



ANNISTON CHEMICAL AGENT DISPOSAL FACILITY FINAL STATIC DETONATION CHAMBER EMISSIONS TEST REPORT

CONDITION 4b

Revision 0, October 2011

PREPARED BY:

Westinghouse Anniston

Trial Burn Department
3580 Morrisville Road
Anniston, AL 36201

PREPARED FOR:

Chemical Materials Agency

Anniston Field Office
3580 Morrisville Road
Anniston, AL 36201

SUBMITTED TO:

Alabama Department of Environmental Management

1400 Coliseum Boulevard
Montgomery, AL 36110-2059
Attn: Gerald Hardy

RCRA Permit Controlled Document

1	TABLE OF CONTENTS	PAGE
2	ES.1 OVERVIEW.....	ES-1
3	ES.2 SAMPLING METHODS	ES-2
4	ES.3 DAILY RUN SUMMARIES.....	ES-2
5	ES.4 PERFORMANCE STANDARDS	ES-3
6	ES.4.1 <u>Select Criteria Pollutant Emissions.....</u>	ES-3
7	ES.4.2 <u>DRE.....</u>	ES-4
8	ES.4.3 <u>Semivolatile Organic Emissions.....</u>	ES-4
9	ES.4.4 <u>Dioxin/Furan Emissions.....</u>	ES-4
10	ES.4.5 <u>Volatile Organic Emissions</u>	ES-4
11	ES.4.6 <u>TOC Emissions</u>	ES-5
12	ES.4.7 <u>Acid Gases and Particulate Emissions.....</u>	ES-5
13	ES.4.8 <u>Trace Metal Emissions.....</u>	ES-5
14	ES.4.9 <u>Energetic Emissions.....</u>	ES-5
15	ES.5 FEED PROHIBITIVE INTERLOCK LIMITS.....	ES-5
16	ES.5.1 <u>Maximum Detonation Chamber Pressure (SDC-01)</u>	ES-6
17	ES.5.2 <u>Minimum Detonation Chamber Temperature (SDC-02).....</u>	ES-6
18	ES.5.3 <u>Minimum Thermal Oxidizer Temperature (SDC-03).....</u>	ES-7
19	ES.5.4 <u>Maximum Thermal Oxidizer Pressure (SDC-04).....</u>	ES-7
20	ES.5.5 <u>Maximum Spray Dryer Temperature (SDC-05).....</u>	ES-8
21	ES.5.6 <u>Maximum Bag House Pressure (SDC-06).....</u>	ES-8
22	ES.5.7 <u>Minimum Acid Scrubber Flow Rate (SDC-07).....</u>	ES-9
23	ES.5.8 <u>Minimum Quench Tower Flow Rate (SDC-08)</u>	ES-9
24	ES.5.9 <u>Maximum Quench Tower Temperature (SDC-09).....</u>	ES-10
25	ES.5.10 <u>Maximum Neutral Scrubber Temperature (SDC-10)</u>	ES-10
26	ES.5.11 <u>Maximum Chemical Agent Emissions (SDC-11/12)</u>	ES-11
27	ES.5.12 <u>Maximum CO Concentration (SDC-13).....</u>	ES-11
28	ES.6 PROPOSED FEED RATES	ES-11
29	ES.7 DATA FOR USE IN THE HRA.....	ES-11
30	ES.8 FINAL CONCLUSIONS	ES-11
31	1.0 INTRODUCTION	1-1
32	1.1 GENERAL FACILITY INFORMATION.....	1-1
33	1.2 DATE AND TIMES OF SDC EMISSIONS TESTING.....	1-2
34	1.3 PROJECT PARTICIPANTS	1-2

1	TABLE OF CONTENTS (Continued)	PAGE
2	2.0 PROCESS DESCRIPTION	2-1
3	2.1 DESCRIPTION OF THE SDC SYSTEM	2-1
4	2.2 SUMMARY OF PROCESS MONITORS AND FLUE GAS ANALYZERS	2-6
5	2.2.1 <u>Location and Description of the Process Control System</u>	2-6
6	2.2.2 <u>Flue Gas Monitoring</u>	2-6
7	3.0 TESTING PROGRAM OVERVIEW.....	3-1
8	3.1 SDC EMISSIONS TESTING OBJECTIVES	3-1
9	3.2 PLANNED EMISSIONS TESTING PROGRAM	3-1
10	3.3 SUMMARY OF ACTUAL TESTING PERFORMED	3-1
11	4.0 FEED PROHIBITIVE INTERLOCKS.....	4-1
12	4.1 FEED RATES	4-1
13	4.2 EXHAUST GAS PARAMETERS	4-1
14	4.2.1 <u>Exhaust Gas Temperature</u>	4-1
15	4.2.2 <u>Exhaust Gas Velocity</u>	4-1
16	4.2.3 <u>APCE Control Parameters</u>	4-1
17	4.2.4 <u>CO Concentration</u>	4-1
18	4.3 FUGITIVE EMISSION SOURCES	4-2
19	5.0 EXHAUST GAS SAMPLING	5-1
20	5.1 FIELD PROGRAM DESCRIPTION	5-1
21	5.2 PRESAMPLING ACTIVITIES	5-2
22	5.2.1 <u>Equipment Calibration</u>	5-2
23	5.2.2 <u>Glassware Preparation</u>	5-3
24	5.2.3 <u>Sample Media Preparation</u>	5-3
25	5.3 SAMPLING METHODS	5-3
26	5.3.1 <u>US EPA Methods 1 and 2</u>	5-3
27	5.3.2 <u>US EPA Method 3B</u>	5-4
28	5.3.3 <u>US EPA Method 4</u>	5-4
29	5.3.4 <u>US EPA Method 6C</u>	5-5
30	5.3.5 <u>US EPA Method 7E</u>	5-5
31	5.3.6 <u>US EPA Method 10</u>	5-5
32	5.3.7 <u>SW-846 Method 0010</u>	5-6
33	5.3.8 <u>SW-846 Method 0010 for TOCs</u>	5-7
34	5.3.9 <u>SW-846 Method 0023A</u>	5-8
35	5.3.10 <u>SW-846 Method 0030</u>	5-9
36	5.3.11 <u>SW-846 Method 0040</u>	5-9
37	5.3.12 <u>US EPA Method 26A</u>	5-10

1	TABLE OF CONTENTS (Continued)		PAGE
2	5.3.13	<u>US EPA Method 29</u>	5-11
3	5.3.14	<u>US EPA Modified Method 5</u>	5-12
4	6.0	ANALYTICAL PROCEDURES.....	6-1
5	6.1	SUMMARY OF ON-SITE ANALYTICAL PROCEDURES	6-1
6	6.1.1	<u>O₂ and CO₂</u>	6-1
7	6.1.2	<u>SO₂</u>	6-1
8	6.1.3	<u>NO_x</u>	6-1
9	6.1.4	<u>CO</u>	6-2
10	6.1.5	<u>Volatile TOCs</u>	6-2
11	6.1.6	<u>Mustard Agent in Exhaust Gas</u>	6-2
12	6.2	SUMMARY OF OFF-SITE ANAYTICAL PROCEDURES	6-3
13	6.2.1	<u>Semivolatile Organics</u>	6-3
14	6.2.2	<u>Dioxins/Furans</u>	6-4
15	6.2.3	<u>Volatile Organics</u>	6-4
16	6.2.4	<u>Total Volatile, Semivolatile, and Nonvolatile Organics</u>	6-5
17	6.2.5	<u>Acid Gases</u>	6-6
18	6.2.6	<u>Particulates</u>	6-6
19	6.2.7	<u>Trace Metals</u>	6-6
20	6.2.8	<u>Energetics</u>	6-7
21	7.0	QA/QC RESULTS.....	7-1
22	7.1	LABORATORY QUALIFICATIONS AND ANALYTICAL STANDARDS	7-1
23	7.1.1	<u>Data Validation</u>	7-1
24	7.1.2	<u>Data Reporting</u>	7-1
25	7.2	FIELD QC SUMMARY	7-1
26	7.2.1	<u>Calibration Procedures</u>	7-1
27	7.2.2	<u>Equipment Leak Checks</u>	7-2
28	7.2.3	<u>Field Blanks</u>	7-2
29	7.3	SAMPLE MANAGEMENT.....	7-2
30	7.3.1	<u>Sample Preservation</u>	7-2
31	7.3.2	<u>Sample Traceability</u>	7-2
32	7.3.3	<u>Sample Transportation and Receiving</u>	7-3
33	7.3.4	<u>Sample Shipping</u>	7-3
34	7.3.5	<u>Sample Holding Times</u>	7-3
35	7.3.6	<u>COC Documentation</u>	7-4
36	7.4	SAMPLE COLLECTION.....	7-4
37	7.4.1	<u>Isokinetic Sampling</u>	7-5

1	TABLE OF CONTENTS (Continued)	PAGE
2	7.4.2 <u>Non-Isokinetic Sampling</u>	7-6
3	7.5 DATA VALIDATION RESULTS	7-9
4	7.5.1 <u>Semivolatile Organics</u>	7-10
5	7.5.2 <u>Semivolatile and Nonvolatile TOCs</u>	7-13
6	7.5.3 <u>Dioxins/Furans</u>	7-15
7	7.5.4 <u>Volatile Organics</u>	7-17
8	7.5.5 <u>Volatile TOCs</u>	7-22
9	7.5.6 <u>Acid Gases</u>	7-25
10	7.5.7 <u>Particulates</u>	7-26
11	7.5.8 <u>Trace Metals</u>	7-26
12	7.5.9 <u>Energetics</u>	7-29
13	7.5.10 <u>Mustard</u>	7-30
14	7.6 CONCLUSIONS	7-31
15	7.6.1 <u>Comparability of Analytical Data</u>	7-31
16	7.6.2 <u>Representativeness of Analytical Data</u>	7-31
17	7.6.3 <u>Completeness of Analytical Data</u>	7-31
18	7.6.4 <u>Analytical Data Usability</u>	7-31
19	8.0 TRIAL BURN RESULTS SUMMARY	8-1
20	8.1 DAILY RUN SUMMARIES	8-1
21	8.2 CYCLONIC FLOW CHECK	8-2
22	8.3 PERFORMANCE STANDARD RESULTS	8-2
23	8.3.1 <u>Select Criteria Pollutant Emissions</u>	8-2
24	8.3.2 <u>DRE</u>	8-2
25	8.3.3 <u>Semivolatile Organic Emissions</u>	8-3
26	8.3.4 <u>Dioxin/Furan Emissions</u>	8-3
27	8.3.5 <u>Volatile Organic Emissions</u>	8-3
28	8.3.6 <u>TOC Emissions</u>	8-3
29	8.3.7 <u>Acid Gases and Particulate Emissions</u>	8-3
30	8.3.8 <u>Trace Metals Emissions</u>	8-3
31	8.3.9 <u>Energetic Emissions</u>	8-4
32	8.4 FEED PROHIBITIVE INTERLOCKS	8-4
33	8.4.1 <u>Maximum Detonation Chamber Pressure (SDC-01)</u>	8-4
34	8.4.2 <u>Minimum Detonation Chamber Temperature (SDC-02)</u>	8-5
35	8.4.3 <u>Minimum Thermal Oxidizer Temperature (SDC-03)</u>	8-5
36	8.4.4 <u>Maximum Thermal Oxidizer Pressure (SDC-04)</u>	8-6
37	8.4.5 <u>Maximum Spray Dryer Temperature (SDC-05)</u>	8-6
38	8.4.6 <u>Maximum Bag House Pressure (SDC-06)</u>	8-7

1	TABLE OF CONTENTS (Continued)		PAGE
2	8.4.7	<u>Minimum Acid Scrubber Flow Rate (SDC-07)</u>	8-7
3	8.4.8	<u>Minimum Quench Tower Flow Rate (SDC-08)</u>	8-7
4	8.4.9	<u>Maximum Quench Tower Temperature (SDC-09)</u>	8-8
5	8.4.10	<u>Maximum Neutral Scrubber Temperature (SDC-10)</u>	8-8
6	8.4.11	<u>Maximum Chemical Agent Emissions (SDC-11/12)</u>	8-9
7	8.4.12	<u>Maximum CO Concentration (SDC-13)</u>	8-9
8	8.5	PROPOSED FEED RATES	8-9
9	8.6	DATA FOR USE IN RISK ASSESSMENT	8-10
10	8.7	FINAL CONCLUSIONS.....	8-10

11	LIST OF FIGURES		PAGE
12	1-1	Organizational Chart.....	1-3
13	5-1	Traverse Point Locations for the SDC Exhaust Duct	5-14
14	5-2	SW-846 Methods 0010 and 0023A Sampling Train.....	5-16
15	5-3	SW-846 Method 0030 Sampling Train.....	5-17
16	5-4	SW-846 Method 0040 Sampling Train.....	5-18
17	5-5	US EPA Method 26A Sampling Train.....	5-19
18	5-6	US EPA Method 29 Sampling Train	5-20
19	5-7	US EPA Modified Method 5 Sampling Train.....	5-21

20	LIST OF TABLES		PAGE
21	ES-1	Sampling Time Intervals.....	ES-13
22	ES-2	Summary of Select Criteria Pollutant Emissions.....	ES-13
23	ES-3	Summary of DRE.....	ES-13
24	ES-4	Summary of Semivolatile Organic Emissions	ES-14
25	ES-5	Summary of Dioxin/Furan Emissions.....	ES-18
26	ES-6	Summary of Volatile Organic Emissions	ES-19
27	ES-7	Summary of TOC Emissions	ES-21
28	ES-8	Summary of Acid Gases and Particulate Emissions	ES-21
29	ES-9	Summary of Trace Metals Emissions	ES-22
30	ES-10	Summary of Energetic Emissions.....	ES-23
31	2-1	FPI Conditions for Mustard and Conventional WMM.....	2-7
32	3-1	Sampling Matrix for Exhaust Gas.....	3-2
33	3-2	Deviation Summary	3-3
34	4-1	Summary of FPI Parameters	4-3
35	4-2	Summary of Tray Weights and Time Intervals.....	4-5
36	4-3	Chloride/Metals Feed Rate Determination	4-8
37	5-1	Calibration Procedures for Equipment.....	5-21

1	<u>LIST OF TABLES (Continued)</u>		<u>PAGES</u>
2	5-2	Isokinetic Sampling Train Summary	5-22
3	5-3	Non-Isokinetic Sampling Train Summary	5-23
4	7-1	Field and Laboratory Sample Identification Cross Reference Guide	7-32
5	7-2	Leak Checks.....	7-39
6	7-3	Semivolatile Organic Sample Holding Time Summary	7-40
7	7-4	Semivolatile Surrogate Standard Results.....	7-41
8	7-5	Semivolatile LCS Results	7-42
9	7-6	Semivolatile TOC Holding Time and Surrogate Standard Results	7-42
10	7-7	Semivolatile TOC LCS Results	7-43
11	7-8	Dioxin/Furan Sample Holding Time Summary	7-43
12	7-9	Dioxin/Furan Internal and Surrogate Standard Results	7-44
13	7-10	Dioxin/Furan LCS Results	7-45
14	7-11	Volatile Holding Time Summary and Surrogate Standard Results	7-46
15	7-12	Volatile LCS Results.....	7-48
16	7-13	Volatile TOC Condensate Holding Time Summary and Surrogate Standard	
17		Results.....	7-49
18	7-14	Volatile TOC Field Spike Results.....	7-49
19	7-15	Volatile TOC LCS Results.....	7-50
20	7-16	Volatile TOC Condensate LCS/LCSD Results.....	7-50
21	7-17	Acid Gas Sample Holding Time Summary	7-51
22	7-18	Acid Gas LCS Results	7-51
23	7-19	Acid Gas MS/MSD Results	7-51
24	7-20	Trace Metal Blank Results.....	7-52
25	7-21	Trace Metal LCS Results	7-53
26	7-22	Trace Metal MS/MSD Results.....	7-54
27	7-23	Energetic Holding Time Summary and Surrogate Standard Results.....	7-55
28	7-24	Energetic LCS Results	7-56
29	8-1	Sampling Time Intervals.....	8-11
30	8-2	Summary of Select Criteria Pollutant Emissions.....	8-11
31	8-3	DRE Summary	8-12
32	8-4	Semivolatile Organic Emissions Summary	8-13
33	8-5	Dioxin/Furan Emissions Summary	8-33
34	8-6	Volatile Organic Emissions Summary.....	8-37
35	8-7	TOC Emissions Summary.....	8-43
36	8-8	Semivolatile Unspeciated Organics Emissions Summary	8-43
37	8-9	Volatile Unspeciated Organics Emissions Summary	8-44
38	8-10	Acid Gases and Particulate Emissions Summary	8-47
39	8-11	Trace Metals Emissions Summary.....	8-48

1	<u>LIST OF TABLES (Continued)</u>		<u>PAGES</u>
2	8-12	Energetic Emissions Summary	8-51
3	8-13	Proposed Feed Rates	8-52
4	<u>LIST OF APPENDICES</u>		
5	A	RCRA PDARS Reports	
6	B	Final ANCDF SDC Emissions Test Plan, Revision 4	
7	C	Sampling Report	
8	C-1	Sample Logs	
9	C-2	Raw Field Data	
10	C-3	Reduced Field Data	
11	D	Instrument Calibration Records	
12	D-1	Process Control Equipment	
13	D-2	Facility CEMS	
14	D-3	Sampling Equipment	
15	E	Feed Sheets	
16	F	Analytical Data Packages	
17	F-1	SO ₂ and NO _x CEMS	
18	F-2	Semivolatile Organics	
19	F-3	Dioxins and Furans	
20	F-4	Volatile Organics	
21	F-5	Semivolatile Unspeciated Organics	
22	F-6	Volatile Unspeciated Organics	
23	F-7	Volatile Condensates	
24	F-8	Acid Gases and Particulates	
25	F-9	Trace Metals	
26	F-10	Energetics	
27	G	DAAMS DRE Package	
28	H	Emission Results for C4bR2 and Particulate Results from C4bR5	
29			

ACRONYMS AND ABBREVIATIONS

- 1
- 2 %percent
- 3 @at
- 4 ---.....not applicable
- 5 ±plus or minus
- 6 <less than
- 7 >greater than
- 8 ≤less than or equal to
- 9 ≥greater than or equal to
- 10 °degree
- 11 °Cdegree Celsius
- 12 °F.....degree Fahrenheit
- 13 3X.....3 times
- 14 5X.....5 times
- 15 6X.....6 times
- 16 50X.....50 times
- 17 100X.....100 times
- 18
- 19 AACADEM Administrative Code
- 20 AAHH.....alarm analyzer high-high
- 21 ADEM.....Alabama Department of Environmental Management
- 22 amu.....atomic mass unit
- 23 ANCDF.....Anniston Chemical Agent Disposal Facility
- 24 APCEair pollution control equipment
- 25 ASC.....allowable stack concentration
- 26
- 27 C1Condition 1
- 28 C2.....Condition 2
- 29 C3.....Condition 3
- 30 C4aCondition 4a
- 31 C4b.....Condition 4b
- 32 CAAClean Air Act
- 33 CCC.....calibration check compound
- 34 CCVcontinuing calibration verification
- 35 CDDchlorinated dibenzo-p-dioxin
- 36 CDF.....chlorinated dibenzofuran
- 37 CEMS.....continuous emissions monitoring system
- 38 cfcubic feet
- 39 cfmcubic feet per minute
- 40 CFR.....Code of Federal Regulations
- 41 COcarbon monoxide
- 42 CO₂.....carbon dioxide
- 43 COCchain-of-custody
- 44 CONControl Room
- 45 CVAAS.....cold vapor atomic absorption spectroscopy

ACRONYMS AND ABBREVIATIONS (Continued)

1	
2	DAAMSDepot Area Air Monitoring System
3	DAS.....Data Acquisition System
4	DCLSdetonation chamber lifting system
5	DCRSdetonation chamber rotating system
6	DIdeionized
7	DLdetection limit
8	DRE.....destruction and removal efficiency
9	dscf.....dry standard cubic feet
10	dscf/hrdry standard cubic feet per hour
11	dscfm.....dry standard cubic feet per minute
12	dscmdry standard cubic meter
13	dsL.....dry standard liter
14	EPA.....Environmental Protection Agency
15	
16	FIDflame ionizing detector
17	FIS.....flow indicting sensor
18	FPDflame photometric detector
19	FPI.....feed prohibitive interlock
20	
21	g.....grams
22	GCgas chromatography
23	g/g-molegram per gram-mole
24	gr/dscfgrains per dry standard cubic feet
25	GRAVgravimetric
26	g/s.....grams per second
27	
28	HCl.....hydrogen chloride
29	HEPAhigh efficiency particulate air
30	HNO ₃nitric acid
31	H ₂ Owater
32	H ₂ O ₂hydrogen peroxide
33	HPLChigh performance liquid chromatography
34	HRAHealth Risk Assessment
35	HRGChigh resolution gas chromatograph
36	HRMShigh resolution mass spectroscopy
37	hrs.....hours
38	H ₂ SO ₄sulfuric acid
39	
40	IAW.....in accordance with
41	IC.....ion chromatography
42	ICALinitial calibration
43	ICPinductively coupled plasma
44	ICSinterference check sample
45	IDidentification
46	IDinduced draft

ACRONYMS AND ABBREVIATIONS (Continued)

