bag, and stored in an insulated cold chest.

The sampling train is assembled in a clean area at the test site and the train components are handled in a manner that minimizes the potential for contamination from air or by direct contact. The train glassware may be rinsed before using with acetone and methylene chloride. A clean and inspected particulate filter is placed in the filter holder. Before each sampling run, the Sample Coordinator supplies the XAD-2 adsorbent trap to the sampling team, who measures and records the weight of the trap to the nearest 0.5 gram, and installs the trap in the train. Impingers 1 and 4 are initially empty, Impingers 2 and 3 each contain 100 ml of deionized water, and Impinger 5 contains 200 to 300 grams of indicating silica gel. No sealant grease is used in assembling the train.

Stack sampling point locations are determined in accordance with Method 1. An initial traverse is made with a pitot tube at each sample point following Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow is checked only on the first day of testing). An Orsat apparatus or a continuous emission monitor system (CEMS) is used to determine stack gas oxygen, carbon dioxide, and dry molecular weight according to Methods 3, 3A, or 3C procedures. The stack gas moisture content is determined according to Method 4. Pretest and post-test leak checks, isokinetic sampling rate, filter change outs (if needed), and data recording are performed according to Method 5 procedures.

The stack gas sampling is conducted following the procedures given in Method 0010. The sample probe exit and filter assembly temperatures are maintained at 248°F ± 25°F, and the gas sample entering the adsorbent module is maintained at or below 68 °F. The sampling rate is adjusted during the test to maintain isokinetic conditions at the probe nozzle within ± 10% of 100%.

After sampling, the probe is removed from the stack and a post-test leak check (Method 5) is conducted. The probe nozzle is wiped to remove PM and covered loosely. After cooling, the probe is wiped to remove external PM, disconnected from the train, and both ends are capped. The probe and filter box-impinger assemblies are transported to the sample recovery area. The sample recovery and sample train cleanup procedures are summarized below.

- 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.
- Front Half 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 times each with acetone, and then rinsed three times with methylene chloride. All rinses are collected in a glass sample bottle (Container No. 2). The final liquid level is marked on the sample container.
- 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 (Container No. 3).
- Back Half Acetone/Methylene Chloride Rinses -- The back half of the filter holder, the filter support, transfer line (if used), and condenser (if

separate from trap) are rinsed three times with acetone followed by two rinses with methylene chloride. The back half rinses are placed into a glass sample bottle (Container No. 4). The final liquid level is marked on the sample container.

- Condensate Knockout Impinger -- The impinger content is measured to the nearest milliliter or weighed to the nearest 0.5 g and transferred to a glass sample bottle (Container No. 5). Any color or film observed is noted on the sample recovery sheet. Rinse the impinger three times with acetone followed by two rinses with methylene chloride, adding the rinses to Container No. 4. The final liquid level is marked on the sample container.
- Impinger Liquids -- The contents of the impingers 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. If no color or film is present, the impinger water may be discarded. If color or film is observed, the impinger water is recovered and added to the condensate in Container No. 5, and the impingers are rinsed three times with acetone followed by two rinses with methylene chloride, with the rinses added to Container No. 4.
- 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.

Once during the test program, a blank train is prepared, set up at the sampling location, and leak tested at the beginning and end of one of the runs. The particulate filter holder and probe is heated for the duration of the sampling period, but no gas will pass through the train. The nozzle is capped with aluminum foil and the exit end of the last impinger is sealed with a cap. The train will remain assembled at the sampling location for a period equivalent to one test run. The blank train samples are recovered using the procedures described above. Samples of the acetone and methylene chloride are collected once during the test as reagent blanks.

All of the sample containers is assigned numbers and labeled with the date and test-run number. The samples are turned over to the Sample Coordinator who records the appropriate data in the field logbook and packs the samples in insulated cold chests. Samples are stored in the sample holding area separate from the container supply area.

References:

"Method 0010 - Modified Method 5 Sampling Train", Test Methods for Evaluating Solid Waste, SW-846, Third Edition, 1986, and Updates

"Method 0010 – Appendix A – Preparation of XAD-2 Adsorbent Resin", Test Methods for Evaluating Solid Waste, SW-846, Third Edition, 1986, and Updates

"Method 1 - Sample and Velocity Traverses for Stationary Sources"

"Method 2 – Determination of stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"

"Method 3 – Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight"

"Method 4 – Determination of Moisture Content in Stack Gases"

"Method 5 – Determination of Particulate Emissions from Stationary Sources"

Table C-3. Method 0010 Stack Gas Semivolatile Organic Sampling Procedure (Continued)

Source for Methods 1 through 5: Appendix A - Test Methods, New Source Performance Standards, 40 CFR 60.

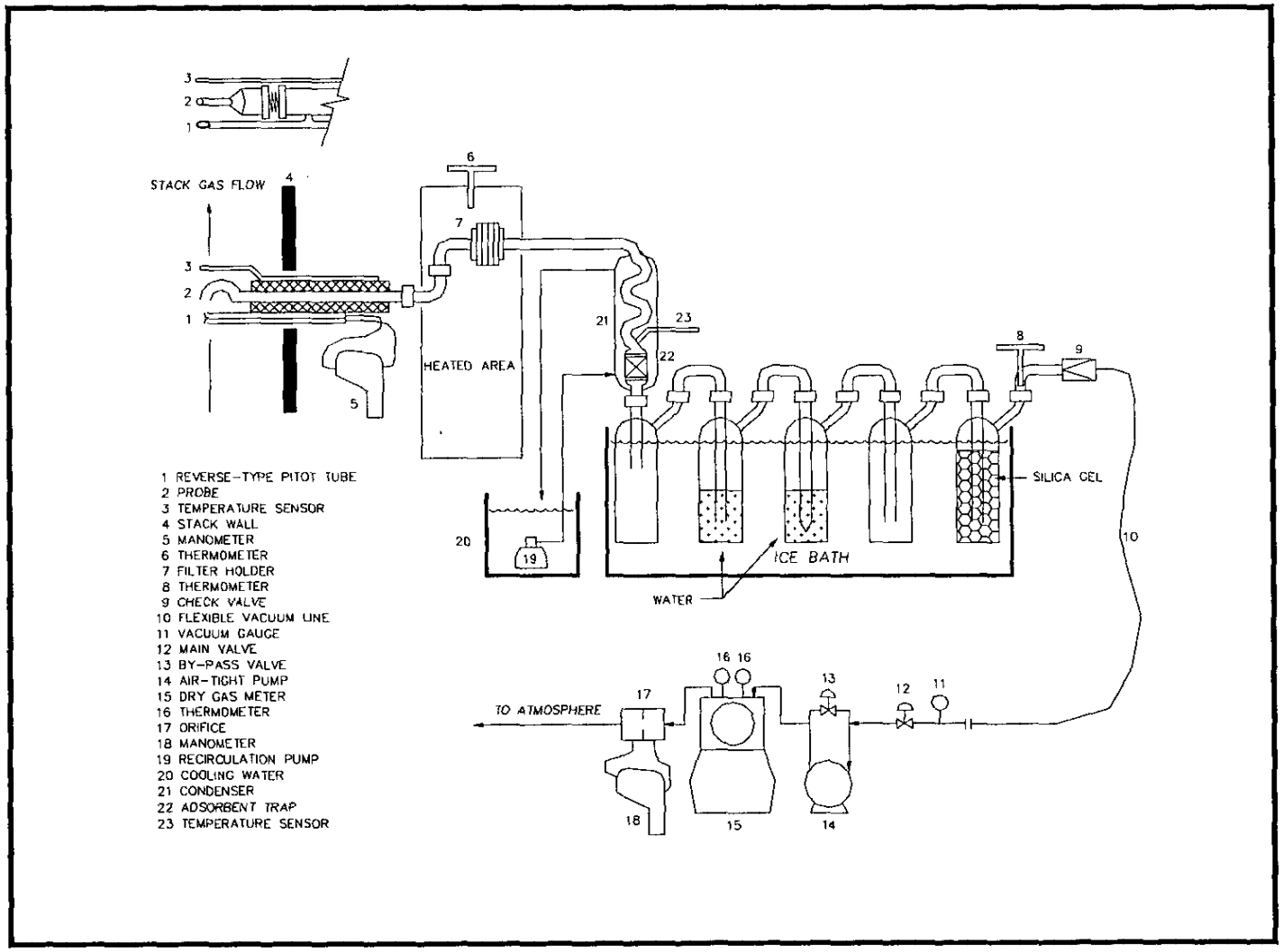

Figure 1. Method 0010 Sample Train for Semivolatile Organics

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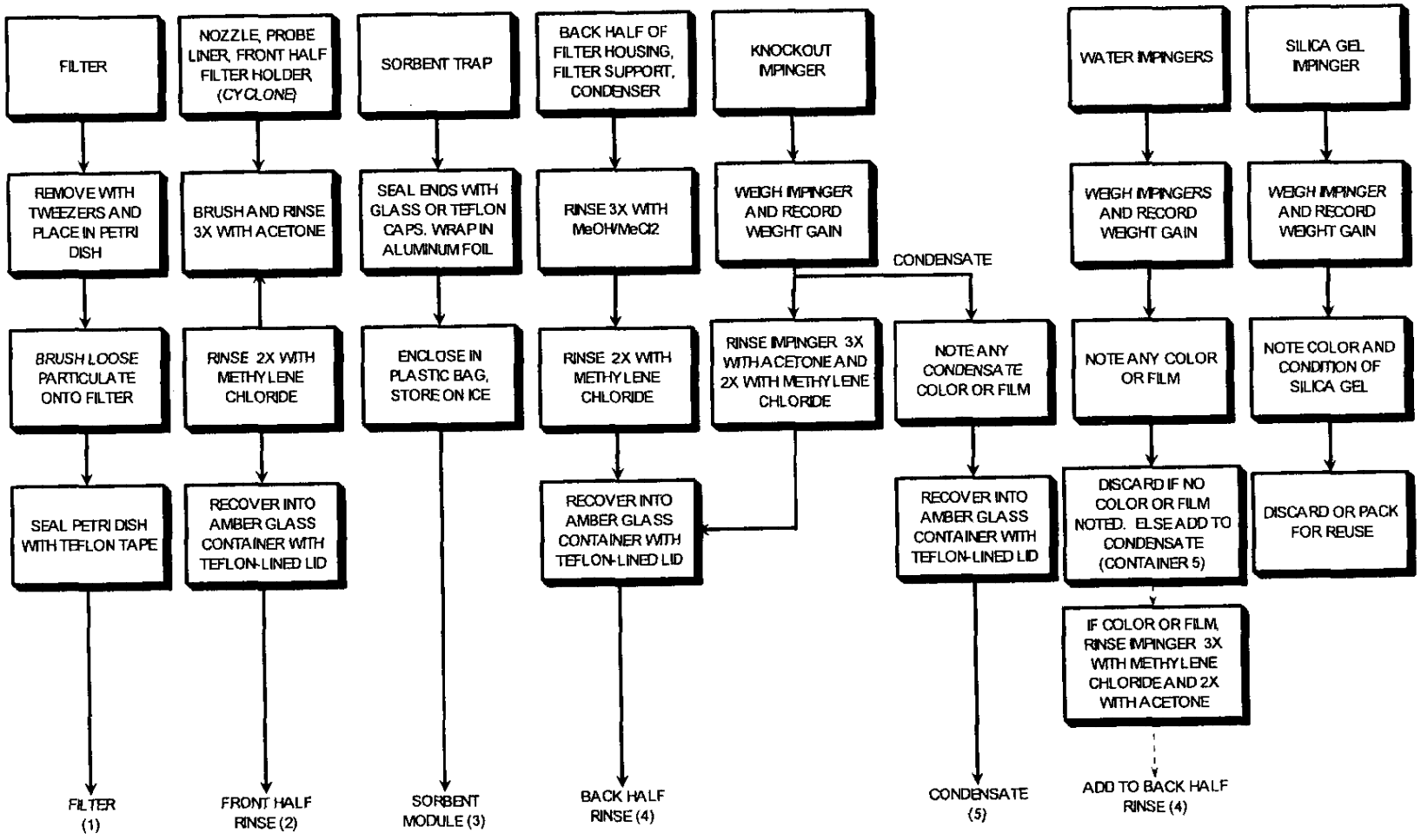

Figure 2. Method 0010 Semivolatile Organics Sample Recovery

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Table C-4. Method 0030 Stack Gas Volatile Organic Sampling Procedure

Sample name: Stack Gas Method 0030 (VOST)

Sampler: Stack sampling team

Location: Exhaust Stack

Equipment: Method 0030 volatile organic sampling train (VOST) as shown in Figure 1 of this table; Tenax and Tenax/charcoal sorbent cartridges sealed in glass culture tubes with Teflon lined screw caps; amber glass VOA vials (40 ml) with plastic screw caps and Teflon septa; screw capped glass container.

Frequency: Continuous with replacement of sorbent cartridge pairs every 40 minutes for a total sampling time of at least 160 minutes. Four pairs of sorbent cartridges are collected during each test run.

Procedure Summary: Stack gases are sampled at a controlled rate of 0.5 liters/minute (L/min) to collect volatile organic compounds (VOCs) on sorbent resin and charcoal, and in stack gas condensate. The mass of each target VOC collected on the sorbents and condensate is quantitatively determined by GC/MS analysis. (Note: This procedure is used to collect VOCs that have boiling points ranging from approximately 35°C to over 100°C.)

The sampling train includes a stainless steel probe with borosilicate or quartz glass liner, a heat-traced Teflon sample line (if used), an isolation valve, a water-cooled glass condenser, a Tenax cartridge, a condensate collection trap, a second water-cooled glass condenser, a Tenax/charcoal cartridge, and a silica gel cartridge. A rotameter, vacuum pump, and dry gas meter complete the train. A submersible pump is used to circulate ice bath water through the condensers.

The sampling train components and reagents are prepared according to the procedures specified in Method 0030. As described in the method, the train glassware is cleaned with nonionic detergent in an ultrasonic bath, rinsed with organic-free (HPLC) water, and dried in an oven. The sorbent material (Tenax resin and charcoal) is soxhlet extracted, vacuum dried, loaded into clean glass tubes, and thermally conditioned with organic-free nitrogen. The tubes are sealed with clean metal caps. Each cartridge (glass tube, sorbent, glass wool, and end caps) is permanently marked with an identification number and direction of sample flow, and sealed in a glass culture tubes that contain clean charcoal. The cleanliness of the sorbent in the cartridge set is checked by analysis of at least one pair of the cartridges that have been spiked with benzene and toluene as described in the method. The dry gas meter is calibrated within 30 days before conducting the test program.

In the laboratory, the cartridges are stored in a cooler at or near 4 °C (39°F) in an area free from volatile organic material. During pretest preparation, one pair of cartridges is selected from the cartridge set and identified as a laboratory blank, which is retained at the laboratory for analysis with the field samples. For transfer to the test site, the cartridges are packed separate from other test supplies and placed on cold packs in insulated containers to keep their temperature at or near 4°C for the duration of the trip. The laboratory blank cartridges are stored in the same manner as the field cartridges. At the test site, the insulated containers are stored in an area as free as possible from volatile organic materials and the cartridges are kept cold in the insulated containers until needed for a test run.

The VOST and a small insulated cooler containing 5 to 8 pairs of sorbent cartridges are taken to the sampling location, where the train is assembled in a manner that minimizes the potential for contamination from air or by direct contact. One pair of sorbent cartridges is installed in the train and the end caps are placed in a clean screw-capped glass container. No sealant grease is used in assembling the train.

A leak-check of the train assembly is performed by closing the isolation valve at the inlet to the first condenser, establishing ice bath water flow through the condensers, and using the pump to create a vacuum that is 25 cm (10 in.) Hg above normal operating pressure (total of approximately 38 cm Hg). The train leak rate must be less than 0.25 cm (0.1 in) Hg for 1 minute before starting the sampling run. The train is returned to atmospheric pressure by admitting ambient air though charcoal at the train inlet.

The VOST is operated according to the procedures provided in Method 0030. The train controls are set to maintain a temperature of 130°C to 150°C (266°F to 302°F) at the sample probe outlet and less than 20°C (68°F) at the inlet to the first cartridge. The stack gas is sampled at a rate 0.5 L/min for 40 minutes to collect a nominal volume of 20 L. The sampling train operating conditions are recorded as required on field data sheets.

At the end of the sampling run, the isolation valve is closed and the leak-check is repeated at the highest vacuum encountered during the run. The sorbent cartridges are removed from the train, the end caps replaced, labeled, and returned to the culture tubes, which are then placed on ice packs in a separate insulated container. A new pair of cartridges is then installed in the train and the procedures for leak checking, sampling, and recovery are repeated as described above. Four pairs of cartridges are collected during each test run. (Note: Additional cartridge pairs are collected if problems occur with the cartridges or the train fails the post-sampling run leak-check.)

At the end of each test run (4 cartridge pairs), any water collected in the condensate trap is transferred into a VOA vial(s), the trap is rinsed with minimum amounts of HPLC water, and the rinse is added to the vial. If there is not enough condensate to fill a VOA vial, organic-free water is added to eliminate headspace. The vials are labeled with sample name, date, and test run number. (Note: For high moisture content gases, the condensate may be recovered after collection of each cartridge pair.)

Field blank samples are collected once during each test run. The end caps are removed from a new pair of cartridges and they are allowed to remain open in the sampling area for approximately 10 minutes to simulate handling of the test cartridges.

The VOST operator delivers the test cartridges, condensate samples (if any), and the field blank cartridges for each test run to the Sample Coordinator, who makes the appropriate notations in the field log book, and packs the samples for shipment to the laboratory. For each shipment of cartridges during the test program, the Sample Coordinator includes one pair of new cartridges as trip blank samples.

Samples are stored at or near 4°C in shipping packages, which are stored in an area away from other samples that may have high concentrations of VOCs. If shipped by truck, the samples are stored away from other chemicals or from where automotive exhaust fumes could become concentrated.

Reference: "Method 0030 - Volatile Organic Sampling Train", Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

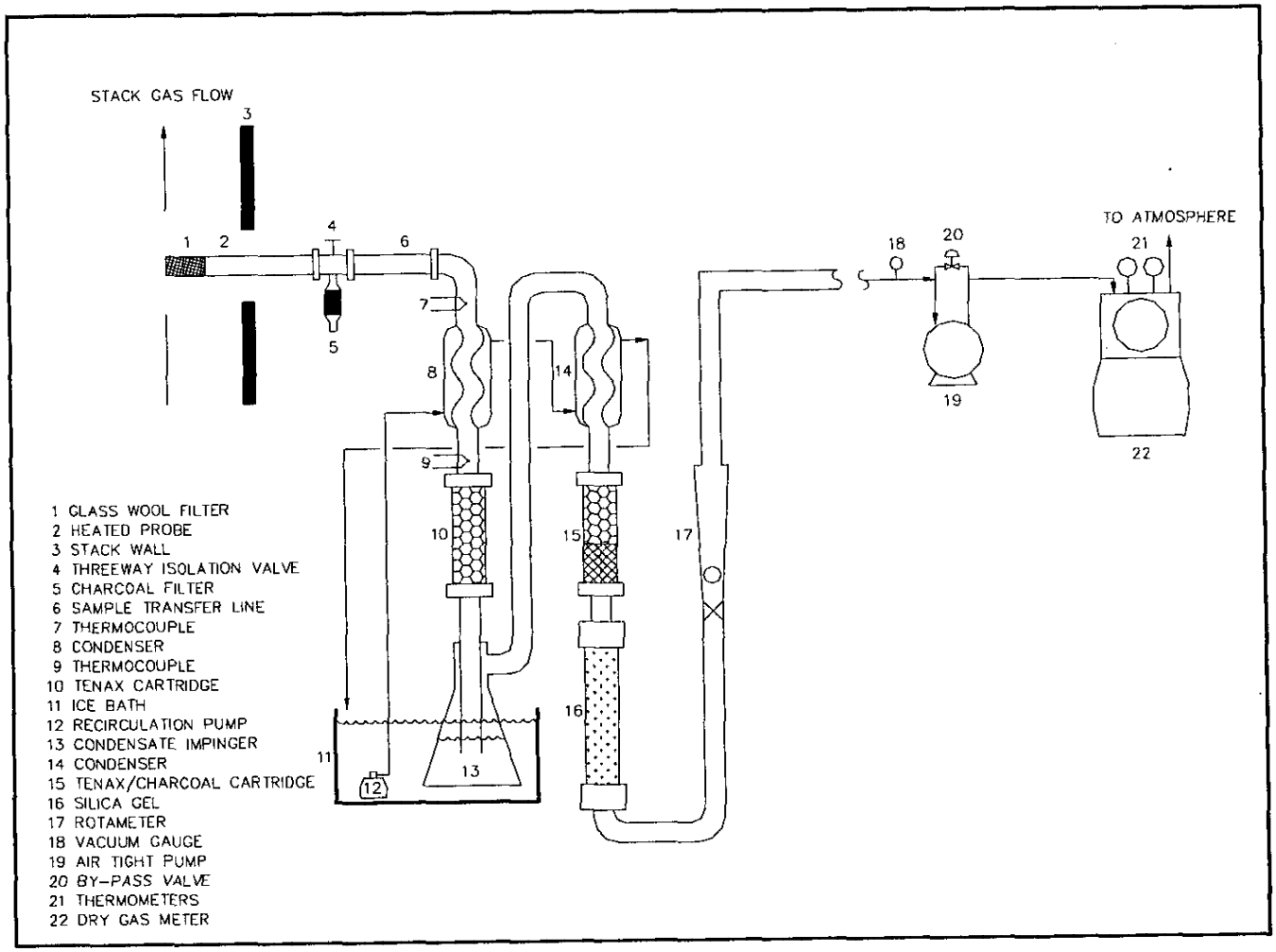

Figure 1. Method 0030 Sample Train for Volatile Organics

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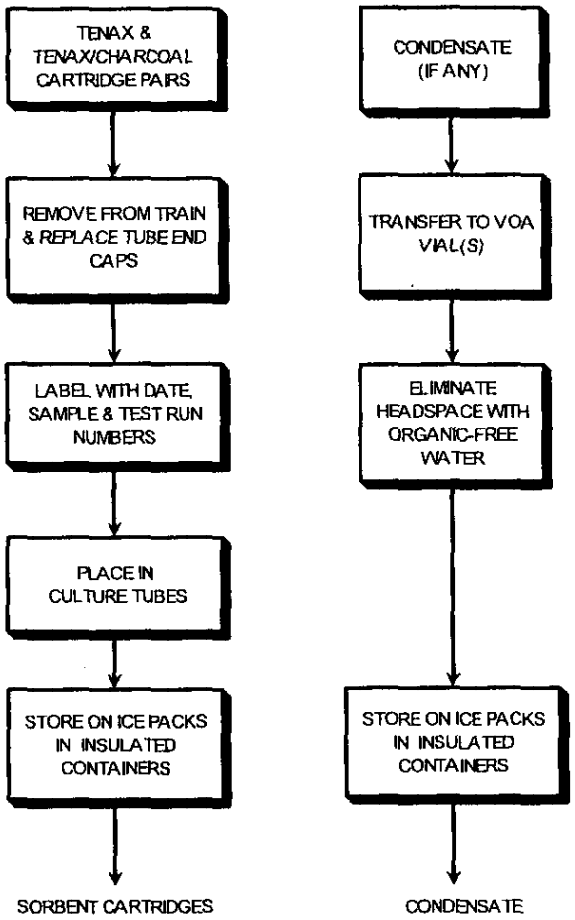

Figure 2. Method 0030 Volatile Organic Sample Recovery

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Table C-5. Method 26A Stack Gas Particulate Matter, Hydrogen Halide, and Halogen Sampling Procedure (Isokinetic)

Sample name: Stack Gas Method 26A (PM, HX, X_2)

Sampler: Stack sampling team

Locations: Exhaust stack

Equipment: Method 26A sampling train components assembled as shown in Figure 1 of this table; amber glass sample jars with Teflon-lined lids; pre-weighed Teflon mat particulate filters [or quartz fiber filters if the stack gas temperature exceeds 410°F (210°C)] in sealed petri dishes; balance; glass graduated cylinder; ambient air conditioning tube containing Ascarite II.

Frequency: Continuous sampling for a minimum of 60 minutes during each test run.

Procedure Summary: This procedure is used to collect samples of stack gas particulate matter, hydrogen halides, and halogens. The stack gases are sampled under isokinetic conditions to collect particulate matter on a filter, hydrogen halides and halogens in absorbing solutions, and to determine the stack gas flow rate. The amount of particulate matter collected is determined by weighing and the halide content of the absorbing solutions is determined by ion chromatography.

The Method 26A sampling train (Figure 1) includes a glass probe nozzle, a heated sample probe with borosilicate or quartz glass probe liner, a heated filter holder with Teflon filter support, a condensate knockout impinger (optional), two acid impingers, an empty impinger (optional), two alkaline impingers, and a silica gel impinger. All impingers are placed in an ice bath. An air tight gas pump, flow rate meter, and dry gas meter complete the train.

All train components, reagents, and cleaning solutions are prepared according to the procedures specified in the methods referenced below. The pretest preparations include soaking the train glassware in hot (≥50°C) soapy water, rinsing it three times each with hot water, distilled/deionized water, and acetone, and allowing it to dry in air. When glassware is dry, all openings are covered with Teflon film until sample train assembly.

The sampling train is assembled in a clean area and train components are handled in a manner that minimizes potential for contamination from air or by direct contact. A carefully inspected Teflon mat (or quartz fiber) filter is placed in the filter holder. When sampling a stack gas that has high moisture content, a condensate knockout impinger containing 50 ml of 0.1N sulfuric acid may be included as the first impinger in the train. The next two impingers each contain 100 ml of 0.1N sulfuric acid. An optional empty impinger may be placed after the sulfuric acid impingers to collect any liquid carryover. The next two impingers each contain 100 ml of 0.1N sodium hydroxide solution. The last impinger is filled with 200 to 300 grams of indicating silica gel.

Stack sampling point locations are determined in accordance with Method 1. An initial traverse is made with a pitot tube at each sample point following Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow is checked only on the first day of testing). An Orsat analyzer or continuous emissions monitoring system (CEMS) is used to determine stack gas oxygen, carbon dioxide, and dry molecular weight according to either Method 3, 3A, or 3C procedures. The stack gas moisture content is determined according to Method 4.

Table C-5. Method 26A Stack Gas Particulate Matter, Hydrogen Halide, and Halogen Sampling Procedure (Isokinetic) (Continued)

Pretest and post-test leak checks, isokinetic sampling rate, filter change outs (if needed), and data recording are performed according to Method 5 procedures.

The stack gas sampling is conducted following the general procedure given in Method 5 with the exception that the temperature of the sample probe and filter assembly is maintained at a minimum of 248°F (instead of 248°F ± 25°F). As required by Method 5, the isokinetic sampling rate is maintained within ±10% of 100%.

After sampling, the probe is removed from the stack and the post-test leak check is performed. The filter surface is inspected for visible moisture which if present, is recovered by the procedure specified in Section 8.1.6 of Method 26A. While visible moisture is not expected to be present under normal sampling conditions, this procedure involves attaching the ambient air conditioning tube to the nozzle tip and operating the train for the time(s) needed to evaporate the moisture and to capture the gases in the impinger solutions.

The sampling train is allowed to cool and when the probe temperature is safe to handle, it is disconnected from the train and the inlet to the filter is cleaned and capped. The probe and the filter/impinger assembly are transported to the sample recovery area. The sample recovery and sampling train cleanup procedures are summarized below.

- Particulate Filter -- The particulate matter filter is recovered from its holder and placed in its original petri dish (Container 1). Any PM and/or filter fibers that adhere to the filter holder or gasket are also recovered and placed in the petri dish, which is then sealed with Teflon tape, placed in a plastic bag.
- Front-half Rinse -- The internal surfaces of the nozzle, probe liner, and front half of the filter holder are brushed and rinsed three times with acetone. All rinses are placed in a sample bottle (Container 2) and the final liquid level is marked on the bottle.
- Acid Impinger Liquid -- The liquid contents of the condensate knockout impinger (if present), the two sulfuric acid impingers, and the carryover impinger (if present), are measured to the nearest milliliter or weighed to the nearest 0.5 g and placed into a sample bottle (Container 3). Any condensate found in the back half of the particulate filter holder or the connecting glassware (or flexible tubing) is also measured or weighed and transferred to Container 3. The back half of the filter holder, acid impingers and all connecting glassware are rinsed with deionized water, and the rinses are added to Container 3. The final liquid level is marked on the sample container. Any color or film observed is noted on the sample recovery sheet.
- Alkaline Impinger Liquid -- The liquid contents of the sodium hydroxide impingers are measured to the nearest milliliter or weighed to the nearest 0.5 g and placed into a sample bottle (Container 4). The sodium hydroxide impingers and all connecting glassware are rinsed with deionized water, and the rinses are added to Container 4. The container is sealed, shaken to mix and the final liquid level marked on the sample container. Any color or film observed is noted on the sample recovery sheet.

Table C-5. Method 26A Stack Gas Particulate Matter, Hydrogen Halide, and Halogen Sampling Procedure (Isokinetic) (Continued)

- 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.

A schematic diagram of the above sample recovery and cleanup procedures is provided in Figure 2 of this table. Following sample recovery, the glassware may be reused at the same sampling location.

Samples of the absorbing reagent solutions equivalent to the amounts used in the sampling train are collected once during the test for reagent blanks. Deionized water from the wash bottle is added to these samples to bring the volumes up to the corresponding recovered sample volumes. Blank samples of the deionized water and acetone in the wash bottles are also collected.

All of the sample containers are assigned numbers and labeled with the date and test-run number. The samples are turned over to the Sample Coordinator who records the appropriate data in the field logbook and packs the samples in insulated cold chests. Samples are stored in the sample holding area separate from the container supply area.

References:

"Method 26A - Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources – Isokinetic Method"

"Method 1 - Sample and Velocity Traverses for Stationary Sources"

"Method 2 – Determination of stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"

"Method 3 – Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight"

"Method 4 – Determination of Moisture Content in Stack Gases"

"Method 5 – Determination of Particulate Emissions from Stationary Sources"

Source: Appendix A - Test Methods, New Source Performance Standards, 40 CFR 60.

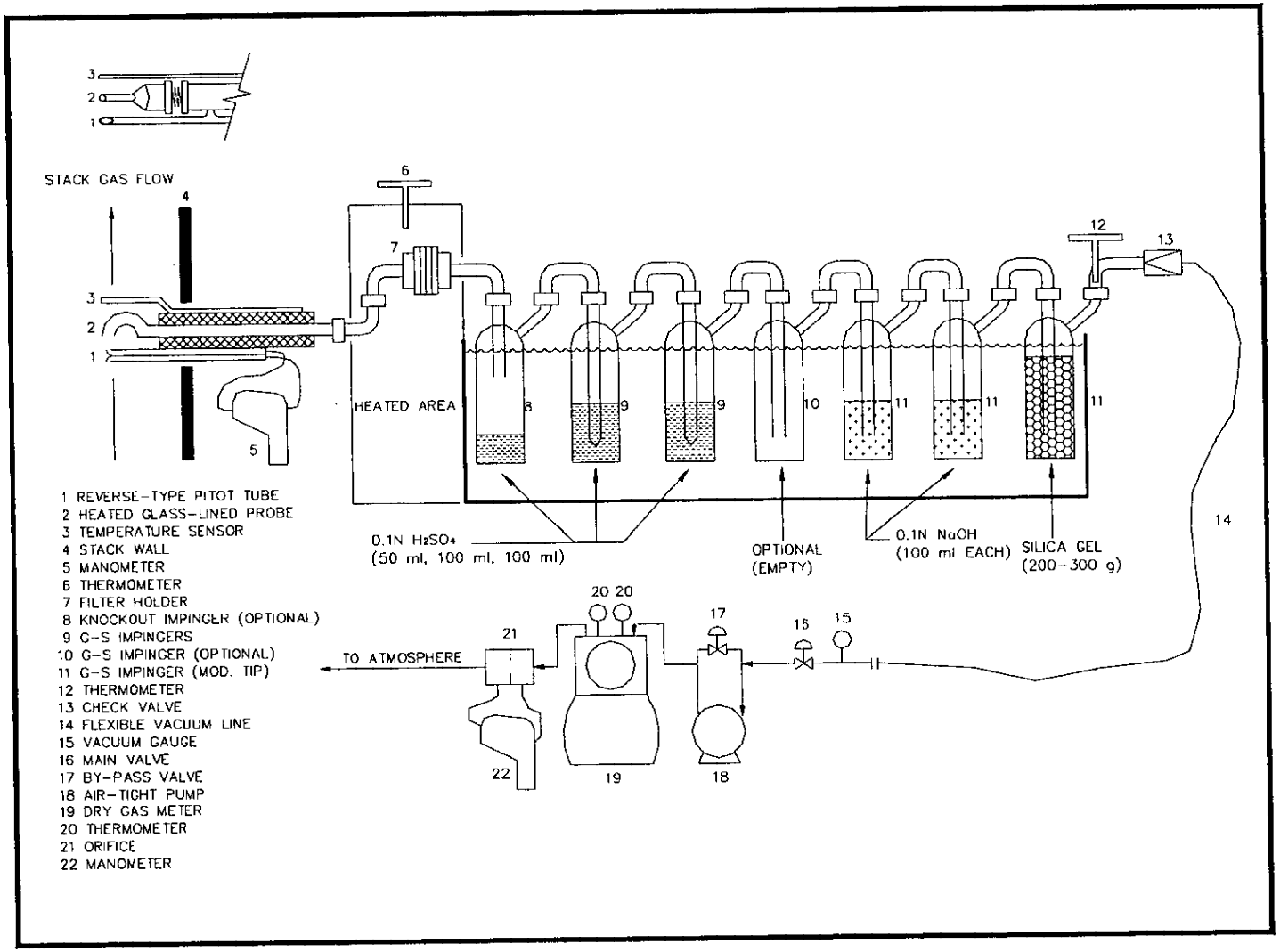

Figure 1. Method 26A Sample Train for Particulate Matter, Hydrogen Halide, and Halogen

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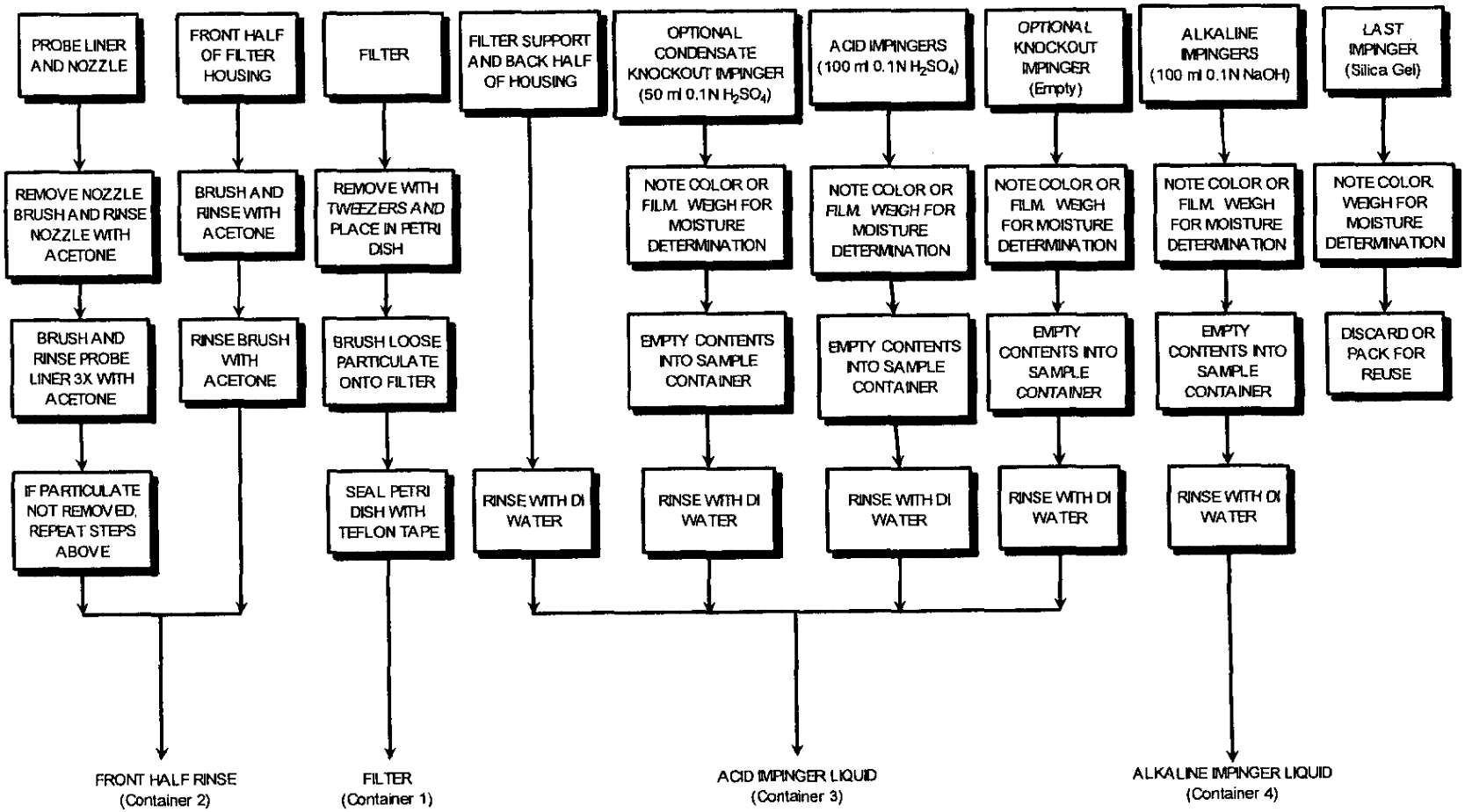

Figure 2. Method 26A Particulate Matter, Hydrogen Halide, and Halogen Sample Recovery

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Table C-6. Method 5 Stack Gas Particle Size Distribution Sampling Procedure
(For Analysis of Particulate Matter Filters by Scanning Electron Microscope)

Sample name: System exhaust particle size distribution (PSD)

Sampler: Stack sampling team

Locations: Incinerator stack

Equipment: Method 5 sampling train as shown in Figure 1 of this table; amber glass sample jars with Teflon-lined lids; inspected and tare weighed polycarbonate or acetate particulate matter (PM) filters sealed in petri dishes; balance; glass graduated cylinder. (Note: This PM filter is a slight variation from the glass fiber filter specified in Method 5, however it significantly enhances the quality of the scanning electron microscope (SEM) analysis by improving the smoothness of the background filter.)

Frequency: Continuous during each test run to collect a maximum of 5 to 10 dry standard cubic feet of sample depending on the sample gas PM concentration. [Note: Sampling rate or time may be adjusted to avoid overloading the filter, which can interfere with the SEM imaging process for particle size distribution determination. Typically, only 20 to 30 minutes total sampling time is required.]

Procedure Summary: Stack gases are withdrawn isokinetically to collect particulate matter (PM) on a filter. The particle size distribution is determined by SEM analyses of the PM filter and a PM filter obtained by filtering the acetone front half rinse.

The Method 5 train includes a stainless steel or glass probe nozzle, a heated probe with a borosilicate or quartz liner, a heated glass filter holder with particulate filter, two water impingers, an empty impinger, and a silica gel impinger. All four impingers are placed in an ice bath. An air tight gas pump, dry gas meter, and a flow rate manometer complete the train.

All train components, reagents, and cleaning solutions are prepared according to the procedures specified in the methods referenced below. The pretest preparations include soaking the train glassware in hot (>50°C) soapy (Alconox or equivalent) water, rinsing it three times each with hot water, distilled/deionized water, and acetone, and drying in air. All glassware openings are then covered with Teflon film until sample train assembly.

The sampling train is assembled in a clean area at the test site and the train components are handled in a manner that minimizes the potential for contamination from air or by direct contact. The train glassware may be rinsed with acetone before assembly. A PM filter is removed from a petri dish and placed in the filter holder. Distilled deionized water (100 mL each) is placed in impingers 1 and 2 and impinger 3 is left empty. Indicating silica gel (200 –300 g.) is placed in impinger 4. A light coating of silicone grease may be used around the outer portion of glass joints,

Stack sampling point locations are determined in accordance with Method 1. An initial traverse is made with a pitot tube at each sample point following Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow is checked only on the first day of testing). An Orsat apparatus or a continuous emission monitoring system (CEM) is used to determine stack gas oxygen, carbon dioxide, and dry molecular weight according to Method 3, 3A, or 3C procedures. The stack gas moisture content is determined according to Method 4.

Table C-6. Method 5 Stack Gas Particle Size Distribution Sampling Procedure (For Analysis of Particulate Matter Filters by Scanning Electron Microscope (Continued)

A sample train leak-check is performed before each test run as recommended in Method 5. The probe and filter heaters are set to maintain 248 °F, the probe nozzle is plugged, and a vacuum of 15 inches Hg is applied to the system. If the leakage rate exceeds 0.02 cfm or 4% of the average sampling rate, corrective action is taken until the train meets the leak rate criteria.

The stack gas sampling is conducted following the procedures given in Method 5. The filter holder assembly is maintained at 248°F ± 25°F and the gas sample exiting the impinger train is maintained less than 68°F. The sampling rate is adjusted during the test to maintain isokinetic conditions at the probe nozzle within ±10% of 100%. Sample train operating data are recorded on field data sheets as specified in the method.

After sampling, the probe is removed from the stack and the leak check is repeated as described above. This post-test leak is required for validation of the velocity head data. The probe nozzle tip is then wiped to remove PM and the nozzle is loosely covered. After cooling, the probe is wiped to remove external PM, disconnected from the train, and both ends are capped. The probe and filter box-impinger assemblies are transported to the sample recovery area. The sample recovery and sample train cleanup procedures are summarized below.

- Particulate Filter -- The particulate filter is removed from its holder and placed into its original petri dish (Container No. 1) which is sealed with tape and placed in a plastic bag.
- Front Half Rinse -- The internal surfaces of the nozzle, probe, and front half of the filter holder are brushed and rinsed three times with acetone. The liquid is then discarded.
- Impinger Liquid -- The liquid contents of impingers 1, 2, and 3 are measured to the nearest milliliter or weighed to the nearest 0.5 g for determination of stack gas moisture content. Any color or film observed is noted on the sample recovery sheet. The liquid is then discarded.
- Silica Gel – The silica gel contents of impinger 4 are weighed to the nearest 0.5 g. The color and condition of the silica gel is noted on the sample recovery sheet.

A sample of the acetone reagent and an unused PM filter are collected once during the test program.

All sample containers are assigned numbers and labeled with the sample name, date and test-run number. The samples are turned over to the Sample Coordinator who records the appropriate data in the field logbook and packs the samples in insulated cold chests. Samples are stored in the sample holding area separate from the container supply area.

References:

"Method 1 - Sample and Velocity Traverses for Stationary Sources"

"Method 2 – Determination of stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"

"Method 3 – Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight"

"Method 3A – Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrument Analyzer Procedure)"

Table C-6. Method 5 Stack Gas Particle Size Distribution Sampling Procedure (For Analysis of Particulate Matter Filters by Scanning Electron Microscope (Continued)

"Method 3C – Determination of Carbon Dioxide, Methane, Nitrogen, and Oxygen from Stationary Sources"

"Method 4 – Determination of Moisture Content in Stack Gases"

"Method 5 – Determination of Particulate Emissions from Stationary Sources"

Source: Appendix A - Test Methods, New Source Performance Standards, 40 CFR 60.

Table C-6. Method 5 Stack Gas Particle Size Distribution Sampling Procedure (For Analysis of Particulate Matter Filters by Scanning Electron Microscope (Continued)

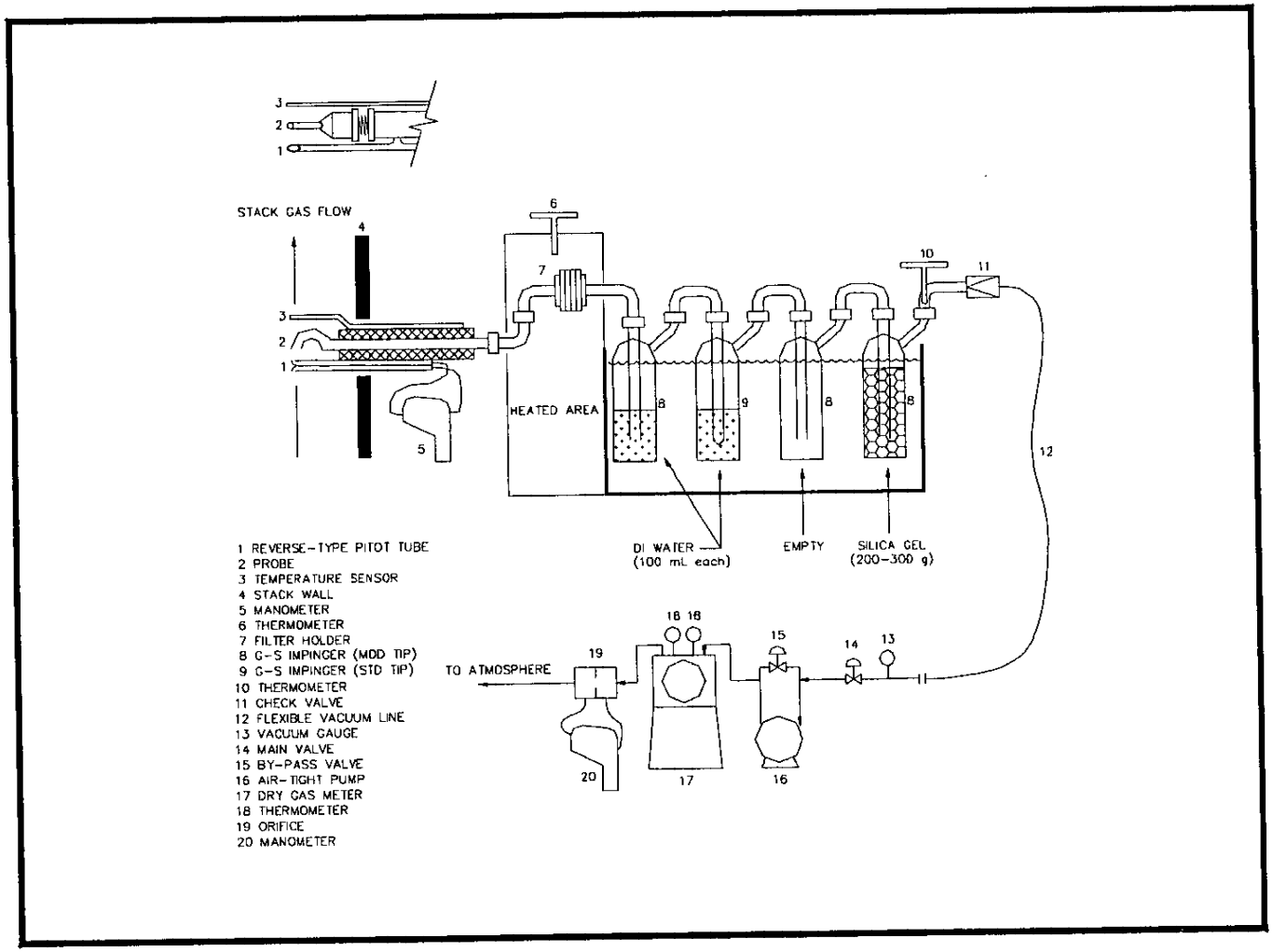

Figure 1. Method 5 Sample Train for Particle Size Distribution by Scanning Electron Microscope

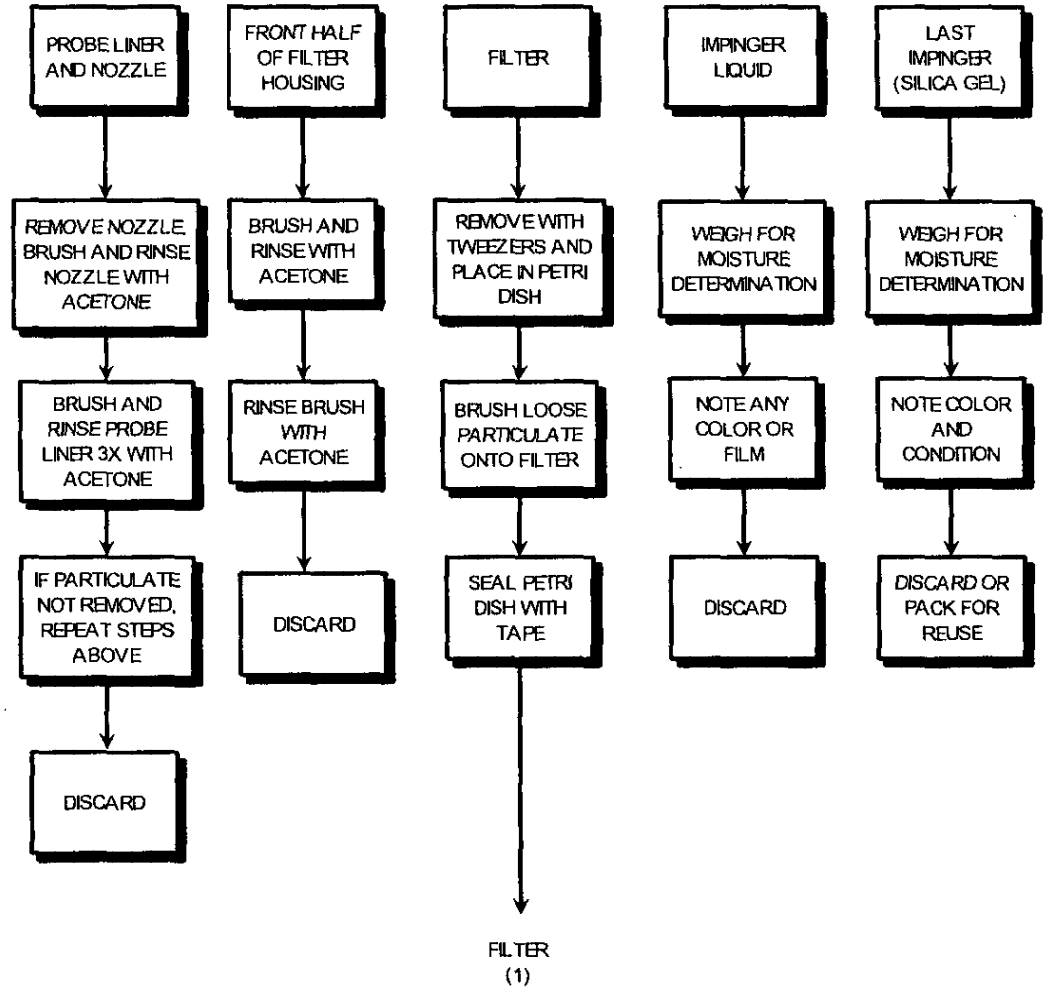

Figure 2. Method 5 Particle Size Distribution by Scanning Electron Microscope Sample Recovery

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Table C-6. Method 5 Stack Gas Particle Size Distribution Sampling Procedure
(For Analysis of Particulate Matter Filters by Scanning Electron Microscope)

Sample name: System exhaust particle size distribution (PSD)

Sampler: Stack sampling team

Locations: Incinerator stack

Equipment: Method 5 sampling train as shown in Figure 1 of this table; amber glass sample jars with Teflon-lined lids; inspected and tare weighed polycarbonate or acetate particulate matter (PM) filters sealed in petri dishes; balance; glass graduated cylinder. (Note: This PM filter is a slight variation from the glass fiber filter specified in Method 5, however it significantly enhances the quality of the scanning electron microscope (SEM) analysis by improving the smoothness of the background filter.)

Frequency: Continuous during each test run to collect a maximum of 5 to 10 dry standard cubic feet of sample depending on the sample gas PM concentration. [Note: Sampling rate or time may be adjusted to avoid overloading the filter, which can interfere with the SEM imaging process for particle size distribution determination. Typically, only 20 to 30 minutes total sampling time is required.]

Procedure Summary: Stack gases are withdrawn isokinetically to collect particulate matter (PM) on a filter. The particle size distribution is determined by SEM analyses of the PM filter and a PM filter obtained by filtering the acetone front half rinse.

The Method 5 train includes a stainless steel or glass probe nozzle, a heated probe with a borosilicate or quartz liner, a heated glass filter holder with particulate filter, two water impingers, an empty impinger, and a silica gel impinger. All four impingers are placed in an ice bath. An air tight gas pump, dry gas meter, and a flow rate manometer complete the train.

All train components, reagents, and cleaning solutions are prepared according to the procedures specified in the methods referenced below. The pretest preparations include soaking the train glassware in hot (>50°C) soapy (Alconox or equivalent) water, rinsing it three times each with hot water, distilled/deionized water, and acetone, and drying in air. All glassware openings are then covered with Teflon film until sample train assembly.

The sampling train is assembled in a clean area at the test site and the train components are handled in a manner that minimizes the potential for contamination from air or by direct contact. The train glassware may be rinsed with acetone before assembly. A PM filter is removed from a petri dish and placed in the filter holder. Distilled deionized water (100 mL each) is placed in impingers 1 and 2 and impinger 3 is left empty. Indicating silica gel (200 –300 g.) is placed in impinger 4. A light coating of silicone grease may be used around the outer portion of glass joints,

Stack sampling point locations are determined in accordance with Method 1. An initial traverse is made with a pitot tube at each sample point following Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow is checked only on the first day of testing). An Orsat apparatus or a continuous emission monitoring system (CEM) is used to determine stack gas oxygen, carbon dioxide, and dry molecular weight according to Method 3, 3A, or 3C procedures. The stack gas moisture content is determined according to Method 4.

Table C-6. Method 5 Stack Gas Particle Size Distribution Sampling Procedure (For Analysis of Particulate Matter Filters by Scanning Electron Microscope (Continued)

A sample train leak-check is performed before each test run as recommended in Method 5. The probe and filter heaters are set to maintain 248 °F, the probe nozzle is plugged, and a vacuum of 15 inches Hg is applied to the system. If the leakage rate exceeds 0.02 cfm or 4% of the average sampling rate, corrective action is taken until the train meets the leak rate criteria.

The stack gas sampling is conducted following the procedures given in Method 5. The filter holder assembly is maintained at 248°F ± 25°F and the gas sample exiting the impinger train is maintained less than 68°F. The sampling rate is adjusted during the test to maintain isokinetic conditions at the probe nozzle within ±10% of 100%. Sample train operating data are recorded on field data sheets as specified in the method.

After sampling, the probe is removed from the stack and the leak check is repeated as described above. This post-test leak is required for validation of the velocity head data. The probe nozzle tip is then wiped to remove PM and the nozzle is loosely covered. After cooling, the probe is wiped to remove external PM, disconnected from the train, and both ends are capped. The probe and filter box-impinger assemblies are transported to the sample recovery area. The sample recovery and sample train cleanup procedures are summarized below.

- *Particulate Filter -- The particulate filter is removed* from its holder and placed into its original petri dish (Container No. 1) which is sealed with tape and placed in a plastic bag.
- Front Half Rinse -- The internal surfaces of the nozzle, probe, and front half of the filter holder are brushed and rinsed three times with acetone. The liquid is then discarded.
- Impinger Liquid -- The liquid contents of impingers 1, 2, and 3 are measured to the nearest milliliter or weighed to the nearest 0.5 g for determination of stack gas moisture content. Any color or film observed is noted on the sample recovery sheet. The liquid is then discarded.
- Silica Gel -- The silica gel contents of impinger 4 are weighed to the nearest 0.5 g. The color and condition of the silica gel is noted on the sample recovery sheet.

A sample of the acetone reagent and an unused PM filter are *collected once during the* test program.

All sample containers are assigned numbers and labeled with the sample name, date and test-run number. The samples are turned over to the Sample Coordinator who records the appropriate data in the field logbook and packs the samples in insulated cold chests. Samples are stored in the sample holding area separate from the container supply area.

References:

"Method 1 - Sample and Velocity Traverses for Stationary Sources"

"Method 2 – Determination of stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"

"Method 3 – Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight"

"*Method 3A – Determination of* Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrument Analyzer Procedure)"

Table C-6. Method 5 Stack Gas Particle Size Distribution Sampling Procedure (For Analysis of Particulate Matter Filters by Scanning Electron Microscope (Continued)

"Method 3C – Determination of Carbon Dioxide, Methane, Nitrogen, and Oxygen from Stationary Sources"

"Method 4 – Determination of Moisture Content in Stack Gases"

"Method 5 – Determination of Particulate Emissions from Stationary Sources"

Source: Appendix A - Test Methods, New Source Performance Standards, 40 CFR 60.

Table C-6. Method 5 Stack Gas Particle Size Distribution Sampling Procedure (For Analysis of Particulate Matter Filters by Scanning Electron Microscope (Continued)

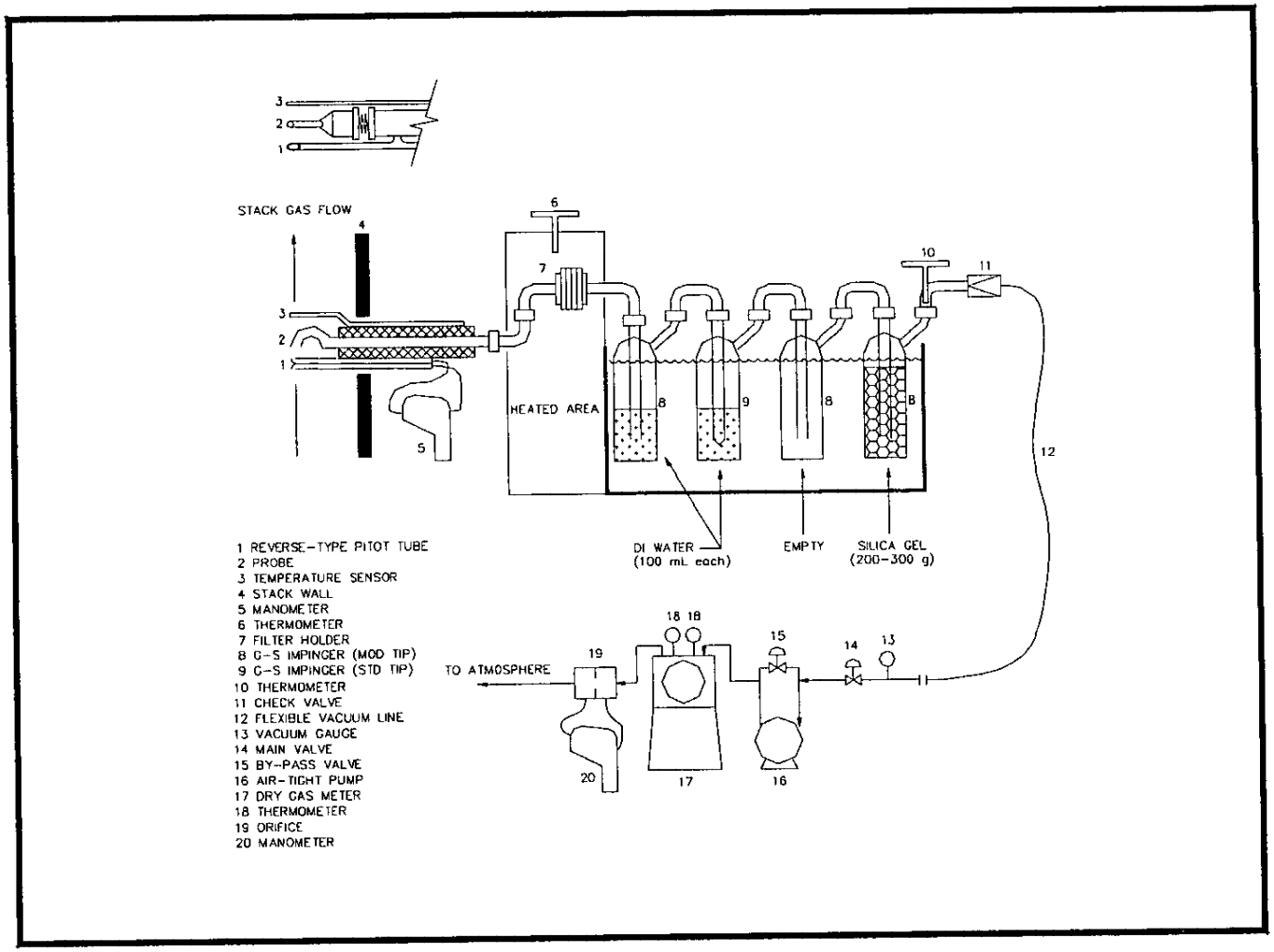

Figure 1. Method 5 Sample Train for Particle Size Distribution by Scanning Electron Microscope

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Table C-6. Method 5 Stack Gas Particle Size Distribution Sampling Procedure (For Analysis of Particulate Matter Filters by Scanning Electron Microscope (Continued)

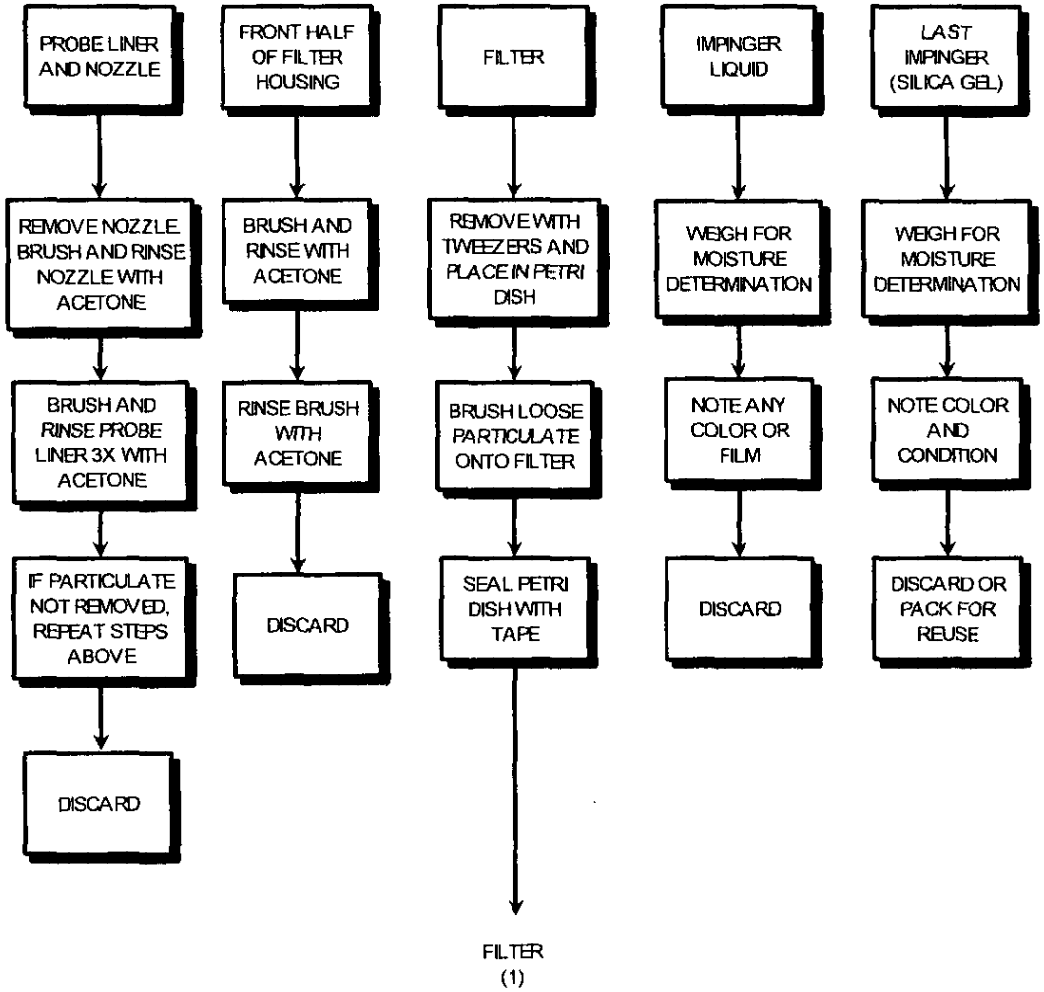

Figure 2. Method 5 Particle Size Distribution by Scanning Electron Microscope Sample Recovery

Table C-7. Method 29/Method 0060 Stack Gas Multiple Metals Sampling Procedure
(Includes Mercury, No Particulate)

Sample name: Stack Gas Method 29/Method 0060 (MM, Hg, No PM)

Sampler: Stack sampling team

Locations: Exhaust stack

Equipment: Method 29/Method 0060 multiple metals sampling train as shown in Figure 1 of this table; amber glass sample jars with Teflon-lined lids; low-metals content particulate filters sealed in petri dishes; balance; glass graduated cylinder.

Frequency: Continuous for 120 minutes during each of three test runs.

Procedure Summary: Gases are sampled isokinetically to collect the sample on a particulate filter and in absorbing solutions. The filter and absorbing solutions are recovered for subsequent metals analyses by inductively coupled plasma emission spectroscopy (ICP) and/or or graphite furnace AAS (GFAAS), and cold vapor AAS (CVASS). [Note: This procedure does not include collection of particulate matter (PM) samples for determination of PM concentration.]

The Method 29/Method 0060 multiple metals train includes a heated sample probe with borosilicate or quartz nozzle and liner, a heated particulate filter holder with Teflon filter support, a condensate knockout impinger (optional), two acidified hydrogen peroxide impingers, an empty impinger, two acidified potassium permanganate impingers, and a silica gel impinger. All impingers are placed in an ice bath. An air tight gas pump, dry gas meter, and manometer complete the train.

All train components, reagents, and cleaning solutions are prepared according to the procedures specified in the methods referenced below. The pretest preparations include rinsing the train glassware with hot tap water, washing with hot soapy water, rinsing three times each with tap water and distilled/deionized water (ASTM D1193-99, Type II). The glassware is then soaked in 10% (v/v) nitric acid solution for a minimum of four hours, rinsed three times with distilled/deionized water, a final rinse with acetone, and allowed to air dry. All glassware openings are covered with Teflon film until sample train assembly.

The sampling train is assembled in a clean area at the test site and the train components are handled in a manner that minimizes contamination from air or by direct contact. A clean and inspected filter is placed in the filter holder. The first impinger is initially empty and serves as a condensate knockout impinger. (This impinger may be eliminated if the moisture to be collected is less than 100 ml.) The next two impingers each contain 100 ml of 5% HNO_3/10% H_2O_2 solution. The carryover impinger is empty and the next two impingers each contain 100 ml of 4% $KmnO_4$/10% H_2SO_4 solution. The last impinger contains 200 to 300 g of indicating silica gel.

Stack sampling point locations are determined in accordance with Method 1. An initial traverse is made with a pitot tube at each sample point following Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow is checked only on the first day of testing). An Orsat analyzer is used to determine stack gas oxygen, carbon dioxide, and dry molecular weight according to Method 3 procedures. The stack gas moisture content is determined according to Method 4.

Table C-7. Method 29/Method 0060 Stack Gas Multiple Metals Sampling Procedure (Includes Mercury, No Particulate) (Continued)

The sample train is operated according to Method 5 procedures for pretest and post-test leak-checks, isokinetic sampling rate, and data recording. The train leak rate must be the less than 0.02 cfm, or less than 4% of the average sampling rate. The sampling rate is adjusted during the test to maintain isokinetic conditions at the probe nozzle within ± 10% of 100%.

After sampling, the probe is removed from the stack and a post-test leak check (Method 5) is conducted. The probe nozzle is wiped to remove PM and covered loosely. After cooling, the probe is wiped to remove external PM, disconnected from the train, and both ends are capped. The probe and filter box-impinger assemblies are transported to the sample recovery area. The sample recovery and sample train cleanup are summarized below.