- 1
- 2 ininches
- 3 inHg.....inch of mercury
- 4 inwc.....inch of water column
- 5
- 6 KMnO₄.....potassium permanganate
- 7
- 8 Lliters
- 9 lbspounds
- 10 lb/lb-molepound per pound-mole
- 11 lbs/hrpounds per hour
- 12 LCSlaboratory control sample
- 13 LCSDlaboratory control sample duplicate
- 14 LDC.....lower detonation chamber
- 15 L/min.....liter per minute
- 16 LOP.....Laboratory Operating Procedure
- 17
- 18 M1US EPA Method 1
- 19 M2US EPA Method 2
- 20 M3BUS EPA Method 3B
- 21 M4US EPA Method 4
- 22 M5US EPA Method 5
- 23 M6CUS EPA Method 6C
- 24 M7E.....US EPA Method 7E
- 25 M10.....US EPA Method 10
- 26 M26AUS EPA Method 26A
- 27 M29.....US EPA Method 29
- 28 MM5E.....US EPA Modified Method 5
- 29 M0010SW-846 Method 0010
- 30 M0023ASW-846 Method 0023A
- 31 M0030SW-846 Method 0030
- 32 M0040SW-846 Method 0040
- 33 M3510CSW-846 Method 3510C
- 34 M3535SW-846 Method 3535
- 35 M3540CSW-846 Method 3540C
- 36 M3542SW-846 Method 3542
- 37 M5041ASW-846 Method 5041A
- 38 M6020SW-846 Method 6020
- 39 M7470ASW-846 Method 7470A
- 40 M7471ASW-846 Method 7471A
- 41 M8260BSW-846 Method 8260B
- 42 M8270CSW-846 Method 8270C
- 43 M8290SW-846 Method 8290
- 44 M8330SW-846 Method 8330
- 45 MACTMaximum Achievable Control Technologies
- 46 MAXmaximum
- 47 MDL.....method detection limit

ACRONYMS AND ABBREVIATIONS (Continued)

- 1
- 2 mgmilligram
- 3 mg/dscmmilligrams per dry standard cubic meter
- 4 mg/m³milligrams per cubic meter
- 5 mg/scmmilligrams per standard cubic meter
- 6 MIN.....minimum
- 7 mLmilliliter
- 8 mmmillimeter
- 9 mmHgmillimeters mercury
- 10 MS.....matrix spike
- 11 MS.....mass spectrometer
- 12 MSDmass spectrometer detector
- 13 MSDmatrix spike duplicate
- 14
- 15 N.....normal
- 16 NaOHsodium hydroxide
- 17 ND.....not detected
- 18 ng.....nanograms
- 19 ng/dscmnanograms per dry standard cubic meter
- 20 NO_xnitrogen oxides
- 21
- 22 O₂oxygen
- 23 OGTOff-Gas Treatment System
- 24
- 25 PDARS.....process data acquisition and recording system
- 26 PDSpressure differential sensor
- 27 pg.....picograms
- 28 PICpressure indicating controller
- 29 PICproduct of incomplete combustion
- 30 PISApressure indicating sensing alarm
- 31 PLCprogrammable logic controller
- 32 ppmvparts per million volume
- 33 psi.....pounds per square inch
- 34
- 35 QA.....quality assurance
- 36 QAPPQuality Assurance Project Plan
- 37 QC.....quality control
- 38 QLquality lab
- 39 QPquality plant
- 40
- 41 R1Run 1
- 42 R2.....Run 2
- 43 R3.....Run 3
- 44 R4.....Run 4
- 45 R5.....Run 5
- 46 RCRA.....Resources Conservation and Recovery Act
- 47 RF.....response factor

ACRONYMS AND ABBREVIATIONS (Continued)

1	
2	RLreporting limit
3	ROHArolling hourly average
4	RPD.....relative percent difference
5	RSD.....relative standard deviation
6	RTretention time
7	
8	SAPSampling and Analysis Plan
9	scmstandard cubic meters
10	scm/hr.....standard cubic meters per hour
11	SDC.....Static Detonation Chamber
12	SFUSafeguard Filter Unit
13	SICsulfur-impregnated carbon
14	sLpmstandard liters per minute
15	SPCC.....system performance check compounds
16	SO ₂sulfur dioxide
17	
18	TCO.....total chromatographable organic
19	TEFtoxic equivalent factor
20	TEQ.....toxic equivalent quotient
21	TI.....temperature indication
22	TIAtemperature indicating alarm
23	TICtemperature indicating controller
24	TICtentatively identified compound
25	TICSAtemperature indicating sensing alarm
26	TOC.....total organic compound
27	TRM.....temporary reference method
28	
29	UDCupper discharge conveyor
30	ug.....micrograms
31	ug/dscm.....micrograms per dry standard cubic meter
32	ug/L.....micrograms per liter
33	USUnited States
34	
35	VACvacuum
36	
37	WAWestinghouse Anniston
38	WMM.....waste military munition

1 **ES.1 OVERVIEW**

2 Anniston Chemical Agent Disposal Facility (ANCDF) conducted emissions testing for mustard-
3 filled munitions with sulfur-impregnated carbon (SIC) in the Safeguard Filter Unit (SFU)
4 (Condition 4b [C4b]) on the Static Detonation Chamber (SDC) System from August 9 to 12,
5 2011, as summarized in Table ES-1, with preliminary information collected on August 8, 2011.
6 Emissions testing results for conventional weapons (Condition 1 [C1]), surrogates (Conditions 2
7 [C2] and 3 [C3]), and chemical agent at a reduced feed rate (Condition 4a [C4a]) were submitted
8 to the Alabama Department of Environmental Management (ADEM) in previous reports.

9 The purpose of this final report is to convey to the ADEM data regarding the performance
10 standards and processing parameters that are enumerated in the Resource Conservation and
11 Recovery Act (RCRA) and Clean Air Act (CAA) Permits for the SDC System. The emissions
12 tests were performed to demonstrate the following objectives as outlined in the ANCDF SDC
13 Emissions Test Plan:

- 14 • Demonstrate the destruction and removal efficiency (DRE) of greater than or
15 equal to (\geq) 99.9999 percent (%) for mustard agent at a feed rate of up to
16 72 pounds per hour (lbs/hr) of mustard agent;
- 17 • Demonstrate a rolling hourly average (ROHA) allowable stack concentration
18 (ASC) of less than ($<$) 0.006 milligrams per cubic meter (mg/m^3) and/or
19 instantaneous ASC of $< 0.03 \text{ mg}/\text{m}^3$ for mustard agent; and
- 20 • Demonstrate that emissions are less than the screening levels established in the
21 Health Risk Assessment (HRA).

22 For C4b, a total of five (5) test runs were conducted; however, only Runs 1, 4, and 5 were used
23 to compare emissions to permitted limits. At the conclusion of C4b Run 2 (C4bR2, etc.), it was
24 discovered that quality plant (QP) Depot Area Air Monitoring System (DAAMS) tubes were not
25 installed for sample collection thus rendering the run unacceptable for DRE and feed rate
26 compliance purposes. With the exception of particulates, the C4bR2 sampling trains were
27 analyzed for informational purposes. The C4bR2 particulate results were used for compliance
28 purposes due to a sampling method deviation incurred during C4bR5 on the acid gas/particulate
29 sampling train. Particulate results for C4bR5 have been included for informational purposes
30 only. C4bR3 was invalidated due to carbon monoxide (CO) exceeding permitted limits.

31 All testing and system/analytical data collection planned for C4b were completed. ANCDF has
32 reviewed the data to assess their usability and to determine appropriate operating conditions for
33 the SDC System. All data have been determined to be useable for their intended purpose.

34 The operating condition of the SDC System was captured by the Process Data Acquisition and
35 Recording System (PDARS). Data was collected in one (1)-minute averages during actual
36 sampling.

1 **ES.2 SAMPLING METHODS**

2 On-site sampling activities included the equipment staging in the field, sampling operations, data
3 logging, and sample recovery. Exhaust gas samples were collected using the following methods
4 in accordance with (IAW) the approved ANCDF SDC Emissions Test Plan and are as follows:

- 5 • United States (US) Environmental Protection Agency (EPA) Methods 1 (M1) and
6 2 (M2) for traverse sampling locations and flow rates;
- 7 • US EPA Method 3B (M3B) for carbon dioxide (CO₂) and oxygen (O₂) levels;
- 8 • US EPA Method 4 (M4) for moisture;
- 9 • US EPA Method 6C (M6C) for sulfur dioxide (SO₂) emissions;
- 10 • US EPA Method 7E (M7E) for nitrogen oxides (NO_x) emissions;
- 11 • US EPA Method 10 (M10) for CO concentrations;
- 12 • SW-846 Method 0010 (M0010) for semivolatile, unspciated, and gravimetric
13 organic emissions [two (2) sampling trains];
- 14 • SW-846 Method 0023A (M0023A) for dioxin/furan emissions;
- 15 • SW-846 Method 0030 (M0030) for volatile organic emissions;
- 16 • SW-846 Method 0040 (M0040) for volatile unspciated organic emissions;
- 17 • US EPA Method 26A (M26A) for the acid gas and particulate emissions;
- 18 • US EPA Method 29 (M29) for trace metal emissions, and
- 19 • US EPA Modified Method 5 (MM5E) for energetic emissions.

20 **ES.3 DAILY RUN SUMMARIES**

21 The following are daily accounts of the on-site test activities. These summaries are presented in
22 sequential order for the entire emissions testing effort and include the preliminary measurements.
23 Table ES-1 presents a summary of the sampling times.

24 **Monday, August 8, 2011 - C4b Preliminary Measurements:** Preliminary velocity traverses
25 and cyclonic flow checks were conducted at the exhaust blower duct prior to the start of the
26 emissions test for C4b. Moisture runs were also conducted to verify the moisture content of the
27 exhaust gas. The cyclonic flow measurements within the duct at the sampling location yielded
28 results within specified limits. All velocity and moisture measurements were reliable indicators
29 of actual flow and moisture conditions and did not change appreciably from run to run. The
30 M0010, M0010 for total organic compounds (M0010-TOC), M0023A, M26A, and M29 field
31 blank sampling trains were set-up and recovered.

32 **Tuesday, August 9, 2011 - C4bR1:** Exhaust gas sampling commenced at 1110 hours (hrs) and
33 was paused at 1310 hrs for port change. All leak checks were successfully completed. Sampling
34 resumed in the second port at 1420 hrs and concluded at 1620 hrs with all leak checks
35 successfully completed. All samples were recovered, labeled, and custody-sealed.

1 **Wednesday, August 10, 2011 - C4bR2:** Exhaust gas sampling commenced at 0940 hrs and
2 was paused at 1140 hrs for port change. All leak checks were successfully completed. Sampling
3 resumed in the second port at 1505 hrs and concluded at 1705 hrs with all leak checks
4 successfully completed. At the conclusion of C4bR2, it was discovered that QP DAAMS tubes
5 were not installed for sample collection thus rendering the run unacceptable for DRE and feed
6 rate compliance purposes. All other samples were recovered, labeled, and custody-sealed.

7 **Thursday, August 11, 2011 - C4bR3:** Exhaust gas sampling commenced at 1130 hrs and was
8 paused at 1330 hrs for port change. All leak checks were successfully completed. Sampling
9 resumed in the second port at 1650 hrs and paused at 1746 hrs due to a Feed Prohibitive
10 Interlock (FPI) (SDC-13: CO Concentration) being incurred preventing further feed. Once the
11 FPI was cleared, sampling resumed at 2041 hrs and concluded at 2145 hrs with all leak checks
12 successfully completed. All samples were recovered, labeled, and custody-sealed. The MM5E
13 field blank sample train was also set-up and recovered.

14 **Friday, August 12, 2011 - C4bR4:** Exhaust gas sampling commenced at 1735 hrs and was
15 paused at 1935 hrs for port change. All leak checks were successfully completed. Sampling
16 resumed in the second port at 2055 hrs and concluded at 2255 hrs with all leak checks
17 successfully completed. All samples were recovered, labeled, and custody-sealed.

18 **Saturday, August 13, 2011 - C4bR5:** Exhaust gas sampling commenced at 1155 hrs and was
19 paused at 1355 hrs for port change. All leak checks were successfully completed. Sampling
20 resumed in the second port at 1600 hrs and concluded at 1800 hrs with all leak checks
21 successfully completed. All samples were recovered, labeled, and custody-sealed.

22 **ES.4 PERFORMANCE STANDARDS**

23 The measured performance standards are discussed in the following sections.

24 **ES.4.1 Select Criteria Pollutant Emissions**

25 CO concentrations were measured by the facility and Temporary Reference Method (TRM)
26 Continuous Emissions Monitoring System (CEMS) located on the exhaust blower duct. Control
27 of products of incomplete combustion was demonstrated by monitoring the CO concentration
28 (ROHA) to below the RCRA/CAA Permit limit of 100 parts per million by volume (ppmv), dry
29 basis, corrected to 7% O₂. CO concentrations were also measured by a TRM CEMS located on
30 the exhaust blower duct. As summarized in Table ES-2, the average ROHA CO concentrations,
31 measured by facility and TRM CEMS, were in compliance with the RCRA/CAA Permit limit of
32 100 ppmv, dry basis, corrected to 7% O₂. The average instantaneous CO emission rates were
33 also in compliance with the CAA Permit limit of 0.02 lbs/hr.

34 SO₂ and NO_x emissions were measured by the TRM CEMS located on the exhaust blower duct.
35 As summarized in Table 7, the average SO₂ and NO_x emission rates were in compliance with the
36 CAA Permit limit of 7.20 and 0.80 lbs/hr, respectively.

37 Composite exhaust gas samples were collected to determine the concentration of O₂ and CO₂ to
38 be used in the calculation of the exhaust gas molecular weight. This calculated molecular weight

1 was used by individual sampling trains to calculate specific parameters associated with gas flow
2 and sampling train isokinetic percentages. In addition, the O₂ data was used to correct emission
3 rates.

4 **ES.4.2 DRE**

5 The DRE results are summarized in Table ES-3. The agent emissions were measured by a
6 DAAMS that was located at the exhaust blower duct near the location where exhaust gas
7 sampling was occurring. The four (4)-hour DAAMS tube set was analyzed for mustard agent
8 concentration by the on-site laboratory. The DRE was calculated per the method specified in
9 ADEM Administrative Code (AAC) 335-14-5-.15(4)(a)1 as follows:

$$10 \quad DRE = \left(\frac{W_{in} - W_{out}}{W_{out}} \right) \times 100$$

11 Where:

12 Win = Feed rate (lbs/hr)
13 Wout = Emission rate (lbs/hr)

14 The feed rate was determined based on the amount of agent per hour demonstrated (see
15 Table ES-3). Further, the feed rate was purity-adjusted which provides a worst-case or lowest
16 DRE. The mustard agent DRE for all runs was in compliance with the RCRA/CAA Permit limit
17 of 99.9999%.

18 **ES.4.3 Semivolatile Organic Emissions**

19 Table ES-4 summarizes the semivolatile organic emissions results by test run and condition
20 average. No blank corrections have been made to the data. In instances where non-detects
21 (NDs) were incurred, the reporting limit (RL) was used to calculate an emissions rate. No
22 permitted emission limits are associated with semivolatile organic emissions.

23 **ES.4.4 Dioxin/Furan Emissions**

24 Table ES-5 summarizes the dioxin/furan emissions results by test run and condition average. No
25 blank corrections have been made to the data. In instances where NDs were incurred, the RL
26 was used to calculate an emissions rate. The US EPA toxicity equivalency factors (TEFs) were
27 applied to the detected quantities of each isomer, as well as the total congeners
28 (EPA/100/R-10/005). For the isomer-specific results, the applicable TEF was used to determine
29 the toxicity equivalency quotient (TEQ). The dioxin/furan emission rates for all runs were in
30 compliance with the CAA Permit limit of 0.20 nanograms-TEQ per dry standard cubic meter
31 (ng-TEQ/dscm), corrected to 7% O₂ using Orsat data.

32 **ES.4.5 Volatile Organic Emissions**

33 Table ES-6 summarizes the volatile organic emissions results by test run and condition average.
34 No blank corrections have been made to the data. In instances where NDs were incurred, the RL
35 was used to calculate an emissions rate. No permitted emission limits are associated with
36 volatile organic emissions.

1 **ES.4.6 TOC Emissions**

2 Table ES-7 summarizes the TOC emissions results by test run and condition average. Sampling
3 for volatile/semivolatile unspciated and gravimetric organics was conducted using the M0010
4 and M0040 sampling trains. In instances where NDs were incurred, the RL was used to calculate
5 an emissions rate. No permitted emission limits are associated with TOC emissions.

6 **ES.4.7 Acid Gases and Particulate Emissions**

7 Table ES-8 summarizes the acid gases and particulate emissions results by test run and condition
8 average. No blank corrections have been made to the data. In instances where NDs were
9 incurred, the RL was used to calculate an emissions rate. The chlorine equivalent concentrations
10 for all runs were in compliance with the CAA Permit limit of 21 ppmv, corrected to 7% O₂ using
11 Orsat data. The particulate emission rates for all runs were in compliance with the RCRA/CAA
12 Permit limit of 0.013 grains per dry standard cubic feet (gr/dscf), corrected to 7% O₂ using Orsat
13 data.

14 **ES.4.8 Trace Metal Emissions**

15 Table ES-9 summarizes the trace metal emissions results by test run and condition average. No
16 blank corrections have been made to the data. In instances where NDs were incurred, the RL
17 was used to calculate an emissions rate. The low-volatile (arsenic, beryllium, and chromium
18 combined), semivolatile (cadmium and lead combined), and high-volatile (mercury) metal
19 emission rates for all runs were in compliance with the CAA Permit limits of 23, 10, and
20 8.1 micrograms per dry standard cubic meter (ug/dscm), corrected to 7% O₂ using Orsat data,
21 respectively.

22 **ES.4.9 Energetic Emissions**

23 Table ES-10 summarizes the energetic emissions results by test run and condition average. No
24 blank corrections have been made to the data. In instances where NDs were incurred, the RL
25 was used to calculate an emissions rate. No permitted emission limits are associated with
26 energetic emissions.

27 **ES.5 FPI LIMITS**

28 Based on the C4b emission results and PDARS data, the FPI parameters were within those listed
29 in Table 2 of the ANCDF SDC Emissions Test Plan and demonstrate that the current permitted
30 setpoints are protective of human health and the environment.

31 Emissions tests have been performed for five (5) test conditions at the SDC. C1 was for
32 processing conventional weapons without SIC in the SFU. C2 and C3 were for processing
33 surrogates, including metal oxides, with (C3) and without (C2) SIC in the SFU. C4a and C4b
34 were for processing chemical agent, at low (C4a) and high (C4b) feeds, with SIC in the SFU.
35 C3, C4a, and C4b were used for FPI determination because of the requirement to use SIC in the
36 SFU while processing conventional or chemical agent munitions.

1 **ES.5.1 Maximum Detonation Chamber Pressure (SDC-01)**

2 The instantaneous FPI setpoint for the maximum detonation chamber pressure was 362 psi. The
 3 following detonation chamber pressures were measured during C3, C4a, and C4b emission
 4 testing:

Statistic (psi)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	2.72	2.88	2.88	2.83
Maximum	8.59	8.57	8.24	8.46
Average	5.87	6.12	6.10	6.03
Statistic (psi)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	4.54	3.25	2.80	3.53
Maximum	10.81	16.12	9.54	12.15
Average	6.57	5.64	4.10	5.44
Statistic (psi)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	7.61	3.50	0.063	3.72
Maximum	18.32	13.01	9.80	13.71
Average	10.42	6.29	2.22	6.31

5 ANCDF proposes 18 psi as the maximum instantaneous detonation chamber pressure FPI
 6 (SDC-01).

7 **ES.5.2 Minimum Detonation Chamber Temperature (SDC-02)**

8 The instantaneous FPI setpoint for the minimum detonation chamber temperature was 1,000°F.
 9 The following detonation chamber temperatures were measured during C3, C4a, and C4b
 10 emission testing:

Statistic (°F)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	1,246.58	1,399.40	1,398.29	1,348.09
Maximum	1,418.57	1,401.45	1,402.85	1,407.62
Average	1,335.85	1,400.16	1,400.01	1,378.67
Statistic (°F)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	1,449.00	1,449.29	1,449.58	1,449.29
Maximum	1,450.67	1,450.67	1,450.59	1,450.64
Average	1,450.05	1,450.01	1,450.01	1,450.02
Statistic (°F)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	1,449.51	1,449.58	1,441.62	1,446.90
Maximum	1,450.67	1,450.59	1,457.40	1,452.89
Average	1,450.04	1,450.00	1,449.93	1,449.99

11 ANCDF proposes to retain the current limit of 1,000°F for this FPI as it is an established
 12 temperature for treatment of chemical agents. Chemical agents held at a temperature of 1,000°F
 13 for a period of 15-minutes are destroyed to the accepted 5X level. Given that no chemical
 14 munition will be within the detonation chamber for < 15-minutes, the low temperature limit of
 15 1,000°F provides suitable protection.