- Particulate Filter – A non-metallic tool is used to remove the particulate filter from its holder and place it in the original petri dish (Container 1). A nylon bristle brush is used to remove any PM or filter fibers from the filter gasket or the holder onto the filter, and the petri dish is sealed with tape and placed in a plastic bag.
- Front Half Rinse -- The internal surfaces of the nozzle, probe, and front half of the filter holder are cleaned by rinsing, brushing, and final rinsing with exactly 100 ml of 0.1N nitric acid. All rinses are placed into an sample bottle (Container 3). [Note: There is no Container 2 (Acetone Rinse) because the collection of PM samples is not included in this procedure.]
- Acidified Peroxide Impingers -- The liquid contents of the condensate knockout impinger (if used) and the two HNO_3/H_2O_2 impingers are measured to the nearest milliliter or weighed to the nearest 0.5 g and placed into a sample bottle (Container 4). The back half of the particulate filter holder is inspected for condensate, which if observed, is measured and/or weighed as described above and transferred to Container 4. The back half of the filter holder, the filter support, the optional condensate knockout impinger (if used), and the two HNO_3/H_2O_2 impingers, and all connecting glassware are rinsed with exactly 100 ml of 0.1N nitric acid, and the rinses are added to Container 4.
- Carryover impinger – The liquid contents of the initially empty impinger is measured to the nearest 0.5 ml and placed into a separate sample bottle (Container 5A). The impinger is then rinsed with exactly 100 ml of 0.10N nitric acid solution and the rinse is added to Container 5A.
- Acidified Permanganate Impingers -- The liquid contents of the acidified permanganate impingers are measured to the nearest 0.5 ml and placed into a separate sample bottle (Container 5B). These impingers and any connecting glassware are then rinsed a minimum of three times using a total of exactly 100 ml of fresh acidified potassium permanganate solution, and the rinses are added to Container 5B, being careful to also transfer any loose precipitated materials into the container. Triple rinsing of the acidified permanganate impingers is then repeated using a total of exactly 100 ml of water. The water rinses are also placed into Container 5B. If visible deposits remain in the impingers following the water rinses, they are rinsed with 25 ml of 8N hydrochloric acid, and the rinse is placed into a separate container (Container 5C) which contains 200 ml of water.

Table C-7. Method 29/Method 0060 Stack Gas Multiple Metals Sampling Procedure (Includes Mercury, No Particulate) (Continued)

- 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.

A schematic diagram of the above sample train recovery and cleanup procedures is provided in Figure 2 of the table. Following sample recovery, the train may be reused at the same sampling location.

The following reagent blank samples are collected once during the test program: one unused particulate filter; 300 ml of the 0.1N nitric acid solution; 100 ml of the water used in sample recovery; 200 ml of the acidified hydrogen peroxide solution, and 100 ml of the acidified potassium permanganate solution. If the acidified potassium permanganate impingers from any run are rinsed with HCl, then a 25 ml blank sample of the 8N HCl solution is also collected and added to 200 ml of water in a separate sample bottle.

Once during the test program, two complete blank trains are assembled in a clean area, brought up to operating temperatures, leak tested, and allowed to sit idle (no sample gas flow) for the duration of one sampling run. The train samples are recovered as described above and subsequently used in matrix spike and matrix spike duplicate analyses to evaluate conformance with analytical data quality objectives.

All of the sample containers are assigned numbers and labeled with the date and test-run number. The samples are turned over to the Sample Coordinator who records the appropriate data in the field logbook and pack the samples in insulated cold chests. Samples are stored in the sample holding area separate from the container supply area.

References:

Method 0060 - Determination of Metals in Stack Emissions", Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

"Method 29 - Determination of Metals Emissions from Stationary Sources"

"Method 1 - Sample and Velocity Traverses for Stationary Sources"

"Method 2 – Determination of stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"

"Method 3 – Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight"

"Method 4 – Determination of Moisture Content in Stack Gases"

"Method 5 – Determination of Particulate Emissions from Stationary Sources"

Source: Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.

Table C-7. Method 29/Method 0060 Stack Gas Multiple Metals Sampling Procedure (Includes Mercury, No Particulate) (Continued)

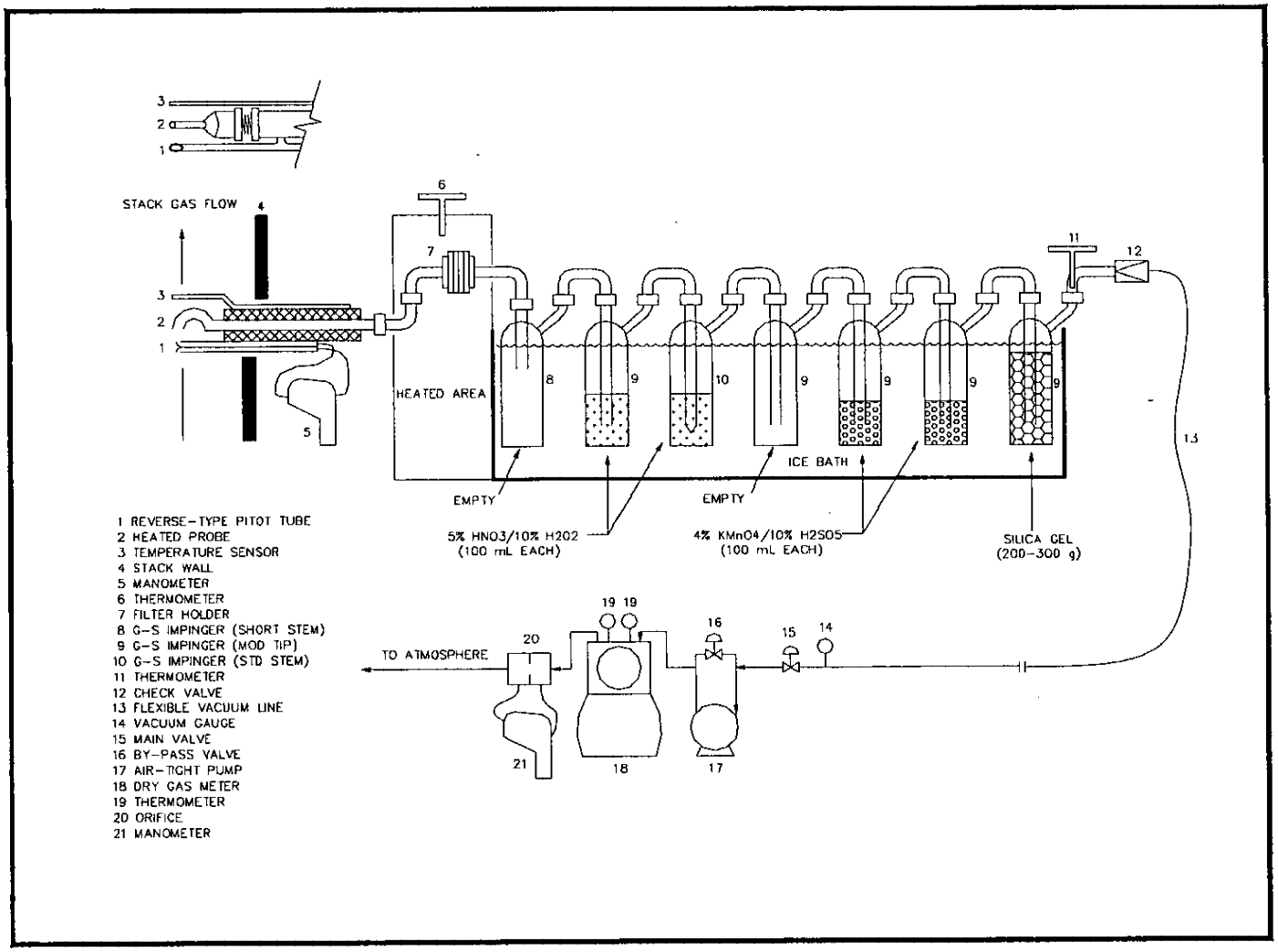

Figure 1. Method 29/Method 0060 Sample Train for Multiple Metals (Including Hg) (No Particulate)

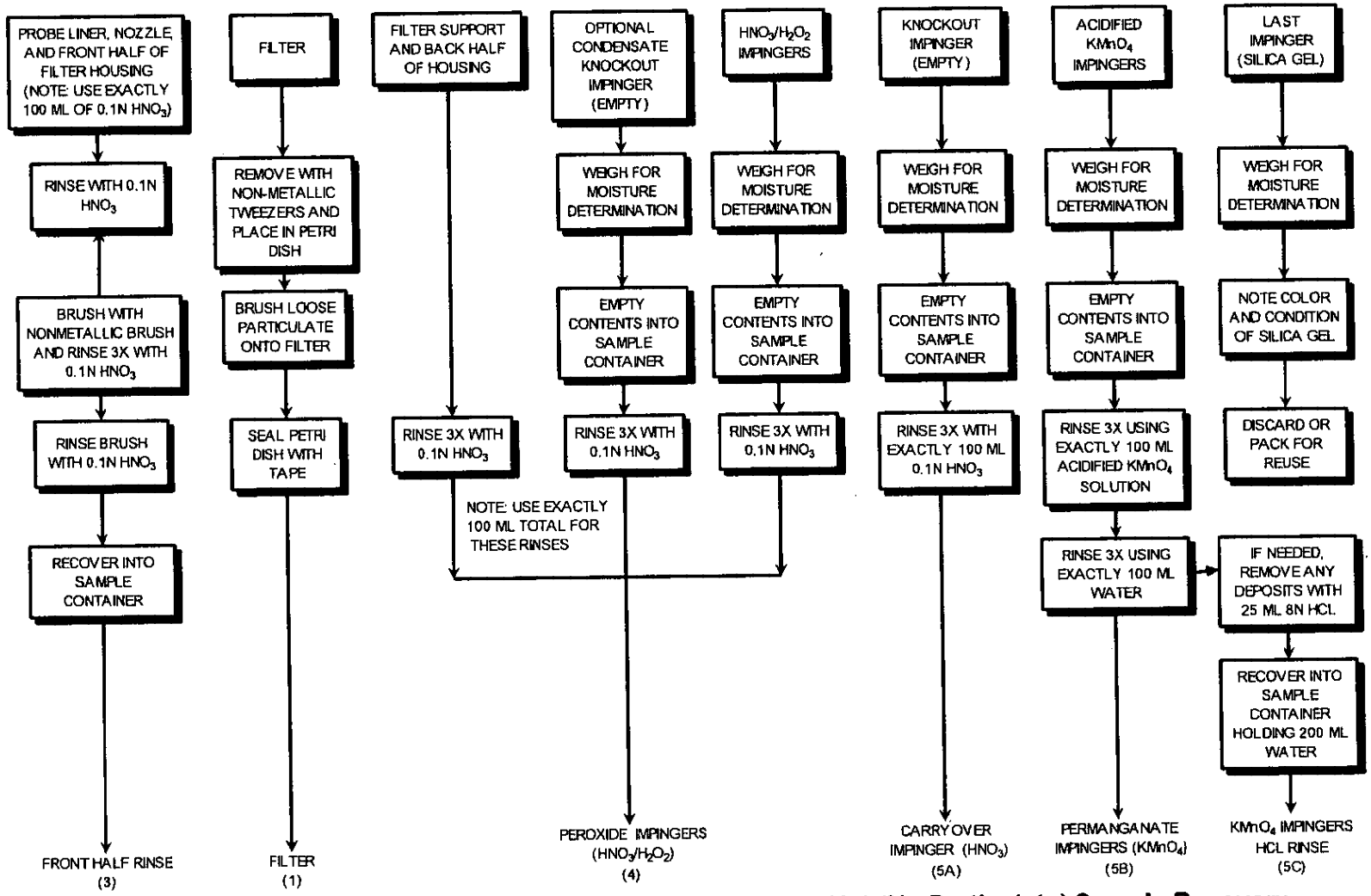

Figure 2. Method 29/Method 0060 Multiple Metals (Including Hg) (No Particulate) Sample Recovery

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Table C-8. Method 0061 Stack Gas Hexavalent Chromium Sampling Procedure

Sample name: Stack Gas Method 0061 (Cr^{+6})

Sampler: Stack sampling team

Locations: Incinerator stack

Equipment: Method 0061 hexavalent chromium sampling train as shown in Figure 1 of this table, cleaned polyethylene sample bottles with leak-free screw caps, graduated cylinder, balance, nitrogen cylinder and purge line, and sample filtration apparatus.

Frequency: Continuous for 60 minutes during each test run.

Procedure Summary: Stack gases are sampled isokinetically to collect hexavalent chromium in an absorbing solution. The hexavalent chromium content of the solution sample is quantitatively determined by ion chromatography employing a post-column reactor (IC/PCR).

The Method 0061 sampling train consists of a glass or Teflon probe nozzle, a Teflon sample line, a Teflon aspirator (or peristaltic pump), four Teflon impingers, and a glass impinger. The first three impingers contain potassium hydroxide absorbing solution, the fourth is empty, and the fifth contains silica gel. All impingers are placed in an ice bath. An air-tight gas pump, dry gas meter, and a gas flow manometer complete the train.

During operation, the gas pump draws the stack gas sample through the nozzle, probe, and the chilled impingers, which serve to remove moisture from the gas and to capture hexavalent chromium. The aspirator (or pump) circulates reagent solution from the first impinger and injects it into the sample line, which returns the solution to the impinger along with the gas sample. The absorbing solution is injected at or near the probe outlet in order to capture and stabilize the hexavalent chromium before it can convert (reduce) to the trivalent oxidation state as it travels through the sample line to the impingers. [Note: If the stack gas temperature is greater than 200°F, 3 to 4 feet of the sample and absorbent lines may be coiled into the ice bath in order to prevent boiling of the absorbing solution.]

All train components, reagents, and cleaning solutions are prepared according to the procedures specified in the reference method. The pretest preparations include rinsing the train glassware with hot tap water, washing with hot soapy water, rinsing three times each with tap water and reagent water (ASTM D1193-99, Type II). The glassware is then soaked in 10% (v/v) nitric acid solution for a minimum of four hours, rinsed three times with reagent water, a final rinse with acetone, and allowed to air dry. All glassware openings are covered with Teflon film until sample train assembly.

The sampling train is assembled in a clean area at the test site and the train components are handled in a manner that minimizes contamination from air or by direct contact. The first impinger contains 150 ml of a 0.1 M solution of potassium hydroxide. Impingers 2 and 3 each contain 75 ml of 0.1 M potassium hydroxide solution. Impinger 4 is initially empty and serves to collect any liquid carryover from upstream impingers. Impinger 5 contains 200 to 400 g of indicating silica gel weighed to the nearest 0.5 g. [Note: The absorbing solution strength in the first impinger may be increased to 0.5 M (or higher if necessary) to maintain a high pH (>8.5) in the solution throughout sampling.]

Stack sampling point locations are determined in accordance with Method 1. An initial traverse is made with a pitot tube at each sample point following Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow

(cyclonic flow is checked only on the first day of testing). An Orsat analyzer or a continuous emission monitoring system (CEMS) is used to determine stack gas oxygen, carbon dioxide, and dry molecular weight according to Method 3, 3A, or 3C procedures. The stack gas moisture content is determined according to Method 4.

The sample train is operated according to Method 5 procedures for pretest, port change, and post-test leak checks, isokinetic sampling, and data recording. The train leak rate must be less than or equal to 0.02 cfm, or less than 4% of the average sampling rate. The sampling rate is adjusted during the test to maintain isokinetic conditions at the probe nozzle within ± 10% of 100%. The sample probe temperature is maintained less than 200°F in order to prevent boiling of the absorbing solution.

After sampling, the probe is removed from the stack and a post-test leak check is performed and the nozzle covered. After cooling, the probe nozzle is wiped to remove external particulate matter and capped. The sampling train assembly is disconnected from the umbilical cord and transported to the sample recovery area. The sample recovery and sample train cleanup procedures are summarized below.

- Impinger 1 pH Check - The pH of the reagent solution in the first impinger is determined using a pH indicator strip. If the solution pH is less than 8.5, the solution is discarded and the test is repeated with appropriate adjustment of the absorbing solution strength. If the solution pH is equal to or greater than 8.5, sample recovery proceeds as follows.
- Post-Test Nitrogen Purge - Nitrogen is bubbled through the impinger train at a rate of approximately 10 liters per minute for 30 minutes as a safeguard against the conversion of hexavalent chromium to the trivalent oxidation state.
- Impinger Solution - The liquid contents of the first four impingers are volumetrically measured to the nearest 1 mL or weighed to the nearest 1 g and placed into a polyethylene sample bottle (Container 1). The impingers, probe nozzle, absorbent circulation system, and connecting tubing are then rinsed four times with distilled, deionized water and the rinses are added to the Container 1.
- Silica Gel -- The silica gel contents of impinger 5 are weighed to the nearest 0.5 g.

Immediately following recovery, the impinger solution (Container 1) is filtered through a 0.45 micrometer acetate filter (or equal) to remove insoluble matter. The sample container is rinsed three times with distilled deionized (DI) water, and the rinses are passed through the filter. The filter and reservoir are then rinsed three times with DI water and these rinses are also passed through the filter and added to the sample. The final sample volume is measured to the nearest 1 mL, and returned to the original polyethylene sample bottle. After sample filtration, the filter and reservoir are rinsed once with 0.1 M nitric acid and once with DI water. These rinses are discarded.

A schematic diagram of the sample recovery and filtration procedures is provided in Figure 2.

Reagent blank samples are collected of the potassium hydroxide absorbing solution(s) used in the sample trains and the reagent water used in rinsing the sample train. The blank volume the absorbing solution is approximately 300 mL. The reagent water volume is equal to the volume of water used in rinsing the train.

Table C-8. Method 0061 Stack Gas Hexavalent Chromium Sampling Procedure (Continued)

All of the sample containers are assigned numbers and labeled with the date and test-run number. The samples are turned over to the Sample Coordinator who records the appropriate data in the field logbook and pack the samples in insulated cold chests. Samples are stored in the sample holding area separate from the container supply area.

References: "Method 0061, Determination of Hexavalent Chromium Emissions from Stationary Sources," SW-846, Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.

"Method 1 - Sample and Velocity Traverses for Stationary Sources"

"Method 2 – Determination of stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"

"Method 3 – Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight"

"Method 4 – Determination of Moisture Content in Stack Gases"

"Method 5 – Determination of Particulate Emissions from Stationary Sources"

Source for Methods 1, 2, 3, 4, and 5: Appendix A, Test Methods, New Source Performance Standards, 40 CFR 60.

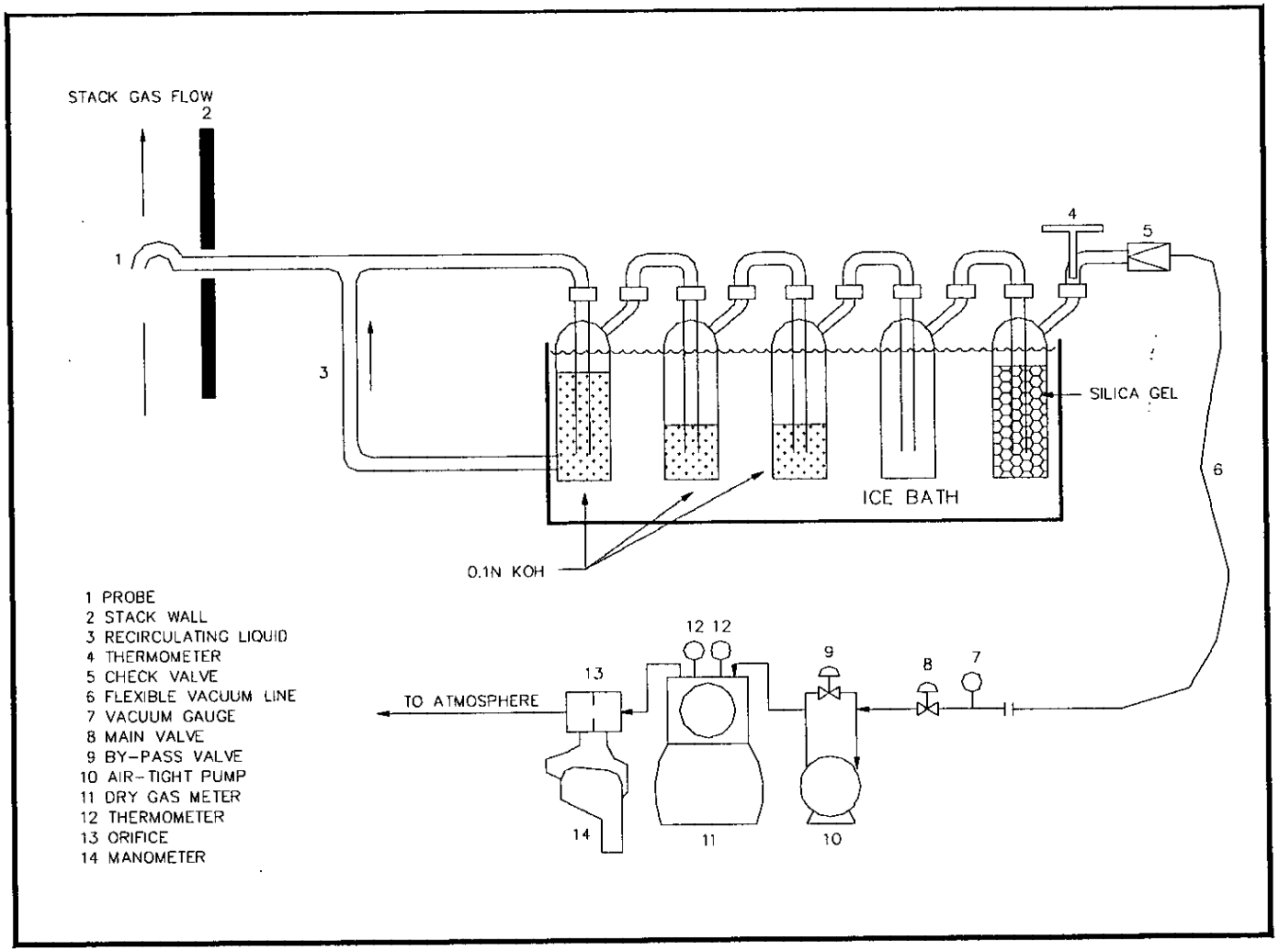

Figure 1. Method 0061 Sample Train for Hexavalent Chromium

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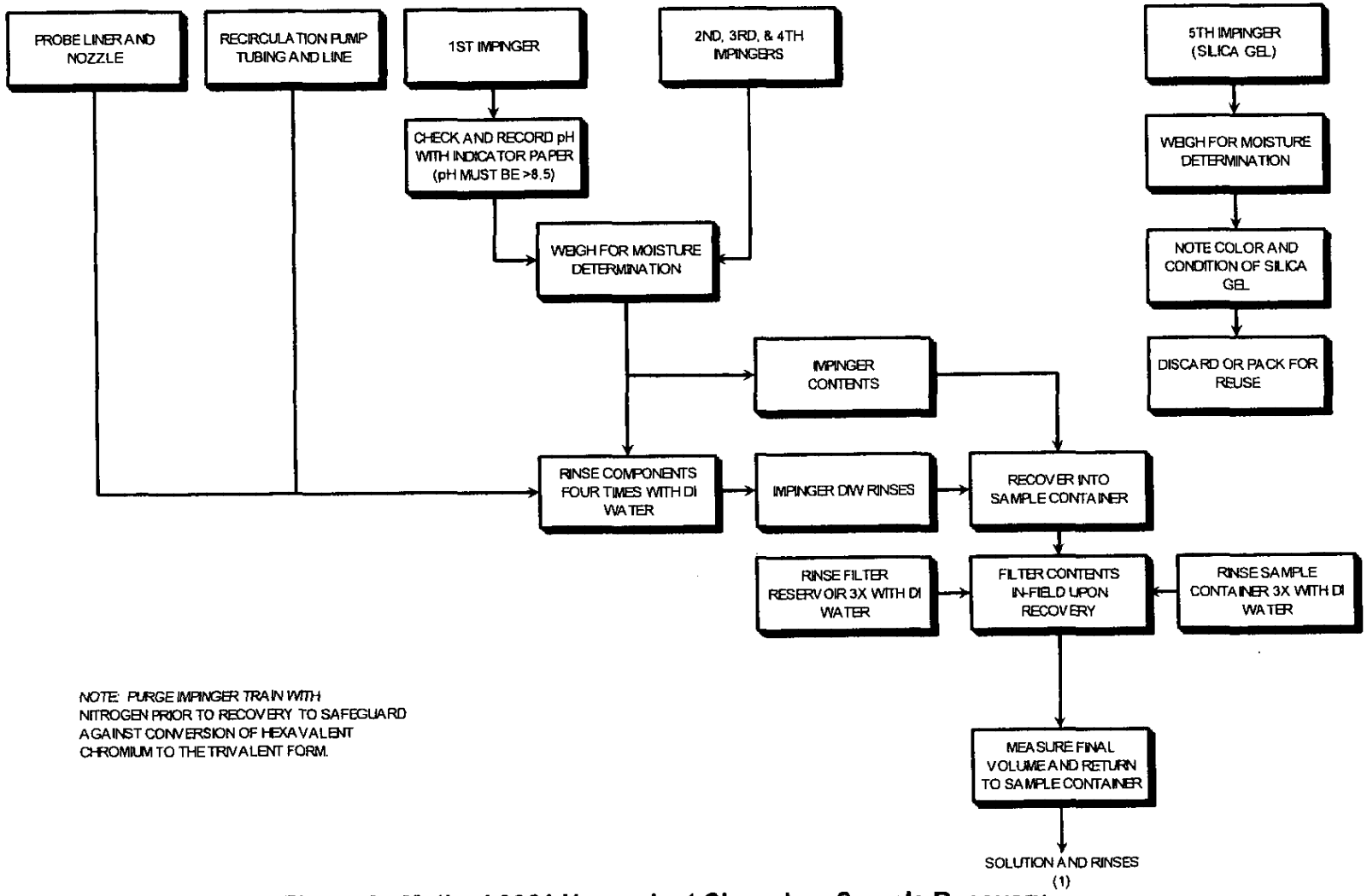

Figure 2. Method 0061 Hexavalent Chromium Sample Recovery

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Table C-9. Method 0010 Stack Gas Total Semivolatile and Nonvolatile Organic Sampling Procedure

Sample name: Stack Gas Method 0010 (Total SVOC & NVOC)

Sampler: Stack sampling team

Locations: Exhaust stack

Equipment: Method 0010 sampling train as shown in Figure 1 of this table; aluminum foil; amber glass sample bottles with Teflon-lined lids; tare weighed particulate filters in sealed petri dishes; balance; glass graduated cylinder.

Frequency: Continuous to collect a minimum of 106 dry standard cubic feet of sample during each sampling run.

Procedure Summary: Stack gases are sampled isokinetically to collect semivolatile and non-volatile organics on a particulate filter, adsorbent resin, and in impinger solutions. The train component samples are recovered in the field and shipped to an analytical laboratory where the mass amount of total semivolatile organics present is subsequently determined by chromatograph/flame ionization detector (GC/FID) analysis of the combined sample extract. The mass amount of total non-volatile organics present is determined by gravimetric analysis after evaporating of a portion of the combined sample extract.

The Method 0010 train includes a glass nozzle, heated probe and particulate filter, a water cooled condenser, adsorbent resin trap, a condenser cooling water system, a condensate knockout impinger, two deionized water impingers, an empty impinger, and a silica gel impinger. All impingers are placed in an ice bath. An air tight pump, dry gas flow meter, and flow rate meter complete the train.

All train components, reagents, and cleaning solutions are prepared according to the procedures specified in the methods referenced below. The pretest preparations include soaking the train glassware in hot (≥50°C) soapy (Alconox or equivalent) water, rinsing it three times each with hot water, distilled/deionized water, and drying in an oven for 2 hours at 400 °C. After cooling, the glassware is rinsed 3 times each with pesticide grade methylene chloride and pesticide grade toluene. When glassware is dry, all openings are covered with cleaned aluminum foil or clean glass plugs until sample train assembly.

The XAD-2 adsorbent resin is prepared according to the procedures specified in Appendix A of Method 0010, which are summarized as follows:

- XAD-2 resin is cleaned by water rinses followed by soxhlet extractions with water, acetone, and methylene chloride, then dried using a flow of inert gas. An extract is prepared from a portion of the XAD-2 resin and analyzed to confirm that it is free of significant background contamination. As an alternate to in-house preparation, resin that is certified clean by laboratory analysis may be purchased.
- The adsorbent trap is loaded with approximately 40 g of the XAD-2 resin and the open end of the resin trap is packed with clean glass wool. The ends of the adsorbent trap are capped and the trap is wrapped in aluminum foil, sealed in a plastic bag, and stored in an insulated cold chest. The resin is stored at less than 120 °F at all times. (Note: No surrogates are added to the resin because the sample analysis does not involve the identification of individual organic compounds.)

Table C-9. Method 0010 Stack Gas Total Semivolatile and Nonvolatile Organic Sampling Procedure (Continued)

The sampling train is assembled in a clean area at the test site and the train components are handled in a manner that minimizes the potential for contamination from air or by direct contact. The train glassware may be rinsed before using with acetone and methylene chloride. A clean and inspected particulate filter is placed in the filter holder. Before each sampling run, the Sample Coordinator supplies the XAD-2 adsorbent trap to the sampling team, who measures and records the weight of the trap to the nearest 0.5 gram, and installs the trap in the train. Impingers 1 and 4 are initially empty, Impingers 2 and 3 each contain 100 ml of deionized water, and Impinger 5 contains 200 to 300 grams of indicating silica gel. No sealant grease is used in assembling the train.

Stack sampling point locations are determined in accordance with Method 1. An initial traverse is made with a pitot tube at each sample point following Method 2 to establish stack gas velocity profile, temperature, and flow rate, and to check for cyclonic flow (cyclonic flow is checked only on the first day of testing). An Orsat apparatus or a continuous emisson monitoring system (CEMS) is used to determine stack gas oxygen, carbon dioxide, and dry molecular weight according to Method 3, 3A, or 3C procedures. The stack gas moisture content is determined according to Method 4. Pretest and post-test leak checks, isokinetic sampling rate, filter change outs (if needed), and data recording are performed according to Method 5 procedures.

The stack gas sampling is conducted following the procedures given in Method 0010. The sample probe exit and filter assembly temperatures are maintained at 248°F ± 25°F, and the gas sample entering the adsorbent module is maintained at or below 68 °F. The sampling rate is adjusted during the test to maintain isokinetic conditions at the probe nozzle within ± 10% of 100%.

After sampling, the probe is removed from the stack and a post-test leak check (Method 5) is conducted. The probe nozzle is wiped to remove PM and covered loosely. After cooling, the probe is wiped to remove external PM, disconnected from the train, and both ends are capped. The probe and filter box-impinger assemblies are transported to the sample recovery area. The sample recovery and sample train cleanup procedures are summarized below.

- Particulate Filter -- The particulate filter is removed from its holder and placed into its original petri dish (Container 1) which is sealed with Teflon tape and placed in a plastic bag.
- Front Half Rinse -- The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or glassware is brushed and rinsed three times with acetone, followed by three rinses with methylene chloride. All rinses are placed into a glass sample bottle (Container 2).
- XAD-2 Adsorbent Resin Trap -- The XAD-2 adsorbent resin trap is removed from the train and both ends are capped. The XAD-2 adsorbent resin trap is then weighed to the nearest 0.5 gram and the weight recorded. The trap is then labeled, covered with aluminum foil, sealed in a plastic bag (Container 3) and stored in an insulated cold chest.
- Condensate Knockout Impinger -- The condensate collected in Impinger 1 is measured to the nearest milliliter or weighed to the nearest 0.5 gram and transferred a glass sample bottle (Container 4). The back half of the particulate filter holder is also inspected for condensate and recovered, if observed, by measuring or weighing and transferring to Container 4 as described above.

- Back Half Rinse -- The back half of the filter holder, the condenser, and the connecting line between the holder and the condenser are rinsed three times with acetone, followed by three rinses with methylene chloride. The condensate knockout impinger (Impinger 1) is rinsed three times with acetone, followed by three rinses with methylene chloride. The rinses are then placed into a glass sample bottle with a Teflon lined lid (Container 5).
- Impinger water -- The contents of impingers 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 film or color, which is noted on the sample recovery sheet. If no color or film is present, the impinger water may be discarded. If color or film is observed, the impinger water is recovered and added to the condensate sample (Container 4).
- Silica Gel -- The silica gel contents of impinger 5 are weighed to the nearest 0.5 g.

Once during the test program, a blank train is prepared, set up at the sampling location, and leak tested at the beginning and end of one of the runs. The particulate filter holder and probe is heated for the duration of the sampling period, but no gas will pass through the train. The nozzle is capped with aluminum foil and the exit end of the last impinger is sealed with a cap. The train remains assembled at the sampling location for a period equivalent to one test run. The blank train samples are recovered using the procedures described above. Samples of the acetone and methylene chloride are collected once during the test as a reagent blank. A blank filter and an XAD-2 resin trap are also collected once during the test.

All of the sample containers is assigned numbers and labeled with the date and test-run number. The samples are turned over to the Sample Coordinator who records the appropriate data in the field logbook and pack the samples in insulated cold chests. Samples are stored in the sample holding area separate from the container supply area.

"Method 0010 - Modified Method 5 Sampling Train", Test Methods for Evaluating Solid Waste, SW-846, Third Edition, 1986, and Updates

"Method 0010 – Appendix A – Preparation of XAD-2 Adsorbent Resin", Test Methods for Evaluating Solid Waste, SW-846, Third Edition, 1986, and Updates

"Guidance for Total Organics", *EPA/600/R-96/036*

"Method 1 - Sample and Velocity Traverses for Stationary Sources"

"Method 2 – Determination of stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"

"Method 3 – Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight"

"Method 4 – Determination of Moisture Content in Stack Gases"

"Method 5 – Determination of Particulate Emissions from Stationary Sources"

Source for Methods 1 through 5: Appendix A - Test Methods, New Source Performance Standards, 40 CFR 60.

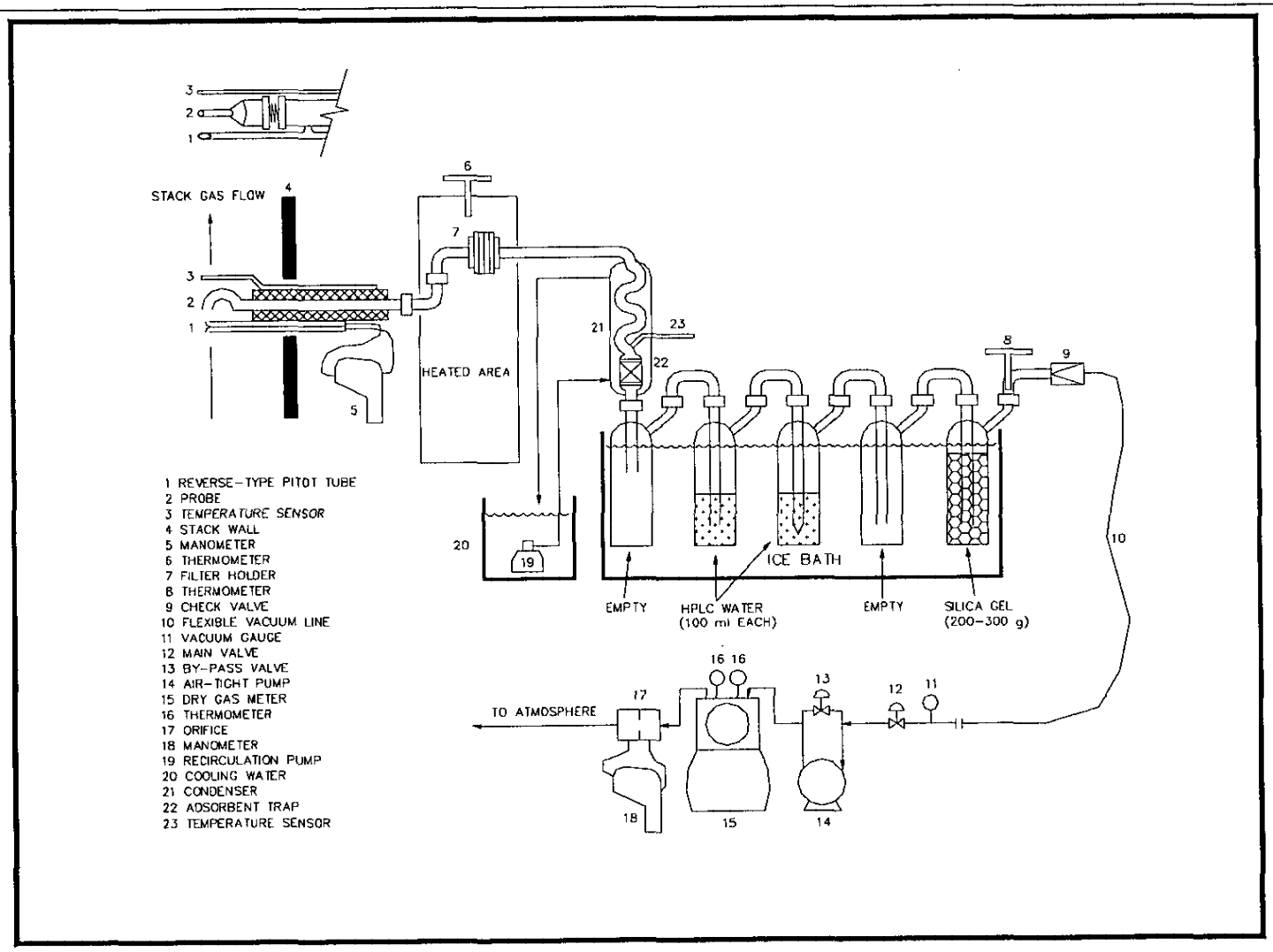

Figure 1. Method 0010 Sample Train for Semivolatile and Nonvolatile Organics

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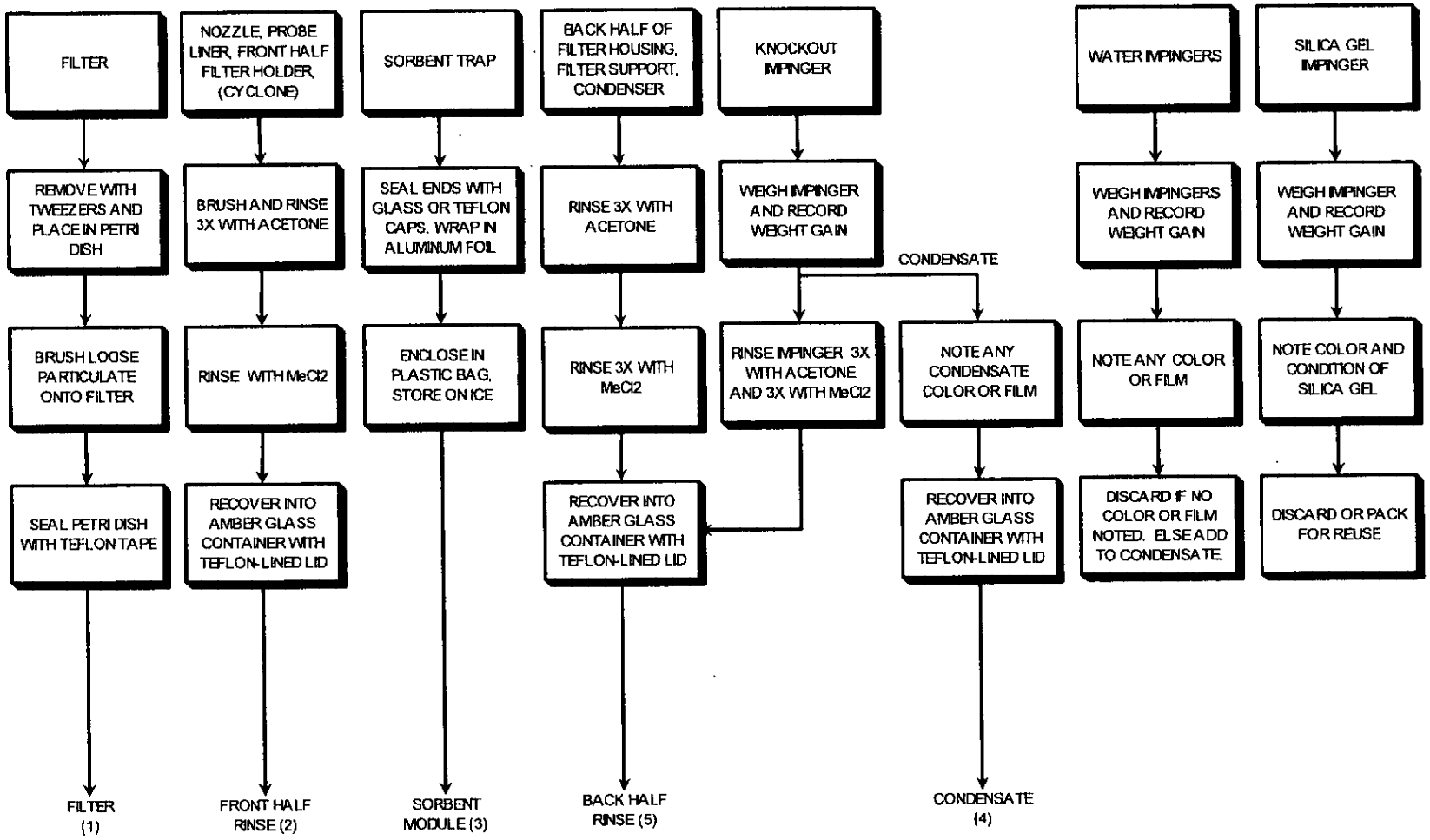

Figure 2. Method 0010 Semivolatile and Nonvolatile Organics Sample Recovery

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Table C-10. Method 0040 Stack Gas Volatile Organic Compound Sampling Procedure

Sample name: Stack Gas Method 0040 (Total VOC)

Sampler: Stack sampling team

Location: Exhaust stack

Equipment: Method 0040 sampling train as shown in Figure 1 of this table; quartz fiber particulate filters; 25-35 liter Tedlar (or equivalent) sample bags; glass VOA vials (40 mL) with plastic screw caps and Teflon septa; graduated glass cylinder.

Frequency: Continuous to fill over 80% of the sample bag during each test run.

Procedure Summary: Stack gases are withdrawn at a controlled rate, cooled to condense moisture, and collected in a flexible bag. The stack gas condensate samples and the dry gas samples in the flexible bags are analyzed by GC/FID for total VOCs following the procedures presented in "Guidance for Total Organics" referenced below. (Note: The total mass of VOCs is based on analyses for C_1–C_7 n-alkane compound groups and not on individual VOC analytes. Individual major n-alkanes are methane, ethane, propane, butane, hexane, and heptane.)

The sampling train includes a glass-lined stainless steel probe, a heated glass or Teflon filter holder with a quartz filter, a 3-way isolation valve, a water-cooled glass condenser and condensate trap, a second 3-way isolation valve, an air tight evacuation container, a Tedlar sample bag, silica gel and charcoal tubes, and a VOST control console. The control console includes a needle valve, vacuum pump, and a flow meter. A third 3-way isolation valve is included in the purge line to allow clean air to enter the system when performing leak checks.

The sampling train components and reagents are prepared according to the procedures specified in Method 0040. As described in the method, the train glassware is cleaned with nonionic detergent and hot water in an ultrasonic bath, rinsed three times each with distilled deionized water, nitric acid, and distilled deionized water, and dried in an oven. The Teflon lines, fittings, and sample bags are cleaned in a similar manner except that they are allowed to air dry in an area that is free of organic compounds. The rigid containers are hand washed and allowed to dry in air.

The gas sample bags are given positive pressure leak checks before each sampling run. For a leak check, the bag is connected to a water manometer and pressurized to 2 to 4 inches of water column and the bag is allowed to stand for 10 minutes. Any displacement of the manometer water indicates a leak. The rigid bag container is leak tested in the same manner.

All sample bags are flushed three times with high purity nitrogen and then filled with the nitrogen. The nitrogen gas in each bag is analyzed for an acceptable level of VOC contamination, which is a response five times the method detection limit or one-half of the level of concern, whichever is less. Nitrogen flushes are repeated until an acceptable level is achieved. The number of bags submitted for analysis may be reduced if analytical results indicate that all bags have an acceptable level of contamination.

Two laboratory blank samples consisting of nitrogen filled bags are retained in the laboratory using the same storage methods as the field samples. These samples are analyzed to help identify the source of contamination when field and trip blanks contain high concentrations of contaminants.

Table C-10. Method 0040 Stack Gas Volatile Organic Compound Sampling Procedure (Continued)

The sample train is operated according to procedures specified in Method 0040. The sample probe end is located at the centroid of the stack, the sample and vacuum lines are connected as indicated in Figure 1. The sample pump is started with the needle valve adjusted to yield a flow that will fill over 50% of the bag during the test period. After the probe, sample line, moisture condenser, and sample bag have been purged several times with the stack gas, the vacuum line connection is changed from the container to the sample bag and the bag is evacuated until the rotometer indicates no flow. [Note: It may be necessary, depending on the stack gas moisture content, to heat the moisture condenser and trap to prevent condensation during purging.]

A leak check of the sampling train is performed after the bag evacuation. The bag isolation valve is closed, the end of the probe is sealed, and a vacuum of 5 in. Hg is applied to the system. After the vacuum has stabilized, the leak rate is timed for 1 minute. A leak rate less than 0.1 in. Hg/min must be achieved before starting the test run.

The pump vacuum and the sample lines are changed back to their original positions (Figure 1). The sample probe and filter assembly heater is set to maintain 130°C ± 5°C (266°F to 284°F) and the ice bath pump is turned on to circulate water through the condenser. The gas pump is then turned on to begin sample collection. The sampling rate during the run is maintained proportional to the stack gas velocity. The rigid container is protected from sunlight during the test run.

After collecting the sample, the pump is stopped, the probe removed from the stack, and the leak check is repeated at the highest vacuum attained during the test run. The sample recovery procedures are summarized in Figure 2 of this table. The bag container is removed to the sample holding location and protected from sunlight. The sample bags are stored in rigid, opaque containers in a restricted area. A sample of the condensate water is collected in a VOA vial with no headspace and any excess is discarded. If needed to eliminate headspace, organic-free (HPLC) water is added to the vial. The condensate samples are stored on ice or in a refrigerated container at 0°C (32°F). [Note: All samples are analyzed within 72 hours unless pretests have been conducted to show that significant deterioration (>20%) does not occur for longer periods of storage.]

The particulate filter is removed and discarded. The silica gel trap is checked for moisture saturation and replaced if needed to protect the sample pump.

Field blank samples of gas and condensate are collected at least once per test day and for each emission source. A gas blank sample is prepared by drawing high-purity air or nitrogen from a compressed gas cylinder through the sampling system into a sample bag, which is recovered in the same manner as the stack gas samples. A condensate blank sample is prepared by filling a VOA vial with HPLC water. The blank samples are transported along with the stack gas samples.

A field spike sample is collected once for every 10 field samples or at least once per test program. The spike sample is prepared according to the procedures described in Section 8.2.5 of Method M0040, which include injecting isotope labeled analogs of the compounds of interest into a bag while a stack gas sample is being collected. The field spike samples are transported with the stack gas samples.

Table C-10. Method 0040 Stack Gas Volatile Organic Compound Sampling Procedure (Continued)

References:	Method 0040 - Sampling of Principle Organic Hazardous Constituents from Combustion Sources using Tedlar Bags", Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986 and Updates. "Guidance for Total Organics" Draft Final Report, EPA/600/R-96/036 (PB97-118533), November, 1996.

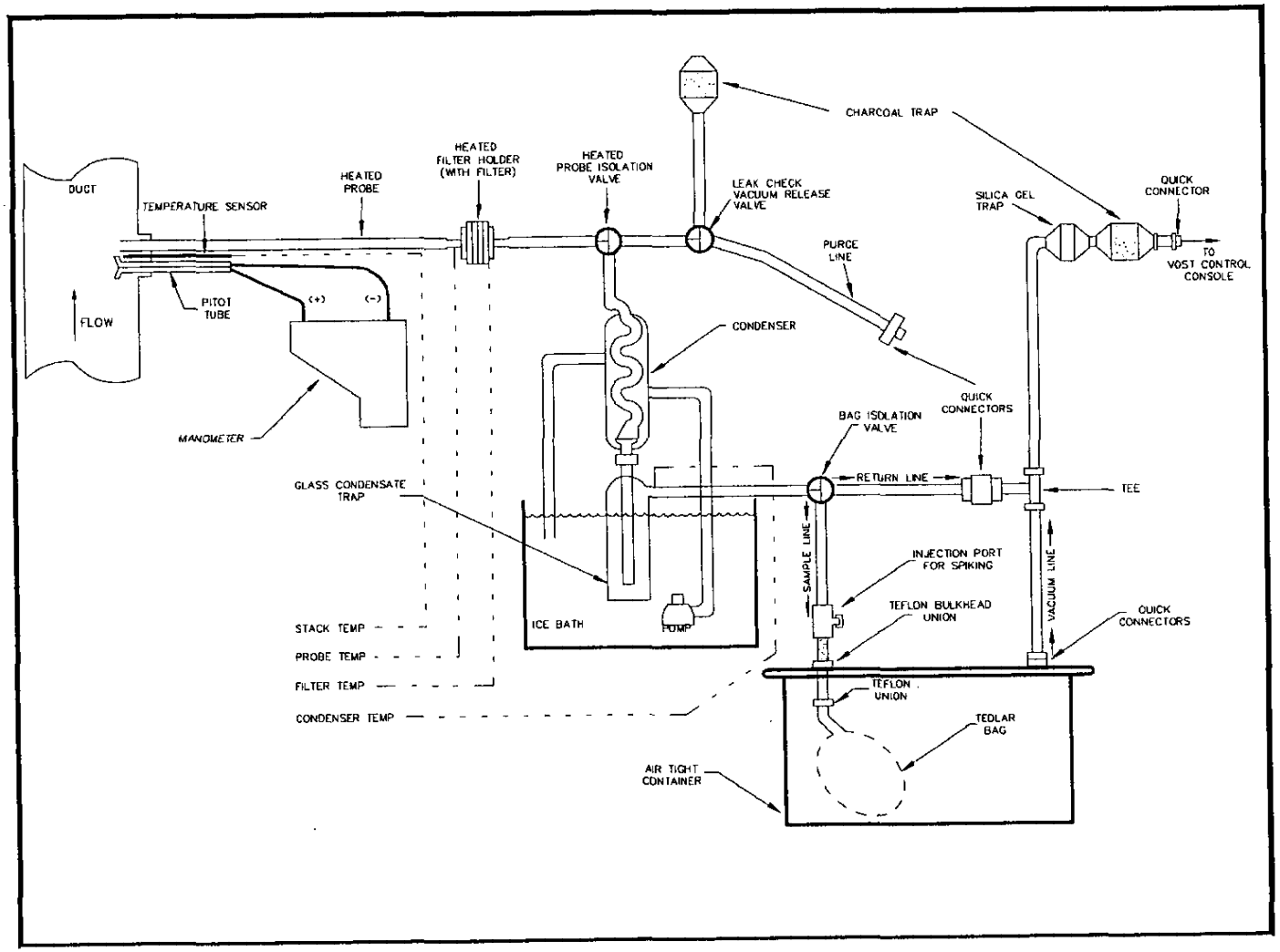

Figure 1. Method 0040 Sample Train for Volatile Organic Compounds

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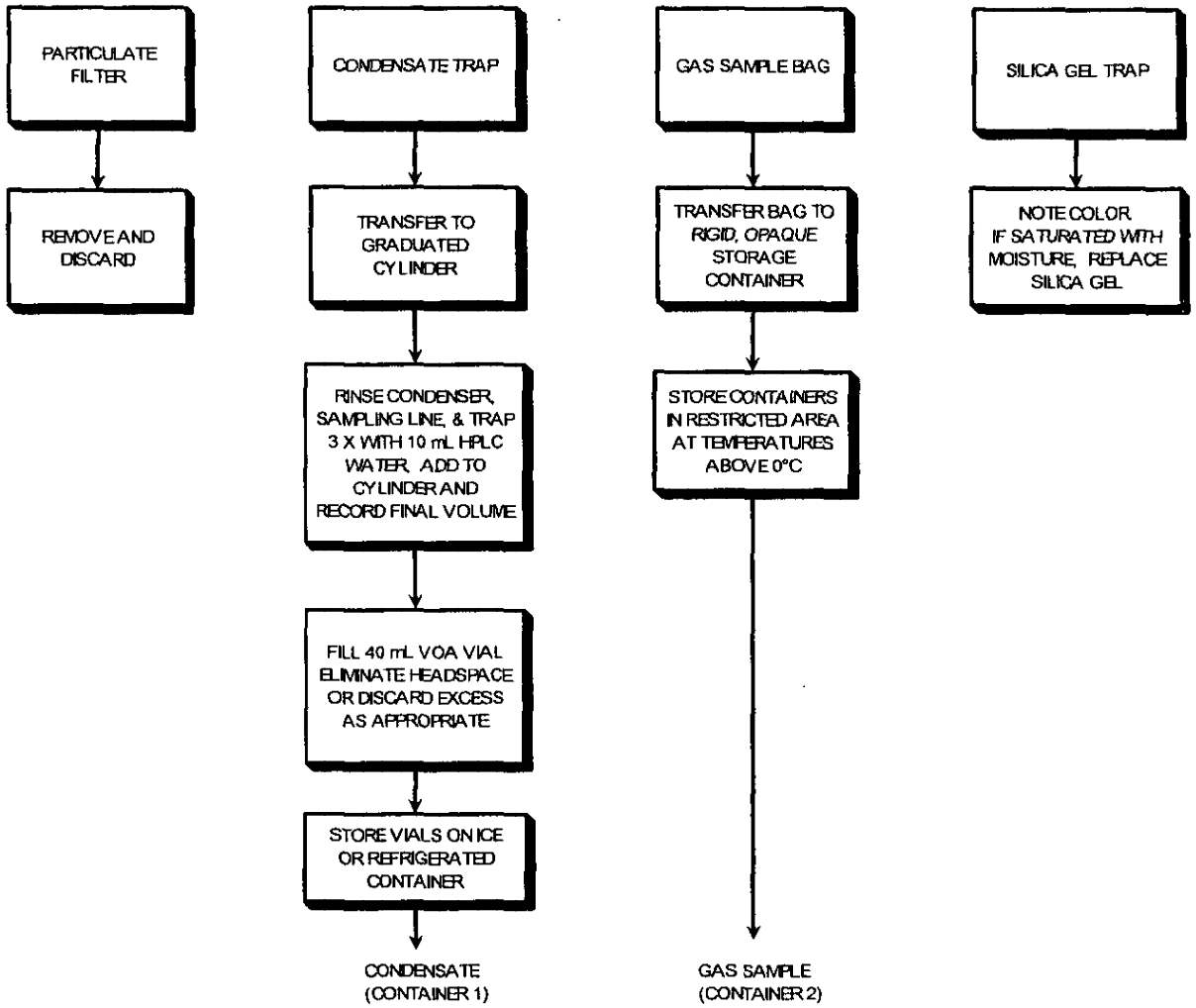

Figure 2. Method 0040 Volatile Organic Compound Sample Recovery

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Table C-11. Method 25A for Total Hydrocarbons using Continuous Emissions Monitor Procedure

Sample name:	Stack gas THC CEMS
Sampler:	Monitoring system operator
Components:	Stack gas extraction probe, heated sample line, filter, THC gas analyzers
Locations:	Exhaust Stack
Frequency:	Continuous during each sampling run; three runs to complete test.
Procedures:	Gas samples are drawn into the probe, transported through a heated sample line, filtered to remove particulate matter, and analyzed directly. The THC monitor shall be four point calibrated before and after each run using the following calibration gas concentrations: • Zero • 25 to 35% of instrument range • 45 to 55% of instrument range • 80 to 90% of instrument range. Calibration error shall be within 5% of standard. Calibration drift during each test run shall be within 3% of span (high and low range).
References:	"Method 25A – Determination of Total Gaseous Organic Concentrations using a Flame Ionization Analyzer", Appendix A - Test Methods, New Source Performance Standards, 40 CFR 60.

Table C-12. Heating Value Analysis

Matrices:	Hex Waste Feed DNAPL Waste Feed
Procedures:	Thoroughly mixed sample aliquots will be weighed and will be combusted per ASTM Method D-240. For low BTU samples, a measured amount of mineral oil may be added to the sample aliquot and the heating value of the original sample aliquot determined via difference.
References:	ASTM D-240, American Society for Testing and Materials, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, Annual Series.

Table C-13. Density Analysis

Matrices	Hex Waste Feed DNAPL Waste Feed
Procedures:	Solid Samples: A sample aliquot is weighed to the nearest 0.1 g. The sample aliquot is added to a known volume of water in a graduated cylinder calibrated with ASTM Type II water. The differential volume is used to determine the volume of the sample aliquot. Liquid samples will be mixed by shaking, and a measured volume of liquid will be weighed to the nearest 0.1 g. A graduated cylinder calibrated with ASTM Type II water will be used.
References:	ASTM D-891 and D-854, American Society for Testing and Materials, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, Annual Series.

Table C-14. Ash Content Analysis

Matrices:	Hex Waste Feed DNAPL Waste Feed
Procedures:	Waste samples will be analyzed according to procedures in ASTM D-482 for liquid samples and ASTM D-5865 for solid samples. An aliquot of the sample will be transferred to a prepared crucible, weighed, and ignited under controlled conditions. The combustion residue will be ashed to constant weight in a muffle furnace at 775°C ± 25°C. Ash procedure will be terminated when consecutive weighings differ by not more than 0.5 mg. Ash content will be calculated according to method procedures.
References:	ASTM D-482 and D-5865, American Society for Testing and Materials, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, Annual Series.

Table C-15. Total Chloride Analysis

Matrices:	Hex Waste Feed DNAPL Waste Feed
Procedures:	Sample aliquots are combusted in an oxygen bomb or flask using the procedures given in SW-846 Method 5050 or ASTM Method D-808 or E-442. (Note: Oxygen bomb combustion is normally used, however, when chloride concentration is expected to exceed 1 wt% the oxygen flask combustion method may be used.) The chloride concentration of the rinse solution is determined by ion chromatography using SW-846 Method 9056.
References:	Method 5050 and Method 9056, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986 and Updates. Method D-808 and E-442, American Society for Testing and Materials, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, Annual Series.

Table C-16. Organics Analysis

Matrices:	Hex Waste Feed DNAPL Waste Feed HCl Product Scrubber Purge
Procedures:	Volatile Organic Analysis (by GC/MS according to SW-846 Method 8260B): Waste Feed Samples: An aliquot for volatile organic analysis will be dispersed in methanol, n-hexadecane or other appropriate solvent for direct injection and analysis. Dilute as necessary, and add surrogates and internal standards (Method 3585). Analyze for volatile organics, to the maximum extent possible, including TICs. Semivolatile Organic Analysis (for SVOCs by GC/MS according to SW-846 Method 8270C and for PCBs by GC/ECD according to SW-846 Method 8082): Waste Feed Samples: An aliquot for semivolatile organic analysis will be dispersed in methylene chloride or other solvent as appropriate for direct injection and analysis in accordance with Method 3580A. Dilute as necessary. Analyze for target SVOCs to the maximum extent possible including TICs, and PCBs. Perform one duplicate analysis and one matrix spike analysis per matrix per test. HCl Product and Scrubber Purge (Aqueous) Samples: The full one liter of sample is subjected to separatory funnel liquid-liquid extraction in accordance with Method 3510C. Add surrogates and internal standards. Analyze for the target POHC (hexachlorobenzene) and PCBs. Perform one duplicate analysis and one matrix spike analysis per matrix per test.
References:	Methods 3510C, 3580A, 3585, 5030B, 8260B, 8270C, and 8082; Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986 and Updates.

Table C-17. Metals Analysis

Matrices:	Hex Waste Feed DNAPL Waste Feed
Procedures:	Aliquots of waste samples will be microwave assisted acid digested according to SW-846 Method 3010A or 3050B as appropriate. The digestion solution will be analyzed for non-mercury metal by inductively coupled argon plasma emission spectroscopy (ICP-ES, SW-846 Method 6010B) or inductively coupled argon plasma emission spectroscopy/mass spectroscopy (ICP-MS, SW-846 Method 6020). For determination of mercury content, the digestion solution will be analyzed by cold vapor atomic absorption spectroscopy (CVAAS) using SW-846 Method 7470A/7471A.
References:	Methods 3010A, 3050B, 6010B, 6020, 7470A, and 7471A, Test Methods for Evaluating Solid Wastes, SW-846, Third Edition, November 1986, and Updates..

Table C-18. Analysis PCDD/PCDFs and PCBs in Method 0023A Samples
(Separate Front Half & Back Half Analyses)

Matrices: Filter (Container No. 1)
Front half rinse (acetone and methylene chloride) (Container No. 2)
Front half rinse (toluene) (Container No. 2A)
Adsorbent resin (XAD-2 resin)/glass wool (Container No. 3)
Back half rinse (acetone and methylene chloride) (Container No. 4)
Back half rinse (toluene) (Container No. 4A)
Condensate (Container No.)

Procedure Summary:

Sample Preparation

Front Half Extraction: The Method 0023A train filter (Container No. 1) is transferred to the extraction thimble of the Soxhlet extraction system. PCDD/PCDF and PCB internal standards are added to the filter. The front half acetone and methylene chloride rinse sample (Container No. 2) is concentrated to 1-2 ml using a Kuderna-Danish concentrator apparatus followed by nitrogen blow down at a temperature of less than 37°C. The front half rinse sample container is rinsed three times with small portions of methylene chloride and these rinses are added to the concentrated solution which is then further concentrated to near dryness. The concentrate is then added to the Method 0023A filter in the Soxhlet apparatus. The filter and front half rinse concentrate are extracted for 18 hours using methylene chloride. The methylene chloride extract is then divided into two equal portions. One portion is used for PCDD/PCDF analysis (Sample 1-D/F); one portion is used for PCB analysis (Sample 1-P) .

After removal of the methylene chloride extract, the concentrated front half toluene rinse is added to the Soxhlet, which is then charged with toluene, and the front half rinses and filter are extracted for an additional 18 hours with toluene. The toluene extract is then divided into two equal portions. One portion is used for PCDD/PCDF analysis (Sample 2-D/F); balance is archived.

Back Half Extraction: The back half acetone and methylene chloride rinse sample (Container No. 4) is concentrated to 1-2 ml using a Kuderna-Danish concentrator apparatus followed by nitrogen blow down at a temperature of less than 37°C. The back half rinse sample container is rinsed three times with small portions of methylene chloride and these rinses are added to the concentrated solution which is then further concentrated to near dryness. The concentrate is then added to the XAD resin and glass wool plug (Container No. 3) in a Soxhlet apparatus. PCDD/PCDF and PCB internal standards are added and the resin, glass wool plug, and back half rinse concentrate are extracted for 18 hours in methylene chloride. The methylene chloride extract is then divided into two equal portions. One portion is used for PCDD/PCDF analysis (Sample 3-D/F); one portion is used for PCB analysis (Sample 3-P).

After removal of the methylene chloride extract, the concentrated back half toluene rinse is added to the Soxhlet, which is then charged with toluene, and the back half rinses, XAD resin, and glass wool plug are extracted for an additional 18 hours with toluene. The toluene extract is then divided into two equal portions. One portion is used for PCDD/PCDF analysis (Sample 4-D/F); the balance is archived.

Condensate Extraction: The aqueous condensate (Container No. 5) extraction is accomplished by transferring the sample to a clean separatory funnel and rinsing the container with three aliquots of methylene chloride. These rinses are also transferred to the separatory funnel. PCB surrogate solutions are then added to the liquid in the separatory funnel. Isotopically-labeled analogs are added at this time. Sufficient organic free water is added to the extract solvent in the separatory funnel to cause the organic and aqueous/methanol phases to separate into two distinct layers. The methylene

chloride layer will be at the bottom. Methylene chloride is added until the ratio of water to methylene chloride is approximately 3:1. Sodium hydroxide is added until the pH of the water layer is > 11 but <14. The sample is then shaken vigorously for 2 minutes with periodic venting to release excess pressure. The organic layer is allowed to separate for at least 10 minutes. The methylene chloride layer is collected in an amber glass bottle. A volume of methylene chloride (approximately equal to the volume of the first extraction) is added to the separatory funnel and the extraction is repeated a second time collecting the methylene chloride in the same amber glass bottle. The extraction is repeated a third time collecting the methylene chloride. The water remaining after the third extraction is then acidified with sulfuric acid to a pH of <2 but > 0. The methylene chloride extraction on the acidified sample is conducted three times as above with collection of the methylene chloride in an amber glass bottle. Combine the methylene chloride from all pH levels, remove moisture, and concentrate for analysis (see description above). The methylene chloride extract is removed from the funnel and is divided into two equal portions. One portion is used for PCB analysis (Sample P-5), and the balance is archived.

PCDD/PCDF Analysis

The methylene chloride and toluene extracts of the front half rinse and filter that were reserved for PCDD/PCDF analysis (Samples 1-D/F and 2-D/F) are combined, evaporated to near dryness, and then redissolved in hexane. The sample is then spiked with PCDD/PCDF alternate and cleanup standards, and subjected to the chromatographic cleanup steps of SW-846 Method 8290. The sample is then concentrated, fortified with PCDD/PCDF recovery standards, and then analyzed by HRGC/HRMS. Results are reported for the total mass of each tetra- through octa-chlorinated PCDD and PCDF congener group as well as for each individual 2,3,7,8- chlorine substituted isomer.

The methylene chloride and toluene extracts of the back half rinse, XAD resin, and glass wool plug that were reserved for PCDD/PCDF analysis (Samples 3-D/F and 4-D/F) are combined, concentrated to near dryness, and redissolved in hexane. The sample is then spiked with PCDD/PCDF alternate and cleanup standards, and subjected to the chromatographic cleanup steps of SW-846 Method 8290. The sample is then concentrated, fortified with PCDD/PCDF recovery standards, and then analyzed by HRGC/HRMS. Results are reported for the total mass of each tetra- through octa-chlorinated PCDD and PCDF congener group as well as for each individual 2,3,7,8-chlorine substituted isomer.

Note that separate PCDD/PCDF analyses of the front half and back half samples are performed as prescribed in SW-846 Method 0023A.

PCB Analysis

The methylene chloride extract of the front half rinse and filter that was reserved for PCB analysis (Sample 1-P) , the methylene chloride extract of the back half rinse, XAD resin, and glass wool plug that was reserved for PCB analysis (Sample 3-P), and the methylene chloride extract of the condensate that was reserved for PCB analysis (Sample 5-P) are analyzed separately. The separate extracts are individually evaporated to near dryness, and then redissolved in hexane. The separate samples are then spiked with PCB alternate and cleanup standards, and subjected to the chromatographic cleanup steps. The separate samples are then concentrated, fortified with PCB recovery standards, and then analyzed by HRGC/HRMS. Results for each sample are reported for the mass of the 217 individual target PCB analytes from EPA Method 1668A, and by the ten homologue groups.

Table C-18. Analysis PCDD/PCDFs and PCBs in Method 0023A Samples
(Separate Front Half & Back Half Analyses) (Continued)

Quality Control:

Method Blank

One laboratory method blank for PCDD/PCDF and PCB will be analyzed for every batch of samples analyzed. The method blank is a performance control sample that is prepared in the laboratory and processed in a manner identical to the field sample. The XAD-2 resin used for the method blank will be obtained from the same batch used for preparation of the field traps.