1 **ES.5.3 Minimum Thermal Oxidizer Temperature (SDC-03)**

2 The instantaneous FPI setpoint for the minimum thermal oxidizer temperature was 1,400°F. The
 3 following thermal oxidizer temperatures were measured during C3, C4a, and C4b emission
 4 testing:

Statistic (°F)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	1,741.34	1,750.03	1,733.59	1,741.65
Maximum	1,940.16	2,005.05	1,998.26	1,981.16
Average	1,802.23	1,805.81	1,809.77	1,805.94
Statistic (°F)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	1,759.77	1,771.66	1,772.50	1,767.97
Maximum	1,916.85	1,983.64	1,941.79	1,947.42
Average	1,806.48	1,805.50	1,809.25	1,807.08
Statistic (°F)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	1,855.83	1,723.48	1,872.88	1,817.39
Maximum	2,104.54	2,061.86	2,088.14	2,084.85
Average	1,914.09	1,914.48	1,930.36	1,919.64

5 ANCDF proposes 1,741°F as the instantaneous minimum thermal oxidizer temperature
 6 (SDC-03).

7 **ES.5.4 Maximum Thermal Oxidizer Pressure (SDC-04)**

8 The instantaneous FPI setpoint for the maximum thermal oxidizer pressure was 0.0 psi. The
 9 following thermal oxidizer pressures were measured during C3, C4a, and C4b emission testing:

Statistic (psi)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	-0.136	-0.138	-0.123	-0.132
Maximum	-0.025	-0.041	-0.040	-0.035
Average	-0.069	-0.069	-0.071	-0.069
Statistic (psi)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	-0.120	-0.188	-0.098	-0.135
Maximum	-0.033	0.055	0.0080	0.010
Average	-0.071	-0.056	-0.065	-0.064
Statistic (psi)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	-0.105	-0.093	-0.095	-0.098
Maximum	-0.035	-0.043	-0.048	-0.042
Average	-0.071	-0.071	-0.071	-0.071

10 ANCDF proposes to retain the instantaneous maximum thermal oxidizer pressure (SDC-04) of
 11 -0.01 psi as the SDC System should be maintained under negative pressure during a feed event to
 12 minimize impacts to human health and the environment.

1 **ES.5.5 Maximum Spray Dryer Temperature (SDC-05)**

2 The instantaneous FPI setpoint for the maximum spray dryer temperature was 500°F. The
 3 following spray dryer temperatures were measured during C3, C4a, and C4b emission testing:

Statistic (°F)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	322.42	322.96	321.56	322.31
Maximum	338.65	339.34	338.83	338.94
Average	329.91	329.91	329.77	329.86
Statistic (°F)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	314.28	308.38	319.03	313.90
Maximum	339.09	345.54	344.30	342.98
Average	330.03	329.98	329.54	329.85
Statistic (°F)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	375.24	382.03	382.03	379.77
Maximum	403.98	398.13	398.61	400.24
Average	390.25	390.14	390.15	390.18

4 ANCDF proposes 400°F as the instantaneous maximum spray dryer temperature (SDC-05).

5 **ES.5.6 Maximum Bag House Pressure (SDC-06)**

6 The instantaneous FPI setpoint for the maximum bag house pressure was 0.3 psi. The following
 7 bag house pressures were measured during C3, C4a, and C4b emission testing:

Statistic (psi)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	0.045	0.053	0.060	0.053
Maximum	0.183	0.182	0.182	0.182
Average	0.129	0.132	0.131	0.131
Statistic (psi)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	0.030	0.020	0.030	0.027
Maximum	0.183	0.180	0.170	0.178
Average	0.105	0.116	0.100	0.107
Statistic (psi)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	0.060	0.070	0.060	0.063
Maximum	0.080	0.095	0.095	0.090
Average	0.069	0.086	0.084	0.080

8 ANCDF proposes 0.18 psi as the instantaneous maximum bag house pressure (SDC-06).

9

1 **ES.5.7 Minimum Acid Scrubber Flow Rate (SDC-07)**

2 The instantaneous FPI setpoint for the minimum acid scrubber flow rate was 1.0 cfm. The
 3 following acid scrubber flow rates were measured during C3, C4a, and C4b emission testing:

Statistic (cfm)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	3.74	3.77	3.76	3.76
Maximum	4.05	4.08	4.09	4.07
Average	3.81	3.81	3.80	3.81
Statistic (cfm)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	3.17	3.17	3.16	3.17
Maximum	3.55	3.56	3.54	3.55
Average	3.25	3.26	3.24	3.25
Statistic (cfm)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	3.21	3.28	3.28	3.26
Maximum	3.58	3.67	3.33	3.53
Average	3.26	3.33	3.30	3.30

4 ANCDF proposes 3.2 cfm as the instantaneous minimum acid scrubber flow rate (SDC-07).

5 **ES.5.8 Minimum Quench Tower Flow Rate (SDC-08)**

6 The instantaneous FPI setpoint for the minimum quench tower flow rate was 0.5 cfm. The
 7 following quench tower flow rates were measured during C3, C4a, and C4b emission testing:

Statistic (cfm)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	2.43	2.45	2.45	2.44
Maximum	2.59	2.59	2.59	2.59
Average	2.56	2.58	2.58	2.57

Statistic (cfm)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	2.69	2.69	2.69	2.69
Maximum	2.89	2.88	2.88	2.89
Average	2.84	2.84	2.84	2.84
Statistic (cfm)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	2.70	2.64	2.79	2.71
Maximum	2.89	2.82	2.82	2.84
Average	2.86	2.80	2.80	2.82

9 ANCDF proposes 2.4 cfm as the instantaneous minimum quench tower flow rate (SDC-08).

10

1 **ES.5.9 Maximum Quench Tower Temperature (SDC-09)**

2 The instantaneous FPI setpoint for the maximum quench tower temperature was 190°F. The
 3 following quench tower temperatures were measured during C3, C4a, and C4b emission testing:

Statistic (°F)	Condition 3							
	C3R1		C3R2		C3R3		Average	
	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004
Minimum	141.18	141.55	145.53	145.61	146.78	146.94	144.50	144.70
Maximum	148.64	149.12	150.73	151.19	151.34	151.78	150.24	150.69
Average	145.97	146.25	147.76	148.03	148.69	148.95	147.47	147.74
Statistic (°F)	Condition 4a							
	C4aR1		C4aR2		C4aR4		Average	
	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004
Minimum	158.57	158.70	154.21	154.17	159.01	159.22	157.26	157.36
Maximum	163.92	164.43	162.74	163.16	165.04	165.42	163.90	164.34
Average	160.41	160.67	158.76	158.98	160.95	161.16	160.04	160.27
Statistic (°F)	Condition 4b							
	C4bR1		C4bR4		C4bR5		Average	
	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004
Minimum	163.43	163.61	164.67	164.77	162.38	162.61	163.49	163.66
Maximum	170.29	170.82	169.93	170.29	169.28	169.58	169.83	170.23
Average	166.55	166.85	167.19	167.43	165.10	165.31	166.28	166.53

4 ANCDF proposes 170°F as the instantaneous maximum quench tower temperature (SDC-09).

5 **ES.5.10 Maximum Neutral Scrubber Temperature (SDC-10)**

6 The instantaneous FPI setpoint for the maximum neutral scrubber temperature was 200°F. The
 7 following neutral scrubber temperatures were measured during C3, C4a, and C4b emission
 8 testing:

Statistic (°F)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	160.02	164.69	164.62	163.11
Maximum	171.98	172.55	173.56	172.70
Average	168.27	170.65	171.12	170.01
Statistic (°F)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	174.94	174.65	175.00	174.86
Maximum	180.85	181.35	182.42	181.54
Average	178.35	178.19	178.76	178.43

Statistic (°F)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	163.82	167.71	164.63	165.39
Maximum	182.25	182.87	182.89	182.67
Average	178.28	179.58	177.02	178.29

9
 10 ANCDF proposes retaining the manufacturer’s standard of 200°F as the instantaneous maximum
 11 neutral scrubber temperature (SDC-10).

1 **ES.5.11 Maximum Chemical Agent Emissions (SDC-11/12)**

2 The instantaneous and ROHA FPI setpoint for the maximum chemical agent emission rate was
 3 0.03 and 0.006 mg/m³, respectively. No ACAMS alarm was incurred during C4b testing.
 4 ANCDF proposes retaining the ACAMS setpoints as it is protective of human health and the
 5 environment.

6 **ES.5.12 Maximum CO Concentration (SDC-13)**

7 The ROHA FPI setpoint for the maximum CO concentration was 100 ppmv, dry basis corrected
 8 to 7% O₂. The following CO concentrations were measured during C3, C4a, and C4b emission
 9 testing:

Statistic (ppmv)	Condition 3			Average
	C3R1	C3R2	C3R3	
Minimum	0.42	0.48	0.16	0.35
Maximum	0.49	1.17	1.14	0.93
Average	0.46	0.61	0.56	0.54
Statistic (ppmv)	Condition 4a			Average
	C4aR1	C4aR2	C4aR4	
Minimum	0.14	0.14	0.14	0.14
Maximum	0.64	7.42	9.01	5.69
Average	0.19	0.99	0.52	0.57
Statistic (ppmv)	Condition 4b			Average
	C4bR1	C4bR4	C4bR5	
Minimum	0.44	0.23	0.16	0.28
Maximum	0.98	1.55	0.58	1.04
Average	0.64	0.51	0.30	0.48

10 ANCDF proposes retaining 100 ppmv, dry basis corrected to 7% O₂, as the maximum ROHA
 11 CO concentration (SDC-13) as this is a regulatory limit.

12 **ES.6 PROPOSED FEED RATES**

13 The chemical agent feed rates demonstrated during C4b were 62.23, 56.62, and 51.11 lbs/hr for
 14 C4bR1, C4bR4, and C4bR5, respectively, with an average of 56.65 lbs/hr (or 56.6 lbs/hr) as
 15 summarized in Table ES-3. Upon approval of this final report, ANCDF proposes a 100% feed
 16 rate of 56.6 lbs/hr.

17 With the exception of nickel and zinc, the maximum metal feed rates were demonstrated during
 18 C3 and approved by ADEM in a previous submittal. The maximum feed rates for nickel and
 19 zinc were demonstrated during C4b. Upon approval of this final report, ANCDF proposes a
 20 100% feed rate for nickel and zinc of 0.025 and 0.069 lbs/hr, respectively.

21 **ES.7 DATA FOR USE IN THE HRA**

22 The emissions rates presented in this report are proposed for modeling in the ANCDF HRA,
 23 which will be submitted under separate cover. For more discussion on health risk, the current
 24 ANCDF Risk Assessment Protocol should be consulted.

1 **ES.8 FINAL CONCLUSIONS**

- 2 The SDC achieved all compliance objectives specified in the ANCDF SDC Emissions Test Plan
3 and RCRA/CAA Permits while processing mustard-filled munitions with SIC in the SFU.

Table ES-1: Sampling Time Intervals

Run	Date	First Port (hours)		Second Port (hours)	
		Start	Stop	Start	Stop
C4bR1	08/09/11	1110	1310	1420	1620
C4bR2 ⁽¹⁾	08/10/11	0940	1140	1505	1705
C4bR3 ⁽²⁾	08/11/11	1130	1330	1650 ⁽²⁾	2145
C4bR4	08/12/11	1735	1935	2055	2255
C4bR5	08/13/11	1155	1355	1600	1800

Footnotes:

- (1) Samples associated C4bR2 were extracted and analyzed for informational purposes only; with the exception of particulates, which were used for compliance purposes.
- (2) C4bR3 was paused from 1746 to 2041 hrs after incurring a FPI (SDC-13: CO Concentration); thus invalidating the run.

Table ES-2: Summary of Select Criteria Pollutant Emissions

Parameter	Units	C4bR1	C4bR4	C4bR5	Average	RCRA/CAA Permit Limit
Carbon Monoxide (facility CEMS) ⁽¹⁾	ppmv	0.64	0.51	0.30	0.48	100 ROHA
	lbs/hr	0.0033	0.0032	0.0011	0.0026	0.02
Carbon Monoxide (TRM CEMS)	ppmv	1.41	1.82	1.56	1.60	---
	lbs/hr	0.0041	0.0051	0.0040	0.0044	---
Sulfur Dioxide (TRM CEMS)	lbs/hr	0.00	0.00054	0.00049	0.00034	7.20
Nitrogen Oxides (TRM CEMS)	lbs/hr	0.27	0.22	0.19	0.23	0.80

Footnote:

- (1) Values summarized in table are averages. See Table 4-1 for minimum and maximum values.

Table ES-3: Summary of DRE

Parameter	Units	C4bR1	C4bR4	C4bR5	Average	RCRA/CAA Permit Limit
DAAMS Tube	---	AT001119	AT001703	AT004276	---	---
Sample Collection Time	minutes	240	240	240	240	---
DAAMS Flow Rate ⁽¹⁾	sLpm	0.19	0.19	0.20	0.19	---
Total Volume ⁽²⁾	scm	4.56E-02	4.56E-02	4.80E-02	4.64E-02	---
Dilution Air ⁽³⁾	%	92.3	92.2	92.0	92.17	---
Percent Sampled	%	7.7	7.8	8.0	7.83	---
Total Sample Volume	scm	3.51E-03	3.56E-03	3.84E-03	3.64E-03	---
Sample Analysis Result	ng	< 3.97E-01 [ND]	< 3.97E-01 [ND]	< 3.97E-01 [ND]	< 3.97E-01 [ND]	---
Flow Rate ⁽⁴⁾	scm/hr	1,780.90	1,722.41	1,533.45	1,678.92	---
Agent Concentration	mg/scm	< 1.13E-04 [ND]	< 1.12E-04 [ND]	< 1.03E-04 [ND]	< 1.09E-04 [ND]	---
Emission Rate	lbs/hr	< 4.44E-07 [ND]	< 4.24E-07 [ND]	< 3.50E-07 [ND]	< 4.06E-07 [ND]	---
Average Feed Rate	lbs/hr	62.23	56.62	51.11	56.65	---
Agent Purity ⁽⁵⁾	%	83.9	83.9	83.9	83.9	---
Purity-Adjusted Feed Rate	lbs/hr	52.21	47.50	42.88	47.53	---
DRE	%	> 99.9999991 [ND]	> 99.9999991 [ND]	> 99.9999991 [ND]	> 99.9999991 [ND]	99.9999

Footnotes:

- (1) Flow rate is set prior to collection of the 4-hour DAAMS tube set and verified after the tubes have been collected. If the ending flow rate is less than the starting flow rate, then the ending (i.e., lower) flow rate is used to calculate the total exhaust gas flow rate.
- (2) Total gas sample volume represents the exhaust gas sample volume and diluent volume.
- (3) Percent dilution is set prior to collection of the 4-hour tube and verified after the tube has been collected. If the ending percent dilution is greater than the starting percent dilution, the ending (i.e., more dilute) dilution is used to calculate exhaust gas sampled.
- (4) The exhaust gas flow rate was calculated based on the average of all isokinetic sample train for the respective run.
- (5) Based on historical data, the average mustard purity of 83.9% has been used (see ANCDF SDC Emissions Test Plan).

Table ES-4: Summary of Semivolatile Organic Emissions

Parameter	Units	C4bR1			C4bR4			C4bR5			Average		
Acenaphthene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Acenaphthylene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Acetophenone	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2-Acetylaminofluorene	g/s	<	2.39E-06	ND	<	2.43E-05	ND	<	2.49E-05	ND	<	2.44E-05	ND
4-Aminobiphenyl	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
Aniline	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Anthracene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Aramite	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
Benzidine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Benzoic acid	g/s	<	1.71E-05	<	<	1.73E-05	<	<	1.85E-05	<	<	1.77E-05	<
Benz (a) anthracene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Benzo (b) fluoranthrene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Benzo (j) fluoranthrene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Benzo (k) fluoranthrene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Benzo (g,h,i) perylene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Benzo (a) pyrene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Benzo (e) pyrene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Benzyl alcohol	g/s	<	1.75E-06	<	<	1.81E-06	<	<	1.85E-06	<	<	1.80E-06	<
Benzaldehyde	g/s	<	2.39E-06	ND	<	2.05E-06	<	<	2.49E-06	ND	<	2.31E-06	<
Biphenyl	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
bis(2-Chloroethoxy)-methane	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
bis(2-Chloroethyl) ether	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
bis(2-Chloroisopropyl) ether	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
bis(2-Ethylhexyl)-phthalate	g/s	<	2.91E-06	<	<	2.49E-06	<	<	3.11E-06	<	<	2.84E-06	<
4-Bromophenyl phenyl ether	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Butyl benzyl phthalate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2-sec-Butyl-4,6-dinitro-phenol	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
4-Chloroaniline	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Chlorobenzilate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
4-Chloro-3-methylphenol	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
1-Chloronaphthalene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2-Chloronaphthalene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND

Table ES-4: Summary of Semivolatile Organic Emissions (Continued)

Parameter	Units	C4bR1			C4bR4			C4bR5			Average		
2-Chlorophenol	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
4-Chlorophenyl phenyl ether	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Chrysene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Diallate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
Dibenz(a,j)acridine	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
Dibenz(a,h)anthracene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Dibenzofuran	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Di-n-butyl phthalate	g/s	<	2.64E-06	<	<	2.31E-06	<	<	2.24E-06	<	<	2.40E-06	<
1,2-Dichlorobenzene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
1,3-Dichlorobenzene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
1,4-Dichlorobenzene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
3,3'-Dichlorobenzidine	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
2,4-Dichlorophenol	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2,6-Dichlorophenol	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Diethyl phthalate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
p-Dimethylaminoazobenzene	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
7,12-Dimethylbenz(a)-anthracene	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
3,3'-Dimethylbenzidine	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
a,a-Dimethylphenethyl-amine	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
2,4-Dimethylphenol	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Dimethyl phthalate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
1,3-Dinitrobenzene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
4,6-Dinitro-2-methylphenol	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
2,4-Dinitrophenol	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
2,4-Dinitrotoluene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2,6-Dinitrotoluene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Diphenylamine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
1,2-Diphenylhydrazine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Di-n-octyl phthalate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Ethyl methanesulfonate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Ethyl parathion	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
Fluoranthene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND

Table ES-4: Summary of Semivolatile Organic Emissions (Continued)

Parameter	Units	C4bR1		C4bR4		C4bR5		Average					
Fluorene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Hexachlorobenzene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Hexachlorobutadiene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Hexachlorocyclopentadiene	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
Hexachloroethane	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Hexachloropropene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Indeno(1,2,3-cd)pyrene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Isophorone	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Isosafrole	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
Methapyrilene	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
3-Methylcholanthrene	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
Methyl methanesulfonate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2-Methylnaphthalene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2-Methyl-5-nitroaniline	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
2-Methylphenol (o-Cresol)	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
3-Methylphenol (m-cresol)	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
4-Methylphenol (o-cresol)	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Pentachloroethane	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
Naphthalene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
1,4-Naphthoquinone	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
1-Naphthylamine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2-Naphthylamine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2-Nitroaniline	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
3-Nitroaniline	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
4-Nitroaniline	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
Nitrobenzene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2-Nitrophenol	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
4-Nitrophenol	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
4-Nitroquinoline-1-oxide	g/s	<	2.39E-06	ND	<	2.43E-05	ND	<	2.49E-05	ND	<	2.44E-05	ND
N-Nitroso-di-n-butylamine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
N-Nitrosodiethylamine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
N-Nitrosodimethylamine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND

Table ES-4: Summary of Semivolatile Organic Emissions (Continued)

Parameter	Units	C4bR1		C4bR4		C4bR5		Average					
N-Nitrosomethylethylamine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
N-Nitrosodiphenylamine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
N-Nitroso-di-n-propylamine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
N-Nitrosomorpholine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
N-Nitrosopiperidine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
N-Nitrosopyrrolidine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Pentachlorobenzene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Pentachloronitrobenzene	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
Pentachlorophenol	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
Phenacetin	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
Phenanthrene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Phenol	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
1,4-Phenylenediamine	g/s	<	2.39E-06	ND	<	2.43E-05	ND	<	2.49E-05	ND	<	2.44E-05	ND
2-Picoline	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
Pronamide	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
Pyrene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
Pyridine	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
Safrole	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND	<	4.88E-06	ND
1,2,4,5-Tetrachloro-benzene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2,3,4,6-Tetrachlorophenol	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
o-Toluidine	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
1,2,4-Trichlorobenzene	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2,4,5-Trichlorophenol	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	<	2.44E-06	ND
2,4,6-Trichlorophenol	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND
1,3,5-Trinitrobenzene	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND	<	1.22E-05	ND

Notes:

- (A) Blank corrections have not been made to these data.
- (B) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

Table ES-5: Summary of Dioxin/Furan Emissions

Parameter	Units	C4bR1		C4bR4		C4bR5		Average		CAA Permit Limit				
Total 2,3,7,8-TetraCDD	g/s	<	2.75E-13	ND	<	2.13E-13	ND	<	2.54E-13	ND	<	2.47E-13	ND	---
Total 2,3,7,8-PentaCDD	g/s	<	4.48E-13	ND	<	2.29E-13	ND	<	2.54E-13	ND	<	3.10E-13	ND	---
Total 2,3,7,8-HexaCDD	g/s	<	8.73E-13	ND	<	8.05E-13	ND	<	6.95E-13	ND	<	7.91E-13	ND	---
Total 2,3,7,8-HeptaCDD	g/s	<	1.27E-12	ND	<	6.32E-13	ND	<	6.22E-13	ND	<	8.40E-13	ND	---
Total OctaCDD	g/s	<	1.29E-11		<	2.53E-12	ND	<	2.29E-12	ND	<	5.91E-12		---
Total 2,3,7,8-TetraCDF	g/s	<	1.11E-12		<	1.32E-12		<	1.45E-12		<	1.29E-12		---
Total 2,3,7,8-PentaCDF	g/s	<	1.05E-12	ND	<	7.34E-13	ND	<	1.15E-12	ND	<	9.81E-13	ND	---
Total 2,3,7,8-HexaCDF	g/s	<	2.01E-12	ND	<	1.82E-12	ND	<	2.27E-12	ND	<	2.03E-12	ND	---
Total 2,3,7,8-HeptaCDF	g/s	<	1.93E-12	ND	<	1.63E-12	ND	<	1.64E-12	ND	<	1.74E-12	ND	---
Total OctaCDF	g/s	<	2.99E-12	ND	<	2.61E-12	ND	<	1.69E-12	ND	<	2.43E-12	ND	---
Total CDD/CDF	ng-TEQ/dscm @ 7% O ₂	<	0.0074		<	0.0057		<	0.0072		<	0.0067		0.20