References:

Method 0023A, "Sampling Method for Polychlorinated Dibenzo-p-Dioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Emissions from Stationary Sources", Test Methods for Evaluating Solid Wastes, SW-846, Third Edition, November 1986, and Updates.

Method 8290, Polychlorinated Dibenzodioxin (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromotography, High-Resolution Mass Spectrtometry (HRGC/HRMS), Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

Method 0010, Modified Method 5 Sampling train, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, September 1986, and Updates

Method 3542, Extraction of Semivolatile Analytes Collected Using Method 0010 (Modified Method 5 Sampling Train), Test Methods for Evaluating Solid Waste, SW-846, Third Edition, December 1996, and Updates

Method 1668A, "Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS", US Environmental Protection Agency, EPA-821-R-00-002, December 1999.

CARB Method 428, "Determination of Polychlorinated Dibenzo-p-dioxin (PCDD), Polychlorinated Dibenzofurans (PCDF), and Polychlorinated Biphenyle (PCB) Emissions from Stationary Sources", California Environmental Protection Agency Air Resources Board, Adopted: March 23, 1988, Amended: September 12, 1990.

Table C-18. Analysis PCDD/PCDFs and PCBs in Method 0023A Samples (Separate Front Half & Back Half Analyses)

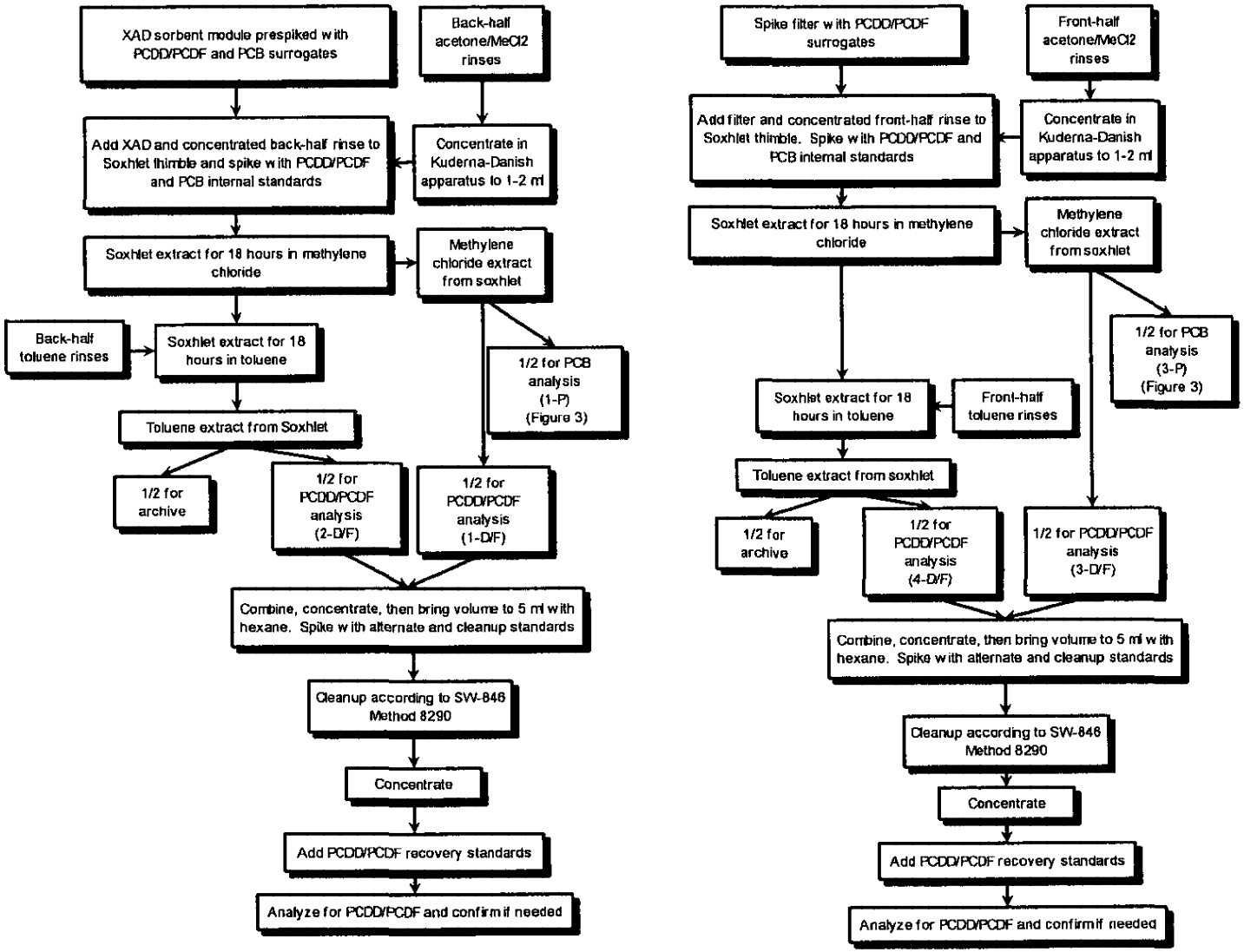

Figure 1. Method 0023A Train Analysis for PCDD/PCDFs and PCBs (Separate Front/Back Analysis Preparation)

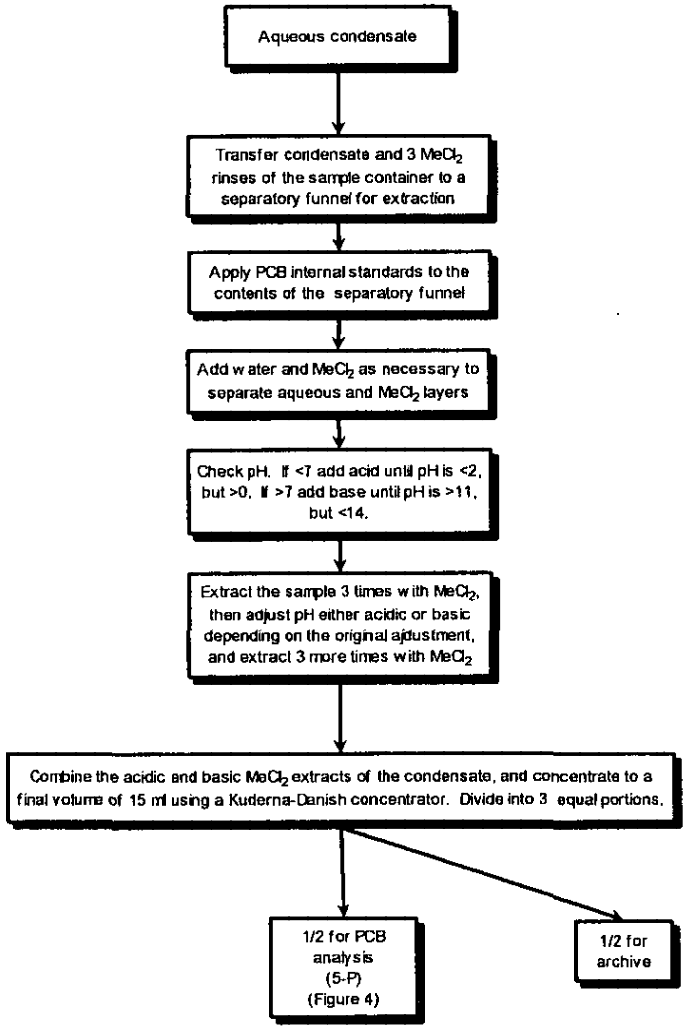

Figure 2. Method 0023A Train Analysis for PCDD/PCDFs and PCBs (Condensate Preparation)

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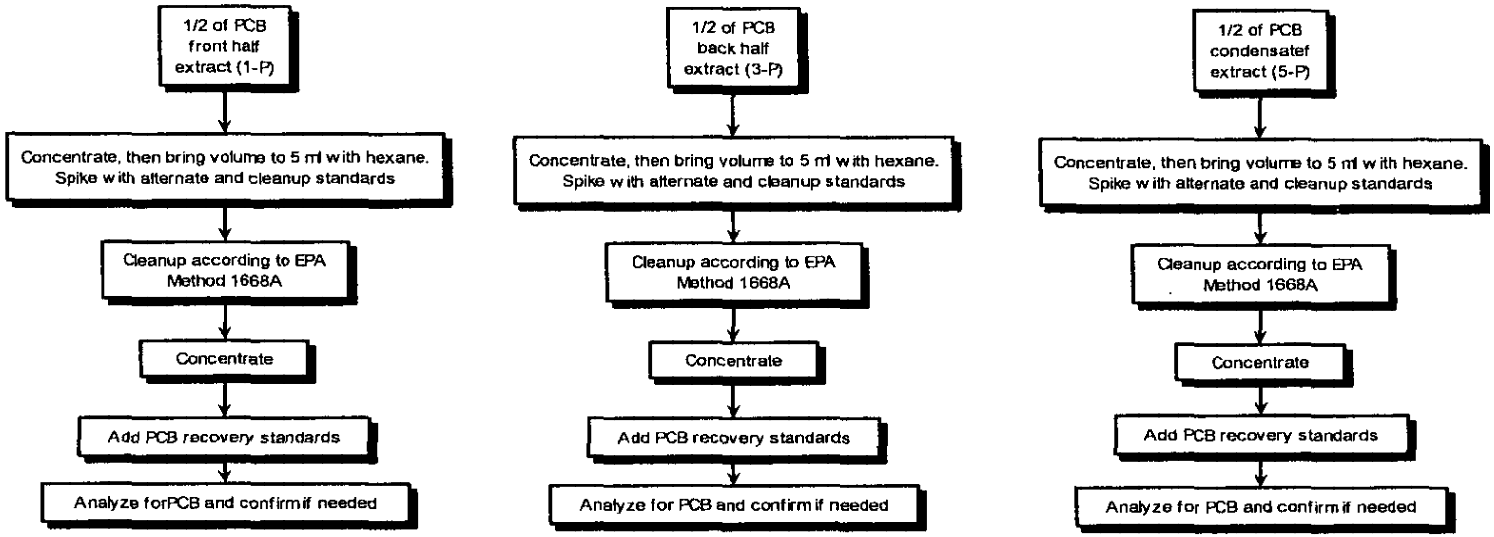

Figure 3. Method 0023 Train Analysis for PCDD/PCDFs and PCBs (PCB Analysis)

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Table C-19. Analysis of Semivolatile Organics in Method 0010 Samples
(Separate Front Half & Back Half Analyses)

Matrices: Filter (Container No. 1)
Front half rinse (acetone and methylene chloride) (Container No. 2)
Adsorbent resin (XAD-2 resin)/glass wool (Container No. 3)
Back half rinse (acetone and methylene chloride) (Container No. 4)
Condensate (Container No.)

Procedure Summary:

Sample Preparation

Front Half Extraction: The Method 0010 train filter (Container No. 1) is transferred to the extraction thimble of the Soxhlet extraction system. SVOC internal standards are added to the filter. The front half acetone and methylene chloride rinse sample (Container No. 2) is concentrated to 1-2 ml using a Kuderna-Danish concentrator apparatus followed by nitrogen blow down at a temperature of less than 37°C. The front half rinse sample container is rinsed three times with small portions of methylene chloride and these rinses are added to the concentrated solution which is then further concentrated to near dryness. The concentrate is then added to the Method 0010 filter in the Soxhlet apparatus. The filter and front half rinse concentrate are extracted for 18 hours using methylene chloride. The methylene chloride extract is then recovered from the Soxhlet extraction system.

Back Half Extraction: The back half acetone and methylene chloride rinse sample (Container No. 4) is concentrated to 1-2 ml using a Kuderna-Danish concentrator apparatus followed by nitrogen blow down at a temperature of less than 37°C. The back half rinse sample container is rinsed three times with small portions of methylene chloride and these rinses are added to the concentrated solution which is then further concentrated to near dryness. The concentrate is then added to the XAD resin and glass wool plug (Container No. 3) in a Soxhlet apparatus. SVOC internal standards are added and the resin, glass wool plug, and back half rinse concentrate are extracted for 18 hours in methylene chloride. The methylene chloride extract is then recovered from the Soxhlet extraction system.

Condensate Extraction: The aqueous condensate (Container No. 5) extraction is accomplished by transferring the sample to a clean separatory funnel and rinsing the container with three aliquots of methylene chloride. These rinses are also transferred to the separatory funnel. SVOC surrogate solutions are then added to the liquid in the separatory funnel. Isotopically-labeled analogs are added at this time. Sufficient organic free water is added to the extract solvent in the separatory funnel to cause the organic and aqueous/methanol phases to separate into two distinct layers. The methylene chloride layer will be at the bottom. Methylene chloride is added until the ratio of water to methylene chloride is approximately 3:1. Sodium hydroxide is added until the pH of the water layer is > 11 but <14. The sample is then shaken vigorously for 2 minutes with periodic venting to release excess pressure. The organic layer is allowed to separate for at least 10 minutes. The methylene chloride layer is collected in an amber glass bottle. A volume of methylene chloride (approximately equal to the volume of the first extraction) is added to the separatory funnel and the extraction is repeated a second time collecting the methylene chloride in the same amber glass bottle. The extraction is repeated a third time collecting the methylene chloride. The water remaining after the third extraction is then acidified with sulfuric acid to a pH of <2 but > 0. The methylene chloride extraction on the acidified sample is conducted three times as above with collection of the methylene chloride in an amber glass bottle. Combine the methylene chloride from all pH levels, remove moisture, and concentrate for analysis (see description above).

Table C-19. Analysis of Semivolatile Organics in Method 0010 Samples
(Separate Front Half & Back Half Analyses) (Continued)

	SVOC Analysis The methylene chloride extract of the front half rinse and filter, the methylene chloride extract of the back half rinse, XAD resin, and glass wool plug, and the methylene chloride extract of the condensate are analyzed separately. The separate extracts are individually evaporated to near dryness, and then redissolved in hexane. The separate samples are then spiked with SVOC alternate and cleanup standards, and subjected to the chromatographic cleanup steps. The separate samples are then concentrated and then analyzed by GC/MS.
Quality Control: One laboratory	Method Blank method blank for SVOC will be analyzed for every batch of samples analyzed. The method blank is a performance control sample that is prepared in the laboratory and processed in a manner identical to the field sample. The XAD-2 resin used for the method blank will be obtained from the same batch used for preparation of the field traps.
References:	Method 0010, Modified Method 5 Sampling train, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, September 1986, and Updates Method 3542, Extraction of Semivolatile Analytes Collected Using Method 0010 (Modified Method 5 Sampling Train), Test Methods for Evaluating Solid Waste, SW-846, Third Edition, December 1996, and Updates Method 8270C, Semivolatile Organics by Gas Chromatography, Mass Spectrometry (GC/MS), Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November1986, and Updates.

Table C-20. Analysis of Volatile Organics in VOST Samples

Matrices: VOST sorbent resins (Tenax and Tenax/Charcoal)
VOST condensate (water)

Procedures: VOST tubes will be analyzed separately.

VOST tube contents will be spiked with surrogate and internal standards, thermally desorbed, bubbled through organic-free water, and trapped on an analytical adsorbent trap.

Target volatile organic analytes are identified and quantified according to the procedures in SW-846 Method 5041A. The analysis will be extended to identify and quantify as many non-target analytes as possible. These tentatively identified compounds (TICs) will include all non-target peaks that are at least 10% of the nearest internal standard, and the identification and quantitation will be made using EPA procedures for TICs. This includes forward and reverse library searches using a response factor of 1 for the nearest internal standard, unless a specific response factor can be determined and used for quantitation. Analysis of the tubes will be performed using GC/MS (SW-846 Method 8260B) following SW-846 Method 5041A for volatile organics on VOST.

Condensate samples will be spiked with surrogate and internal standards and analyzed by GC/MS directly using a purge-and-trap device following SW-846 method 8260. The TIC analysis will also be performed on the condensate sample as described above for the VOST tubes.

References: Method 5041A, Protocol for Analysis of Sorbent Cartridges from Volatile Organic Sampling Train: Wide-bore Capillary Column Technique, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

Method 8260A, Volatile Organics by GC/MS, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

Table C-21. Analysis of Particulate Matter in Method 26A Samples

Matrices:	Particulate filter Front half sampling train rinse
Procedures:	The Method 5 tare weighted particulate filter will be oven dried at 105°C (220°F) for 2 to 3 hours and the weight will be determined to the nearest 0.1 mg. The differential weight will be reported. The Method 5 front half rinse will be evaporated to dryness at ambient temperature and pressure, dessicated for 24 hours, and the residue weight will be determined and reported to the nearest 0.1 mg. The total mass captured on the filter and with the probe rinse will be reported as filterable particulate for the sampling train.
References:	EPA Method 5, Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.

Table C-22. Analysis of Chloride in Method 26A Samples

Matrices:	Acid Impinger Liquid - sulfuric acid solution for HCl analysis Alkaline Impinger Liquid - sodium hydroxide solution for Cl_2 analysis
Procedures:	The Method 26A impinger samples, including reagent blanks, will be analyzed for hydrogen chloride and chlorine using an ion chromatograph. Acid and alkaline samples are analyzed as separate batches. Acid and alkaline method blanks are analyzed for the respective batches. All chloride ions found in the acid impinger solution are assumed to occur due to the absorption of HCl. All chloride ions found in the alkaline impinger solution are assumed to result from the absorption of Cl_2. *All samples are analyzed in duplicate.*
References:	Method 9057, Protocol for the Analysis of Samples from HCl/Cl_2 Emission Sampling Trains, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November 1986, and Updates.

Table C-23. Analysis of Particle Size Distribution from Method 5 Filter Samples Using SEM

Matrices: Particulate filter

Procedures: The Method 5 particulate filter will be oven dried at 105°C (220°F) for 2 to 3 hours. After drying, the filter is subjected to scanning electron microscopy to determine the particle size distribution.

A primary electron beam is focused to a diameter of 20 to 60 Å and is magnetically scanned over the area of the specimen under investigation. Collision of the primary electron beam with the surface of the specimen produces low energy secondary electrons and back-scattered primary electrons. These are drawn to a positively charged scintillator, where the energy of the back-scattered and secondary electrons is converted to photons. The photon intensity is converted to an electrical signal whose output is proportional to the electron intensity. The photomultiplier signal is suitably amplified and used to modulate the intensity of a cathode ray tube (CRT). The CRT and the magnetic scanning coils are driven by the same scan generator in order to produce the image of the specimen on the screen of the CRT. Magnification is provided by varying the length of scan of the primary electron beam across the specimen while holding the scan length on the CRT constant. The procedure for magnification calibration is performed by varying the accelerating voltage from 2 kV to 20 kV at various magnifications and working distances.

The particle size distribution for each sample will be determined at the appropriate magnification. Each filter will be divided into four, and one analysis of the center of each piece will be performed, with the average being reported. This involves a photographic recording of the contrast generated through the dependence of secondary electron emission on surface topography, sample composition, crystallinity, and the magnetic nature of the material. It is possible to report the particle size down to 0.1 µm. The distribution of particles will be determined electronically as a percent of the total number of particles in each range. The reported cuts will sum up to at least 95% of the total. The following "cuts" will be reported:

Diameter Range
< 0.1 µm
0.1 - 0.5 µm
0.5 - 1 µm
1 - 5 µm
5 - 10 µm
10 - 100 µm
>100 µm

As stated above, the electron microscope image will be optically examined and the number of particles in each size range will be reported. In order to convert this "number distribution" into a "mass distribution" as needed for input to the risk assessment modeling, a unit density will be assigned to each particle and the resulting mass of material in each particle size range will be calculated.

Table C-24. Analysis of Stack Gas Multiple Metals Samples

Matrices: Particulate filter
Probe rinse (nitric acid)
Nitric acid/hydrogen peroxide impinger solutions and rinses
Potassium permaganate/sulfuric acid impinger solutions and rinses
Potassium permaganate/sulfuric acid impinger 8N HCl rinses

Procedures: The sampling train probe rinse and particulate filter will be digested separately according to methods referenced below. The digestion solutions are combined, filtered, and brought to a known volume. A 50 to 100 ml aliquot is extracted for Hg analysis (discussed below) and the remaining solution is analyzed for test target non-Hg metals by inductively coupled argon plasma emission spectroscopy (ICP, SW-846 Method 6010B) or by inductively coupled argon plasma emission spectroscopy/mass spectroscopy (ICP/MS, SW-846 Method 6020). If individual metals are found at concentrations below the ICP or ICP/MS detection limits, the digestion solutions may be analyzed by graphite furnace atomic absorption spectroscopy (GFAAS) according to the SW-846 7000-series methods referenced below.

The nitric acid/hydrogen peroxide impinger solution and rinse volume is measured and an aliquot is removed for Hg analysis (discussed below). The remaining liquid is digested according to the methods referenced below. The digestion solution will be analyzed for test target non-Hg metals by ICP or by ICP/MS.

Aliquots of the combined probe rinse/filter digestate and nitric acid/hydrogen peroxide impinger solution, as well as the potassium permaganate/sulfuric acid solutions will be analyzed separately for Hg by manual cold vapor atomic absorption spectroscopy (CVAAS) according to SW-846 Method 7470A/7471A.

The results of the two non-Hg component analyses will be summed to give the non-Hg metals content in the gas sample. The results of the five Hg component analyses will be summed to give the Hg content in the gas sample.

References: "Method 29 - Determination of Metals Emissions form Stationary Sources", Appendix A, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60.

"Method 0060 - Determination of Metals in Stack Emissions", Test Methods for Evaluating Solid Wastes, SW-846, Third Edition, November 1986, and Updates.

Methods 3010A, 3050B, 6010B, 6020, 7470A and 7471A, Test Methods for Evaluating Solid Wastes, SW-846, Third Edition, November 1986, and Updates.

Table C-25. Analysis of Method 0061 Stack Gas Samples for Hexavalent Chromium

Matrices:	Method 0061 sample train filtered potassium hydroxide impinger solution
Procedures:	The filtered potassium hydroxide absorbing solution from the sampling train impingers is analyzed for hexavalent chromium directly by ion chromatography coupled with a post-column reactor. If increased sensitivity is required for trace levels of hexavalent chromium, a preconcentration system, utilizing a solid sorbent as described in the method referenced below, can be combined with the ion chromatograph and post-column reactor.
References:	Method 7199, SW-846, Test Methods for Evaluating Solid Waste, Third Edition, November 1986 and Updates.

Table C-26. Analysis of Total Semivolatile and Nonvolatile Organics in Method 0010 Samples

Matrices: Filter - Container No. 1.
Front half rinses (acetone/methylene chloride) - Container No. 2.
Adsorbent resin (XAD-2 resin)/glass wool - Container No. 3.
Stack gas condensate (water) - Container No. 4.
Back half rinses (acetone/methylene chloride) - Container No. 5.

Procedures: The SW-846 Method 0010 train is disassembled and "broken-down according to the specifications of SW-846 Method 3542. Exceptions to the method as written must be observed in order to obtain data for total organics determination. Per the Total Organics guidance, the front and back half rinses, particulate filter, and adsorbent resin/glass wool are combined and soxhlet extracted with methylene chloride. The final pooled extract volume must be no less that 5 mL. Since the extracts for total organics determinations are analyzed by GC/FID and gravimetric techniques, none of the surrogates, isotopically-labeled standards, or internal standards associated with GC/MS analysis (Method 8270C) should be added to the extractors or sample extracts.

The methylene chloride extracts are combined, and split into two portions and used as follows:

- One portion of the extract is used for semivolatile organic analysis using Total Chromatographic Organic (TCO) GC/FID analysis according to EPA Draft Guidance for Total Organics. Details of the method are described in Appendix C of the Guidance.
- The other portion of the methylene chloride extract is used for nonvolatile organic analysis using gravimetric mass (GRAV) Method according to EPA Draft Guidance for Total Organics. Details of the method are described in Appendix D of the Guidance.

References: EPA Guidance for Total Organics (EPA/600/R-96/036).

Table C-27. Analysis of Total Volatile Organics in Method 0040 Samples

Matrices:	Method 0040 gas sample bag Method 0040 condensate
Procedures:	The gas bag will be connected directly to the analytical instrument sample loop and analyzed for C_1 - C_7 hydrocarbons, organic compounds boiling in the range -160°C to 100°C by GC/FID according to the procedures in EPA Guidance for Total Organics. Condensate samples will be analyzed by GC/FID directly using a purge-and-trap device. Details of the procedure are describe in Appendix B of the EPA Guidance for Total Organics.
References:	Guidance for Total Organics, EPA/600/R-96/036, March 1996.

APPENDIX D

POHC DRE ANALYSIS

SEMI-VOLATILE POHC DRE DATASHEET

Evaluates POHC feed/spiking rate needed for desired DRE demonstration, and accounts for PICs/background

Client:	Occidental Chemical Corporation	Proj. No.:	OXY050703
Facility:	Geismar, LA	By:	CEM
Case:	F-1 Furnace Low Temp DRE Test (Test 1)	Date:	04-Dec-07
		Worksheet:	HCB-POHC.WK4

Input Data

POHC Name	Hexachlorobenzene
POHC Molecular Weight	285
Actual Stack Gas Flow Rate (acfm)	7600
Stack Gas Temperature (deg F)	174
Stack Gas Moisture (% vol)	41%
Dry Stack Gas Flow Rate (dscfm)	5,384
DRE Requirement (%)	99.99
Expected DRE (%)	99.999
Sampling Train Lower Quantitation Limit (ug/train fraction)	10
Sampling Train Upper Quantitation Limit (ug/train fraction)	500
Sampling Train Lower Quantitation Limit (ug/train)	30
Sampling Train Upper Quantitation Limit (ug/train)	1,500
Sample Volume (dscf)	106
Hex Waste Feed Rate (gpm)	2.40
Hex Waste Feed Rate (lb/hr)	1,678
Expected HCB Concentration (mg/kg)	50,232
Expected HCB Feed Rate (g/hr)	38,238
Expected HCB Feed Rate (lb/hr)	84
Analytical Safety Factor	5
Fraction of Sample Extract for POHC Analysis	1
POHC Background Concentration in Stack Gas (ug/l)	0
POHC Contamination in Sample Train (ug/sample)	0

Minimum Emissions and Feed/Spiking Required to Demonstrate Regulatory DRE

% DRE (Regulatory Limit)	99.99
Stack Emission Rate Required for Detection (lb/hr)	4.03E-04
Min. Stack Conc. to Demonstrate DRE (ug/dscf)	5.66E-01
Min. Stack Conc. to Demonstrate DRE (ppbvds)	3.37500
Min. Feed/Spiking Rate to Demonstrate DRE (lb/hr)	4.031
Feed/Spiking Rate With Analytical Safety Factor Applied (lb/hr)	20.16

Minimum Emissions and Feed/Spiking Required to Demonstrate Expected DRE

% DRE (Expected Performance)	99.999
Stack Emission Rate Required for Detection (lb/hr)	4.03E-04
Min. Stack Conc. to Demonstrate DRE (ug/dscf)	5.66E-01
Min. Stack Conc. to Demonstrate DRE (ppbvds)	3.375
Min. Feed/Spiking Rate to Demonstrate DRE (lb/hr)	40
Feed/Spiking Rate With Analytical Safety Factor Applied (lb/hr)	202

Potential Emissions and DRE Demonstration Capability at Actual Feed/Spiking Rate

Feed/Spiking Rate (lb/hr)	84
POHC Emission at Regulatory DRE (lb/hr)	8.43E-03
POHC in Stack Gas at Regulatory DRE (ug/dscf)	1.18E+01
POHC in Stack Gas at Regulatory DRE (ppbvds)	35.2872
POHC Emissions at Expected DRE (lb/hr)	8.43E-04
POHC in Stack Gas at Expected DRE (ug/dscf)	1.18E+00
Train Loading at Regulatory DRE (ug/train)	1,255
Train Loading at Expected DRE (ug/train)	125.5
Max. DRE Demonstrated at Feed/Spiking Rate (%)	99.9995218

Impact of Sample/Combustion Gas PICs and Background POHC Concentration

Emissions at Regulatory DRE from Actual Spiking (lb/hr)	8.43E-03
Emissions Equivalent from PICs/Background (lb/hr)	0.00E+00
Apparent Total Emissions w/PICs & Background (lb/hr)	8.43E-03
Apparent DRE at Reg. DRE w/PICs & Background (%)	99.99
Added Sample Train Loading from PICs/Background (ug)	0.00
DRE Required to Counter PICs/Background (%)	99.99

SEMI-VOLATILE POHC DRE DATASHEET

Evaluates POHC feed/spiking rate needed for desired DRE demonstration, and accounts for PICs/background

Client:	Occidental Chemical Corporation	Proj. No.:	OXY050703
Facility:	Geismar, LA	By:	CEM
Case:	F-1 Furnace Max Feed Rate DRE Test (Test 2)	Date:	04-Dec-07
		Worksheet:	HCB-POHC.WK4

Input Data

POHC Name	Hexachlorobenzene
POHC Molecular Weight	285
Actual Stack Gas Flow Rate (acfm)	7200
Stack Gas Temperature (deg F)	174
Stack Gas Moisture (% vol)	41%
Dry Stack Gas Flow Rate (dscfm)	5,101
DRE Requirement (%)	99.99
Expected DRE (%)	99.999
Sampling Train Lower Quantitation Limit (ug/train fraction)	10
Sampling Train Upper Quantitation Limit (ug/train fraction)	500
Sampling Train Lower Quantitation Limit (ug/train)	30
Sampling Train Upper Quantitation Limit (ug/train)	1,500
Sample Volume (dscf)	106
Hex Waste Feed Rate (gpm)	4.00
Hex Waste Feed Rate (lb/hr)	2,797
Expected HCB Concentration (mg/kg)	50,232
Expected HCB Feed Rate (g/hr)	63,729
Expected HCB Feed Rate (lb/hr)	140
Analytical Safety Factor	5
Fraction of Sample Extract for POHC Analysis	1
POHC Background Concentration in Stack Gas (ug/l)	0
POHC Contamination in Sample Train (ug/sample)	0

Minimum Emissions and Feed/Spiking Required to Demonstrate Regulatory DRE

% DRE (Regulatory Limit)	99.99
Stack Emission Rate Required for Detection (lb/hr)	3.82E-04
Min. Stack Conc. to Demonstrate DRE (ug/dscf)	5.66E-01
Min. Stack Conc. to Demonstrate DRE (ppbvds)	3.37500
Min. Feed/Spiking Rate to Demonstrate DRE (lb/hr)	3.819
Feed/Spiking Rate With Analytical Safety Factor Applied (lb/hr)	19.10

Minimum Emissions and Feed/Spiking Required to Demonstrate Expected DRE

% DRE (Expected Performance)	99.999
Stack Emission Rate Required for Detection (lb/hr)	3.82E-04
Min. Stack Conc. to Demonstrate DRE (ug/dscf)	5.66E-01
Min. Stack Conc. to Demonstrate DRE (ppbvds)	3.375
Min. Feed/Spiking Rate to Demonstrate DRE (lb/hr)	38
Feed/Spiking Rate With Analytical Safety Factor Applied (lb/hr)	191

Potential Emissions and DRE Demonstration Capability at Actual Feed/Spiking Rate

Feed/Spiking Rate (lb/hr)	140
POHC Emission at Regulatory DRE (lb/hr)	1.40E-02
POHC in Stack Gas at Regulatory DRE (ug/dscf)	2.08E+01
POHC in Stack Gas at Regulatory DRE (ppbvds)	62.0793
POHC Emissions at Expected DRE (lb/hr)	1.40E-03
POHC in Stack Gas at Expected DRE (ug/dscf)	2.08E+00
Train Loading at Regulatory DRE (ug/train)	2,207
Train Loading at Expected DRE (ug/train)	220.7
Max. DRE Demonstrated at Feed/Spiking Rate (%)	99.9997282

Impact of Sample/Combustion Gas PICs and Background POHC Concentration

Emissions at Regulatory DRE from Actual Spiking (lb/hr)	1.40E-02
Emissions Equivalent from PICs/Background (lb/hr)	0.00E+00
Apparent Total Emissions w/PICs & Background (lb/hr)	1.40E-02
Apparent DRE at Reg. DRE w/PICs & Background (%)	99.99
Added Sample Train Loading from PICs/Background (ug)	0.00
DRE Required to Counter PICs/Background (%)	99.99

APPENDIX E

CONTINUOUS MONITORING SYSTEM PERFORMANCE EVALUATION TEST PLAN

(CMSPETP)

F-1 INDUSTRIAL FURNACE
CONTINUOUS MONITORING SYSTEM
PERFORMANCE EVALUATION TEST PLAN
OCCIDENTAL CHEMICAL CORPORATION
EPA I.D. NO. LAD 092 681 824

PREPARED FOR:

OxyChem®

OCCIDENTAL CHEMICAL CORPORATION
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NOVEMBER 2007
Revision: 0
Focus Project No. 050703

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APPENDIX A: EXAMPLE CALIBRATION DATA SHEETS

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Exhibit A-7. Example CPMS Instrument Calibration Data Sheet

ACRONYMS AND ABBREVIATIONS

AWFCO	automatic waste feed cutoff
CD	calibration drift
CE	calibration error
CEM	continuous emissions monitoring
CEM PET	CEM Performance Evaluation Test
CEMS	CEM system
CPT	Comprehensive Performance Test
CMS	continuous monitoring system
CMS PEP	CMS Performance Evaluation Plan
CMS PET	CMS Performance Evaluation Test
CMS PETP	CMS Performance Evaluation Test Plan
CO	carbon monoxide
DOC	Documentation of Compliance
EPA	U.S. Environmental Protection Agency
HAPF	hydrochloric acid production furnace
HC or THC	total hydrocarbons
HWC MACT	Hazardous Waste Combustor Maximum Achievable Control Technology
LDEQ	Louisiana Department of Environmental Quality
MACT	Maximum Achievable Control Technology
NESHAP	National Emission Standards for Hazardous Air Pollutants
NDIR	non-dispersive infrared
NOC	Notification of Compliance
O_2	oxygen
QA	quality assurance
RA	relative accuracy
RCRA	Resource Conservation and Recovery Act
RM	reference method
RT	response time
TSCA	Toxic Substances Control Act

1.0 INTRODUCTION

Occidental Chemical Corporation (OxyChem) operates an industrial furnace, the F-1 Furnace, at its Geismar Plant located in Ascension Parish, Geismar, Louisiana. The F-1 Furnace is currently permitted under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA). Phase II of the Hazardous Waste Combustor (HWC) Maximum Achievable Control Technology (MACT) rule was promulgated in October 2005 at 40 CFR 63 Subpart EEE. The F-1 Furnace must comply with the HWC MACT performance standards for hydrochloric acid production furnaces (HAPFs).

The F-1 Furnace system includes a continuous monitoring system (CMS) for demonstrating continuous compliance with applicable emission standards and operating parameters. The CMS includes "parameter CMS" such as flowmeters, pressure transmitters, thermocouples, pH meters, etc., that measure parameter data from the operation of the system, and a continuous emissions monitoring system (CEMS) that monitors stack gas concentrations of carbon monoxide (CO) and oxygen (O_2).

The HWC MACT places considerable emphasis on continuous monitoring to demonstrate compliance with applicable emission standards and operating parameter limits. As such, facilities are required to conduct performance evaluations on the CMS used to demonstrate compliance with the HWC MACT requirements. As part of the preparations for the Comprehensive Performance Test (CPT), OxyChem will conduct a CMS Performance Evaluation Test (CMS PET) to verify the CMS instruments are calibrated and collecting valid data.

This CMS Performance Evaluation Test Plan (CMS PETP) is submitted as an Appendix to the CPT Plan. The CMS PETP includes the procedures for calibration of the parameter CMS (flow, temperature, pressure, etc.), and CO and O_2 CEMS. This plan will be in place as part of the F-1 Furnace operating record when compliance with the HWC MACT regulations is certified.

2.0 PERFORMANCE EVALUATION OBJECTIVES

Pursuant to Section 63.1207(e) of the HWC MACT, OxyChem must develop and submit a site-specific CMS PETP for approval by the Administrator. The purpose of the CMS PETP is to provide a synopsis of the methods and procedures that will be used to verify the monitoring devices included in the CMS are calibrated and collecting valid data during unit operation. This CMS PETP:

- Describes the CMS
- Outlines the methods and procedures that will be used to calibrate the CMS
- Specifies instrument performance criteria
- Describes the CMS integration with the automatic waste feed cutoff (AWFCO) system
- Outlines the AWFCO functional testing
- Presents a schedule for the program procedures, tests, and audits
- Lists the data quality objectives
- Presents the internal and external quality assurance (QA) program.

Specific procedures referenced and summarized by this test plan for the F-1 Furnace will be included in the CMS Performance Evaluation Plan (CMS PEP) that will be developed pursuant to Section 63.8(d) of the MACT General Provisions and included in the operating record.

The scope of the CMS PET includes assessing the accuracy of the instruments used to continuously demonstrate compliance with the HWC MACT requirements. This assessment includes ensuring the instruments are properly integrated with the AWFCO system. To verify the accuracy of an instrument, OxyChem will demonstrate that the instrument meets either the performance specification promulgated by EPA, or the manufacturer's recommended specification if an appropriate performance specification has not been promulgated. OxyChem will also perform an AWFCO system test to verify that an alarm will be triggered and the hazardous waste feed will be shut off if the control system records an operating parameter outside the AWFCO set point.

The performance evaluation program summary is discussed in more detail in Section 4.0. Specific performance criteria are also discussed in Section 4.0 of this plan.

3.0 CONTINUOUS MONITORING SYSTEM (CMS) DESCRIPTION

The CMS for OxyChem's F-1 Furnace consists of parameter CMS and CEMS. Parameter CMS are instruments that are electronically connected to the unit's control system. The data collected by the control system are stored and managed by the connected computer system. The computer system performs the data processing necessary to demonstrate compliance with system operational limits. The CEMS includes monitors that measure CO and O_2 concentrations in the stack to demonstrate compliance with the CO emission limit. Figure 3-1 shows the general monitoring locations for temperature, pressure, flow and other measurement instruments related to the F-1 Furnace's AWFCO system. Further description is provided below.

3.1 PARAMETER CMS DESCRIPTION

Parameter CMS consist of a combination of instruments that continuously monitor and record parameter data from the operation of the F-1 Furnace system. A list of the continuously monitored HWC MACT operating parameters applicable to the F-1 Furnace is presented in Table 3-1. The parameters are grouped consistent with the CPT Plan:

- Group 1 parameter limits are established from test operating data, and are used to ensure that the system operating conditions are not significantly less rigorous than those demonstrated during the test. Most Group 1 parameters are continuously monitored and recorded, and are interlocked with the automatic waste feed cutoff system. During the test periods (miniburn and formal test), continuously monitored and interlocked Group 1 parameters will be operational, but will be set at values that will allow the desired operating limits to be demonstrated.

- Group 2 parameter limits are regulatory specified limits, and are not based on the test operating conditions, e.g., the maximum stack CO or HC concentration. Most Group 2 parameters are continuously monitored and recorded, and are interlocked with the automatic waste feed cutoff system. Interlocks for continuously monitored Group 2 parameters will be operational during the test periods, without modification to the interlock set points.

- Group 3 parameter limits are based on manufacturer's recommendations, operational safety, and good operating practice considerations rather than on the test operating conditions. Group 3 parameter limits may be regulatory specified limits. Some Group 3 parameters may be continuously monitored and recorded, and may be interlocked with the automatic waste feed cutoff system. Interlocks for continuously monitored Group 3 parameters will be operational during the test periods.

3.1.1 CMS Instruments

Installed flowmeters, pressure transducers, thermocouples, and pH meters are used to collect process information on the F-1 Furnace system's key regulatory parameters. These key process monitoring instruments are listed in Table 3-2 along with the instrument ranges.

3.1.2 Data Acquisition and Recording

Each monitoring instrument produces a continuous electronic signal proportional to the instrument range. The signals are output to the F-1 Furnace control system. The connected computer system uses the control system collected data and an internal program to conduct required data manipulations and calculations. The computer compares instantaneous or computed rolling average values to the respective AWFCO set points. The operating parameter data are stored in the computer's data storage system.

The computer system evaluates each CMS measurement at least once every 15 seconds, and each minute computes and records the one-minute average value for each parameter from the four most recent 15-second readings. This meets the definition of a continuous monitor as defined by Section 63.1201(a) of the HWC MACT. To calculate an hourly rolling average, the system computes the arithmetic mean of the 60 most recent one-minute average values. As each new one-minute average value is recorded, the least recent of the previous 60 values is discarded from the data register, the new one-minute value is added, and an hourly rolling average is calculated and recorded. For a 12-hour rolling average, the arithmetic mean of 720 one-minute average values is calculated in the same way.

The computer system does not incorporate readings (data) generated during calibration periods into the instantaneous readings or the rolling average calculations. Once valid CMS data are available again, the computer system will resume rolling average calculations using the previously valid data values.

3.2 CONTINUOUS EMISSIONS MONITORING SYSTEM (CEMS)

The F-1 Furnace stack gases are continuously monitored for CO and O_2 to indicate proper operation of the combustion process using the following procedures:

- Stack gas CO by non-dispersive infrared (NDIR) analyzer operated according to the protocols of 40 CFR 60, Appendix B, Specification 4B
- Stack gas O_2 by paramagnetic analyzer operated according to the protocols of 40 CFR 60, Appendix B, Specification 4B.

CEMS for the F-1 Furnace are extractive systems designed to continuously measure CO and O_2 levels in the exhaust gases. The ranges of the CEMS analyzers are provided in Table 3-2. The extractive sample conditioning system includes a sample probe and filter, a heated sample transport line, a sample conditioner, and a sample gas pump. Samples of the stack gas are continuously drawn through the sample probe located in the stack and in direct contact with the stack gas. The heated sample line transports the gas sample from the sample probe to the sample gas conditioner at a temperature above the sample gas dew point. The sample gas pump draws the continuous sample through the sample

probe, the heated sample line and sample gas conditioner to the analyzers. In the sample gas conditioner, moisture is removed from the gas sample by first chilling the gas well below its dew point and condensing the moisture. The condensate is separated from the sample gas and the dry gas sample then enters the analyzers.

Table 3-1. HWC MACT AWFCO Parameters

Operational Parameter	Citation	Averaging Period
Group 1 Parameters		
Maximum total waste feed rate [a]	40 CFR 63.1209(j)(3), (k)(4)	Hourly RA
Maximum total chlorine feed rate [b]	40 CFR 63.1209(o)(1)	12-hour RA
Minimum combustion temperature	40 CFR 63.1209(j)(1), (k)(2)	Hourly RA
Maximum combustion air flow [c]	40 CFR 63.1209(j)(2), (k)(3), (o)(2)	Hourly RA
Minimum scrubber water pH	40 CFR 63.1209(o)(3)(iv)	Hourly RA
Minimum scrubber liquid to gas ratio (L/G) [d]	40 CFR 63.1209(o)(v)	Hourly RA
Group 2 Parameters		
Maximum stack gas carbon monoxide concentration	40 CFR 63.1218(a)(5)(i)	Hourly RA
Stack gas oxygen concentration [e]		NA
Group 3 Parameters		
Minimum atomizing steam pressure	40 CFR 63.1209(j)(4)	Hourly RA
Minimum liquid feed pressure to the scrubber	40 CFR 63.1209(o)(3)(iii)	Hourly RA

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Table 3-2. F-1 Furnace Major Process Instrumentation

Parameter	Location	Inst. No.	Units	Scale	Accuracy (±% Full Scale)	Instrument Type
Hex Waste Feed	Waste Feed Line	FI-18A_PV	gpm	0-5	2%	Orifice
Solvent Waste Feed	Waste Feed Line	FI-21A_PV	gpm	0-3	2%	Orifice
Natural Gas Feed	Waste Feed Line	FI-26_PV	mscfh	0-2,000	2%	Orifice
Atomizing Steam Pressure	Steam Supply Line	PSL-19	psig	NA	NA	Low Pressure Switch
Atomizing Steam Pressure	Hex Waste Feed Line	PI-1-1	psig	0-200	0.065%	Pressure Transmitter
Atomizing Steam Pressure	Solvent Waste Feed Line	PI-1-2	psig	0-200	0.065%	Pressure Transmitter
Combustion Air Flow Rate	Compressor Discharge	FI-24A_PV	scfm	0-8,440	2%	Pitot tube
D-9 Vent Flow [a]	Vent Duct	FI-9	scfm	0-130	2%	Thermal dispersion
D-35 Vent Flow [a]	Vent Duct	FI-24-1A_PV FI-24-1B_PV	scfm	0-40 0-600	0.25%	Thermal Dispersion
D-64 Vent Flow [a]	Vent Duct	FI-64-1_PV	scfm	0-512	2%	Mass flowmeter w/ Orifice
D-76 Vent Flow [a]	Vent Duct	FI-76-1_PV	scfm	0-1,005	1%	Mass flowmeter w/ Orifice
D-398 Vent Flow [a]	Vent Duct	FI-398-1_PV	lb/hr	0-51	1%	Mass flowmeter w/ Orifice
D-559 Vent Flow [a]	Vent Duct	FIC-559-1_PV	scfm	0-2,000	2%	Orifice w/Differential Pressure
DR-2180 Vent Flow [a]	Vent Duct	FI-2180_PV	scfm	0-200	1%	V-Cone w/Differential Pressure
Oxidizer Temperature	Exit of Combustion Chamber	TI-10_PV, TI-37_PV	°F	1,000-2,500	0.2%	Type K thermocouple
Oxidizer Temperature	Exit of Combustion Chamber	TIC-5_PV	°F	1,000-2,500	0.2%	Type K thermocouple
T-11 Bottoms Acid Conc.	Discharge Line	AIC-15_PV	wt%	0-21	0.2%	Refractive index
Caustic Scrubber Recycle Flow Rate	T-11 Column Caustic Scrubber Section Recycle Line	FI-40_PV	gpm	0-300	0.5%	Magnetic flowmeter
Caustic Scrubber Recycle Flow Pressure	T-11 Column Caustic Scrubber Section Recycle Line	PI-11-3	psig	0-60	0.075%	Pressure Transmitter

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Table 3-2. F-1 Furnace Major Process Instrumentation

Parameter	Location	Inst. No.	Units	Scale	Accuracy (±% Full Scale)	Instrument Type
Caustic Scrubber Differential Pressure	T-11 Column Caustic Scrubber Section	PDI-11-1	inwc	0-10	0.075%	Pressure Transmitter
Caustic Scrubber pH	T-11 Column Caustic Scrubber Section Recycle	AIC-2_PV	pH units	0-14	≤ 0.1 pH	pH probe and transmitter
Caustic Scrubber Ox/Red Potential	T-11 Column Caustic Scrubber Section Recycle	AIC-22-1_PV	mV	-800 to +800	≤ 1 mV	Glass measure & Reference electrodes
Water to T-11	Feed Line to T-11 Column Water Scrubber Section Recycle	FIC-35_PV	gpm	0-50	2%	Orifice
Water to D-22 (T-11)	Feed Line	FI-22-4_PV	gpm	0-15	2%	Orifice
Caustic Flow to D-22 (T-11)	Feed Line	FIC-22-3_PV	gpm	0-28	0.5%	Magnetic flowmeter
Stack Gas CO Concentration	T-11 Stack	CO-AN-4_PV	ppm	0-100 0-1,000	2%	Non-dispersive Infrared (NDIR)
Stack Gas O_2 Concentration	T-11 Stack	O2-AN-3_PV	%vol	0-25	0.2%	Electroconductivty fuel cell
Stack Temperature	T-11 Stack	TI-7A_PV, TI-7B_PV	°F	0-400	0.2%	Type J thermocouple
Steam to Header	Steam Line	FI-27_PV	lb/hr	0-13,620	0.2%	Orifice
Boiler Temperature (B-3)	B-3	TI-6A_PV, TI-14_PV	°F	0-1,200	0.2%	Type J thermocouple

Notes:

[a] Vent flows are monitored for chlorine feed rate contribution.

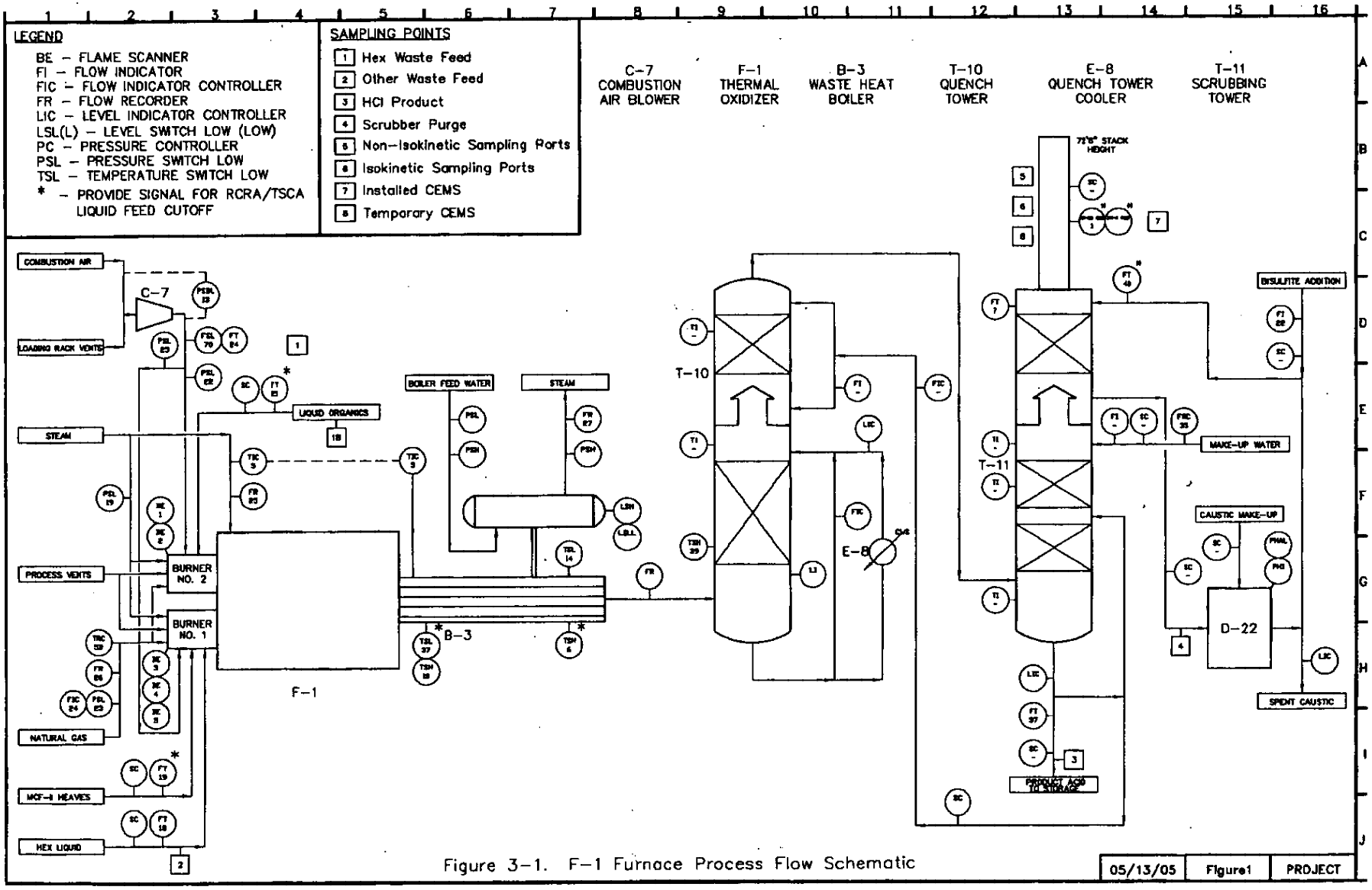

Figure 3-1. F-1 Furnace Process Flow Schematic

4.0 PERFORMANCE EVALUATION PROGRAM SUMMARY

The purpose of the CMS PET is to verify the CMS are calibrated and collecting valid data. To calibrate the system instruments, OxyChem will follow procedures defined in performance specifications promulgated by EPA, or manufacturer's recommendations for those devices that do not have promulgated performance specifications. The CMS PET of the CMS components will consist of three parts:

- Instrument calibration verification
- Functional testing of the AWFCO system and associated alarms, and
- Audit of CMS data reduction and recording functions.

A brief description of each is provided below.

4.1 INSTRUMENT CALIBRATION VERIFICATION

4.1.1 Parameter CMS

The parameter CMS will be calibrated as part of the CMS PET. Summaries of the calibration procedures are shown in Table 4-1.

4.1.1.1 Instrument Calibration

The instrument calibration will be completed within 60 days prior to beginning the CPT. As EPA has not promulgated any specific performance specifications for parameter CMS, OxyChem will use manufacturer's procedures and working knowledge of specific instruments to conduct the calibrations.

4.1.1.2 Instrument Location

Pursuant to Section 63.8(c)(2) of the MACT General Provisions, all CMS are installed such that representative measurements of emissions or process parameters from the affected source are obtained. OxyChem has installed all CMS so that they measure representative process parameters or process emissions. Instrument locations are shown in Figure 3-1.

4.2 CEMS

The CEMS PET will follow the requirements in Performance Specification 4B for CO and O_2 CEMS found in 40 CFR Part 60, Appendix B. The CEMS PET will consist of the following four tests:

- Calibration Drift (CD) Test - Measures the difference in the CEM output readings compared to the actual calibration gas values after a 24-hour period of operation. This test demonstrates the stability of the CEMS over time.

- Calibration Error (CE) Test - Measures the difference between the concentration indicated by the CEM and the known concentrations of calibration gases. A CE test will document the accuracy and linearity of the monitoring equipment over the entire measurement range.

- Relative Accuracy (RA) Test - A measure of agreement between a measured value and an accepted or true value. The RA test is conducted by comparing the CEMS response to a value determined by using a standard reference method (RM) on a separate sampling and analytical system. The RA test is used to validate the calibration technique and verify the ability of the CEMS to provide representative and accurate measurements.

- Response Time (RT) Test - Measures the time interval between the start of a step change in the system input (e.g. change of calibration gas) and the time the data recorder displays 95% of the final value.

The CD, CE and RT tests are conducted separately on the CO and O_2 monitors. The RA test is conducted on a combined CO and O_2 reading (i.e., CO corrected to 7% O_2) such that separate RA tests are not required for these monitors. A summary of the performance criteria that must be demonstrated during this CEM PET is provided in Table 4-2. A brief description of each test is provided below.

4.2.1 Calibration Drift (CD) Test

The CD test must be conducted separately for each monitor while the facility is operating under normal conditions. The CD test will be conducted by determining the monitor response to the injection of zero-level and high-level calibration gas values. The zero-level and high-level calibration gas values to be used for CEMS are presented in Table 4-3. The CD readings are repeated every 24 hours for seven consecutive days. During this seven-day period, no unscheduled CEMS maintenance or repairs will take place. If the combustion unit is taken out of service during the test period, the onset and duration of the downtime will be recorded and the CD test will be continued when the unit resumes operation. Once the 24-hour drift reading has been recorded, the analyzer may be adjusted, if necessary.

4.2.1.1 Carbon Monoxide Monitor

Data sheets will be used to record test data and calibration drift results for the CO monitor operating on the low span and the high span range. The CEMS test operator records the CO gas standard concentrations from the gas cylinders on the data sheet, and confirms that the concentrations are within the ranges shown in Table 4-3 for conducting the calibration drift test.

The zero-level and high span-level calibration gases are injected at the sample probe and the monitor responses to the gases are recorded on the data sheet. (Note that the monitor response recorded is not corrected to 7% oxygen.) The difference between the monitor response and the calibration gas value is the calibration drift test result, which is recorded on the data sheet. The calibration drift as a percent of span is calculated and recorded on the data sheet. The CO monitor calibration must not drift more than an average of 3% from the reference standard (calibration gas value) for six out of seven consecutive test days.

4.2.1.2 Oxygen Monitor

A data sheet is prepared for recording test data and calibration drift results for the O_2 monitor. The CEMS test operator obtains the O_2 gas standard concentrations (zero-level and span-level) from the gas cylinders, records the concentrations on the data sheet, and confirms that the concentrations are within the ranges shown in Table 4-3 for conducting the calibration drift test.

The zero-level and high span-level calibration gases are injected at the sample probe and the monitor responses to the gases are recorded on the data sheet. The difference between the monitor response and the calibration gas value is the CD test result, which is recorded on the data sheet. The O_2 monitor calibration must not drift more than an average of 0.5% O_2 from the reference standard (calibration gas value) for seven consecutive test days.

4.2.2 Calibration Error (CE) Test Protocol

The CE tests will be conducted separately for each monitor while the system is operating under normal conditions during the 7-day CD test period. The CE test will be conducted by determining the monitor response to the injection of zero-level, mid-level, and high-level calibration gases at the sample probe. The calibration gas values used for each of the monitors are presented in Table 4-3. The test protocols are summarized below.

4.2.2.1 Carbon Monoxide Monitor

During the CO CE test, the CEMS test operator obtains the CO gas standard concentrations from the gas cylinders, records the concentration values on the data sheet, and confirms that the concentrations are within the ranges shown in Table 4-3 for conducting the CE test.

The zero-level, mid-level, and high-level calibration gases are injected non-consecutively at each of the three measurement points and the monitor responses to the gases are recorded on the data sheet. (Note

that the monitor responses recorded are not corrected to 7% oxygen.) The difference between the monitor response and the calibration gas value at each level is calculated and recorded on the data sheet. After completing three runs each of the low, mid, and high span ranges, the mean difference of the readings at the low-level, mid-level, and high-level gases is calculated and entered on the data sheet. The CE result is presented as a percent of span, which is calculated by dividing the mean difference at each level by the appropriate monitor span (200 ppmv for the low range and 3,000 ppmv for the high range). The mean difference between the CEMS and reference values at all three test points must be no greater than 5 percent of span value.

4.2.2.2 Oxygen Monitor

The CEMS test operator obtains the O_2 gas standard concentrations (zero-level, mid-level, and high-level) from the gas cylinders, records the concentrations on the data sheet, and confirms that the concentrations are within the ranges shown in Table 4-3 for conducting the CE test.

The zero-level, mid-level, and high-level calibration gases are injected non-consecutively at each of the three measurement points and the monitor responses to the gases are recorded on the data sheet. The difference between the monitor response and the calibration gas value at each level is calculated and recorded on the data sheet. After completing three runs each of the low, mid, and high span ranges, the mean difference of the readings at the low-level, mid-level, and high-level gases is calculated and entered on the data sheet. The CE result is presented as a percent of span, which is calculated by dividing the mean difference at each level by the monitor span (25% O_2). The mean difference between the CEMS and reference values at all three test points must be no greater than 0.5 percent of span.

4.2.3 Relative Accuracy (RA) Test

The RA tests will be conducted during the CD test period. This test is conducted using a specified reference method (RM) test to determine an actual or true value. A total of 12 RA tests will be conducted. OxyChem can reject a maximum of three tests to demonstrate compliance with the RA criteria as long as nine readings are used to determine the RA. All data points will be reported.

The RA testing will be conducted on a CO reading that has been corrected to 7% O_2 such that a separate RA test does not have to be conducted on the O_2 monitor.

The RA test will be performed on the CO monitor using EPA Method 10, 10A, or 10B (40 CFR 60, Appendix A) as the RM. Since the CO monitor is a NDIR monitor, an alternative interference trap will be used for the RM test as specified in Section 10.1 of the Performance Specification 2 of 40 CFR 60, Appendix B.

The RM and CO monitor measurement will be consistent on a moisture and % O_2 basis. The CO monitor response will be compared against the corresponding RM value and the results will be summarized. The mean of the differences between the RM value and the CO monitor response, the standard deviation, the confidence coefficient, and the CO monitor RA will be calculated using the equations in Section 8.0 of Performance Specification 2 of 40 CFR 60, Appendix B. For the CO monitor, the relative accuracy shall be no greater than 10 percent of the mean value of the RM mean or 5 ppm, whichever is greater.

4.2.4 Response Time (RT) Test

The RT tests will be conducted during the CD test period. The CO and the O_2 monitors will be tested at zero-level and high-level calibration gas values. The entire CEMS will be checked including the sample extraction, transport, and conditioning apparatus, and the gas analyses and data recording systems.

4.2.4.1 Carbon Monoxide Monitor

A zero-level calibration gas will be introduced into the system as close to the sample probe as practical. Once the system has stabilized (i.e. no change greater than 1% of the full scale for 30 seconds), the monitor will be switched to monitor the combustion gas and the time required for the system to reach 95% of the final stable value will be recorded. This time is called the upscale RT.

Once a stable value has been attained, the high-level calibration gas will be introduced at the same point. Once a stable value has been attained, the monitor will be switched back to the combustion gas and the time required for the system to reach 95% of the final stable value will be recorded. This is called the downscale RT. This procedure will be repeated three times. Once the tests are completed, an average RT will be calculated for both the upscale and downscale RT's. The longer of these two means is the RT for the system. The response time for the CO monitor must not exceed 2 minutes

In some cases, the combustion gas concentration is approximately equal to the zero-level calibration gas concentration such that there may be no noticeable step change in the system reading once the monitor is switched from monitoring the calibration gas to monitoring the combustion gas. In these cases, an upscale reading cannot be obtained. If this occurs, the RT from the downscale measurement will be used to determine compliance with the RT performance criteria.

4.2.4.2 Oxygen Monitor

The RT test will be conducted for the O_2 monitor as described above for the CO monitor. The RT test data will be recorded on a data sheet similar to the RT for the CO monitor. The response time for the O_2 monitor must not exceed 2 minutes.

4.2.5 Pretest Preparation

4.2.5.1 Calibration Gas Cylinder Inventory

Prior to initiating the CEMS PET, a calibration gas inventory will be conducted to verify and document that the required calibration gases are on-site. Table 4-3 lists all calibration gases required for conducting the CEM PET.

4.2.5.2 Installation Verification

Performance Specification 4B suggests that the sampling point be located:

- ≥ 2 equivalent duct diameters downstream from the nearest control device, point of pollution generation or other point at which a change in the pollutant concentration or emission rate may occur.
- ≥ 0.5 equivalent duct diameters upstream from the effluent exhaust or next control device.

F-1 Furnace sampling points more than exceed the Specification 4B guidance and will provide representative samples of the combustion gas stream from the F-1 Furnace. In addition, the sample probe assemblies are located in the stack that is operated under positive pressure and should be free from air in-leakage that could impact combustion gas concentrations.

4.2.5.3 Stratification Test

Stratification tests are not required as part of this evaluation because all points are less than 1.0 meter from the side wall of the duct (paragraph 3.3 of Performance Specification 4B). In addition, the F-1 Furnace combustion gases are thoroughly mixed. The sample point locations are free from air in-leakage. There is no reason to believe that the monitored gases could be stratified to the extent that it would cause failure of the RA test. OxyChem will verify this by inspection and record the findings.

4.2.5.4 Reference Method Sampling and Analytical System

A qualified stack sampling contractor using a temporary CEMS will be utilized to conduct the RA test for the CO and O_2 monitors. This CEMS will be used to perform the RM identified in Paragraph 4.3 of

Performance Specification 4B for CO and Section 3 of Performance Specification 3 for O_2. The sample port locations for the RM sampling and analytical system are located in the same areas as the other ports for the installed CEMS.

During the RA test, the combustion gas sample for the RM sampling and analytical system will be collected at 3 points on a measurement line (traverse) over the duct cross section. The 3 traverse points will be located at 16.7%, 50%, and 83.3% of the stack diameters as measured from the inside duct wall. During the test, the sample probe will be located within 1.2 inches of the traverse points and the sample collected for 7 minutes at each point (total of 21 minutes).

4.3 AWFCO SYSTEM INTEGRATION AND TESTING

The control system/computer system includes an AWFCO system that stops the hazardous waste feed when the control system records an operating condition outside the limits necessary to comply with permit conditions. The parameter CMS and CEMS described in this plan are integrated with the AWFCO system. Each AWFCO parameter has an alarm and alarm message associated with it that audibly sounds and logs in the control room when the trip point for that AWFCO parameter is approached. The control system/computer system compares the instantaneous or calculated rolling average values, depending on the parameter averaging times, to the corresponding parameter trip set point. Upon exceedence of an interlock set point, the control system/computer system activates shutoff command to stop the hazardous waste feed. In addition, an AWFCO will trigger if the lower or upper range limits of any CMS instrument is reached or exceeded during a one-minute average. Additional AWFCO trips will occur if any CMS instrument measurement control system/computer system software is turned off or sends an invalid data input.

As part of the CMS PET, the AWFCO system will be tested. To test the AWFCO system, OxyChem will simulate a measurement signal in the control system/computer system associated with the parameters of the CMS. The simulated CMS measurement signal in the control system/computer system will be increased or decreased, to the level that trips the AWFCO. The indication that the AWFCO has tripped will be shown as an alarm on the computer screen. OxyChem will verify that an AWFCO alarm causes the hazardous waste feed to cease. The proper functioning of the system will be documented. OxyChem will also perform invalid data input AWFCO tests. Invalid data inputs occur when the control system/computer system input measurements are out of range or there is a loss of the instrument measurement signal. OxyChem will test the invalid data AWFCO trips by turning off the software measurement loop causing a invalid data state.

4.4 DATA QUALITY OBJECTIVES

OxyChem expects the data measured by the continuous monitoring devices to be precise, accurate, and complete. The CMS will be calibrated using manufacturer's procedures or standard EPA accepted procedures prior to the conducting the CPT. The expected accuracies of the continuous monitoring instruments will be presented in the CMS PEP prepared in accordance with Section 63.8(d) of the MACT General Provisions.

Table 4-1. Summary of CMS Instrumentation Calibration Procedures

Parameter	Instrument Type	Calibration Procedure
Waste Feed Rate	Flow orifice; pressure transmitter	Inspect orifice for wear, accumulation and proper installation.
		Measure orifice bore. Clean and reinstall.
		Calibrate pressure transmitter as noted below.
Natural Gas Flow Rate	Flow orifice; pressure transmitter	Inspect orifice for wear, accumulation and proper installation.
		Calibrate pressure transmitter as noted below.
Temperature	Thermocouples	Check thermocouple type and condition. Use a standard thermocouple simulator to generate a millivolt signal from the ANSI standard thermocouple tables corresponding to a given temperature.
		At the thermocouple well, generate a signal according to process value listed on the master calibration sheet back to the transmitter or switch, and verify readings on the DCS. Check @ 0%, 25%, 50%, 75% and 100% of the span. Record all as-found and as-left data on the master calibration sheet. Verify that the DCS readout is the same as test value.
		If an error is detected greater than the manufacture accuracy full range specification, check condition of all wiring and connections, check the transmitter or switch directly, make any repairs or replacements necessary to bring the reading back into tolerance. Any replacement will be with a factory-calibrated thermocouple.
		Record all repairs and replacements on the master calibration sheet.
Combustion Air Flow	Pitot tube; pressure transmitter	Inspect orifice for wear, accumulation and proper installation.
		Measure orifice bore. Clean and reinstall.
		Calibrate pressure transmitter as noted below.