Notes:

- (A) Blank corrections have not been made to these data.
- (B) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

Table ES-6: Summary of Volatile Organic Emissions Summary of Volatile Organic Emissions

Parameter	Units	C4bR1		C4bR4		C4bR5		Average			
Acetone	g/s	<	1.06E-05		9.61E-06		9.23E-06	<	9.82E-06		
Benzene	g/s	<	3.26E-07	<	3.38E-07	<	3.34E-07	<	3.33E-07		
Bromodichloromethane	g/s	<	9.02E-07	<	1.09E-06	<	7.36E-07	<	9.09E-07		
Bromoform	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	9.18E-07	ND	
Bromomethane	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND	
1,3-Butadiene	g/s	<	1.26E-06	<	5.72E-07	<	7.71E-07	<	8.66E-07		
2-Butanone (Methyl Ethyl Ketone)	g/s	<	5.42E-06	<	5.20E-06	<	3.65E-06	<	4.76E-06		
Carbon Disulfide	g/s	<	7.04E-07	<	1.05E-06	<	1.12E-06	<	9.58E-07		
Carbon Tetrachloride	g/s	<	5.04E-06	<	1.24E-05	<	6.25E-06	<	7.90E-06		
Chlorobenzene	g/s	<	3.89E-07	<	3.98E-07	<	3.10E-07	<	3.66E-07		
Chloroethane	g/s	<	8.66E-07	<	6.36E-07	<	8.40E-07	<	7.81E-07		
Chloroform	g/s	<	1.79E-05	<	1.39E-05	<	1.20E-05	<	1.46E-05		
Chloromethane	g/s	<	3.35E-06	<	2.66E-06	<	2.77E-06	<	2.93E-06		
2-Chloropropane	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.62E-07	ND	
Dibromochloromethane	g/s	<	9.79E-07	ND	<	6.20E-07	<	5.65E-07	<	7.21E-07	
1,2-Dibromoethane (Ethylene Dibromide)	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	8.49E-07	ND	
Dibromomethane	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	8.49E-07	ND	
cis-1,4-Dichloro-2-butene	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND	
trans-1,4-Dichloro-2-butene	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND	
1,1-Dichloroethane	g/s	<	7.95E-07	<	5.94E-07	<	7.72E-07	<	7.20E-07		
1,2-Dichloroethane	g/s	<	4.05E-07	<	4.16E-07	<	3.28E-07	<	3.83E-07		
1,1-Dichloroethene	g/s	<	1.51E-06	<	9.41E-07	<	1.24E-06	<	1.23E-06		
trans-1,2-Dichloroethene	g/s	<	3.97E-07	<	3.66E-07	<	3.41E-07	<	3.68E-07		
Dichlorodifluoromethane(Freon 12)	g/s	<	9.41E-07	<	8.47E-07	<	7.25E-07	<	8.38E-07		
1,2-Dichloropropane (Propylene Dichloride)	g/s	<	4.30E-07	<	3.21E-07	<	4.33E-07	<	3.95E-07		
cis-1,3-Dichloropropene	g/s	<	4.93E-07	ND	<	4.25E-07	<	4.02E-07	<	4.40E-07	
trans-1,3-Dichloropropene	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.27E-07	ND	
Ethyl Benzene	g/s	<	3.86E-07	<	4.66E-07	ND	<	4.27E-07	ND	<	4.26E-07
Hexane	g/s	<	8.84E-07	<	9.17E-07	<	7.92E-07	<	8.64E-07		
2-Hexanone	g/s	<	4.09E-06	ND	<	3.86E-06	ND	<	3.54E-06	ND	

Table ES-6: Summary of Volatile Organic Emissions (Continued)

Parameter	Units	C4bR1			C4bR5			C4bR5			Average		
Iodomethane	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND	<	1.84E-06	ND
4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	g/s	<	4.09E-06	ND	<	3.86E-06	ND	<	3.54E-06	ND	<	3.83E-06	ND
Methylene Chloride	g/s		1.50E-05			1.07E-05			1.16E-05			1.25E-05	
2-Propanol	g/s	<	8.95E-05	ND	<	8.45E-05	ND	<	7.75E-05	ND	<	8.39E-05	ND
Styrene	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.27E-07	ND	<	4.62E-07	ND
1,1,1,2-Tetrachloroethane	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.27E-07	ND	<	4.62E-07	ND
1,1,2,2-Tetrachloroethane	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	8.49E-07	ND	<	9.18E-07	ND
Tetrachloroethene (Tetrachloroethylene)	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.27E-07	ND	<	4.62E-07	ND
Toluene	g/s	<	4.22E-07		<	3.57E-07		<	3.00E-07		<	3.60E-07	
1,1,1-Trichloroethane	g/s	<	4.50E-07		<	3.32E-07		<	3.30E-07		<	3.71E-07	
1,1,2-Trichloroethane (Methyl Chloroform)	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	8.49E-07	ND	<	9.18E-07	ND
Trichloroethene	g/s	<	5.21E-07		<	6.58E-07		<	5.85E-07		<	5.88E-07	
Trichlorofluoromethane (Freon 11)	g/s	<	1.41E-06		<	6.39E-07		<	5.29E-07		<	8.59E-07	
1,2,3-Trichloropropane	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	8.49E-07	ND	<	9.18E-07	ND
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	g/s	<	1.58E-06		<	7.87E-07		<	1.19E-06		<	1.19E-06	
m,p-Xylene	g/s	<	8.43E-07		<	7.95E-07		<	7.91E-07		<	8.10E-07	
o-Xylene	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.27E-07	ND	<	4.62E-07	ND
Vinyl Acetate	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND	<	1.84E-06	ND
Vinyl Bromide	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND	<	1.84E-06	ND
Vinyl Chloride	g/s	<	3.85E-06		<	2.59E-06		<	3.92E-06		<	3.45E-06	

Notes:

- (A) No blank corrections have been made to these data. If undetected in the analysis, the DL is reported.
- (B) Results have been reported considering both the reporting and MDLs as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the reporting and MDLs are incorporated into the emission estimate as reported.

Table ES-7: Summary of TOC Emissions

Parameter	Units	C4bR1		C4bR4		C4bR5		Average	
Concentration	mg/m ³	<	11.59	<	10.64	<	13.62	<	11.95
Emission Rate	lbs/hr	<	2.83E-02	<	2.49E-02	<	2.96E-02	<	2.76E-02
Emission Rate	g/s	<	3.56E-03	<	3.14E-03	<	3.73E-03	<	3.48E-03

Note:

(A) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

Table ES-8: Summary of Acid Gases and Particulate Emissions

Parameter	Units	C4bR1		C4bR4		C4bR5		Average		RCRA/CAA Permit Limit	
Hydrogen Chloride	g/s	<	9.33E-05	ND	<	9.95E-05	ND	<	9.25E-05	ND	---
Chlorine	g/s	<	1.78E-05	ND	<	2.08E-05	ND	<	1.91E-05	ND	---
Chloride Equivalents	ppmv @ 7% O ₂	<	0.42	ND	<	0.46	ND	<	0.45	ND	21
Hydrogen Fluoride	g/s	<	9.33E-05	ND	<	1.09E-04	ND	<	9.62E-05	ND	---
Particulates ⁽¹⁾	gr/dscf @ 7% O ₂		0.00050			0.00074			0.00066		0.013

Notes:

(A) Blank corrections have not been made to these data.

(B) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

Footnote:

(1) Due to a sampling method deviation incurred during C4bR5, the particulate results from C4bR2 were used for compliance purposes. C4bR5 particulate results are included for information purposes only in Appendix H.

Table ES-9: Summary of Trace Metal Emissions

Parameter	Units	C4bR1		C4bR4		C4bR5		Average		CAA Permit Limit		
Antimony	g/s	<	2.73E-08		2.18E-08	<	2.85E-08	<	2.59E-08	---		
Arsenic	g/s	<	4.10E-08	<	3.18E-08	<	5.11E-08	ND	<	4.13E-08	---	
Barium	g/s		3.47E-07		2.59E-07		3.37E-07			3.14E-07	---	
Beryllium	g/s	<	2.45E-08	ND	<	1.51E-08	<	2.56E-08	ND	<	2.17E-08	---
Boron	g/s		5.81E-06		2.80E-06		1.81E-06			3.47E-06	---	
Cadmium	g/s		6.31E-09		1.11E-08		4.54E-09			7.33E-09	---	
Chromium	g/s		2.37E-07		4.56E-07		2.28E-07			3.07E-07	---	
Cobalt	g/s		2.76E-08		4.61E-08		8.83E-09			2.75E-08	---	
Copper	g/s		1.89E-07		2.42E-07		1.81E-07			2.04E-07	---	
Lead	g/s		6.79E-08		6.46E-08		4.78E-08			6.01E-08	---	
Manganese	g/s		5.70E-07		1.37E-06		8.95E-07			9.46E-07	---	
Mercury	g/s		2.00E-07	<	3.52E-07	<	2.91E-07		<	2.81E-07	---	
Nickel	g/s		1.85E-07		2.30E-07		1.62E-07			1.92E-07	---	
Phosphorus	g/s	<	2.02E-06	<	2.24E-06	<	2.30E-06		<	2.19E-06	---	
Selenium	g/s	<	1.36E-07	ND	<	8.65E-08	ND	<	1.01E-07	ND	---	
Silver	g/s		4.16E-08		5.12E-07		2.81E-07			2.78E-07	---	
Thallium	g/s	<	2.45E-08	ND	<	2.50E-08	ND	<	2.56E-08	ND	---	
Tin	g/s	<	5.05E-07		2.27E-07		2.89E-07		<	3.40E-07	---	
Vanadium	g/s	<	1.22E-07	ND	<	1.24E-07	ND	<	1.28E-07	ND	---	
Zinc	g/s		2.34E-06		2.44E-06		1.87E-06			2.22E-06	---	
Arsenic, Beryllium, & Chromium	ug/dscm @ 7% O ₂	<	1.72	<	3.061	<	2.09		<	2.29	23	
Cadmium and Lead	ug/dscm @ 7% O ₂		0.42		0.46		0.36			0.41	10	
Mercury	ug/dscm @ 7% O ₂		1.13	<	2.14		1.99		<	1.75	8.1	

Notes:

- (A) Blank corrections have not been made to these data.
- (B) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

Table ES-10: Summary of Energetic Emissions

Parameter	Units	C4bR1			C4bR4			C4bR5			Average		
2,4-Dinitrotoluene	g/s	<	1.91E-07	ND	<	2.18E-07	ND	<	1.98E-07	ND	<	2.02E-07	ND
2,6-Dinitrotoluene	g/s	<	1.91E-07	ND	<	2.18E-07	ND	<	1.98E-07	ND	<	2.02E-07	ND
HMX	g/s	<	1.91E-07	ND	<	2.18E-07	ND	<	1.98E-07	ND	<	2.02E-07	ND
Nitroglycerin	g/s	<	7.63E-07	ND	<	8.62E-07	ND	<	7.99E-07	ND	<	8.08E-07	ND
RDX	g/s	<	1.91E-07	ND	<	2.18E-07	ND	<	1.98E-07	ND	<	2.02E-07	ND
2,4,6-Trinitrotoluene	g/s	<	1.91E-07	ND	<	2.18E-07	ND	<	1.98E-07	ND	<	2.02E-07	ND

Notes:

- (A) Blank corrections have not been made to these data.
- (B) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

1.0 INTRODUCTION

The US Army has designed and built a hazardous waste disposal facility for the destruction of the chemical munitions stockpile at Anniston Army Depot in Anniston, Alabama. The ANCDF is designed to dispose of chemical nerve agents, mustard agents, munitions containing agent, contaminated refuse, ton containers, liquid wastes, explosive, and propellant components. The ANCDF operates under RCRA Permit, AL3 210 020 027, issued pursuant to the Code of Alabama 1975 §§ 22-30-1-et. seq. Further references to this permit will be termed the RCRA Permit. ANCDF must also comply with its CAA Permit.

The SDC System allows ANCDF the ability to process intact explosively configured munitions. Under the requirements of the RCRA Permit and ADEM regulations, the SDC System must demonstrate an ability to effectively treat any hazardous waste such that human health and the environment are protected.

ANCDF proposed five (5) emissions test conditions for the SDC System:

- C1 - Conventional munitions emissions test without SIC in the SFU;
- C2 - Surrogate emissions test spiking chlorobenzene, in addition to metal oxides, without SIC in the SFU;
- C3 - Surrogate emissions test spiking chlorobenzene, in addition to metal oxides, with SIC in the SFU;
- C4a - Mustard-filled munitions emissions test while processing 105-mm projectiles with SIC in the SFU; and
- C4b - Mustard-filled munitions emissions test while processing 4.2-inch mortars with SIC in the SFU.

The emissions test results for C1, C2, C3, and C4a have been submitted to ADEM for review and approval. The emissions test results for C4b are contained in this report. Westinghouse Anniston (WA) has the responsibility for operating the SDC System and executing the emissions tests, as required. WA has contracted a third party, URS of Austin, Texas, to provide sampling and analysis support. URS-Austin performed emissions sampling, packaging, transporting samples to the off-site laboratories for analysis, and reporting of the analytical results.

1.1 GENERAL FACILITY INFORMATION

The following general facility information pertains to ANCDF:

Facility Name:	Anniston Chemical Agent Disposal Facility
Mailing Address	3580 Morrisville Road
	Anniston, AL 36201
Physical Address	Same
EPA ID Number	AL3 210 020 027
Facility Contact	Timothy K. Garrett
Telephone Number	(256) 238-1652

1.2 DATE AND TIMES OF SDC EMISSIONS TESTS

The SDC emissions test for C4b commenced on August 9, 2011, and was completed on August 12, 2011. A total of five (5) test runs were conducted; however, only C4bR1, C4bR4, and C4bR5 were used to compare emissions to permitted limits. At the conclusion of C4bR2, it was discovered that QP DAAMS tubes were not installed for sample collection thus rendering the run unacceptable for DRE and feed rate compliance purposes. With the exception of particulates, the C4bR2 sampling trains were analyzed for informational purposes. The C4bR2 particulate results were used for compliance purposes due to a sampling method deviation incurred during C4bR5 on the acid gas/particulate sampling train. Particulate results for C4bR5 have been included for informational purposes only. C4bR3 was invalidated due to CO exceeding permitted limits. Daily run summaries are provided in Section 8.1.

1.3 PROJECT PARTICIPANTS

The SDC was operated by WA personnel during the C4b emissions tests. IAW the approved ANCDF SDC Emissions Test Plan, the WA Test Director was the point of contact for any concerns associated with the emissions test. URS-Austin conducted the exhaust gas sampling with TestAmerica, Inc. providing the laboratory analytical support. Figure 1-1 presents the organizational chart for the SDC emissions test, including the department, name, and title of key personnel. ADEM (Air and Land Divisions) provided regulatory oversight. The Science Applications International Corporation and/or the Chemical Materials Agency and Washington Group International provided oversight of sampling activities for WA.

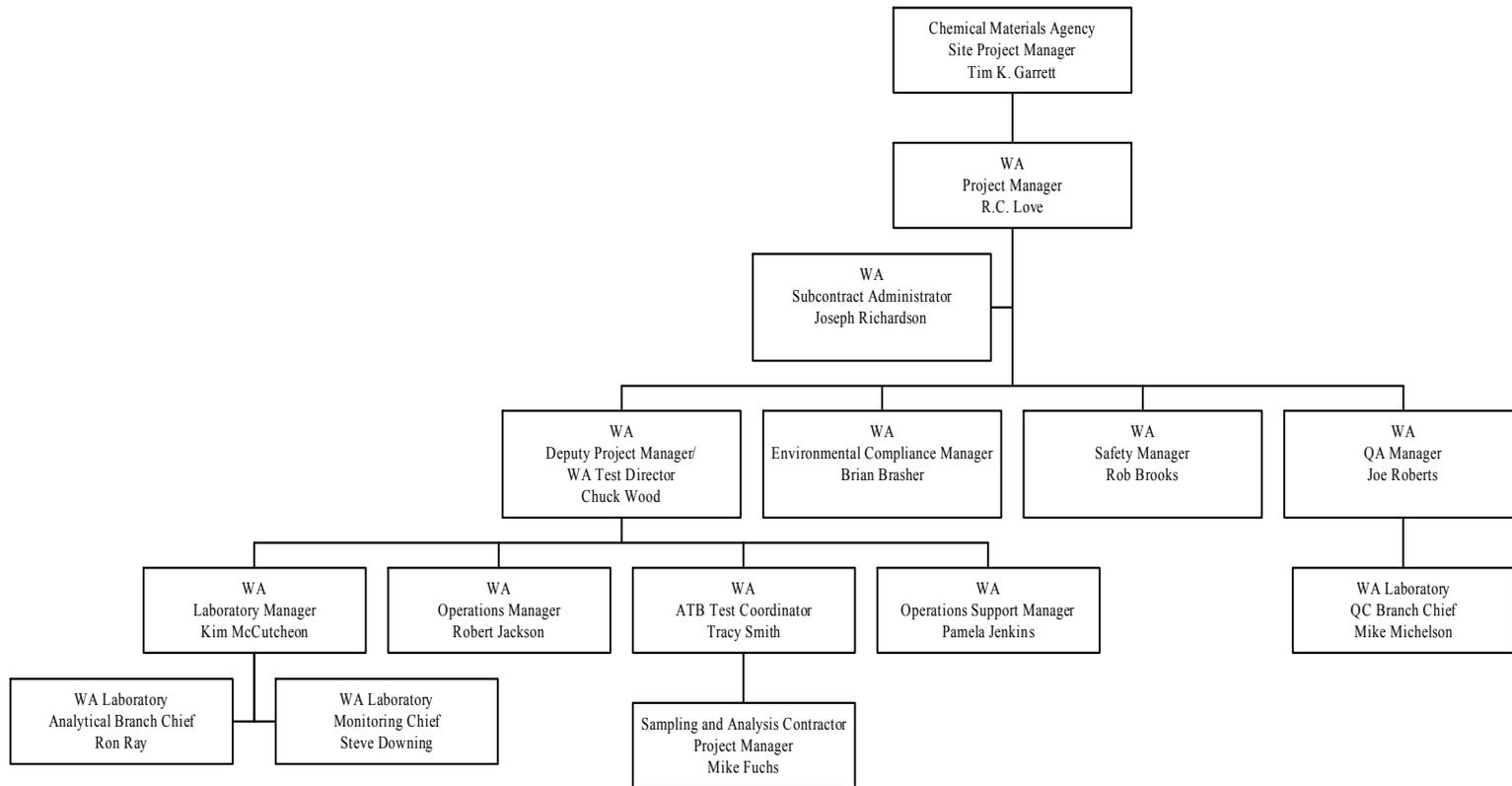


Figure 1-1: Organizational Chart

2.0 PROCESS DESCRIPTION

This section provides a brief process description of the SDC System, design information, process monitors, and monitoring points.

2.1 DESCRIPTION OF THE SDC SYSTEM

The SDC System is designed for destruction of munitions and munition components by indirect/conductive heating. The munitions are fed via a conveyor system. The solid scrap material remaining from the munitions is emptied into a scrap-box. The off-gas generated is cleaned and filtered in the Off-Gas Treatment (OGT) System.

The loading area is where munitions are placed in ammunition trays and loaded onto the loading conveyor. The loading conveyor is designed to accept multiple trays prior to any conveyor movement. After the loading conveyor is loaded, the loading operator leaves the area and the loading conveyor moves one (1) tray at a time into the SDC. As each item is conveyed from the loading room to the SDC for destruction the loading conveyor conveys it over to the munitions lift where it is elevated to the level of the first loading chamber. From the lift, the item is then conveyed to the apron of the first loading chamber.

At this point the loading system pauses until the SDC Control Room (CON) operator acknowledges that the tray is ready to load into the SDC. All movements from the loading conveyor to the first loading chamber are automatic. However, the CON operator has full control of all movements and can abort or reverse the movements as required. The loading conveyor and lift are also equipped with guides, interlocks, and sensors that prevent misalignment of trays or other problems and will halt movements automatically if problems arise.

Once at the apron of the first loading chamber and after the operator gives the go-ahead for the loading operation, the first loading chamber gate is opened to admit the tray. The first loading chamber gate is equipped with an inflatable gasket seal which prevents leakage from the first loading chamber. After the gate is opened, the tray containing the munition item is pushed into the munition feed tray located in the first loading chamber by an electrically operated ram equipped with sensors to detect misfeeds and other problems. After the tray is inserted, the ram withdraws and the first loading gate is closed and sealed. Next the second feed gate (which is also fitted with inflatable seals to prevent leakage) opens and a hydraulically operated ram pushes the munition into the second loading chamber. The ram is withdrawn and the second loading gate closes.

To transfer the waste military munition (WMM) from the second loading chamber to the SDC, the cradle and fragment valve rotate 90 degrees (°) as a unit. The fragment valve is a round circular plug shaped device that is positioned above the entrance to the SDC to prevent fragments from impacting the second loading chamber. When rotated, the fragment valve moves out of the opening to the SDC and the cradle is aligned discharging the munitions to the SDC. Once the munitions have been delivered to the SDC, the cradle and fragment valve are rotated in the opposite direction, lining up the fragment valve over the opening to the SDC and the cradle to receive the next load. Once over the SDC, a hydraulic piston presses down on the fragment valve to hold it in position. Loading chamber gates are configured and designed to contain detonations or fragments within them equal to the design limit of the rest of the chamber.

1 After the munitions are fed to the inner detonation chamber the items heat resulting in a
2 detonation and/or deflagration. As there is insufficient air contained within the detonation
3 chamber to support complete combustion of the detonation products, the result is a pyrolysis
4 reaction, which breaks down the detonation gases to simple compounds which are then further
5 treated in the OGT System.

6 A description of key equipment is provided below.

7 **Conveyor System:** The conveyor system is electrically powered and consists of a series of
8 conveyors which transport the ammunition trays to the lift, which lifts the trays up to loading
9 chamber 1, and electrical pusher which pushes the tray into loading chamber 1.

10 **Gate 1:** Gate 1 is the inlet hatch to loading chamber 1. It is a sliding gate and operated
11 hydraulically. The gate is sealed gastight with 1 pneumatic seal. An electric pusher is mounted
12 on gate 1 which pushes the package into loading chamber 2.

13 **Gate 2:** Gate 2 is the inlet gate to loading chamber 2. It is a sliding gate and operated
14 hydraulically. The gate is sealed gastight with 2 pneumatic seals. It is designed to withstand
15 explosions up to 6.6 pounds (lbs) trinitrotoluene equivalent.

16 **Loading Chamber 1/2 and Cradle:** Between loading chamber 1 and 2 there is a gastight gate.
17 Loading chamber 2 has a built in hydraulic powered cradle. The cradle is designed to withstand
18 the pressure and the fragments from the detonation chamber. When the tray has been pushed in
19 loading position the cradle turns 90° in clock wise direction and the package falls down into the
20 detonation chamber. The cradle then turns back and a fragment valve provides a fragment shield
21 by means of a hydraulically operated cone that seals off loading chamber 2 against the SDC.
22 Both positions of the cradle may be monitored by cameras so that both a successful loading of
23 the tray and a successful fall into the SDC can be assured.

24 **Destruction of Munitions in the SDC:** The munition is dumped into the detonation chamber
25 and lands on the hot scrap material at the bottom of the chamber. The munitions are heated until,
26 deflagration or detonation and the explosives in the munitions are destroyed. The destruction
27 process is identified either by the dynamic pressure sensor and/or the static pressure sensor,
28 aided by a sound sensor.

29 The heat is generated by heating elements in the space between the chamber and the shell.
30 During the destruction process, pressure and temperature inside the SDC are monitored and
31 recorded in the CON. Heated sweep air is continuously added to the static kiln during operation.
32 The gases from the destruction process will be transferred into and cleaned by the OGT System.

33 To eliminate potential overpressure peaks coming from the SDC, the off gases shall pass through
34 a buffer tank in order to reduce such pressure peaks before the gases are transferred to the
35 downstream OGT System.

36 **Upper Detonation Chamber (UDC):** The upper part of the SDC is mounted to the outlet flange
37 of loading chamber 2. Connections for incoming process air, outlet exhaust gases, temperature
38 sensors and pressure gauges are placed on the SDCs upper part.

39 **Lower Detonation Chamber (LDC):** The lower part of the SDC has an inner fragment shield
40 and an outer chamber. The space between the chamber and scrap chute is filled with insulation.
41 Electrical resistance heating elements are located in the bottom.

- 1 ***Elevating and Turning System:*** When emptying the LDC, it is first lowered by the
2 hydraulically powered mechanical lifting jacks that make up the SDC Lifting System (DCLS).
3 The rotation of the LDC is made by a hydraulic motor, connected to the LDC with a chain which
4 makes up the SDC Rotating System (DCRS).
- 5 ***Locking and Sealing System:*** The upper and lower parts of the SDC are locked to each other
6 with a locking ring during destruction. The locking ring is maneuvered by two (2) hydraulic
7 cylinders. For the emptying procedure the locking ring is turned to the open position and lower
8 part of the SDC is lowered and turned. The connection between upper and lower part of the
9 SDC is sealed by three (3) pressurized pneumatic gaskets during destruction.
- 10 ***Hydraulic Power Unit:*** The hydraulic power unit provides power to operate the elevating and
11 turning system for the SDC (DCLS), tilting unit, gates 1 and 2, locking ring, and pushers. It has
12 a built in backup pump which is driven by the uninterrupted power supply of the SDC facility.
- 13 ***Scrap Chute and Scrap Conveyor:*** When operators determine (based on the material being fed)
14 the SDC should be emptied of treated material, the LDC is lowered and then turned 180° so the
15 scrap material can fall down the scrap chute to the scrap conveyor.
- 16 ***Scrap Conveyor System:*** Scrap conveyor 1 transports the scrap material to scrap conveyor 2.
17 Scrap conveyor 2 moves the scrap onto the vibration table. Scrap conveyor 1 and 2 are slow
18 moving and allow the scrap to cool to a temperature where the material may be inspected. The
19 vibration table distributes the scrap evenly and delivers it onto the scrap inspection conveyor. It
20 also separates dust from the scrap which is collected underneath in a basket. The scrap
21 inspection conveyor allows visual inspections of WMM after treatment has occurred in the SDC.
- 22 ***Detonation Chamber Air Heater:*** The air heater heats the process air. This hot air is led into
23 the SDC to aid the destruction process.
- 24 ***Reserve Flush Tank:*** The reserve tank contains the water based solution which may be used to
25 flush loading chamber 1 as needed after any loading sequence. Process air provides the needed
26 pressure to drive the solution into loading chamber 1. When necessary, the solution can be
27 emptied from loading chamber 1 into the SDC for destruction. Otherwise it will flow back into
28 the reserve flush tank.
- 29 ***OGT System:*** The OGT System consists of a buffer or equalization tank which smoothes out
30 pressure pulses caused by detonation within the SDC, followed by an orifice which also helps to
31 smooth the flow going to downstream components of the system. Following the orifice, the gas
32 is heated to approximately 2,000°F for at least two (2) seconds, then cooled by a quench
33 followed by a dry scrubber filter and then remaining contaminants are removed by two (2) wet
34 scrubber stages. The last step is a multistage exhaust filtration system, which acts as a safeguard
35 backing up the OGT System before releasing the off gas to the environment. It should be noted
36 that the entire OGT System from the exit of the SDC to the thermal oxidizer is maintained at
37 adequate temperature to reduce condensation. Descriptions of these items are provided below.
- 38 ***Buffer Tank:*** This unit is designed to smooth gas pressure and volume surges from the SDC
39 that occur whenever a munition detonates or deflagrates within the SDC. By smoothing surges
40 the design of downstream equipment is simplified and the equipment is better able to operate
41 near its optimum design flow rate. This allows more consistent removal of contaminants. The
42 buffer tank is comprised of a cone bottom cylindrical tank made of stainless steel. The inlet and
43 outlet of the tank is configured in such a way that the tank also acts as a cyclone, allowing the

1 removal of large particles of ash and small metal fragments from detonations. These materials
2 are collected in the bottom of the conical tank section and are periodically and automatically
3 removed using a lock hopper type rotary valve. The entire tank and all piping are maintained at
4 a temperature using electric heaters and insulation.

5 **Orifice:** The orifice plate also helps to smooth the flow of gases presented to downstream
6 equipment. The orifice plate is comprised of a sharp edged orifice located in a stainless steel
7 metal plate which is in turn sandwiched between two (2) pipe flanges. This plate is replaceable
8 if needed, and is also maintained at temperature using electric heaters and insulation.

9 **Process Ventilation Cyclone, Filter, and Fan:** The fan drives the process ventilation for the
10 SDC. The cyclone and filter remove dust from the process ventilation. The dust is transferred to
11 the air mainly from the scrap emptying sequence and the scrap conveyor system.

12 **Thermal Oxidizer:** The off gases resulting from the pyrolysis process in the SDC are transferred
13 to a thermal oxidizer. The thermal oxidizer is designed to accept all gases resulting from one (1)
14 feed cycle to the SDC. The thermal oxidizer is oversized for this peak flow and is actually able
15 to accommodate twice the flow that is anticipated. The OGT System is sufficiently designed to
16 accommodate feed rates greater than the design for the SDC.

17 The thermal oxidizer uses natural gas or propane as a fuel to enable the development of the high
18 temperatures required. The thermal oxidizer design is based on a retention time of two (2)
19 seconds or more at approximately 2,000°F for the peak load expected from the upstream SDC.
20 An additional flow of secondary air is automatically added to ensure an oxidizing environment.
21 The gases to be treated are fed tangentially via a ring system to ensure proper treatment of the
22 contaminated gases.

23 **Spray Dryer:** The off gas coming from the thermal oxidizer exits with a temperature of
24 approximately 2,000°F. This off gas is quickly cooled to approximately 350°F by the injection of
25 water into the gas stream. The injected water will evaporate and the energy needed for the
26 evaporation is taken from the off gas so that the gas will rapidly cool. The water injection or
27 quench takes place in a spray dryer that is positioned at the inlet of the next treatment stage, the
28 acid scrubber. The spray dryer uses spent scrubber liquids for the water feed and subsequently
29 evaporates this water, leaving dry salts and particulates for disposal and removing the need for a
30 water treatment system to process spent scrubber solutions. The dry salts and particulates are
31 automatically removed from the bottom of the spray dryer and collected in a container using a
32 rotary lock hopper type valve for disposal.

33 **Bag House Filter:** A bag house filter is located after the spray dryer. This unit is comprised of
34 a filter system where the bags have a layer of absorbent material added to them which is
35 automatically renewed on a periodic basis. Most of the dust and heavy metals are removed in
36 this unit. The removal occurs in a zone on the inside of the bags where an absorbent sodium
37 bicarbonate is added. The ratio of the material may be adjusted to fit the application. The
38 powdered mixture is fed continuously from a hopper by a screw feeder and pneumatic feed
39 system to the bag house where it adds to the layer of spent material on the inside of the bags.
40 This allows a fresh surface to be presented to the incoming gases at all times. Periodically when
41 the pressure drop across the filter exceeds a set point, the bags are emptied using a pulse jet, and
42 the spent solids with the collected process dust is processed through a rotary lock hopper valve
43 into a drum for disposal.

1 **Quench Venturi:** In the next step the air is cooled from approximately 350 to 170°F. This is
2 done with scrubber solution water from the acid scrubber. The water remaining from this step is
3 cooled and recycled to the acid scrubber sump.

4 **Acid Scrubber:** The off gas in the acid scrubber will be further cooled to the operating
5 temperature of the scrubber, which is approximately 150°F. The acid scrubber is a counter
6 current design where the scrubber liquid flows counter current to the gas flow. The acid
7 scrubber will remove several contaminants from the off gas. Initially, dust is removed by
8 washing out solid particles in the washing tower. Acid gases, volatile and semi-volatile heavy
9 metals will also be removed from the off gas. These components will dissolve in the scrubber
10 liquid making it acidic. The scrubber pH will be controlled by a pH controller that ensures that
11 the liquid has a sufficiently high pH value to obtain the necessary concentration gradient to wash
12 the gases. The resistivity of the scrubber liquid will be monitored. In case of a low resistivity
13 value indicating a high dissolved salt content the scrubber liquid will be partly replaced by fresh
14 water. Excess scrubber liquid is then transferred to the spray dryer for evaporation and salt
15 removal. Scrubber liquid is pumped from the bottom of the scrubber column to the top and is
16 distributed inside the column by spray nozzles. The off gas enters the column from a position
17 located just above the column sump and streams from the bottom to top of the column. In order
18 to ensure an adequate mixing and contact between the liquid and the gas, the columns are filled
19 with a column packing material. As a safeguard, the temperature of the off gas inlet will be
20 monitored. In case of a high temperature off gas, due to a quench malfunction, an emergency
21 water injection will be switched on.

22 **Neutral Scrubber:** After the acid scrubber the off gas is fed to the neutral scrubber. The neutral
23 scrubber removes any residual contaminants that passed through the dry and acid scrubbers. The
24 neutral scrubber has the same dimensions and is built using the same construction principles as
25 the acid scrubber. The neutral scrubber also operates with a counter current gas liquid flow. To
26 obtain a good material exchange between the gas and the liquid, a column packing is used.

27 The scrubber liquid is monitored by a pH controller. Two (2) solutions may be used to maintain
28 the proper neutral pH. One (1) is a sodium hydroxide solution and the other is a hydrogen
29 chloride solution. The amount of scrubber liquid in the neutral scrubber is controlled by a level
30 transmitter in the sump of the scrubber column. To obtain a constant quality in the scrubber a
31 continuous waste stream is taken out through the column sump, which goes into the spray dryer.
32 This stream is replaced by fresh caustic solution as needed.

33 **Induced Draft (ID) Fans:** The ID fans are located downstream after the particle filter. The ID
34 fans ensure that the pressure of the off gas is slightly below atmospheric pressure. The pressure
35 is controlled by pressure transmitters. The speed of the ID fans is adjustable by a frequency
36 controller. The control of the pressure ensures that no contaminated off gas above emissions
37 limitations is released into the environment. The ID fans work continuously during the operation
38 of the plant. Two (2) redundant fans are installed. If one (1) fails, the other will automatically
39 take over.

40 **SFU System:** All gases exiting the OGT System are transferred to a final SFU System. The
41 system provides positive backup capacity to the main OGT in the event of system malfunction.
42 The SFU System is an exhaust filtration unit. The exhaust unit is designed and built IAW the
43 requirements by the US Army's Chemical Demilitarization program. The SFU System is

1 designed as a series of filters - prefilter, high-efficiency particulate air (HEPA), charcoal, space,
2 charcoal HEPA, and charcoal (if applicable).

3 The exhaust filter housings are made of stainless steel and are equipped with differential pressure
4 monitors on all filters to ensure adequate flow and to monitor for when a filter needs to be
5 replaced. Filters within the unit use a bag in / bag out system so that the operator changing the
6 filters never comes in contact with the actual filter media. The systems include an ID fan to
7 provide negative pressure in the system to protect against leakage.

8 **Stack:** The stack for discharge of cleaned gases meets the requirements of the American
9 Conference of Governmental Industrial Hygienist industrial ventilation manual.

10 **2.2 SUMMARY OF PROCESS MONITORS AND FLUE GAS ANALYZERS**

11 **2.2.1 Location and Description of the Process Control System**

12 The proper operation of the process control system is necessary to ensure consistent compliance
13 with all RCRA/CAA Permit conditions and safe, efficient operation of the SDC System. The
14 CON is the remote location where the SDC System is normally operated. The CON houses an
15 operator control console, which includes closed-circuit television monitors for observing
16 operations at various locations, as well as emergency shutdown controls. All remote operations,
17 with exception of emergency shutdown, are performed through an operator keyboard using the
18 equipment controls and indications displayed on advisor screens. Processing and sequencing
19 operations are controlled automatically through the programmable logic controller (PLC), which
20 continuously communicates with the operator console in the CON. The automatic control
21 system provides continuous automatic control of the treatment process.

22 The PLC is also connected to a dedicated alarm concentrator that is programmed to continually
23 scan for alarm conditions and to initiate alarms in the CON, alerting the operator of abnormal
24 conditions. The process control software was designed to provide pre-alarms in the CON. These
25 pre-alarms are used to warn the CON operator in time to take corrective action should a process
26 variable approach a FPI or equipment shutdown condition.

27 The PDARS logs and notes the time of all abnormal conditions, as well as the starting and
28 stopping of equipment and operator entries. This system is also used to record process data such
29 as temperature, pressure, and waste feed intervals. PDARS records data at varying intervals.
30 The PDARS takes instantaneous readings at a maximum interval of fifteen seconds and records
31 averages on a one (1)-minute basis. All PDARS data collected for RCRA/CAA instrumentation
32 is included in the ANCDF operating record as required by the CAA/RCRA Permits and
33 applicable regulations.

34 **2.2.2 Flue Gas Monitoring**

35 The SDC System flue gases were monitored for select criteria pollutants by facility and TRM
36 CEMS. The facility CEMS monitors the flue gas for CO in the exhaust blower duct and is
37 programmed into the FPI System (see Table 2-1). The TRM CEMS are provided and operated
38 by URS-Austin and monitor the SDC System for SO₂ and NO_x for the duration of the emissions
39 test.

Table 2-1: FPI Conditions for Mustard and Conventional WMM⁽¹⁾

Item No.	Instrument Tag Number	Process Data Description	Range	Parameter
SDC-01	PI 12007	Detonation Chamber Static Pressure Indication	MAX	362 psi
SDC-02	TI 12021	Detonation Chamber Temperature Indication	MIN	1,000°F
SDC-03	TICS 310 AVG	Thermal Oxidizer Temperature	MIN	1,400° F
SDC-04	PICS 310 AVG	Thermal Oxidizer Pressure	MAX	0.0 psi
SDC-05	TICS 320 AVG	Spray Dryer Temperature	MAX	500°F
SDC-06	PDS 33001	Bag-house Differential Pressure	MAX	0.3 psi
SDC-07	FIA 34204	Acid Scrubber Process Flow	MIN	1.0 cfm
SDC-08	FIS 34203	Quench Tower Flow	MIN	0.5 cfm
SDC-09	TIS 34003, 34004	Quench Tower Temperature	MAX	190°F
SDC-10	TIA 37002	Neutral Scrubber Discharge Temperature	MAX	200°F
SDC-11	SDC 038 A/B/C	Chemical Agent Emissions	MAX	0.03 mg/m ³ (instantaneous)
SDC-12	SDC 038 A/B/C	Chemical Agent Emissions	MAX	0.006 mg/m ³ (ROHA)
SDC-13	AAHH-900	CO Concentration	MAX	100 ppmv, dry basis @ 7% O ₂ (ROHA)

Footnote:

- (1) Operational parameter(s) interlock will prohibit the transfer from loading chamber 1 into chamber 2 until all conditions are met or within range.

3.0 TESTING PROGRAM OVERVIEW

This section summarizes the SDC emissions testing objectives, the planned test program, the actual testing performed, and any deviations from the approved ANCDF SDC Emissions Test Plan which is included as Appendix B.

3.1 SDC EMISSIONS TESTING OBJECTIVES

The emissions tests were performed to demonstrate the following objectives as outlined in the ANCDF SDC Emissions Test Plan:

- Demonstrate DRE of $\geq 99.9999\%$ for mustard agent at a feed rate of up to 72 lbs/hr of mustard agent;
- Demonstrate a ROHA ASC of $< 0.006 \text{ mg/m}^3$ and/or instantaneous ASC of $< 0.03 \text{ mg/m}^3$ for mustard agent; and
- Demonstrate that emissions are less than the screening levels established in the HRA.

3.2 PLANNED EMISSIONS TESTING PROGRAM

The purpose of the SDC emissions testing was to demonstrate the objectives discussed under Section 3.1 by executing a minimum of three (3) test runs. The SDC System was operated at normal conditions to confirm the system operating conditions. Normal system data was collected in addition to the specific sampling and analyses performed to determine the DRE and to confirm the efficiency of the SDC System. The sampling matrix for exhaust gas is found in Table 3-1.

3.3 SUMMARY OF ACTUAL TESTING PERFORMED

The actual testing performed was consistent with the planned program as summarized in Section 3.2 and fully described in the approved ANCDF SDC Emissions Test Plan. Table 3-1 provides a summary of the actual testing that was performed. Table 3-2 summarized deviations from the approved ANCDF SDC Emissions Test Plan. The results of the testing are in Section 8 for the exhaust gas emissions.

Table 3-1: Sampling Matrix for Exhaust Gas

Analyte	Sampling Method	Planned	Performed
Traverse Points	US EPA Method 1	Yes	Yes
Flue Gas Velocity	US EPA Method 2	Yes	Yes
Oxygen and Carbon Dioxide	US EPA Methods 3B	Yes	Yes
Moisture	US EPA Method 4	Yes	Yes
Sulfur Dioxide	US EPA Method 6C	Yes	Yes
Nitrogen Oxides	US EPA Method 7E	Yes	Yes
Semivolatile Organics	SW-846 Method 0010	Yes	Yes
Dioxins/Furans	SW-846 Method 0023A	Yes	Yes
Volatile Organics	SW-846 Method 0030	Yes	Yes
Total Organic Compounds	SW-846 Method 0010 and 0040	Yes	Yes
Acid Gases and Particulates	US EPA Method 26A	Yes	Yes
Trace Metals	US EPA Method 29	Yes	Yes
Energetics	US EPA Modified Method 5	Yes	Yes
Carbon Monoxide	US EPA Method 10	Yes	Yes

Table 3-2: Deviations Summary

SAP/QAPP	Deviation	Basis and Impact
SAMPLING		
Section 6.1.9	The probe temperature of the M26A train was maintained within the method-specified range of 248 to 273°F at all times with the exception of the last 25 minutes of C4bR4 where a probe temperature of 274°F was recorded.	No significant impact. It is not expected that the one (1) degree temperature excursion impacted the reported particulate or acid gas results.
	The filter temperature of the M26A train was maintained within the method-specified range of 248 to 273°F at all times with the exception of the first 15 minutes in the second port of C4bR5 where a maximum filter temperature of 334°F was recorded.	C4bR5 particulate results may be biased low. The filter temperature was recorded at 61°F over the maximum temperature established by the sampling method. While acid gas emissions are not expected to be impacted by this circumstance, it is possible that more volatile particulate would not have been recoverable for this run. Though the C4bR5 filter particulate catch is consistent with those measured during the other runs, the particulate results for C4bR5 should be considered estimated. For compliance comparison purposes, particulate results for C4bR2 were used in lieu of C4bR5. Particulate emission results for C4bR5 are summarized in Appendix H.
Table A-1	All isokinetic sampling trains collected dry sample volumes that were in excess of 3 m ³ as required by the SAP/QAPP. However, the volume of the M26A train for C4bR5 when corrected to standard conditions is < 3 m ³ (2.9 dscm or 102.279 dscf was collected).	No impact. The sample volume collected is sufficient to demonstrate particulate and acid gas emissions.
Table A-3	For C4bR2, a QP tube was not aspirated with the DAAMS DRE samples and QP results were not available for this run.	There is increased uncertainty for the C4bR2 DAAMS DRE measurement. Though valid DAAMS DRE samples were collected and analyzed, an associated QP is not available to assess loss of analyte during sampling or interferences. The C4bR2 DAAMS DRE result should be considered estimated.
Table A-4	For C4bR3, the DRE DAAMS sampling time exceeded 240 minutes.	No impact. During C4bR3, the DRE DAAMS sampling array was started approximately 15 minutes prior to the isokinetic sampling trains commencing sampling of the second port. The DRE DAAMS completed sampling at the same time as the isokinetic sampling trains and “no credit” was taken for the additional sample time when determining total volume sampled for DRE calculations.
ANALYTICAL		
Table A-6	Exhaust gas analyses were generally performed within all required QC criteria. However, there were some sample analyses where not all QC criteria were met. Specific failures are addressed in Section 7.6.	No impact. All reported exhaust gas data is considered usable. There are some results that should be considered estimated. Usability of each sample analysis is discussed in Section 7.6.
Table A-9	A trip blank (aqueous) for the M0040 sampling train was not included with the sample shipment.	Though any potential contamination from shipment of the sample could not be assessed, the reported sample results are not impacted by this circumstance as they are not corrected for trip blank contamination.