Table 4-1. Summary of CMS Instrumentation Calibration Procedures

Parameter	Instrument Type	Calibration Procedure
Liquid Flow Rate (e.g., Recycle Flow)	Magnetic or Coriolis flow meters; transmitters	Purchased pre-calibrated. File certification paperwork in project files. Inspect flow element and record condition. To calibrate the transmitter, use a calibrator to simulate the electronic flow signal from the sensor element. Generate a signal according to process value listed on the master calibration sheet and check electronically @ 0%, 25%, 50%, 75% and 100% of the span. Adjust electronically if any drift is found. Record as-found and as-left measurement reading on the master calibration sheet. Verify that the DCS readout is same as test value. If an error is detected greater than the manufacture accuracy full range specification, check condition of all wiring and connections, check the transmitter or switch directly, make any repairs or replacements necessary to bring the reading back into tolerance.
		Record all repairs and replacements on the master calibration sheet.
pH	pH probe and transmitter	Take readings with three buffer solutions of low and high values. Adjust the low and high values to match actual pH values. (Buffer solutions of low and high values are not the same as Zero and Span.) Use pH medium buffer solution to check for linearity test value. Record as-found and as-left measurement reading on the master calibration sheet. Verify that the DCS readout is the same as test value. If an error is detected greater than the manufacturer accuracy full range specification, check condition of all wiring and connections, check the transmitter or switch directly, make any repairs or replacements necessary to bring the reading back into tolerance. Record all repairs and replacements on the master calibration sheet.
Oxidation/Reduction Potential	Probe and transmitter	Clean and inspect electrode. Immerse electrode in laboratory standard solutions corresponding to low, middle, and high range conductivity, and compare transmitter response.
		Record as-found and as-left measurement reading on the master calibration sheet. Verify that the DCS readout is the same as test value. If an error is detected greater than the manufacturer accuracy full range specification, check condition of all wiring and connections, check the transmitter or switch directly, make any repairs or replacements necessary to bring the reading back into tolerance.
		Record all repairs and replacements on the master calibration sheet.

Table 4-1. Summary of CMS Instrumentation Calibration Procedures

Parameter	Instrument Type	Calibration Procedure
Vent Flow Rate	Mass flow meter	Purchased pre-calibrated. File certification paperwork in project files.
		Verify range. Fill with process fluid; block in flow meter; electrically zero the instrument.
Vent Flow Rate	V-Cone w/Differential Pressure	Inspect orifice for wear, accumulation and proper installation.
		Calibrate pressure transmitter as noted below.
Pressure	Differential Pressure Transmitters	Use a standard pressure calibrator to generate a signal corresponding to the pressure signal data listed on the master calibration sheet, typically, 5 points. Verify that the DCS readout is the same as test value. Record as-found and as-left calibration measurement readings on the master calibration sheet. If an error is detected greater than the manufacture accuracy full range specification, check condition of all wiring and connections, check the transmitter or switch directly, make any repairs or replacements necessary to bring the reading back into tolerance.
		Record all repairs and replacements on the master calibration sheet.

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Table 4-2. CEMS Performance Criteria [a]

Monitor/Test	Performance Criteria	Reference	Notes
Carbon Monoxide Monitor	-	-	
Calibration Drift	≤ 3 % of span	PS 4B, 4.2	For 6 out of 7 days; low and high range
Calibration Error	≤ 5 % of span	PS 4B, 4.4	At all three test points
Response Time	≤ 2 minutes	PS 4B, 4.5	Longest of the upscale and downscale averages
Relative Accuracy	≤ 10 % of RM Mean	PS 4B, 4.3	or 5 ppm, whichever is greater [b]
Oxygen Monitor	-	-	
Calibration Drift	≤ 0.5 % O_2	PS 4B, 4.2	For 7 consecutive days
Calibration Error	≤ 0.5 % O_2	PS 4B, 4.4	At all three test points
Response Time	≤ 2 minutes	PS 4B, 4.5	Longest of the upscale and downscale averages
Relative Accuracy	≤ 20 % of RM Mean	PS 4B, 4.3	or 1%, whichever is greater

PS - Performance Specification, RM - Reference Method

Notes:

[a] Original reference for performance criteria is Performance Specification 4B.

[b] If the average concentration of CO in the emissions is < 5 ppmv (I.e., < 5 % of the 100 ppmv standard), compliance with the RA criteria has been demonstrated if the RM demonstrates that CO emissions are < 5 ppmv.

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Table 4-3. CEMS Performance Evaluation Test Calibration Gas Requirements

TEST/MONITOR	UNITS	CALIBRATION GAS CONCENTRATIONS [a]		
		Zero	Mid-Level	High-Level
Calibration Drift and Response Time Tests [b]				
CO - Low span	ppmv	0-40	NA	100 - 180
CO - High span 1	ppmv	0-600	NA	1,500 - 2,700
O_2	vol%	0-5	NA	12.5 - 22.5
Calibration Error Test [c]				
CO - Low span	ppmv	0 -40	60 - 80	140 - 160
CO - High span 1	ppmv	0 -600	900 - 1,200	2,100 - 2,400
O_2	vol%	0 -2	8 - 10	14 - 16

Notes:
[a] A copy of the suppliers certificate of analysis must be provided for each gas cylinder. The gas concentrations for the calibration error tests must be certified by the suppliers according to EPA Protocol 1.

[b] Cal gas concentration ranges per 40 CFR 266 Appendix IX, Section 2.0, Article 2.1.4.2.1 and 40 CFR 266 Appendix IX, Section 2.0, Article 2.1.4.2.2

[c] Cal gas concentration ranges per 40 CFR 60, Appendix B, Performance Specification 4B

5.0 TEST SCHEDULES

The performance evaluation of the parameter CMS will be completed in conjunction with the testing of the CEMS. The testing of both parameter CMS and the CEMS is expected to take approximately 7 days on-site and preparation will begin approximately 3 weeks prior to the CPT.

6.0 QUALITY ASSURANCE

Pursuant to Section 63.8(e)(3) of the MACT General Provisions, the CMS PETP must include an internal and external QA program. The QA programs are described below:

6.1 INTERNAL QA

The quality of data generated by the system will be assured by implementing internal quality control procedures. The internal QA program will include the activities planned by routine operators and analysts to provide an assessment of CMS performance. The routine procedures include the following:

- Testing and other quality assurance checks of parameter CMS and CEMS following procedures summarized by this test plan and specified in the CMS PEP. In addition to this CMS PETP, the CMS PEP will be prepared pursuant to Section 63.8(d) of the MACT General Provisions and will be finalized and integrated into OxyChem's Operating Record by the HWC MACT compliance date or the submission of a Notification of Compliance (NOC) or a Documentation of Compliance (DOC), whichever is earlier.
- Field verification of the CMS instrument location, condition, and installation.
- Daily audit of the CEMS components and operating parameters. Corrective action will be taken as needed to remedy malfunctions or abnormal operating conditions.
- Daily calibration drift checks on the CEMS. The results of the calibration drift check will be reviewed daily and the monitoring instruments will be adjusted for drift as appropriate.

6.2 EXTERNAL QA

OxyChem's external QA program shall include systems audits that include the opportunity for on-site evaluation of instrument calibration, data validation, sample logging, and documentation of quality control data and field maintenance activities. The QA program implementation will verify conformance via:

- Reviews of calibration procedures in the CMS PEP
- Reviews of data sheets to ensure completeness and accuracy
- Examinations of facility records documenting the data verification and data reduction/calculation procedures performed for compliance purposes.

The Administrator may perform similar verification of conformance to the QA Program by a similar review process.

In addition, the quality of data generated by the CMS will be assured by implementing the quality control procedures presented in the CMS PEP. This program addresses all aspects of quality control for the F-1 Furnace process parameter monitors and the continuous emission monitors.

7.0 DOCUMENTATION

Results of the performance evaluations will be summarized on data sheets. All data sheets, calculations, CMS system data records, and calibration or reference material certification will be included in CMS PET Report. This report will be included as part of the NOC and will be maintained as part of the Operating Record.

APPENDIX A: EXAMPLE CALIBRATION DATA SHEETS

Exhibit A-1. Example Data Sheet for Conducting the CO Seven-Day Calibration Drift Tests

Exhibit A-2. Example Data Sheet for Conducting the O_2 Seven-Day Calibration Drift Tests

Exhibit A-3. Example Data Sheet for Conducting the CO Calibration Error Test

Exhibit A-4. Example Data Sheet for Conducting the O_2 Calibration Error Test

Exhibit A-5. Example Data Sheet for Conducting the Response Time Test

Exhibit A-6. Example Data Sheet for Conducting the Relative Accuracy Test Audit

Exhibit A-7. Example CPMS Instrument Calibration Data Sheet

EXHIBIT A-1

EXAMPLE DATA SHEET FOR CONDUCTING THE CARBON MONOXIDE MONITOR SEVEN DAY CALIBRATION DRIFT TEST

Source: _____ Operator: _____

Location: _____ Low Range (ppmv): _____

Monitor: _____ High Range (ppmv): _____

Serial Number: _____

Calibration Gas Category	Day	Date	Operator Initials	Calibration Gas Concentration (ppm)	(a) Monitor Response (ppm)	CD Result Difference (±ppm)	(b) % of Span	(c, d) Pass/Fail
Zero Level	1							
	2							
	3							
	4							
	5							
	6							
	7							
Low Span Level	1							
	2							
	3							
	4							
	5							
	6							
	7							
High Span	1							
	2							
	3							
	4							
	5							
	6							
	7							

a) Monitor response reading before correction to 7% oxygen.
b) % of Span = Difference/Span x 100
c) The acceptance criteria is ≤ 3% of span (≤ 6 ppmv for the low range and ≤ 90 ppmv for high range)
d) The CO monitor must pass the daily CD test 6 out of the 7 days (Section 4.2 of Performance Specification 4B).

Exhibit A-2

EXAMPLE DATA SHEET FOR CONDUCTING THE OXYGEN MONITOR SEVEN DAY CALIBRTION DRIFT TEST

Source: _____ Operator: _____

Location: _____ Range (vol%): _____

Monitor: _____

Serial Number: _____

Calibration Gas Category	Day	Date	Operator Initials	Calibration Gas Concentration (vol%)	Monitor Response (vol%)	CD Result Difference (±vol%)	(a) Pass/Fail
Zero Level	1						
	2						
	3						
	4						
	5						
	6						
	7						
Span Level	1						
	2						
	3						
	4						
	5						
	6						
	7						

a) The acceptance criteria is ≤ 0.5 vol%.

EXHIBIT A-3

EXAMPLE DATA SHEET FOR CONDUCTING THE CARBON MONOXIDE MONITOR CALIBRATION ERROR TEST

Source: _____ Date: _____

Sample Probe Location: Exhaust Duct Time: _____

System No. _____ Operator: _____

CO Monitor: _____ Serial No._____
(Manufacturer and model number)

Span: 0-200 ppm Tag No._____
0-3000 ppm

Run Number	Cylinder I.D. No.	Calibration Value (ppm)	Monitor Response (ppm)	Difference (ppm) Zero/Low	Mid	High
Low Span (0 - 200 ppm)						
1 - Zero						
2 - Mid						
3 - High						
4 - Mid						
5 - Zero						
6 - High						
7 - Zero						
8 - Mid						
9 - High						
Mean Difference (ppm) =						
Low Span Calibration Error (% of span) =						
High Span (0 - 3000 ppm)						
1 - Zero						
2 - Mid						
3 - High						
4 - Mid						
5 - Zero						
6 - High						
7 - Zero						
8 - Mid						
9 - High						
Mean Difference (ppm) =						
High Span Calibration Error (% of span) =						

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EXHIBIT A-4

EXAMPLE DATA SHEET FOR OXYGEN MONITOR CALIBRATION ERROR TEST

Source: _____ Date: _____

Sample Probe Location: Exhaust Duct Time: _____

System No. _____ Operator: _____

O_2 Monitor: _____ Serial No._____
(Manufacturer and model number)

Span: 0-25 vol% Tag No._____

Run Number	Cylinder I.D. No.	Calibration Value (%)	Monitor Response (%)	Difference (%)		
				Zero	Mid	High
1 - Zero						
2 - Mid						
3 - High						
4 - Mid						
5 - Zero						
6 - High						
7 - Zero						
8 - Mid						
9 - High						
Mean Difference (%) =						

Exhibit A-5. Example Data Sheet
Response Time

Date: _____

Inspector: _____

CEMS Train: A B (circle one) Analyzer: CO or O_2 (circle one)

Analyzer Manuf. and Model #: _____

Analyzer Serial #: _____

Record

ZG = Zero Calibration Gas = _____ ppmv or % (circle one) Cylinder # = _____

SG = Span Calibration Gas = _____ ppmv or % (circle one) Cylinder # = _____

Calculate

Response Time (RT) = Time required to reach 95% of stable value
Approx. RT_U Stable Value = .95 X SG = _____ ppmv or % (circle one)
Approx. RT_D Stable Value = .95 X ZG = _____ ppmv or % (circle one)

Action		95% of Stable Value (ppm or %)	Response Time for 95% of Final Value: Upscale (seconds)	Response Time for 95% of Final Value: Downscale (seconds)
1 Apply **Zero Gas** *until monitor reads stable for 30 seconds. Stable is* considered +/- 1% of span.				
2 Apply a step change by introducing the **Span Gas**. Record the time to reach RT_U.	RT_U			
3 Reintroduce the **Zero Gas** and wait for a stable reading before recording the RT_D	RT_D			
4 Apply a step change by applying **Span Gas**. Record the time to reach RT_U.	RT_U			
5 Apply a step change by applying **Zero Gas**. Record the time to reach RT_D.	RT_D			
6 Apply a step change by applying **Span Gas.** Record the time to reach RT_U.	RT_U			
7 Apply a step change by applying **Zero Gas**. Record the time to reach RT_D.	RT_D			
Average Response Time (120 sec max) =				

The slower of the two means (RT_D and RT_U) is the response time

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Exhibit A-6

EXAMPLE DATA SHEET FOR CONDUCTING THE QUARTERLY ABSOLUTE CALIBRATION AUDIT (ACA) OR RELATIVE ACCURACY TEST AUDIT (RATA) FOR CARBON MONOXIDE/OXYGEN MONITORS

Source: _____ Date: _____

Sample Probe Location: Exhaust Duct Operator: _____

CO Monitor: _____ Serial No. _____

Span: 0-200 ppm, 0-3000 ppm Tag No._____

O2 Monitor: _____ Serial No. _____

Span: 0-25 % Tag No._____

	Carbon Monoxide (Low Range)			Carbon Monoxide (High Range)			Oxygen		
Measurement	CEMS Response (ppm)	Calibration Gas Concentration (ppm)	Difference (ppm)	CEMS Response (ppm)	Calibration Gas Concentration (ppm)	Difference (ppm)	CEMS Response (%)	Calibration Gas Concentration (ppm)	Difference (%)
1									
1									
1									
2									
2									
2									
Arithmetic Mean (ppm) [a]									
Relative accuracy (% of RM) [a]									

Exhibit A-7
CPMS Instrument Calibration Data Sheet

Instrument Information	Specification
Instrument ID:	Range/Set point
Date Calibration Due	Instrument Tolerance
Instrument Name	Process Tolerance
Work Order Number	

Remarks/Comments

Calibration Data

Parameters	Units	STD. Reading	Instrument Tolerance	As Found Reading	Deviation	Final Reading

Reference Instrument Used

ID Number	Description	Manufacturer	Calibrated Date	Calibrated Due Date

Action Taken	Certification & Completion Report		
Comply with specs	Done By:	Date:	Hours
Calibrated			
Out of Service	Supervisor:	Date:	Entry Check:
Not Found			

APPENDIX F

THERMOCOUPLE LOCATION DRAWINGS

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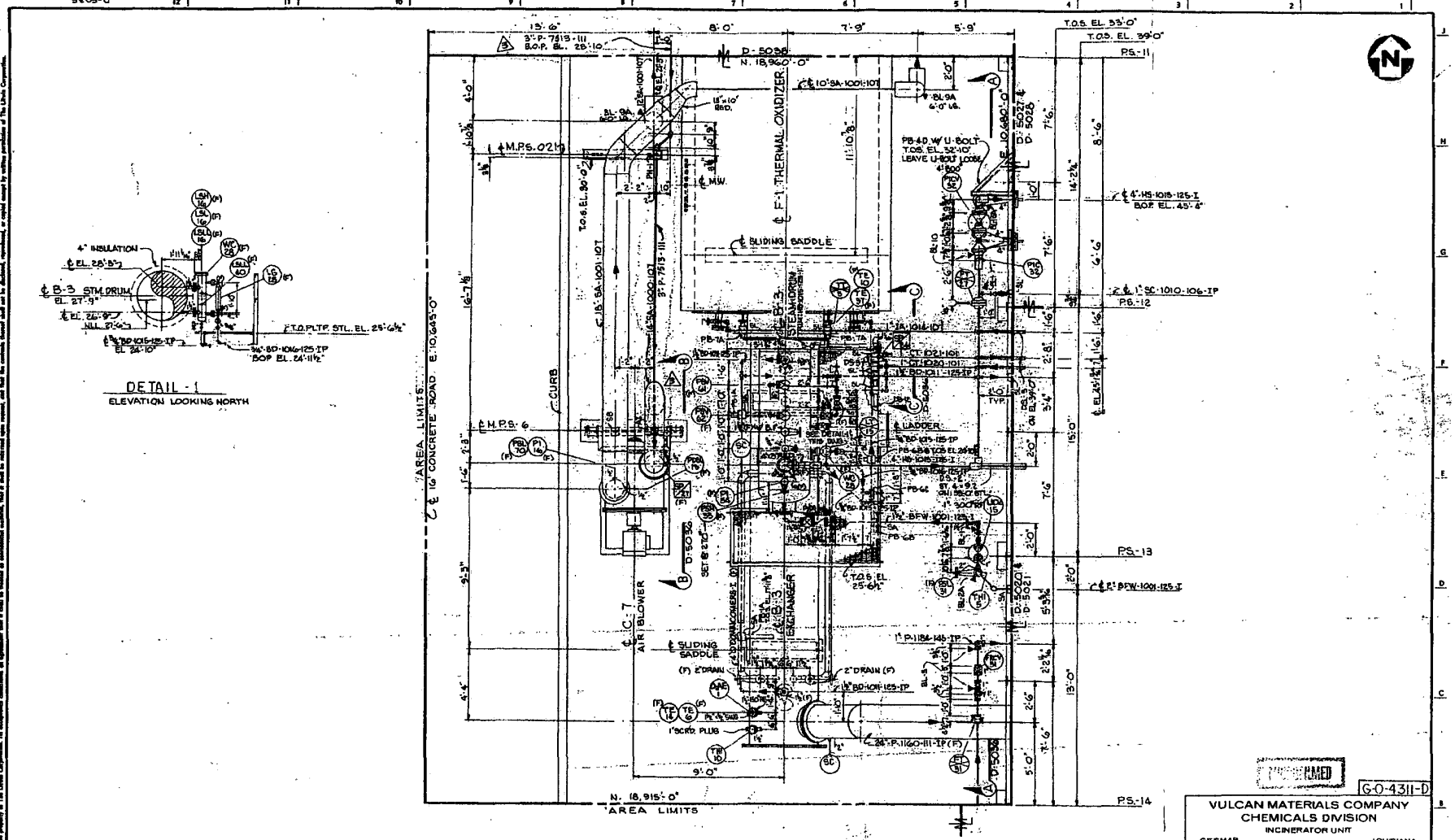

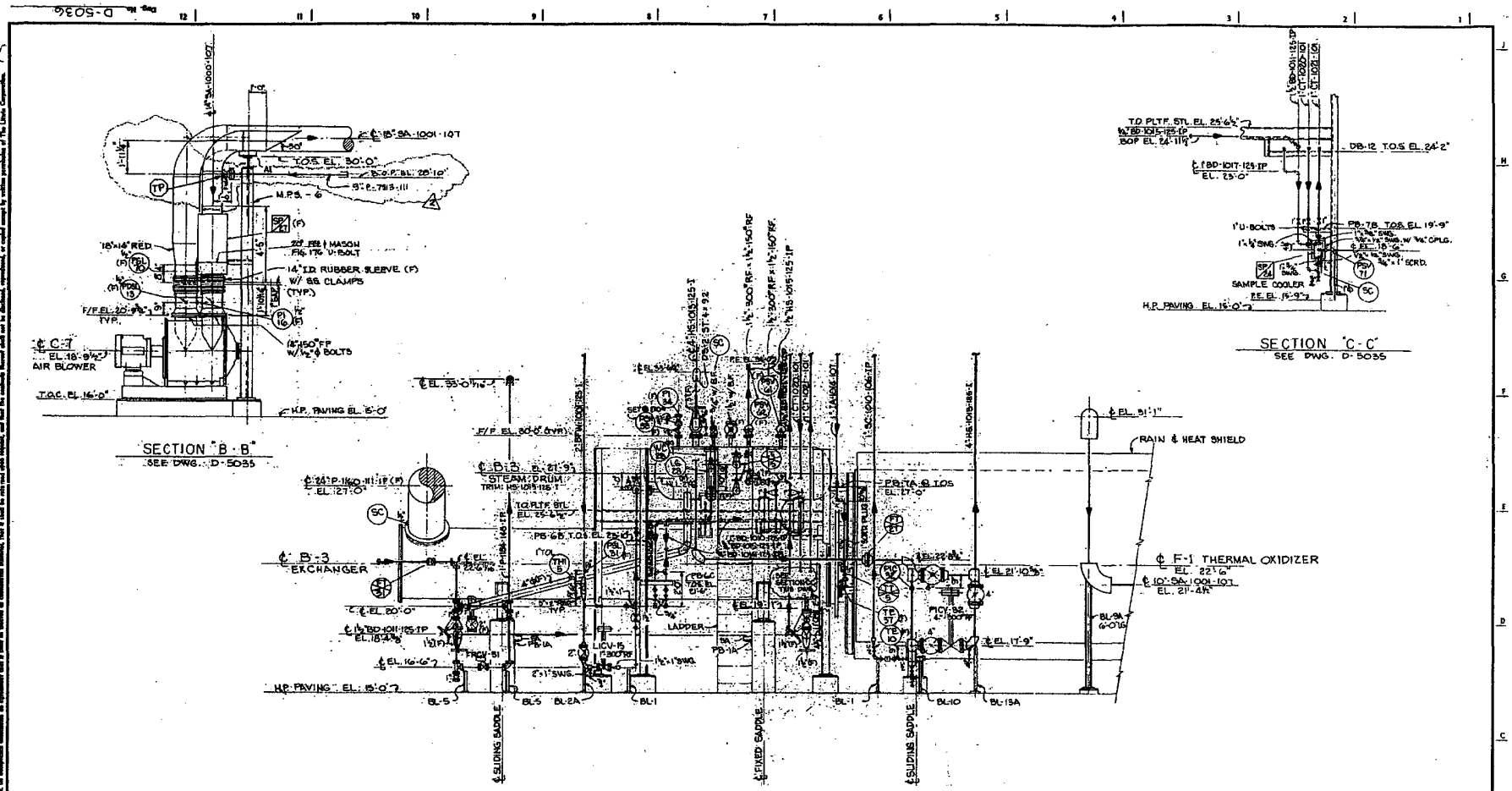

DWG. NO.	REFERENCE DRAWINGS	MK	ZONE	DATE	REVISIONS	DR. CH.	ENGRG. APPL.	PROJ. APPL.	MK	ZONE	DATE	REVISIONS	DR. CH.	ENGRG. APPL.	PROJ. APPL.
D-5001	PIPING GENERAL NOTES & DETAILS														
									2		8-31-83	ADDED 3" P-7513-111			
									1		2-3-78	ISSUED FOR CONSTRUCTION			
									0		1-25-78	ISSUED FOR APPROVAL			

APPROVED FOR CONSTRUCTION WHEN SIGNED BELOW
2/15/76
DATE

APPROVED FOR CONSTRUCTION
By James R. Jensen
Date February 15, 1978
Vulcan Materials Company

Litwin CORPORATION
WICHITA KANSAS HOUSTON TEXAS

DR. T. ADAMS DATE 1-25-78 DATE 2/15/76
CHK. FREY DATE 2-5-78 DATE
DATE 2-16-78

G-0-4312-D

VULCAN MATERIALS COMPANY
CHEMICALS DIVISION
INCINERATOR UNIT
BEISMAR LOUISIANA

PIPING SECTIONS
AREA D

SCALE 3/8" = 1'-0" | CONT. NO. 5428 | DWG. NO. D-5036 | REV. 2

MICROFILMED

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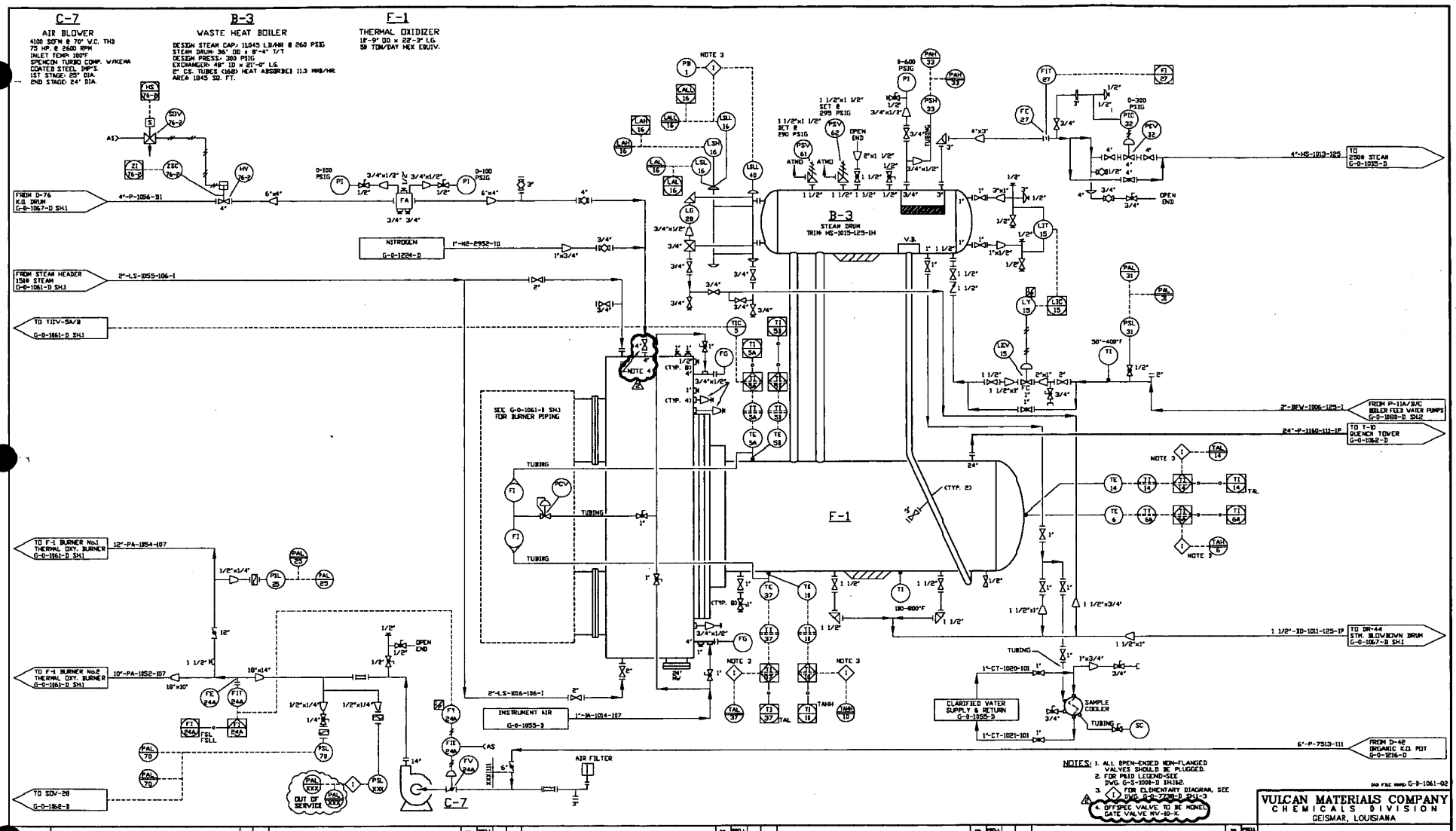
C-7
AIR BLOWER
4100 SCFM @ 70° V.C. THD
75 HP. @ 2600 RPM
INLET TEMP: 100°F
SPENCON TURBO COMP. W/KEMA
COATED STEEL IMP'S.
1ST STAGE: 25" DIA.
2ND STAGE: 24" DIA.
B-3
WASTE HEAT BOILER
DESIGN STEAM CAP: 11,045 LB/HR @ 260 PSIG
STEAM DRUM: 36" OD x 8'-4" T/T
DESIGN PRESS: 300 PSIG
EXCHANGER: 48" ID x 21'-0" LG.
2" C.S. TUBES (168) HEAT ABSORBED 11.3 MMB/HR.
AREA: 1845 SQ. FT.
F-1
THERMAL OXIDIZER
18'-9" OD x 22'-3" LG.
50 TON/DAY HEX EQUIV.
FROM D-76 K.O. DRUM G-0-1067-D SH.1
4"-P-1056-111
NITROGEN G-0-1224-D
1"-N2-2952-111
FROM STEAM HEADER 150# STEAM G-0-1061-D SH.1
2"-LS-1055-106-I
TO TICV-5A/B G-0-1061-D SH.1
B-3
STEAM DRUM
TRIM: HS-1015-125-IH
V.B.
SEE G-0-1061-D SH.1 FOR BURNER PIPING
TUBING
F-1
TO F-1 BURNER No.1 THERMAL OXY. BURNER G-0-1061-D SH.1
12"-PA-1054-107
TO F-1 BURNER No.2 THERMAL OXY. BURNER G-0-1061-D SH.1
10"-PA-1052-107
INSTRUMENT AIR G-0-1055-D
1"-IA-1014-107
2"-LS-1016-106-I
AIR FILTER
OUT OF SERVICE
TO SOV-28 G-0-1062-D
C-7
CLARIFIED WATER SUPPLY & RETURN G-0-1055-D
SAMPLE COOLER
TO 250# STEAM G-0-1055-D
4"-HS-1013-125
FROM P-11A/B/C BOILER FEED WATER PUMPS G-0-1080-D SH.2
2"-BFW-1006-125-I
TO T-10 QUENCH TOWER G-0-1062-D
24"-P-1160-111-IP
TO DR-44 STM. BLOWDOWN DRUM G-0-1067-D SH.1
1 1/2"-BD-1011-125-IP
FROM D-42 ORGANIC K.O. POT G-0-1216-D
6"-P-7513-111
NOTES: 1. ALL OPEN-ENDED NON-FLANGED VALVES SHOULD BE PLUGGED.
2. FOR P&ID LEGEND-SEE DWG. G-S-1008-D SH.1&2.
3. FOR ELEMENTARY DIAGRAM, SEE DWG. G-0-7738-D SH.1-3
4. OFFSPEC VALVE TO BE MONEL GATE VALVE MV-10-X.
DWG. NO. REFERENCE DRAWINGS
REVISION
0 2/05 PSM FIELD VERIFICATION-NEW
1 11-05 ERF #1587 UTILITIES DCS UPGRADE AS-BUILT
2 2-07 PCR# 60603306 INSTALLED MONEL GATE VA. MV-10-IX
VULCAN MATERIALS COMPANY
CHEMICALS DIVISION
GEISMAR, LOUISIANA
PIPING & INSTRUMENT DIAGRAM
F-1 INCINERATOR UNIT
THERMAL OXIDIZER SYSTEM
UTILITIES
SCALE: NONE
DWN BY: JRD
DATE: 8/03
DWG NO. G-0-1061-D SH.2
REV. 2

ALTERNATIVE MONITORING APPLICATION PURSUANT TO 40 CFR 63.1209(g) FOR THE F-1 FURNACE

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1.0 INTRODUCTION

Occidental Chemical Company (OxyChem) operates an industrial furnace, the F-1 Furnace, at its Geismar Plant located in Ascension Parish, Geismar, Louisiana. The F-1 Furnace is currently permitted under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA). Phase II of the Hazardous Waste Combustor (HWC) Maximum Achievable Control Technology (MACT) rule was promulgated in October 2005 at 40 CFR 63 Subpart EEE. The F-1 Furnace must comply with the HWC MACT performance standards for hydrochloric acid production furnaces (HAPFs).

OxyChem is planning to conduct the comprehensive performance test (CPT) as early as February 2008. The CPT plan is being submitted to the Louisiana Department of Environmental Quality (LDEQ) and U.S. Environmental Protection Agency (EPA) Region. This Alternative Monitoring Application (AMA) is being submitted pursuant to the HWC MACT provisions in 40 CFR 63.1209(g) *Alternative monitoring requirements other than continuous emissions monitoring systems* (CEMS)

The F-1 Furnace is a captive system treating only liquid waste and process vent streams generated by the on-site manufacturing operations. All of the chemical processes produce chlorinated organic chemical products. Correspondingly, all of the liquid waste and vent streams also include chlorinated organics. These streams are treated in the F-1 Furnace on nearly a continuous basis. Natural gas is co-fired with the wastes and vent streams. Energy generated from combustion is recovered in the F-1 Furnace's boiler to produce steam for on-site use. The HCl recovery system following the energy recovery boiler removes hydrogen chloride (HCl) from the combustion gas to produce aqueous 10-18 weight percent hydrochloric acid (HCl) which is used in the facility's wastewater treatment system.

The information presented in this AMA is organized to address the content of the application required by the HWC MACT provisions at 40 CFR 63.1209(g)(1)(iii)(B). Section 2.0 provides a brief engineering description of the F-1 Furnace. Section 3.0 summarizes the alternative monitoring provisions of the HWC MACT rule, and includes:

- A description of each provision to which an alternative is being requested, and applicable details of the alternative
- Data or information justifying each alternative monitoring item being requested
- Data or information documenting that each alternative monitoring item being requested would, if approved and implemented, *"provide equivalent or better assurance of compliance with the relevant emission standard, or that it is the monitoring requirement that best assures compliance with the standard and that is technically and economically practical"*.

Section 4.0 discusses the timing for approval of the application as specified in the HWC MACT provisions.

2.0 BRIEF ENGINEERING DESCRIPTION

2.1 GENERAL DESCRIPTION

Figure 1 provides a schematic of the F-1 Furnace system. The F-1 Furnace consists of a thermal oxidizer, energy recovery boiler, quench tower, and scrubbing tower. The F-1 Furnace is used to treat liquid chlorinated organic liquid waste and vapor vent streams generated from manufacturing units at the Geismar Plant. HCl is recovered from the combustion gas and is used in the facility's wastewater treatment system.