4.0 FEED PROHIBITIVE INTERLOCKS

FPI for the SDC System were established in the approved ANCDF SDC Emissions Test Plan. These FPI, which are presented in Table 2-1, were identified to ensure emissions do not exceed the performance standards as stated in RCRA Permit Condition V.D.3 and continuously monitored and recorded by the PDARS (see Appendix A). The PDARS data consist of one (1)-minute values calculated from the average of four (4) 15-second readings. Data recorded or calculated by the PDARS includes the average, minimum, and maximum values collected for each FPI parameter and are summarized in Table 4-1.

4.1 FEED RATES

Table 4-2 presents a summary of the chemical agent rates for each test run. The average chemical agent feed rate was 62.23, 56.62, and 51.11 lbs/hr for C4bR1, C4bR4, and C4bR5, respectively, with a condition average of 56.65 lbs/hr using an average destruction timer of 13 minutes.

With the exception of nickel and zinc, the metal feed rates were demonstrated during C3 and approved by ADEM in a previous submittal. As summarized in Table 4-3, the maximum feed rate for nickel and zinc was demonstrated during C4b at 0.025 and 0.069 lbs/hr, respectively.

4.2 EXHAUST GAS PARAMETERS

During the SDC emissions testing, monitoring of all exhaust gas parameters was conducted. These parameters included the exhaust gas parameters listed in Table 3-1 and the key process parameters identified in Table 2-1. Results of the exhaust gas sampling, including emission rates and key process parameter data are presented in Section 8. The following subsections present results for exhaust gas temperature and velocity, air pollution control equipment (APCE) parameters, and CO concentrations and rates.

4.2.1 Exhaust Gas Temperature

The detonation chamber and thermal oxidizer temperatures were continuously measured and recorded using temperature indicating controller as summarized in Table 4-1.

4.2.2 Exhaust Gas Velocity

The detonation chamber flow rate was continuously measured and recorded using a pressure indicating sensor as summarized in Table 4-1.

4.2.3 APCE Control Parameters

The key APCE parameters for the SDC System are listed in Table 2-1. Each of the key APCE parameters was continuously measured and recorded during each test run as summarized in Table 4-1.

4.2.4 CO Concentration

The CO concentration was continuously monitored and recorded using a facility CEMS using an analyzing indication transmitter which provides the data from the monitor of record. As summarized in Table 4-1, all recorded values are expressed as ppmv, dry basis and corrected to 7% O₂.

1 **4.3 FUGITIVE EMISSION SOURCES**

2 The SDC System, excluding the SFU, is housed in a sprung structure. The primary means of
3 controlling fugitive emissions from the SDC System is by maintaining the thermal oxidizer at a
4 pressure that is below the room or structure pressure in which it is located. The average of the
5 average thermal oxidizer pressures recorded were approximately -0.071 psi for C4b.
6 Additionally, the sprung structure that houses the SDC System is maintained at a negative
7 pressure with respect to the atmosphere by regulating the fan speed.

Table 4-1: Summary of FPI Conditions

Parameter/Description	Instrument Tag Number	Range	Units	Statistic	C4bR1	C4bR4	C4bR5	Average
SDC-FPI-01 Detonation Chamber Pressure	PISA 12007	< 362	psi	Minimum	7.61	3.50	0.063	3.72
				Maximum	18.32	13.01	9.80	13.71
				Average	10.42	6.29	2.22	6.31
SDC-FPI-02 Detonation Chamber Temperature	TICSA 12021	> 1,000	°F	Minimum	1,449.51	1,449.58	1,441.62	1,446.90
				Maximum	1,450.67	1,450.59	1,457.40	1,452.89
				Average	1,450.04	1,450.00	1,449.93	1,449.99
SDC-FPI-03 Thermal Oxidizer Temperature	TIC 31001, 31002, and 31003	> 1,400	°F	Minimum	1,855.83	1,723.48	1,872.88	1,817.39
				Maximum	2,104.54	2,061.86	2,088.14	2,084.85
				Average	1,914.09	1,914.48	1,930.36	1,919.64
SDC-FPI-04 Thermal Oxidizer Pressure	PIC 31006, 31007, and 31008	< 0.0	psi	Minimum	-0.105	-0.093	-0.095	-0.098
				Maximum	-0.035	-0.043	-0.048	-0.042
				Average	-0.071	-0.071	-0.071	-0.071
SDC-FPI-05 Spray Dryer Temperature	TIC 32009, 32010, and 32011	< 500	°F	Minimum	375.24	382.03	382.03	379.77
				Maximum	403.98	398.13	398.61	400.24
				Average	390.25	390.14	390.15	390.18
SDC-FPI-06 Bag House Pressure	PDS 33001	< 0.3	psi	Minimum	0.060	0.070	0.060	0.063
				Maximum	0.080	0.095	0.095	0.090
				Average	0.069	0.086	0.084	0.080
SDC-FPI-07 Acid Scrubber Flow Rate	FIS 34204	> 1.0	cfm	Minimum	3.21	3.28	3.28	3.26
				Maximum	3.58	3.67	3.33	3.53
				Average	3.26	3.33	3.30	3.30
SDC-FPI-08 Quench Tower Flow Rate	FIS 34203	> 0.5	cfm	Minimum	2.70	2.64	2.79	2.71
				Maximum	2.89	2.82	2.82	2.84
				Average	2.86	2.80	2.80	2.82

Table 4-1: Summary of FPI Conditions (Continued)

Parameter/Description	Instrument Tag Number	Range	Units	Statistic	C4bR1	C4bR4	C4bR5	Average
SDC-FPI-09 Quench Tower Temperature	TI 34003	< 190	°F	Minimum	163.61	164.77	162.61	163.66
				Maximum	170.82	170.29	169.58	170.23
				Average	166.85	167.43	165.31	166.53
SDC-FPI-09 Quench Tower Temperature	TI 34004	< 190	°F	Minimum	163.43	164.67	162.38	163.49
				Maximum	170.29	169.93	169.28	169.83
				Average	166.55	167.19	165.10	166.28
SDC-FPI-10 Neutral Scrubber Temperature	TIA 37002	< 200	°F	Minimum	163.82	167.71	164.63	165.39
				Maximum	182.25	182.87	182.89	182.67
				Average	178.28	179.58	177.02	178.29
SDC-13 CO Concentration	AAHH-900	< 100 (ROHA)	ppmv (dry basis @ 7% O ₂)	Minimum	0.44	0.23	0.16	0.28
				Maximum	0.98	1.55	0.58	1.04
				Average	0.64	0.51	0.30	0.48

Table 4-2: Summary of Tray Weights and Time Intervals

Run	Port (Sampling Time)	Tray	Munition Type	Munitions per tray	HD Agent (lbs/tray)	Energetics (lbs/tray)	Entered DC (hr:min)	Interval (minutes)	
C4bR1	Conditioning	1	105mm (HD)	4	11.88	1.28	8:31	---	
	Conditioning	2	105mm (HD)	4	11.88	1.28	9:23	52	
	Conditioning	3	105mm (HD)	4	11.88	1.28	9:40	17	
	Conditioning	4	105mm (HD)	4	11.88	1.28	9:55	15	
	Conditioning	5	105mm (HD)	4	11.88	1.28	10:39	44	
	Conditioning	6	4.2inch (HD)	2	12.00	0.288	10:52	13	
	Port 1		7	4.2in (HD)	2	12.00	0.288	11:03	11
			8	4.2in (HD)	2	12.00	0.288	11:15	12
			9	4.2in (HD)	2	12.00	0.288	11:27	12
			10	4.2in (HD)	2	12.00	0.288	11:39	12
			11	4.2in (HD)	2	12.00	0.288	11:51	12
			12	4.2in (HD)	2	12.00	0.288	12:03	12
			13	4.2in (HD)	2	12.00	0.288	12:15	12
			14	4.2in (HD)	2	12.00	0.288	12:28	13
			15	4.2in (HD)	2	12.00	0.288	12:40	12
			16	4.2in (HD)	2	12.00	0.288	12:52	12
			17	4.2in (HD)	2	12.00	0.288	13:04	12
	Conditioning	18	4.2in (HD)	2	12.00	0.288	14:04	---	
	Port 2		19	4.2in (HD)	2	12.00	0.288	14:17	13
			20	4.2in (HD)	2	12.00	0.288	14:28	11
			21	4.2in (HD)	2	12.00	0.288	14:40	12
			22	4.2in (HD)	2	12.00	0.288	14:50	10
			23	4.2in (HD)	2	12.00	0.288	15:02	12
			24	4.2in (HD)	2	12.00	0.288	15:14	12
			25	4.2in (HD)	2	12.00	0.288	15:24	10
			26	4.2in (HD)	2	12.00	0.288	15:35	11
			27	4.2in (HD)	2	12.00	0.288	15:45	10
			28	4.2in (HD)	2	12.00	0.288	15:55	10
			29	4.2in (HD)	2	12.00	0.288	16:05	10
			30	105mm (HD)	4	11.88	1.28	16:18	13
C4bR1 Average:			---	---	12.00	0.33	---	11.57	
62.23 lbs/hr HD Agent									

Table 4-2: Summary of Tray Weights and Time Intervals (Continued)

Run	Port (Sampling Time)	Tray	Munition Type	Munitions per tray	HD Agent (lbs/tray)	Energetics (lbs/tray)	Entered DC (hr:min)	Interval (minutes)	
C4bR4	Conditioning	1	4.2in (HT)	2	11.50	0.288	15:14	---	
	Conditioning	2	4.2in (HT)	2	11.50	0.288	15:39	---	
	Conditioning	3	4.2in (HT)	2	11.50	0.288	15:57	---	
	Conditioning	4	4.2in (HT)	2	11.50	0.288	16:36	---	
	Conditioning	5	4.2in (HT)	2	11.50	0.288	16:48	---	
	Conditioning	6	4.2in (HT)	2	11.50	0.288	17:17	---	
	Port 1		7	105mm (HD)	4	11.88	1.28	17:33	16
			8	105mm (HD)	4	11.88	1.28	17:45	12
			9	105mm (HD)	4	11.88	1.28	17:59	14
			10	105mm (HD)	4	11.88	1.28	18:15	16
			11	105mm (HD)	4	11.88	1.28	18:28	13
			12	105mm (HD)	4	11.88	1.28	18:42	14
			13	105mm (HD)	4	11.88	1.28	18:53	11
			14	105mm (HD)	4	11.88	1.28	19:04	11
			15	105mm (HD)	4	11.88	1.28	19:14	10
			16	105mm (HD)	4	11.88	1.28	19:24	10
	Conditioning	17	105mm (HD)	4	11.88	1.28	20:41	---	
	Port 2		18	4.2in (HT)	2	11.50	0.288	20:55	14
			19	4.2in (HT)	2	11.50	0.288	21:06	11
			20	105mm (HD)	4	11.88	1.28	21:19	13
			21	105mm (HD)	4	11.88	1.28	21:33	14
			22	105mm (HD)	4	11.88	1.28	21:44	11
			23	105mm (HD)	4	11.88	1.28	21:57	13
			24	105mm (HD)	4	11.88	1.28	22:09	12
			25	105mm (HD)	4	11.88	1.28	22:21	12
			26	105mm (HD)	4	11.88	1.28	22:32	11
			27	105mm (HD)	4	11.88	1.28	22:45	13
C4bR4 Average:			---	---	11.84	1.18	---	12.55	
					56.62 lbs/hr HD Agent				

Table 4-2: Summary of Tray Weights and Time Intervals (Continued)

Run	Port (Sampling Time)	Tray	Munition Type	Mun/tray	HD Agent (lbs/tray)	Energetics (lbs/tray)	Entered DC (hr:min)	Interval (minutes)
C4bR5	Conditioning	1	4.2in (HT)	2	11.50	0.288	10:01	---
	Conditioning	2	4.2in (HT)	2	11.50	0.288	10:26	---
	Conditioning	3	4.2in (HT)	2	11.50	0.288	10:41	---
	Conditioning	4	4.2in (HT)	2	11.50	0.288	10:57	---
	Conditioning	5	105mm (HD)	4	11.88	1.28	11:40	---
	Port 1	6	105mm (HD)	4	11.88	1.28	11:52	12
		7	105mm (HD)	4	11.88	1.28	12:06	14
		8	105mm (HD)	4	11.88	1.28	12:22	16
		9	105mm (HD)	4	11.88	1.28	12:36	14
		10	105mm (HD)	4	11.88	1.28	12:50	14
		11	105mm (HD)	4	11.88	1.28	13:04	14
		12	105mm (HD)	4	11.88	1.28	13:17	13
		13	105mm (HD)	4	11.88	1.28	13:29	12
		14	105mm (HD)	4	11.88	1.28	13:42	13
		15	105mm (HD)	4	11.88	1.28	13:52	10
	Conditioning	16	105mm (HD)	4	11.88	1.28	15:44	---
	Port 2	17	105mm (HD)	4	11.88	1.28	16:00	16
		18	105mm (HD)	4	11.88	1.28	16:15	15
		19	105mm (HD)	4	11.88	1.28	16:29	14
		20	105mm (HD)	4	11.88	1.28	16:45	16
		21	105mm (HD)	4	11.88	1.28	16:58	13
		22	105mm (HD)	4	11.88	1.28	17:10	12
		23	105mm (HD)	4	11.88	1.28	17:26	16
		24	105mm (HD)	4	11.88	1.28	17:43	17
		25	105mm (HD)	4	11.88	1.28	17:57	14
C4bR5 Average:			---	---	11.88	1.28	---	13.95
					51.11 lbs/hr HD Agent			

Table 4-3: Chloride/Metals Feed Rate Determination

Constituent	C3 Feed Rate			C4b Feed Rate			Maximum Feed Rate (lb/hr)
	Spike (lb/hr)	½-Size Tray (lb/hr)	Total (lb/hr)	Agent/Energetic (lb/hr)	Full-Size Tray (lb/hr)	Total (lb/hr)	
Chloride	4.00	---	4.00	25.2	---	25.2	25.2
Antimony	0.12	---	0.12	0.0015	---	0.0015	0.12
Arsenic	0.11	---	0.11	0.020	---	0.020	0.11
Barium	2.46	0.0000032	2.46	0.0026	0.0000075	0.0026	2.46
Beryllium	0.00085	---	0.00085	0.00031	---	0.00031	0.00085
Boron	0.075	---	0.075	0.0031	---	0.0031	0.075
Cadmium	0.0012	---	0.0012	0.00031	---	0.00031	0.0012
Chromium	0.95	0.0000077	0.95	0.019	0.000018	0.019	0.95
Cobalt	0.0087	---	0.0087	0.0013	---	0.0013	0.0087
Copper	0.090	0.000018	0.090	0.029	0.000044	0.029	0.090
Lead	3.59	0.0000013	3.59	1.53	0.0000031	1.53	3.59
Manganese	0.34	0.0000026	0.34	0.052	0.0000062	0.052	0.34
Mercury	0.014	---	0.014	0.0041	---	0.0041	0.014
Nickel	0.016	0.0000017	0.016	0.025	0.0000040	0.025	0.025
Phosphorus	0.49	---	0.49	0.18	---	0.18	0.49
Selenium	0.0016	---	0.0016	0.00063	---	0.00063	0.0016
Silver	0.0026	---	0.0026	0.00041	---	0.00041	0.0026
Thallium	0.00033	---	0.00033	0.000054	---	0.000054	0.00033
Tin	0.051	0.000044	0.051	0.017	0.00010	0.018	0.051
Vanadium	0.0010	---	0.0010	0.00031	---	0.00031	0.0010
Zinc	0.012	0.000028	0.012	0.069	0.000066	0.069	0.069

5.0 EXHAUST GAS SAMPLING

URS-Austin collected all exhaust gas samples during C4b with the exception of the DAAMS DRE samples that were collected by the onsite laboratory. The sampling locations were selected to yield representative samples for the stream being collected.

The exhaust blower duct sampling location was accessed through flanged ports in the duct between the exhaust blower and stack. The inner diameter of the exhaust blower duct was measured prior to testing and determined to be 12 inches at the sampling location. This sampling location was downstream of any online OGT equipment and evaluated prior to testing by M1 and M2 for representativeness. Figure 5-1 presents the traverse point locations for the exhaust blower duct. Eight (8) -point tests were conducted during each isokinetic test run. The M0030 and M0040 sampling trains were collected from the ports that were situated nearest to the stack, with each probe located at a single point within the duct. The TRM CEMS probe was located at the same port set used by the M0030 sampling train.

This section describes the procedures that were followed during the field sampling program. Throughout the overall program, US EPA-approved sampling protocols were utilized. The remainder of this section is divided into three (3) subsections: Field Program Description, Pre-Sampling Activities, and Sampling Methods.

5.1 FIELD PROGRAM DESCRIPTION

C4b consisted of five (5) test runs. C4bR2 was analyzed for all parameters but was not used to determine test averages as QP tubes were not installed during the run. C4bR3 was invalidated due to high CO exceedances. Samples associated with C4bR3. The exhaust gas test methods that were utilized are as follows:

- M1: “*Sample Velocity Traverse for Stationary Sources*,” 40 Code of Federal Regulations (CFR) Part 60, Appendix A;
- M2: “*Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)*,” 40 CFR Part 60, Appendix A;
- M3B: “*Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air*,” 40 CFR Part 60, Appendix A;
- M4: “*Determination of Moisture Content in Stack Gases*,” 40 CFR Part 60, Appendix A;
- M6C: “*Determination of Sulfur Dioxide Emissions from Stationary Sources*,” 40 CFR Part 60, Appendix A;
- M7E: “*Determination of Nitrogen Oxide Emissions from Stationary Sources*,” 40 CFR Part 60, Appendix A;
- M10: “*Determination of Carbon Monoxide Emissions from Stationary Sources*,” 40 CFR Part 60, Appendix A;

- 1 • M0010: “*Modified Method 5 Sampling Train*,” EPA 600/8-85-003;
- 2 • M0010-TOC: “*Guidance for Total Organics*,” EPA 600/R-96-033;
- 3 • M0023A: “*Determination of Polychlorinated Dibenzo-p-Dioxins and*
4 *Polychlorinated Dibenzofurans from Stationary Sources*,” EPA 600/8-85-003;
- 5 • M0030: “*Volatile Organic Sampling Train and the Protocol for the Collection*
6 *and Analysis of Volatile POHCs Using VOST*,” EPA 600/8-85-003;
- 7 • M0040: “*Sampling of Principal Organic Hazardous Constituents from*
8 *Combustion Sources Using Tedlar Bags*,” EPA 600/8-85-003;
- 9 • M26A: “*Determination of Hydrogen Halide and Halogen Emissions from*
10 *Stationary Sources*,” 40 CFR Part 60, Appendix A. [Particulates were determined
11 from this train as well.]
- 12 • M29: “*Determination of Metals Emissions from Stationary Sources*,” 40 CFR
13 Part 60, Appendix A; and
- 14 • MM5E: “*Determination of Particulate Emissions from Stationary Sources*,” 40
15 CFR Part 60, Appendix A. [**NOTE:** *This method was modified to determine*
16 *energetic constituents. The modified method, Revision 1.05, was submitted to*
17 *ADEM for review and was approved for use.*]

18 **5.2 PRESAMPLING ACTIVITIES**

19 Presampling activities included equipment calibration, sample media preparation, and
20 precleaning of the sample train glassware. Each of these activities are described or referenced in
21 the following subsections. Other presampling activities included team meetings and
22 conferences, equipment packing, equipment setup, and finalization of all details leading up to the
23 coordinated initiation of the sampling program.

24 **5.2.1 Equipment Calibration**

25 A program of positive actions was followed to prevent the failure of equipment or instruments
26 during use. Maintenance and calibration were employed to ensure accurate measurements from
27 the field and laboratory instruments.

28 Equipment scheduled for field use was cleaned and checked prior to calibration, as appropriate.
29 General readiness of the equipment entailed a visual inspection of the meter boxes, sample hot
30 boxes, probes, and umbilicals for dust, oil, or dirt in lines, and loose fittings and connections. An
31 adequate supply of spare parts was taken to the field to minimize downtime due to equipment
32 failure.

33 Equipment calibration was conducted IAW the procedures outlined in US EPA documents
34 entitled “*Quality Assurance Handbook for Air Pollution Measurement Systems; Volume III -*
35 *Stationary Source Specific Methods*” (EPA 600/4-77-0276). All required calibrations were

1 performed prior to the test program, with post-test calibrations performed as required.
2 Documentation of pretest calibrations was kept in the project file during the field effort and
3 copies provided to the regulatory observers prior to the start of the emissions tests. The
4 calibration procedures for the equipment are summarized in Table 5-1. Copies of the equipment
5 calibration forms for process control equipment, facility CEMS, and exhaust gas sampling
6 equipment can be found in Appendix D.

7 **5.2.2 Glassware Preparation**

8 Prior to field use, sample train glassware was subjected to method-specific cleaning procedures
9 in order to minimize sample contamination. Cleaning and storage procedures for sampling train
10 glassware were IAW the procedures summarized in the Sampling and Analysis Plan
11 (SAP)/Quality Assurance Project Plan (QAPP). Sample bottles were purchased pre-cleaned and
12 sealed to specified US EPA protocols. Sample bottles were fitted with Teflon[®] cap liners.

13 **5.2.3 Sample Media Preparation**

14 Reagents used for the testing program were of sufficient grade or quality to meet or exceed
15 method requirements. This included the use of spectro-grade solvents from the same lot, when
16 possible, and the collection and analysis of the appropriate blanks. Deionized (DI) reagent water
17 used in all organic sampling trains was of a grade and quality that was demonstrated to be
18 “organic-free” as per SW-846 requirements.

19 Resin used in the M0010, M0010-TOC, M0023A, and MM5E sampling trains was prepared and
20 certified clean by TestAmerica. The sorbent traps were loaded with resin at the laboratories with
21 the openings packed with cleaned glass wool to ensure no resin would be lost. Field surrogates
22 were added by the laboratory prior to shipping, as required. The M0030 traps were conditioned
23 by the laboratory IAW procedures specified in M0030.

24 **5.3 SAMPLING METHODS**

25 On-site sampling activities included the equipment staging in the field, sampling operations, data
26 logging (except where noted below), and sample recovery. Copies of field sampling data sheets
27 can be found in Appendix C.

28 Each isokinetic test run had a total sample time of 240 minutes (two (2) ports at
29 120 minutes/port). The M0030 sampling train, which is non-isokinetic, was operated for a total
30 of 160 minutes (40 minutes/set of traps). The non-isokinetic M0040 sampling train was operated
31 to collect two (2) one (1)-hour bag samples. The M3B (non-isokinetic composite sample) was
32 sampled by a separate pumping system operated in conjunction with an isokinetic sampling train.

33 **5.3.1 US EPA Methods 1 and 2**

34 Velocity traverses were conducted at the exhaust blower duct sampling location with an S-type
35 pitot assembly IAW M1 and M2. An S-type pitot tube with an attached inclined manometer was
36 used to measure the gas velocities. An attached Type-K thermocouple with remote digital
37 display was used to determine the exhaust gas temperature.

1 Prior to commencing sampling, a preliminary determination of exhaust gas velocity and
2 volumetric flow rate was performed to assist in selecting the correct nozzle diameter to ensure all
3 isokinetic testing requirements were met. During the actual sampling, exhaust gas velocity, and
4 volumetric flow rate measurements were conducted with each isokinetic sampling train. The
5 required number of sampling traverse points for each sampling location was determined
6 following M1. Pitot tubes were leak-checked before and after each test run.

7 Exhaust duct static pressure measurements, as required by M2, were recorded manually once per
8 run. This static pressure reading was used to calculate stack gas volumetric flow rate for each
9 isokinetic sampling train.

10 A cyclonic flow check was conducted at the sampling location prior to testing IAW Section 11.4
11 of M1. This procedure was used to ensure the flow was not "swirling" at the sampling location.
12 The equipment used consisted of an S-type pitot tube connected to an inclined manometer to
13 measure the duct's differential pressure, and an angle finding device (i.e., leveled angle finder for
14 horizontal ports or delineated port plate for vertical ports). The pitot tube was positioned at each
15 traverse point so that the face openings of the pitot tube were perpendicular to the exhaust duct
16 cross-sectional plane. This position is called the zero reference. If the velocity pressure reading
17 was zero, the cyclonic angle was recorded as 0°. If the velocity pressure reading was not zero,
18 the pitot tube was rotated clockwise or counterclockwise until the velocity pressure reading
19 became zero. This angle was then measured and reported to the nearest degree. After this
20 technique was applied at each traverse point, the average of the absolute values of the cyclonic
21 angles was calculated. This average was < 20° and the flow conditions in the source were
22 deemed acceptable to test.

23 **5.3.2 US EPA Method 3B**

24 O₂ and CO₂ concentrations were determined during each test run using a bag sampling system
25 IAW M3B. The exhaust gas was collected in an evacuated Tedlar bag. These samples were
26 collected in conjunction with an isokinetic sampling train representing each traverse point within
27 the exhaust duct. One (1) sample was collected for each run.

28 Analysis was conducted using an Orsat combustion gas analyzer. A sample from the Tedlar bag
29 from each run was drawn into the analyzer and analyzed onsite for the concentrations of CO₂ and
30 O₂ on a percentage basis. Analysis and calculation procedures were repeated until the individual
31 dry molecular weights for any three (3) analyses differed from their mean by no more than
32 0.3 gram per gram-mole (g/g-mole) (0.3 pound per pound-mole (lb/lb-mole)). To determine the
33 actual O₂ and CO₂ concentrations for each run, the resulting three (3) acceptable readings for
34 each parameter were averaged. These average results were then used by all isokinetic sampling
35 trains in the determination of the exhaust gas molecular weight. In addition, the O₂
36 concentrations were used for correcting emissions, as applicable, to 7% O₂.

37 **5.3.3 US EPA Method 4**

38 Prior to the test runs, during preliminary measurements, an initial exhaust gas moisture
39 measurement was performed IAW M4. This method is applicable for the determination of the
40 moisture content of stack gas. A gas sample was extracted at a constant rate from the duct, and
41 the moisture removed from the gas stream by a series of chilled impingers. The amount of the

1 collected moisture was then determined gravimetrically and used in the calculation of percent
2 moisture. M4 was used in conjunction with M0010, M0010-TOC, M0023A, M26A, M29, and
3 MM5E for the determination of moisture at the sampling location. The weight gain for each
4 sample train's impinger configuration was recorded and used in the exhaust gas moisture
5 determination calculation.

6 **5.3.4 US EPA Method 6C**

7 SO₂ was determined during each test run using a TRM CEMS. Two (2) two-hour runs were
8 completed for each run. This allowed for parsing of the data such that it would correspond with
9 the actual times each port was sampled by the isokinetic sampling trains.

10 A logbook was kept and calibrations, quality assurance (QA)/quality control (QC) activities,
11 routine maintenance, and repair activities were documented for the SO₂ testing. Activities
12 related to the pre-test checks (calibration drift/error and response time tests) were also recorded.
13 All data related to SO₂ sampling and the pre-test activities were logged using the Data
14 Acquisition System (DAS).

15 The TRM CEMS was calibrated IAW M6C. In general, the QA/QC measures included the use
16 of US EPA protocol calibration gases, pre- and post-test run calibrations, calibration error, and
17 bias tests. Copies of the certifications for the gas standards, documentation of all TRM CEMS
18 QA/QC procedures, and results summaries of the TRM CEMS QC are provided in Appendix D.

19 **5.3.5 US EPA Method 7E**

20 NO_x was determined during each test run using a TRM CEMS. Two (2) two-hour runs were
21 completed for each run. This allowed for parsing of the data such that it would correspond with
22 the actual times each port was sampled by the isokinetic sampling trains.

23 A logbook was kept and calibrations, QA/QC activities, routine maintenance, and repair
24 activities were documented for the NO_x testing. Activities related to the pre-test checks
25 (calibration drift/error and response time tests) were also recorded. All data related to NO_x
26 sampling and the pre-test activities were logged using the DAS and/or the digital strip chart
27 recorder.

28 The TRM CEMS was calibrated IAW M7E. In general, the QA/QC measures included the use
29 of US EPA protocol calibration gases, a converter check, pre- and post-test run calibrations,
30 calibration error, and bias tests. Copies of the certifications for the gas standards, documentation
31 of all TRM CEMS QA/QC procedures, and results summaries of the TRM CEMS QC are
32 provided in Appendix D.

33 **5.3.6 US EPA Method 10**

34 CO was determined during each test run using a TRM CEMS. Two (2) two-hour runs were
35 completed for each run. This allowed for parsing of the data such that it would correspond with
36 the actual times each port was sampled by the isokinetic sampling trains.

1 A logbook was kept and calibrations, QA/QC activities, routine maintenance, and repair
2 activities were documented for the CO testing. Activities related to the pre-test checks
3 (calibration drift/error and response time tests) were also recorded. All data related to CO
4 sampling and the pre-test activities were logged using the DAS and/or the digital strip chart
5 recorder.

6 The TRM CEMS was calibrated IAW M7E. In general, the QA/QC measures included the use
7 of US EPA protocol calibration gases, pre- and post-test run calibrations, calibration error, and
8 bias tests. Copies of the certifications for the gas standards, documentation of all TRM CEMS
9 QA/QC procedures, and results summaries of the TRM CEMS QC are provided in Appendix D.

10 **5.3.7 SW-846 Method 0010**

11 A sampling train was used to measure and determine the emission rate of the semivolatile
12 product of incomplete combustion (PICs) and tentatively identified compounds (TICs) IAW
13 M0010. Table 5-2 summarizes the exhaust gas characteristics measured by the M0010 sampling
14 train.

15 The sampling train consisted of a heated, glass-lined probe with a glass button-hook nozzle, and
16 a heated Teflon[®] transfer line. A thermocouple and S-type pitot tube with an inclined
17 manometer were attached to the probe for measurement of gas temperature and velocity. The
18 sample gas passed through the probe to a heated, glass fiber filter. The probe and the filter
19 holder were maintained at 248°F plus or minus (\pm) 25°F throughout each test period.
20 Downstream of the heated filter, the gas passed through a heated Teflon[®] transfer line to a water-
21 cooled condenser module, then through a sorbent module containing resin. The heated Teflon[®]
22 transfer line was maintained at 248°F \pm 25°F throughout each test period. The temperature of the
23 exhaust gas entering the resin module was kept below 68°F. The gas then passed through a
24 series of ice-cooled impingers kept below 68°F to enable condensation and collection of
25 entrained moisture.

26 The first impinger, acting as a condensate reservoir (knockout) connected to the outlet of the
27 resin module, was modified with a short stem IAW method requirements. The next two (2)
28 impingers each contained 100-milliliter (mL) of DI water. The second DI water-filled impinger
29 was equipped with a Greenburg-Smith impinger stem. The fourth impinger was empty, and the
30 fifth impinger was loaded with indicating silica gel. All connections within the train were glass
31 or Teflon[®]. No sealant greases were used. A dry gas meter, pump, and calibrated orifice meter
32 followed the impingers. The M0010 sampling train configuration is depicted in Figure 5-2.

33 A M0010 sample was collected over a four (4)-hour sampling period for each test run. Sampling
34 was isokinetic (90 to 110%) with readings of exhaust gas and necessary sampling parameters
35 recorded six (6) times (6X) for each of the eight (8) sampling points.

36 Leak checks of the entire M0010 sampling train were performed prior to the start of sampling,
37 during port changes, and at the completion of sampling. All leak checks and leakage rates were
38 documented on the relevant field test data sheet. The acceptance standard for the M0010
39 sampling train was a leak rate of less than or equal to (\leq) 0.02 cfm performed at the highest

1 vacuum reached during the period since the previous leak check. Pitot tubes were also
2 successfully leak checked, both prior to and after sampling.

3 Following the completion of each test run (including final leak check), the M0010 sampling train
4 was disassembled at the sampling location, partially recovered, and transported to a recovery
5 trailer onsite. The sample recovery sequence is detailed on the field sampling log for the
6 sampling train found in Appendix C. Each M0010 train resulted in the following sample
7 fractions: front-half (probe, heated Teflon[®] transfer line, nozzle, front-half glassware) recovery
8 rinse, filter, back-half (back-half filter holder and condenser) recovery rinse, resin module,
9 condensate, and first impinger condensate and rinse.

10 **5.3.8 SW-846 Method 0010 for TOCs**

11 A sampling train was used to measure and determine the emission rate of the semi- and
12 nonvolatile TOCs IAW M0010. Table 5-2 summarizes the exhaust gas characteristics measured
13 by the M0010-TOC sampling train.

14 This train was run in conjunction with the M0040 which yielded the volatile portion for the
15 TOC. The methods provide for the sampling and analysis of total organics from stack gas
16 emissions, combining the organics from three (3) specific boiling point/vapor pressure ranges:
17 light hydrocarbons and volatile organics, semivolatile organics, and nonvolatile organics. Two
18 (2) sampling procedures and four (4) analytical techniques were combined to generate a value for
19 total organics. The mass of organics that remain after correction for the identified organics, from
20 SW-846 methodologies, is called residual organic carbon. This mass is used in estimating risk
21 from unidentified organic emissions.

22 The sampling train consisted of a heated, glass-lined probe with a glass button-hook nozzle, and
23 a heated Teflon[®] transfer line. A thermocouple and S-type pitot tube with an inclined
24 manometer were attached to the probe for measurement of gas temperature and velocity. The
25 sample gas passed through the probe to a heated, glass fiber filter. The probe and the filter
26 holder were maintained at 248°F ± 25°F throughout each test period. Downstream of the heated
27 filter, the gas passed through a heated Teflon[®] transfer line to a water-cooled condenser module,
28 then through a sorbent module containing resin. The heated Teflon[®] transfer line was
29 maintained at 248°F ± 25°F throughout each test period. The temperature of the exhaust gas
30 entering the resin module was kept below 68°F. The gas then passed through a series of
31 ice-cooled impingers kept below 68°F to enable condensation and collection of entrained
32 moisture.

33 The first impinger, acting as a condensate reservoir (knockout) connected to the outlet of the
34 resin module, was modified with a short stem IAW method requirements. The next two (2)
35 impingers each contained 100-mL of DI water. The second DI water-filled impinger was
36 equipped with a Greenburg-Smith impinger stem. The fourth impinger was empty, and the fifth
37 impinger was loaded with indicating silica gel. All connections within the train were glass or
38 Teflon[®]. No sealant greases were used. A dry gas meter, pump, and calibrated orifice meter
39 followed the impingers. The M0010-TOC sampling train configuration is depicted in Figure 5-2
40 (the same train configuration as M0010).

1 A M0010-TOC sample was collected over a four (4)-hour sampling period during each
2 emissions test. Sampling was isokinetic (90 to 110%) with readings of exhaust gas and
3 necessary sampling parameters recorded 6X for each of the eight (8) sampling points.

4 Leak checks of the entire M0010-TOC sampling train were performed prior to the start of
5 sampling, during port changes, and at the completion of sampling. All leak checks and leakage
6 rates were documented on the relevant field test data sheet. The acceptance standard for the
7 M0010-TOC sampling train was a leak rate of ≤ 0.02 cfm performed at the highest vacuum
8 reached during the period since the previous leak check. Pitot tubes were also successfully leak
9 checked, both prior to and after sampling.

10 Following the completion of each test run (including final leak check), the M0010-TOC
11 sampling train was disassembled at the sampling location, partially recovered, and transported to
12 a recovery trailer onsite. The sample recovery sequence is detailed on the field sampling log for
13 the sampling train found in Appendix C. Each M0010-TOC train resulted in the following
14 sample fractions: front-half (probe, heated Teflon[®] transfer line, nozzle, front-half glassware)
15 recovery rinse, filter, resin module, condensate, and back-half rinse.

16 **5.3.9 SW-846 Method 0023A**

17 A sampling train was used to measure and determine the emission rate of the dioxins/furans IAW
18 M0023A. Table 5-2 summarizes the exhaust gas characteristics for dioxins/furans measured by
19 the M0023A sampling trains.

20 The sampling train consisted of a heated, glass-lined probe with a glass button-hook nozzle, and
21 a heated Teflon[®] transfer line. A thermocouple and S-type pitot tube with an inclined
22 manometer were attached to the probe for measurement of gas temperature and velocity. The
23 sample gas passed through the probe to a heated, glass fiber filter. The probe and the filter
24 holder were maintained at $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$ throughout each test period. Downstream of the heated
25 filter, the gas passed through a heated Teflon[®] transfer line to a water-cooled condenser module,
26 then through a sorbent module containing resin. The heated Teflon[®] transfer line was
27 maintained at $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$ throughout each test period. The temperature of the exhaust gas
28 entering the resin module was kept below 68°F . The gas then passed through a series of
29 ice-cooled impingers kept below 68°F to enable condensation and collection of entrained
30 moisture.

31 The first impinger, acting as a condensate reservoir (knockout) connected to the outlet of the
32 resin module, was modified with a short stem IAW method requirements. The next two (2)
33 impingers each contained 100-mL of DI water. The second DI water-filled impinger was
34 equipped with a Greenburg-Smith impinger stem. The fourth impinger was empty, and the fifth
35 impinger was loaded with indicating silica gel. All connections within the train were glass or
36 Teflon[®]. No sealant greases were used. A dry gas meter, pump, and calibrated orifice meter
37 followed the impingers. The M0023A sampling train configuration is depicted in Figure 5-2 (the
38 same train configuration as M0010).

39 A M0023A sample was collected over a four (4)-hour sampling period during each emissions
40 test. Sampling was isokinetic (90 to 110%) with readings of exhaust gas and necessary sampling
41 parameters recorded 6X for each of the eight (8) sampling points.

1 Leak checks of the entire M0023A sampling train were performed prior to the start of sampling,
2 during port changes, and at the completion of sampling. All leak checks and leakage rates were
3 documented on the relevant field test data sheet. The acceptance standard for the M0023A
4 sampling train was a leak rate of ≤ 0.02 cfm performed at the highest vacuum reached during the
5 period since the previous leak check. Pitot tubes were also successfully leak checked, both prior
6 to and after sampling.

7 Following the completion of each test run (including final leak check), the M0023A sampling
8 train was disassembled at the sampling location, partially recovered, and transported to a
9 recovery trailer onsite. The sample recovery sequence is detailed on the field sampling log for
10 the sampling train found in Appendix C. Each M0023A train resulted in the following sample
11 fractions: front-half (probe, heated Teflon[®] transfer line, nozzle, front-half glassware) recovery
12 rinse, filter, back-half rinse, and resin module.

13 **5.3.10 SW-846 Method 0030**

14 The M0030 was used to determine emission rates of the volatile PICs and TICs in the exhaust
15 gas. M0030 procedures and QA/QC requirements as described in M0030 were followed. The
16 M0030 sampling system is a non-isokinetic sampling train, and sampling rates are predetermined
17 based on desired run times.

18 Table 5-3 summarizes the exhaust gas characteristics measured by the M0030 sampling train.
19 Approximately 20 liters (L) were collected through each set of traps at a sampling rate of
20 approximately 0.5 liters per minute (L/min). Four (4) sets of traps were collected for each test
21 run. The condensate was collected at the end of the run. A diagram of the sampling train is
22 presented in Figure 5-3.

23 Handling precautions were followed to reduce the potential for contamination of the resin.
24 Tenax resin is susceptible to contamination. The resin stock was thermally desorbed under
25 helium and stored either sealed in the collection traps or under helium. A packed trap was
26 desorbed to serve as a laboratory blank prior to placing the batch of Tenax traps in the field. The
27 laboratory prepared sufficient sealed blank traps in sealed containers for the M0030 sampling.
28 Four (4) pairs of traps and a condensate sample were collected during each test run. One (1) pair
29 of field blanks were collected for each test run, and one (1) pair of trip blanks were provided for
30 each shipping container containing M0030 samples being shipped to the laboratory. M0030 data
31 is reported in Section 8, uncorrected for any field blank contamination.

32 **5.3.11 SW-846 Method 0040**

33 A M0040 sampling train was used to measure and determine the emission rates of volatile TOCs
34 IAW M0040. Table 5-3 summarizes the exhaust gas characteristics measured by the M0040
35 sampling train.

36 The methods provide for the sampling and analysis of total organics from stack gas emissions,
37 combining the organics from three (3) specific boiling point/vapor pressure ranges: light
38 hydrocarbons and volatile organics, semi-volatile organics, and nonvolatile organics. Two (2)
39 sampling procedures and four (4) analytical techniques were combined to generate a value for

1 total organics. The mass of organics that remain after correction for the identified organics, from
2 SW-846 methodologies, is called residual organic carbon. This mass will be used in estimating
3 risk from unidentified organic emissions.

4 The M0040 sampling train consisted of a glass-lined probe, a heated glass or Teflon[®] filter
5 holder and quartz filter attached to one (1) of two (2) inlets of a glass and Teflon[®] three (3)-way
6 isolation valve. The second valve inlet was connected to a charcoal trap to filter incoming air
7 when releasing system pressure after leak checks. The outlet of the isolation valve was
8 connected to a glass, water-cooled, coil-type condenser and a glass condensate trap for the
9 removal and collection of condensable liquids present in the gas stream. A Teflon[®] transfer line
10 connected the condensate trap to a second three (3)-way isolation valve and the isolation valve to
11 a Tedlar bag contained in a rigid, air-tight container for sampling, storage and transport. The bag
12 container was connected to a control console with a Teflon[®] vacuum line between the bag
13 container and the control console to protect the console and sampling personnel from hazardous
14 emissions in case of a bag rupture during sampling. The M0040 sampling train configuration is
15 depicted in Figure 5-4.