2.2 COMBUSTOR DESCRIPTION

The F-1 Furnace was custom designed by John Zink Company and as such has no model number. System components were designed and supplied by various manufacturers.

The F-1 Furnace system is a 15 MMBtu/hr thermal oxidizer designed to oxidize liquid wastes and vapor vents. Most of the liquid wastes treated are capable of supporting autogeneous combustion. Vapor vents are generated by chemical production and loading operations on both a continuous and an intermittent basis, and are composed mostly of air and/or nitrogen and trace amounts of volatile organic vapors.

The energy recovery boiler (primary cooler) is a fire tube, shell-and-tube type boiler. The boiler is operated to produce 250 psig saturated steam. The steam produced by the system's boiler is secondary benefit. The steam generation is relatively small compared to the facility's overall steam demand. However, the heat removal provided by the boiler is necessary to produce the high concentration HCl. Without the boiler, the high HCl concentration product would not be possible.

2.3 FEED SYSTEM DESCRIPTION

F-1 Furnace is equipped with two John Zink combination fuel gas and liquid burners designed for force draft operation. The burners use natural gas to maintain combustion temperature. The burners are equipped with electric ignition gas pilots, flame scanner ports, burner plenums, and refractory tiles. Each burner is rated at 7.5 MMBtu/hr.

The liquid waste is pumped from storage tanks and is introduced into the combustion zone through the burners via steam atomized nozzles. Flow meters on the liquid waste lines measure the liquid waste feed rates.

Vapor vents are delivered to the F-1 Furnace via header systems. The organic vapors in the vents include some of the same organic constituents found in the liquid wastes. The process vapor vents are

introduced into the combustion zone through the burners. The loading rack vapor vents are introduced into the inlet side of the combustion air blower and then through the burners.

The F-1 Furnace is a forced draft (positive pressure) system. Air for combustion of auxiliary fuel, liquid waste feed, and vapor vent feed is provided via the combustion air blower. The combustion air blower is the combustion gas prime mover. Combustion air is pushed by the combustion air blower through the burners, into the combustion zone. The forced draft pushes the combustion gas through the energy recovery zone, the HCl recovery system, the caustic scrubber, and out the stack.

2.4 DESCRIPTION OF AWFCO SYSTEM

The F-1 Furnace control system includes an automatic waste feed cutoff (AWFCO) system that stops the hazardous waste feed when the control system records an operating condition outside the limits necessary to comply with permit conditions.

The vents treated in the F-1 Furnace are regulated under the facility Title V permit, and their treatment is subject to compliance with other MACT rule standards. These vents are not hazardous wastes per 40 CFR 261.21(a)(3). Vent flows to the F-1 Furnace may continue after an AWFCO occurs. Alternatively, the vents may be diverted to the F-2 Furnace.

2.5 HCl RECOVERY SYSTEM

Integral to the F-1 Furnace is an HCl recovery system. After the energy recovery boiler, HCl produced from the combustion of chlorinated organics is recovered from the combustion gas. The HCl recovery system includes the quench and scrubber tower (T-10) and the two water scrubber sections of the scrubbing tower (T-11). The HCl recovery system is operated to produce ~10-25% HCl.

T-10 is a packed column scrubber that uses recycled aqueous HCl to adiabatically saturate and cool the combustion gas to begin recovery of the HCl. The entire column contains two packed sections. The bottom section is filled with ceramic packing. The top section is filled with Kynar packing. The bottom section is on a recycle loop. The bottom section recycle loop includes heat removal via a water-cooled heat exchanger. Weak acid from the T-11 bottoms is introduced to the top of the upper packed section to control HCl strength in the tower bottoms. The top section overflows (down flows) to the bottom section. The bottom section is operated on level control. The level controller actuates valves that control the flow rate of the recovered HCl to a storage tank.

The water scrubber includes two sections of the T-11 scrubbing tower (the two lower sections). These first two sections are filled with Kynar packing. Process water or clarified water is introduced to upper water section to maintain level in the bottom. The level controller actuates valves that control the flow

rate of makeup water to the upper water section. The upper water scrubber section overflows (down flows) to the lower water scrubber section.

2.6 APC SYSTEM

The F-1 Furnace combustion gas from the HCl recovery section is treated in the caustic scrubber portion (third section) of the T-11 scrubbing tower. The T-11 caustic scrubber section removes residual HCl/Cl_2 remaining in the combustion gas after the HCl recovery. The modifications to the T-11 caustic scrubber section include replacement of the current saddle-type Kynar packing with an ultra-low differential pressure Kynar Qpac® packing. Additionally, the tray-type liquid distribution plate is replaced with a trough-style distributor. With the new packing and liquid distributor changes, the column differential pressure will be less than 1-inch water column (inwc).

The liquid level in the caustic scrubber section of the column is operated on level control. Water purged from the caustic scrubber is sent to the wastewater treatment system. Process water or clarified water is introduced to the caustic scrubber as needed to dilute salts and prevent solids precipitation.

The scrubbed combustion gas from the caustic scrubber exits the top of the column and is discharged through the integrated stack. The stack is equipped with a continuous emissions monitoring systems (CEMS) for carbon monoxide (CO) and oxygen (O_2).

3.0 ALTERNATIVES TO PARAMETRIC MONITORING PROVISIONS OF 40 CFR 63.1209

3.1 GENERAL

The 40 CFR 63.1209 provisions prescribe specific operating parameters that must be continuously monitored to demonstrate compliance with the HWC MACT standards, and how they are to be established as permit limits. These operating parameters include limits for the HWC feed streams, combustion zone, and APC system operation. Table 1 presents F-1 Furnace's major process instrumentation. The HWC MACT operating parameter limits applicable to the F-1 Furnace are presented in Table 2.

OxyChem has identified provisions of the HWC MACT requirements that do not appropriately address the unique features of the F-1 Furnace. For these situations, the HWC MACT rule at 40 CFR 63.1209(g) allows petitioning to request use of alternative monitoring procedures as long as the alternative *"would provide equivalent or better assurance of compliance with the relevant emission standard, or that it is the monitoring requirements that best assures compliance with the standard and that is technically and economically practical"*. At 40 CFR 63.1209(g)(B)(ii) of the HWC MACT also states that the application can include a request to waive an operating parameter limit if it can be demonstrated that *"neither the operating parameter limit nor an alternative operating parameter limit is needed to assure compliance with the emission standards of this subpart"* (referring to Subpart EEE – the HWC MACT rule).

Consistent with the above provisional language, OxyChem herein requests approval of variations or alternatives to specific HWC MACT prescribed operating parameters limits for the F-1 Furnace HWC units as noted in the following sections and summarized in Table 3.

3.2 LOW ENERGY SCRUBBER DIFFERENTIAL PRESSURE

The caustic scrubber for HCl/Cl_2 emissions control meets the HWC MACT definition of a low energy scrubber. One of the operating limits prescribed at 63.1209(o)(3)(ii) for low energy scrubbers is minimum pressure drop across the low energy wet scrubber. This limit is one of three limits specifically prescribed by HWC MACT as indicators of adequate liquid to gas contacting, the other two limits being minimum liquid feed pressure to a low energy wet scrubber [63.1209(o)(3)(iii)] and minimum liquid to gas ratio (L/G) [63.1209 (o)(3)(v)]. F-1 Furnace instrumentation exists or is being added to continuously monitor all three of these HWC MACT required parameters. In the CPT plan, OxyChem proposes limits for minimum liquid feed pressure and minimum L/G. OxyChem is requesting to waive the requirement for a minimum differential pressure limit based on the configuration of the F-1 Furnace's caustic scrubber.

Differential pressure does provide some limited indication of the effectiveness of water distribution within a low energy scrubber. A minimum differential pressure can provide an indication that water is being

effectively distributed over the full cross-section of the column and that channeling (gas bypassing contact with the liquid) is not occurring. Excessive differential pressure can provide an indication of column plugging and/or flooding.

As noted in Section 2.6 of this AMA, the modifications to the caustic scrubber include new ultra-low differential pressure packing and a trough-style distributor. These changes in packing and liquid distribution will result in a column differential pressure typically less than 1-inch water column (inwc). Specifically, the expected pressure drop across the caustic scrubber section can be as low as approximately 0.25 inwc. This differential pressure estimate is based on a recycle flow of 200 gpm and a combustion gas flow based on 1.5 gpm of liquid waste feed to the F-1 Furnace and no process vents. These conditions are the relative nominal, low end of the operating conditions for the F-1 Furnace. The expected pressure drop is too low to effectively provide any reliable indication or measure of proper liquid distribution. Therefore, OxyChem requests waiving differential pressure as an operating limit for the caustic scrubber.

Because OxyChem will have instrumentation to measure caustic scrubber differential pressure, OxyChem proposes to continuously monitor and record the differential pressure. However, OxyChem requests waving any requirement to have a specific limit on caustic differential pressure or to have that limit connected to the AWFCO system. The other two caustic scrubber operating limits, minimum liquid feed pressure and minimum L/G, provide adequate assurance of good liquid and gas contacting.

3.3 HCL RECOVERY SYSTEM

The caustic scrubber section of the T-11 column is the HCl/Cl_2 emissions control device. All of the preceding combustion gas/water contacting in the T-10 column and lower two sections of the T-11 comprise the HCl recovery system. OxyChem requests that no HWC MACT compliance operating parameter limits be applied to these production unit operations.

The HCl recovery system devices are operated to produce 10-18 wt% HCl. The concentration of HCl in gas phase is proportional to its vapor pressure in the liquid phase. The gas temperature in the absorber columns is typically 170-180°F. Refer to Figure 2. The vapor pressure of HCl ranges from approximately 1-8 mmHg for HCl concentrations of 10-18 wt% at 176°F. Assuming an atmospheric pressure of 760 mmHg, the potential concentration of HCl in the gas phase is 0.13-1.05% (1,300-10,500 ppm). The corresponding removal efficiencies to meet the HWC MACT emissions limit of 150 ppm are nominally 89.6-98.6%. Demonstrated HCl control efficiencies for caustic scrubbers are routinely greater than 99.9%. Additionally, previous F-1 Furnace emissions test data, prior to the HCl control modifications, show the F-1 Furnace HCl/Cl_2 emissions are less than the 150 ppm HWC MACT limit. The modifications to the caustic scrubber will only improve this performance.

Based on this information, OxyChem requests that no HWC MACT operating limits be placed on the operation of the HCl recovery system. HWC MACT-related HCl/Cl_2 controls are proposed for the caustic scrubber system. Given the relative narrow range in the variability of the caustic scrubber inlet conditions, consistent and reliable control of HCl/Cl_2 emissions via limits on the caustic scrubber operation are sufficient to assure compliance with HWC MACT.

3.4 COMBUSTION GAS VELOCITY INDICATION

All combustion gas velocity indicators for HWC units are indirect measures of combustion gas residence time. The HWC MACT rule requires establishing indicator of combustion gas velocity and residence time related to organic destruction and removal efficiency (DRE) and emissions controls. The HWC MACT rule provides significant latitude as to the designation of the appropriate indicator. Specifically, the HWC MACT rule at 63.1209(j)(2) states:

> *"As an indicator of gas residence time in the control device, you must establish and comply with a limit on the maximum flue gas flowrate, the maximum production rate, or another parameter that you document in the site-specific test plan as an appropriate surrogate for gas residence time, as the average of the maximum hourly rolling averages for each run."*

Similar language appears in multiple locations in Section 63.1209. OxyChem plans to use combustion air flow as the indicator of combustion gas velocity.

Refer to Table 4. These same data are presented as Table 2-2 of the CPT plan. Many HWC units use stack gas flow as the indirect indicator of combustion gas velocity. The data in Table 4 show the stack gas flow for the F-1 Furnace can actually be lower at higher waste feed rates. This is due to the very high concentrations of chlorine in the waste feed. The chlorine forms HCl in the combustion zone that is then removed by the HCl recovery system and caustic scrubber. The result is as waste feed rate increases, residence time in the combustion zone decreases (higher flow) while the combustion gas residence time in the downstream recovery and control devices actually increases (lower flow after initial HCl removal). The F-1 Furnace stack gas flow is actually the measure of non-HCl dry gas flow through the system. Therefore, under variable waste feed conditions, front-end combustion air flow measurement is actually a better indicator of combustion gas velocity, especially for the combustion zone residence time as it relates to organic DRE. OxyChem proposes to use combustion air flow as the indicator of combustion gas velocity.

3.5 COMPLIANCE WHEN HAZARDOUS WASTE IS NOT IN THE SYSTEM

The HWC MACT regulations in 40 CFR 63.1209(a) and 63.1209(b) include provisions that address calculating rolling averages for CEMS and parameter CMS, respectively, during periods when hazardous

waste feed is cutoff and during intermittent operations. These provisions also state that continuous monitoring of carbon monoxide and oxygen in the stack gas, and all HWC MACT required parameter CMS, must continue when hazardous waste is cutoff if the source is operating.

Provisions also state that periods of time when one-minute values are not available for calculating rolling averages must be ignored; when one-minute values become available again, the first one-minute value must be averaged with the previous one minute values (i.e. the last 59 values when calculating 1-hour rolling averages) to calculate rolling averages. In addition, clarification is made in the provisions that the facility owner/operator is not subject to the CEMS and parameter CMS requirements when hazardous waste feed is cutoff and the hazardous waste residence time has expired, provided the facility documents in the operating record the requirements that they are subject to during these periods.

OxyChem is in the process of upgrading the process control system logic so that the system reprogramming for calculating rolling averages is consistent with the HWC MACT provisions discussed above. Related programming must also be accomplished for noting and counting events that qualify as exceedences. Through a careful review of the provisions discussed above, and related conversations with EPA personnel identified as contact people for the HWC MACT rule, OxyChem has established a basis for calculating rolling averages and counting exceedences that warrant clarification in order to ensure that the programming functions are consistent with the HWC MACT. This basis is as follows:

- In the event OxyChem chooses to stop hazardous waste to the F-1 Furnace, following expiration of the residence time, all rolling average calculations for hazardous waste burning may be discontinued. At this point OxyChem may enter a mode of operation that is defined in the operating record, and demonstration of compliance with this mode will proceed as required by this mode. The operating modes and applicable limits will be defined and delineated in the startup, shutdown and malfunction plan (SSMP). When OxyChem chooses to reintroduce hazardous waste to the F-1 Furnace, the first one-minute value for each continuously monitored parameter will be added to its previous 59 one-minute average values for calculating hourly rolling averages (or 719 values for calculating 12-hour rolling averages).

- In the event of an AWFCO that includes an exceedence of any HWC MACT emission or operating parameter limit, rolling average calculations for all HWC MACT parameters will continue to be calculated. In this way, the calculation of rolling average for the parameter that was exceeded can be brought within the allowable limit (for example, lower CO one-minute average values can be utilized in the averaging calculation with the high readings that caused the AWFCO, thereby effectively lowering the HRA). However, if during this time another HWC MACT parameter exceeds its respective limit after the AWFCO occurs and the hazardous waste residence time has expired, this latter exceedence will not be counted as a permit limit exceedence. [For example, if the combustion chamber temperature dropped below the HRA limit 20 minutes after hazardous waste had cleared the combustion chamber, this would clearly not represent a real destruction and removal efficiency (DRE) incident]. When the calculated HRA for the parameter that caused the AWFCO is within its respective permit limit, and all other continuously monitored parameters are within their respective limits, hazardous waste can be reintroduced to the combustion chamber. This procedure ensures that all rolling averages can continue to be calculated consistent with EPA intended

methodology and an accurate count of "real" exceedences of the emission standards and operating parameter limits is maintained.

OxyChem requests that the agency document agreement with the described approach, as presented in this alternative monitoring application, to compliance when hazardous waste is not in the system.

4.0 AGENCY APPROVAL OF ALTERNATIVE MONITORING APPLICATIONS

This AMA is being submitted consistent with the requirement at 40 CFR 63.1209(g)(1)(iii)(A) to submit the application no later than the date of submittal of the CPT Plan. The timing for approval of this application under 40 CFR 63.1209(g)(1)(iii)(C) states that the Administrator will provide notification of the approval or intention to disapprove the application within 90 days of receipt of the application, and within 60 days after receipt of any supplementary information that is submitted. However, OxyChem plans to commence the CPT in February 2008 and welcomes comments at the agency's earliest convenience since the alternative monitoring issues identified in this application affect system design and instrument procurement activities, test planning, control system configuration, and completion of HWC MACT compliance plans.

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Table 1. F-1 Furnace Major Process Instrumentation

Parameter	Location	Inst. No.	Units	Scale	Accuracy (±% Full Scale)	Instrument Type
Hex Waste Feed	Waste Feed Line	FI-18A_PV	gpm	0-5	2%	Orifice
Solvent Waste Feed	Waste Feed Line	FI-21A_PV	gpm	0-3	2%	Orifice
Natural Gas Feed	Waste Feed Line	FI-26_PV	mscfh	0-2,000	2%	Orifice
Atomizing Steam Pressure	Steam Supply Line	PSL-19	psig	NA	NA	Low Pressure Switch
Atomizing Steam Pressure	Hex Waste Feed Line	PI-1-1	psig	0-200	0.065%	Pressure Transmitter
Atomizing Steam Pressure	Solvent Waste Feed Line	PI-1-2	psig	0-200	0.065%	Pressure Transmitter
Combustion Air Flow Rate	Compressor Discharge	FI-24A_PV	scfm	0-8,440	2%	Pitot tube
D-9 Vent Flow [a]	Vent Duct	FI-9	scfm	0-130	2%	Thermal dispersion
D-35 Vent Flow [a]	Vent Duct	FI-24-1A_PV FI-24-1B_PV	scfm	0-40 0-600	0.25%	Thermal Dispersion
D-64 Vent Flow [a]	Vent Duct	FI-64-1_PV	scfm	0-512	2%	Mass flowmeter w/ Orifice
D-76 Vent Flow [a]	Vent Duct	FI-76-1_PV	scfm	0-1,005	1%	Mass flowmeter w/ Orifice
D-398 Vent Flow [a]	Vent Duct	FI-398-1_PV	lb/hr	0-51	1%	Mass flowmeter w/ Orifice
D-559 Vent Flow [a]	Vent Duct	FIC-559-1_PV	scfm	0-2,000	2%	Orifice w/Differential Pressure
DR-2180 Vent Flow [a]	Vent Duct	FI-2180_PV	scfm	0-200	1%	V-Cone w/Differential Pressure
Oxidizer Temperature	Exit of Combustion Chamber	TI-10_PV, TI-37_PV	°F	1,000-2,500	0.2%	Type K thermocouple
Oxidizer Temperature	Exit of Combustion Chamber	TIC-5_PV	°F	1,000-2,500	0.2%	Type K thermocouple
T-11 Bottoms Acid Conc.	Discharge Line	AIC-15_PV	wt%	0-21	0.2%	Refractive index
Caustic Scrubber Recycle Flow Rate	T-11 Column Caustic Scrubber Section Recycle Line	FI-40_PV	gpm	0-300	0.5%	Magnetic flowmeter
Caustic Scrubber Recycle Flow Pressure	T-11 Column Caustic Scrubber Section Recycle Line	PI-11-3	psig	0-60	0.075%	Pressure Transmitter
Caustic Scrubber Differential Pressure	T-11 Column Caustic Scrubber Section	PDI-11-1	inwc	0-10	0.075%	Pressure Transmitter
Caustic Scrubber pH	T-11 Column Caustic Scrubber Section Recycle	AIC-2_PV	pH units	0-14	≤ 0.1 pH	pH probe and transmitter
Caustic Scrubber Ox/Red Potential	T-11 Column Caustic Scrubber Section Recycle	AIC-22-1_PV	mV	-800 to +800	≤ 1 mV	Glass measure & Reference electrodes

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Table 1. F-1 Furnace Major Process Instrumentation

Parameter	Location	Inst. No.	Units	Scale	Accuracy (±% Full Scale)	Instrument Type
Water to T-11	Feed Line to T-11 Column Water Scrubber Section Recycle	FIC-35_PV	gpm	0-50	2%	Orifice
Water to D-22 (T-11)	Feed Line	FI-22-4_PV	gpm	0-15	2%	Orifice
Caustic Flow to D-22 (T-11)	Feed Line	FIC-22-3_PV	gpm	0-28	0.5%	Magnetic flowmeter
Stack Gas CO Concentration	T-11 Stack	CO-AN-4_PV	ppm	0-100 0-1,000	2%	Non-dispersive Infrared (NDIR)
Stack Gas O_2 Concentration	T-11 Stack	O2-AN-3_PV	%vol	0-25	0.2%	Electroconductivty fuel cell
Stack Temperature	T-11 Stack	TI-7A_PV, TI-7B_PV	°F	0-400	0.2%	Type J thermocouple
Steam to Header	Steam Line	FI-27_PV	lb/hr	0-13,620	0.2%	Orifice
Boiler Temperature (B-3)	B-3	TI-6A_PV, TI-14_PV	°F	0-1,200	0.2%	Type J thermocouple

Notes:

[a] Vent flows are monitored for chlorine feed rate contribution.

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Table 2. HWC MACT Operating Limits Applicable to the F-1 Furnace

LIMIT	REGULATORY CITATION - 63.1209	HOW ESTABLISHED	AVERAGING TIME	ASSOCIATED STANDARD						
				DRE	Dioxins/ Furans	Hg	SVM	LVM	PM	HCl/ Cl_2
LIMITS ASSOCIATED WITH THE COMBUSTION SYSTEM										
Minimum combustion temperature	(j)(1), (k)(2)	Average of test run averages	Hourly rolling average	Low DRE Temp Test	Low DRE Temp Test					
Maximum combustion gas flow rate	(j)(2), (k)(3), (o)(2)	Average of the maximum hourly rolling averages	Hourly rolling average	Low DRE Temp Test	Low DRE Temp Test	Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Low DRE Temp Test
LIMITS ASSOCIATED WITH THE FEEDSTREAMS										
Maximum hazardous waste feed rate	(j)(3), (k)(4), Preamble 9/30/99 Rule, page 52937	Maximum pumpable and maximum total as the average of the maximum rolling hour averages	Hourly rolling average	Max FR DRE Test	Max FR DRE Test					
Maximum feed rate of total chlorine and chloride	(o)(1)	Average of the average hourly rolling averages	12-hour rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Max FR DRE Test
LIMITS ASSOCIATED WITH WET SCRUBBERS										
Minimum pressure drop across low energy wet scrubbers	(o)(3)(ii)	Manufacturer's specifications	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Mfr. Spec.
Minimum liquid feed pressure to a low energy wet scrubber	(o)(3)(iii)	Manufacturer's specifications	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Mfr. Spec.
Minimum scrubber water pH	(o)(3)(iv)	Average of the test run averages	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Max FR DRE Test
Minimum liquid to gas ratio (L/G)	(o)(3)(v)	Average of the test run averages	Hourly rolling average			Comply w/ HCl/Cl_2 stds. per 63.1218(a)(2), (3), (4) & (7)				Max FR DRE Test

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Table 3. Candidates for Alternative Monitoring Under §63.1209(g) – F-1 Furnace

MACT Prescriptive Monitoring Process Indicator	Alternative Procedure Proposed	Comment or Justification for Alternative Procedure Proposed
Minimum pressure drop across low energy wet scrubber, 63.1209(o)(3)(ii)	None; waiving of this additional indicator of liquid and gas contacting as an AWFCO parameter is proposed.	The modifications of to the caustic scrubber include new ultra-low differential pressure packing and a trough-style distributor. These changes in packing and liquid distribution will result in a column differential pressure typically less than 1-inch water column (inwc). Specifically, the expected pressure drop across the caustic scrubber section can be as low as approximately 0.25 inwc. This differential pressure estimate is based on a recycle flow of 200 gpm and a combustion gas flow based on 1.5 gpm of liquid waste feed to the F-1 Furnace and no process vents. These conditions are the relative nominal, low end of the operating conditions for the F-1 Furnace. The expected pressure drop is too low as to effectively provide any reliable indication or measure of proper liquid distribution. Therefore, OxyChem requests waiving differential pressure as an operating limit for the caustic scrubber. Because OxyChem will have instrumentation to measure caustic scrubber differential pressure, OxyChem proposes to continuously monitor and record the differential pressure. However, OxyChem requests waving any requirement to have a specific limit on caustic differential pressure or to have that limit connected to the AWFCO system. The other two caustic scrubber operating limits, minimum liquid feed pressure to a low energy wet scrubber [63.1209(o)(3)(iii)] and minimum liquid to gas ratio (L/G) [63.1209 (o)(3)(v)], provide adequate assurance of good liquid and gas contacting.
Limits Associated with Low Energy Wet Scrubbers, 63.1209(o)(ii)-(v)	Waive these requirements for the HCl recovery system operation; the caustic scrubber operational limits are sufficient to assure compliance with the HWC MACT HCl/Cl_2 emissions limit.	The caustic scrubber section of the T-11 column is the HCl/Cl_2 emissions control device. All of the preceding combustion gas/water contacting in the T-10 column and lower two sections of the T-11 comprise the HCl recovery system. The HCl recovery system devices are operated to produce 10-18 wt% HCl. The concentration of HCl in gas phase is proportional to its vapor pressure in the liquid phase. The vapor pressure of HCl ranges from approximately 1-8 mmHg for HCl concentrations of 10-18 wt% at 176°F. The potential concentration of HCl in the gas phase is 0.13-1.05% (1,300-10,500 ppm). The corresponding removal efficiencies to meet the HWC MACT emissions limit of 150 ppm are nominally 89.6-98.6%. Demonstrated HCl control efficiencies for caustic scrubbers are routinely greater than 99.9%. Additionally, previous F-1 Furnace emissions test data, prior to the HCl control modifications, show the F-1 Furnace HCl/Cl2 emissions are less than the 150 ppm HWC MACT limit. The planned modifications to the caustic scrubber will only improve this performance. OxyChem requests that no HWC MACT operating limits be placed on the operation of the HCl recovery system. HWC MACT-related HCl/Cl_2 controls are proposed for the caustic scrubber system. Given the relative narrow range in the variability of the caustic scrubber inlet conditions, consistent and reliable control of HCl/Cl_2 emission via limits on the caustic scrubber operation are sufficient to assure compliance with HWC MACT.

Table 3. Candidates for Alternative Monitoring Under §63.1209(g) – F-1 Furnace

MACT Prescriptive Monitoring Process Indicator	Alternative Procedure Proposed	Comment or Justification for Alternative Procedure Proposed
Maximum combustion gas flow rate, 63.1209 (j)(2), (k)(3), & (o)(2)	Combustion air flow rate	The HWC MACT rule provides significant latitude as to the designation of the appropriate indicator. Specifically, the HWC MACT rule at 63.1209(j)(2) states: *"As an indicator of gas residence time in the control device, you must establish and comply with a limit on the maximum flue gas flowrate, the maximum production rate, or another parameter that you document in the site-specific test plan as an appropriate surrogate for gas residence time, as the average of the maximum hourly rolling averages for each run."* Many HWC units use stack gas flow as the indirect indicator of combustion gas velocity. Due to the very high concentrations of chlorine in the waste feed, the stack gas flow for the F-1 Furnace can actually be lower at higher waste feed rates. The chlorine forms HCl in the combustion zone that is then removed by the HCl recovery system and caustic scrubber. The result is as waste feed rate increases, residence time in the combustion zone decreases (higher flow) while the combustion gas residence time in the downstream recovery and control devices actually increases (lower flow after initial HCl removal). The F-1 Furnace stack gas flow is actually the measure of non-HCl dry gas flow through the system. Therefore, under variable waste feed conditions, front-end combustion air flow measurement is actually a better indicator of combustion gas velocity, especially for the combustion zone residence time as it relates to organic DRE.

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Table 4. F-1 Furnace Combustion Gas Residence Time

F-1 Furnace Combustion Gas Residence Time at Low Combustion Temperature			
Estimated Stack Gas Flow:	7,600 acfm @	174 °F	
Combustion Chamber Temperature:		1,650 °F	
Estimated Stack Gas Flow @ Combustion Chamber Temperature:		25,293 acfm	
Acid Gas (as HCl) Removed by Acid Recovery and APC Systems:			
Hex Waste Feed Rate:	1,678 lb/hr	2.4 gpm	
Other Waste Waste Feed Rate:	661 lb/hr	0.90 gpm	
Hex Waste Chloride Content:	50 wt%		
Other Waste Chloride Content:	39 wt%		
Total Chloride Feed as Cl:	1,100 lb/hr		
Total Chloride Feed as HCl:	1,131 lb/hr		
Total Chloride Feed as HCl:	31.0 lbmol/hr		
HCl Volume @ Combustion Chamber Temperature:		795 acfm @	1,650 °F
Total Estimated Volumetric Flow through Combustion Chamber:		26,088 acfm @	1,650 °F
Total Combustion Chamber Volume:		1,410 ft^3	
Hazardous Waste Residence Time in the Combustion Zone:		3.2 seconds	

F-1 Furnace Combustion Gas Residence Time at Maximum Waste Feed Rate			
Estimated Stack Gas Flow:	7,200 acfm @	174 °F	
Combustion Chamber Temperature:		2,200 °F	
Estimated Stack Gas Flow @ Combustion Chamber Temperature:		30,208 acfm	
Acid Gas (as HCl) Removed by Acid Recovery and APC Systems:			
Hex Waste Feed Rate:	2,797 lb/hr	4.0 gpm	
Other Waste Waste Feed Rate:	1,101 lb/hr	1.5 gpm	
Hex Waste Chloride Content:	50 wt%		
Other Waste Chloride Content:	39 wt%		
Total Chloride Feed as Cl:	1,833 lb/hr		
Total Chloride Feed as HCl:	1,884 lb/hr		
Total Chloride Feed as HCl:	51.6 lbmol/hr		
HCl Volume @ Combustion Chamber Temperature:		1,670 acfm @	2,200 °F
Total Estimated Volumetric Flow through Combustion Chamber:		31,878 acfm @	2,200 °F
Total Combustion Chamber Volume:		1,410 ft^3	
Hazardous Waste Residence Time in the Combustion Zone:		2.7 seconds	

Note: Flow data are based on previous emissions testing results.

FIGURE 1

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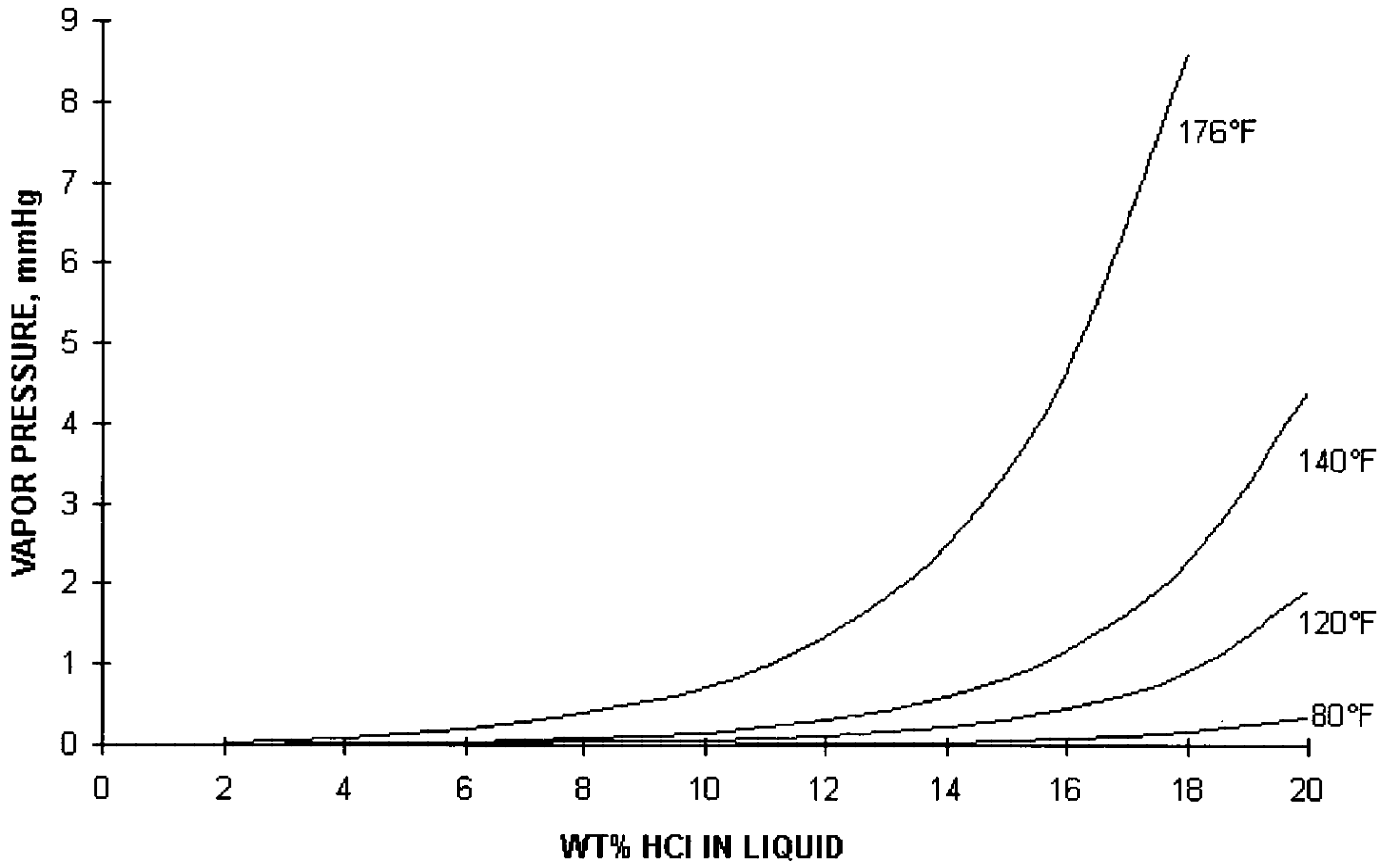

Figure 2. HCl Vapor Pressure

Source: http://www.cheresources.com/hclpicklezz.shtml

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