16 Leak checks of the entire M0040 train were performed before and after each sampling run. In
17 the event any portion of the train was disassembled and reassembled, leak checks were
18 performed prior to disassembling the train and again upon reassembly. All leak checks and
19 leakage rates were documented on the relevant field test data sheets.

20 Two (2) Tedlar bag gas samples were collected per run with approximately 40 L of sample
21 collected into each Tedlar bag at a flow rate of approximately 0.65 L/min. A daily field blank
22 was also collected. Each run produced the following samples: Tedlar bag sample 1, condensate
23 sample 1, Tedlar bag sample 2, condensate sample 2, Tedlar bag field blank (only one (1) per
24 day), and condensate field blank (only one (1) per day).

25 A field control spike was conducted using one (1) bag during one (1) of the sampling runs for
26 each condition. The field control spikes consisted of a known concentration of a target
27 compound (propane) injected directly into the Tedlar bag of a field sample.

28 **5.3.12 US EPA Method 26A**

29 A sampling train was used to measure and determine the emission rate of the acid gases IAW
30 M26A. Table 5-2 summarizes the exhaust gas characteristics measured by the M26A sampling
31 train.

32 The sampling train consisted of a heated, glass-lined probe with a glass button-hook nozzle, and
33 a Teflon[®] transfer line. A thermocouple and S-type pitot tube with an inclined manometer were
34 attached to the probe for measurement of gas temperature and velocity. The sample gas passed
35 through the probe to a heated filter. The probe and the filter holder were maintained in the range
36 of 248°F to 273°F throughout each test period with exceptions noted in Section 7. The gas then
37 passed through a series of six (6) ice-cooled impingers kept below 68°F to enable condensation
38 and collection of entrained moisture.

1 The first impinger served as a moisture knockout and contained 50 mL of 0.1 normal (N) sulfuric
2 acid (H₂SO₄). The next two (2) impingers contained 100 mL of 0.1N H₂SO₄. The fourth and
3 fifth impingers contained 100 mL of 0.1N sodium hydroxide (NaOH). The sixth impinger
4 contained a pre-weighed amount of silica gel. The impingers were followed by a dry gas meter
5 pump and calibrated orifice meter. The M26A sampling train configuration is depicted in
6 Figure 5-5.

7 A M26A sample was collected over a four (4)-hour sampling period for each emissions test.
8 Sampling was isokinetic (90 to 110%) with readings of exhaust gas and necessary sampling
9 parameters recorded 6X for each of the eight (8) sampling points.

10 Leak checks of the entire M26A sampling train were performed prior to the start of sampling,
11 during port changes, and at the completion of sampling. All leak checks and leakage rates were
12 documented on the relevant field test data sheet. The acceptance standard for the M26A
13 sampling train was a leak rate of ≤ 0.02 cfm performed at the highest vacuum reached during the
14 period since the previous leak check. Pitot tubes were also successfully leak checked, both prior
15 to and after sampling.

16 Following the completion of each test run (including the final leak check), the filter and filter
17 housing was visually inspected to verify that there was no moisture present and that a purge with
18 filtered air was not required. The sample recovery sequence is detailed on the field sampling log
19 for the sampling train found in Appendix C. Each M26A train resulted in the following sample
20 fractions: filter, front-half solvent rinse, 0.1N H₂SO₄ impinger catches, and 0.1N NaOH impinger
21 catches.

22 **5.3.13 US EPA Method 29**

23 A sampling train was used to measure and determine the emission rate of the trace metals IAW
24 M29. Table 5-2 summarizes the exhaust gas characteristics measured by the M29 sampling
25 train.

26 The sampling train consisted of a heated glass-lined probe with a glass button-hook nozzle, and a
27 Teflon[®] transfer line. A thermocouple and S-type pitot tube with an inclined manometer were
28 attached to the probe for measurement of gas temperature and velocity. The sample gas passed
29 through the probe to a heated filter. The probe and the filter holder were maintained at 248°F \pm
30 25°F throughout each test period. Downstream of the heated filter, the gas passed through a
31 series of seven (7) ice-cooled impingers kept below 68°F to enable condensation and collection
32 of entrained moisture.

33 The first impinger was empty and served as a moisture knockout. The second and third
34 impingers contained 100 mL of a 5% nitric acid (HNO₃)/10% hydrogen peroxide (H₂O₂)
35 solution. The fourth impinger was empty. The fifth and sixth impingers contained 100 mL of a
36 4% potassium permanganate (KMnO₄)/10% H₂SO₄ solution. The seventh impinger contained a
37 pre-weighed amount of silica gel. The impingers were followed by a dry gas meter, pump, and
38 calibrated orifice meter. The M29 sampling train configuration is depicted in Figure 5-6.

1 A M29 sample was collected over a four (4)-hour sampling period for each emissions test.
2 Sampling was isokinetic (90 to 110%) with readings of exhaust gas and necessary sampling
3 parameters recorded 6X for each of the eight (8) sampling points.

4 Leak checks of the entire M29 sampling train were performed prior to the start of sampling,
5 during port changes, and at the completion of sampling. All leak checks and leakage rates were
6 documented on the relevant field test data sheet. The acceptance standard for the M29 sampling
7 train was a leak rate of ≤ 0.02 cfm performed at the highest vacuum reached during the period
8 since the previous leak check. Pitot tubes were also successfully leak checked, both prior to and
9 after sampling.

10 Following the completion of each test run (including final leak check), the M29 sampling train
11 was disassembled at the sampling location, partially recovered, and transported to a recovery
12 trailer onsite. The sample recovery sequence is detailed on the field sampling log for the
13 sampling train found in Appendix C. Each M29 train resulted in the following sample fractions:
14 filter, probe nozzle and front-half filter housing 0.1N HNO₃ rinse, back-half filter housing and
15 0.1N HNO₃ impinger catch (impingers 1, 2, and 3), impinger 4 - 0.1N HNO₃ rinse (empty),
16 impingers 5 and 6 - acidified KMnO₄ impinger catch, and impingers 5 and 6 hydrogen chloride
17 (HCl) rinse.

18 **5.3.14 US EPA Modified Method 5**

19 A sampling train was used to measure and determine the emission rate of target energetic
20 compounds IAW MM5E. Table 5-2 summarizes the exhaust gas characteristics measured by the
21 MM5E sampling train.

22 The sampling train consisted of a heated, glass-lined probe with a glass button-hook nozzle and a
23 heated sample line. A thermocouple and S-type pitot tube attached to an inclined manometer
24 were attached to the probe for measurement of gas temperature and velocity measurement. The
25 sample gas passed through the probe assembly to a heated filter. The probe, filter holder, and
26 transfer line were maintained at $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$ throughout each test period. Downstream of the
27 heated filter, the gas passed through a heated sample line and then through a series of three (3)
28 ice-cooled impingers kept below 68°F to enable condensation of entrained moisture. The first
29 impinger had a short stem and was charged with 50 mL of DI water to serve as the primary
30 condensate knockout. The second and third impingers were empty. After passing through the
31 first three (3) impingers, the sample gas passed through a two (2) section sorbent module. Each
32 section of the module contained approximately 10 grams (g) of resin separated by a glass wool
33 plug. The gas then passed through a fourth ice-cooled impinger (empty) and finally through a
34 fifth impinger containing a preweighed amount of silica gel. All connections within the train
35 were glass or Teflon[®]. No sealant greases were used. The impingers were followed by a dry gas
36 meter, pump, and calibrated orifice meter. The MM5E sampling train configuration is depicted
37 in Figure 5-7.

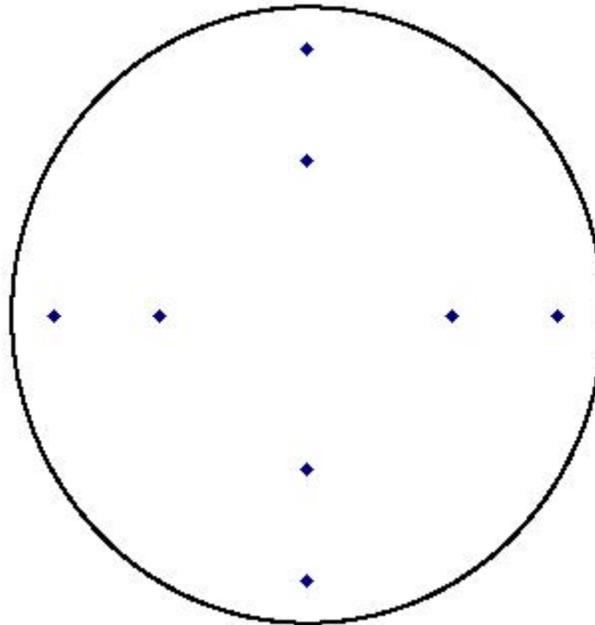
38 A MM5E sample was collected over a four (4)-hour sampling period for each emissions test.
39 Sampling was isokinetic (90 to 110%) with readings of exhaust gas and necessary sampling
40 parameters recorded 6X for each of the eight (8) sampling points.

1 Leak checks of the entire MM5E sampling train were performed prior to the start of sampling,
2 during port changes, and at the completion of sampling. All leak checks and leakage rates were
3 documented on the relevant field test data sheet. The acceptance standard for the MM5E
4 sampling train was a leak rate of ≤ 0.02 cfm performed at the highest vacuum reached during the
5 period since the previous leak check. Pitot tubes were also successfully leak checked, both prior
6 to and after sampling.

7 Following the completion of each test run (including final leak check), the MM5E sampling train
8 was disassembled at the sampling location, partially recovered, and transported to a recovery
9 trailer onsite. The sample recovery sequence is detailed on the field sampling log for the
10 sampling train found in Appendix C. Each MM5E train resulted in the following sample
11 fractions: front-half rinse and filter, impingers 1, 2, 3, and 4 condensate and rinsate, and resin
12 module.

13

Figure 5-1: Traverse Point Locations for the SDC Exhaust Duct



Traverse Point	Fraction of Diameter	Distance From Wall (inches)
1	6.7	0.804
2	25	3.0
3	75	9.0
4	93.3	11.2

Note: Traverse point locations are recorded on a field log sheet provided in Appendix C.

Figure 5-2: SW-846 Methods 0010 and 0023A Sampling Train

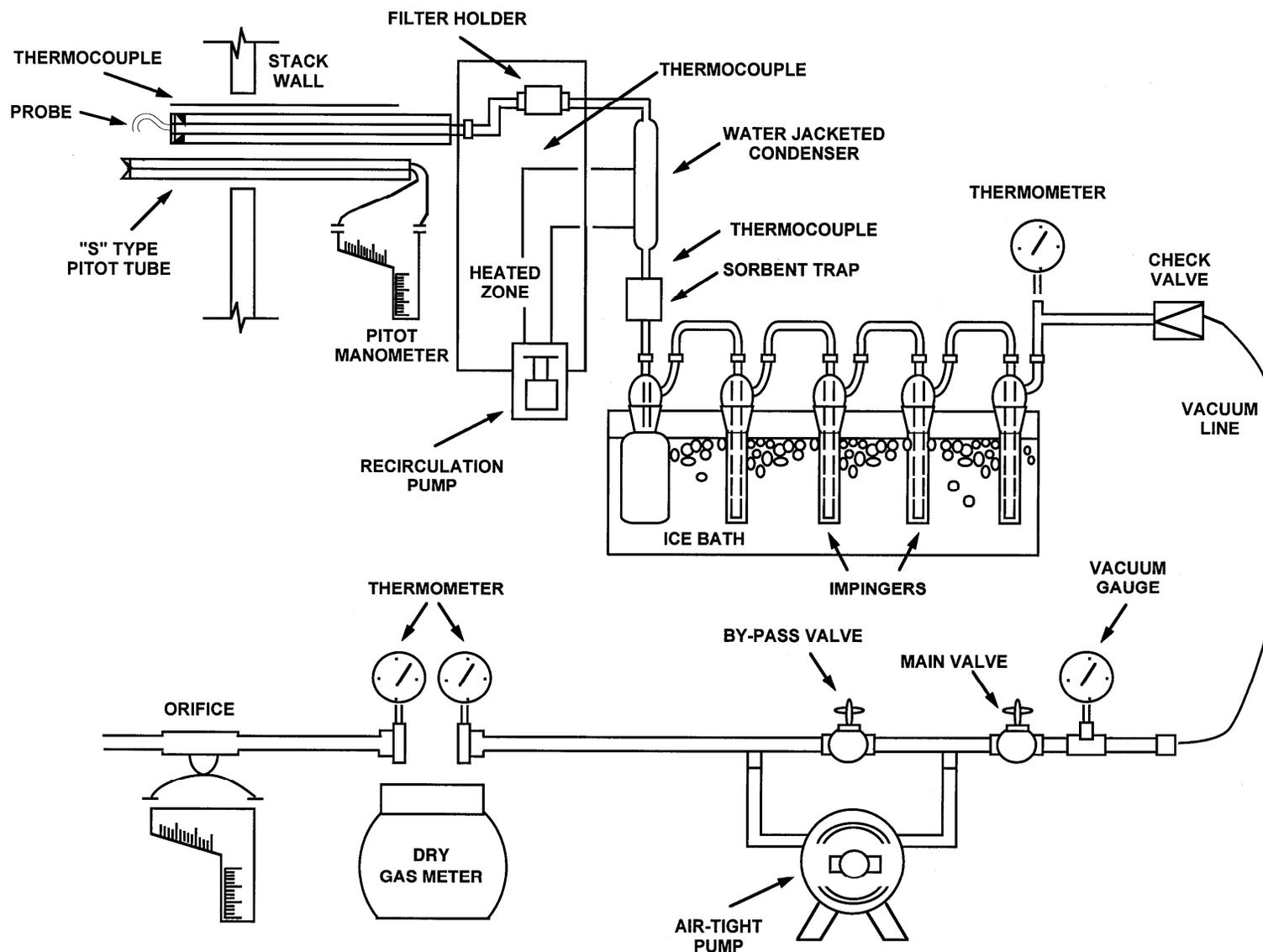


Figure 5-3: SW-846 Method 0030 Sampling Train

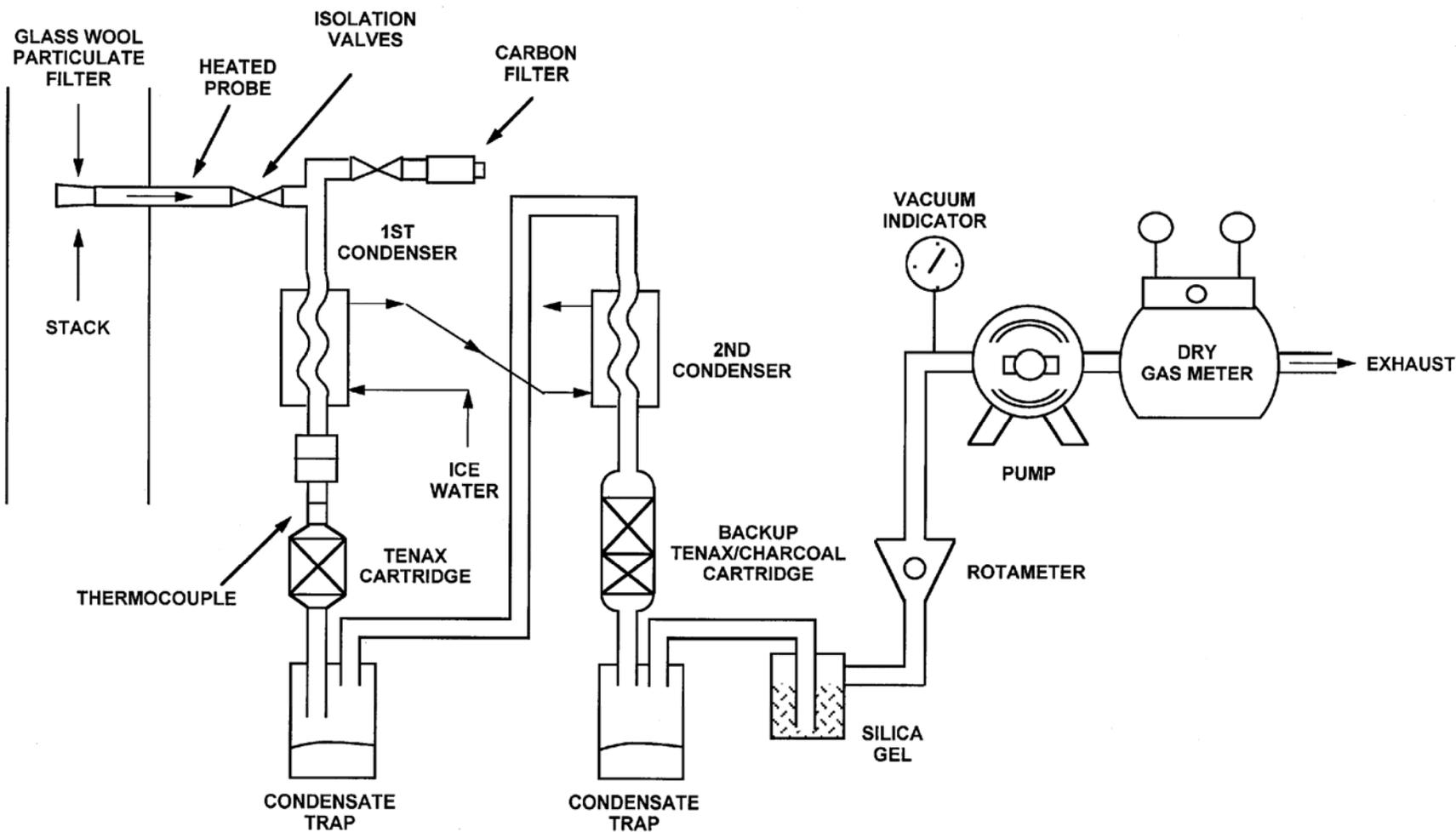


Figure 5-4: SW-846 Method 0040 Sampling Train

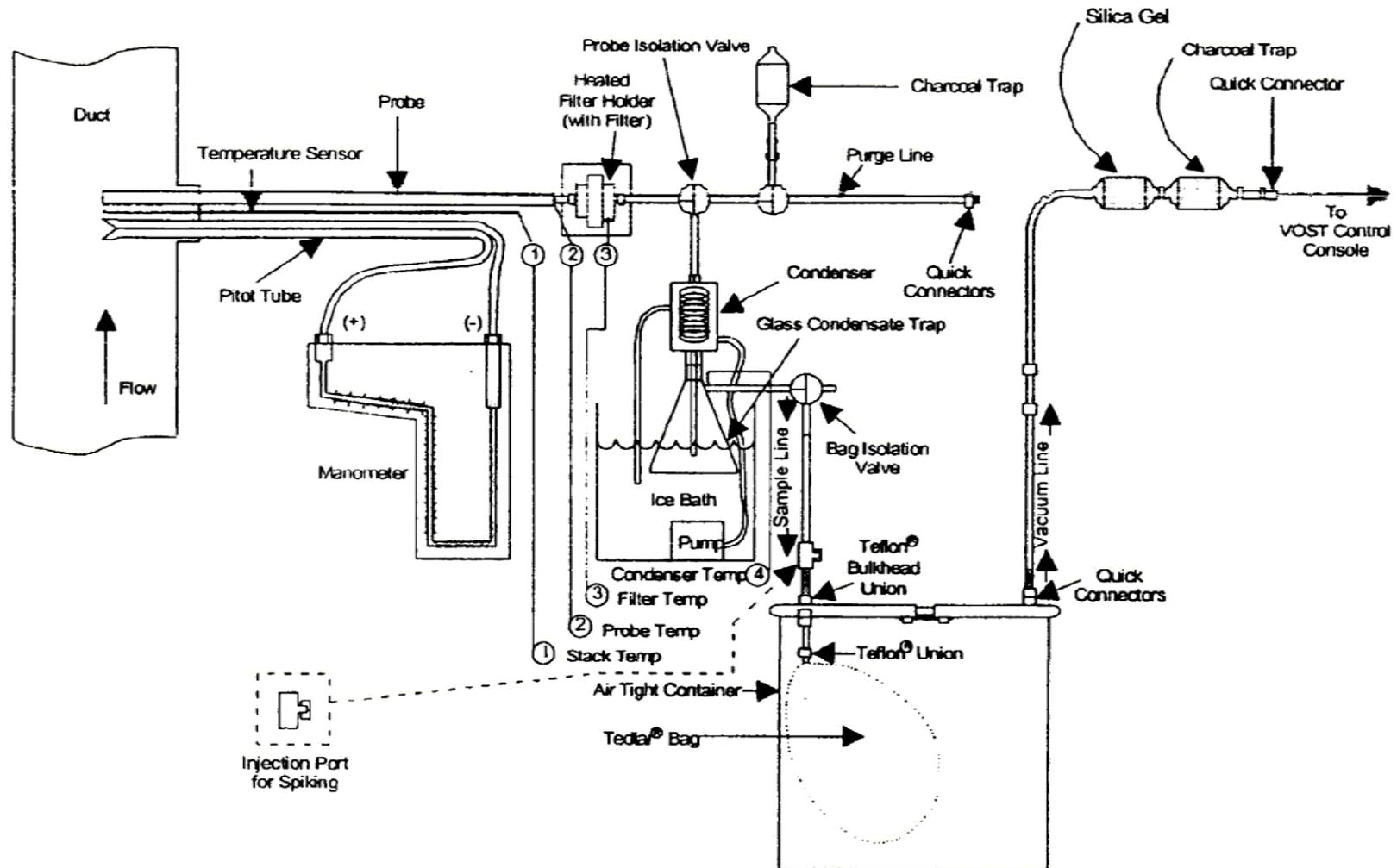


Figure 5-5: US EPA Method 26A Sampling Train

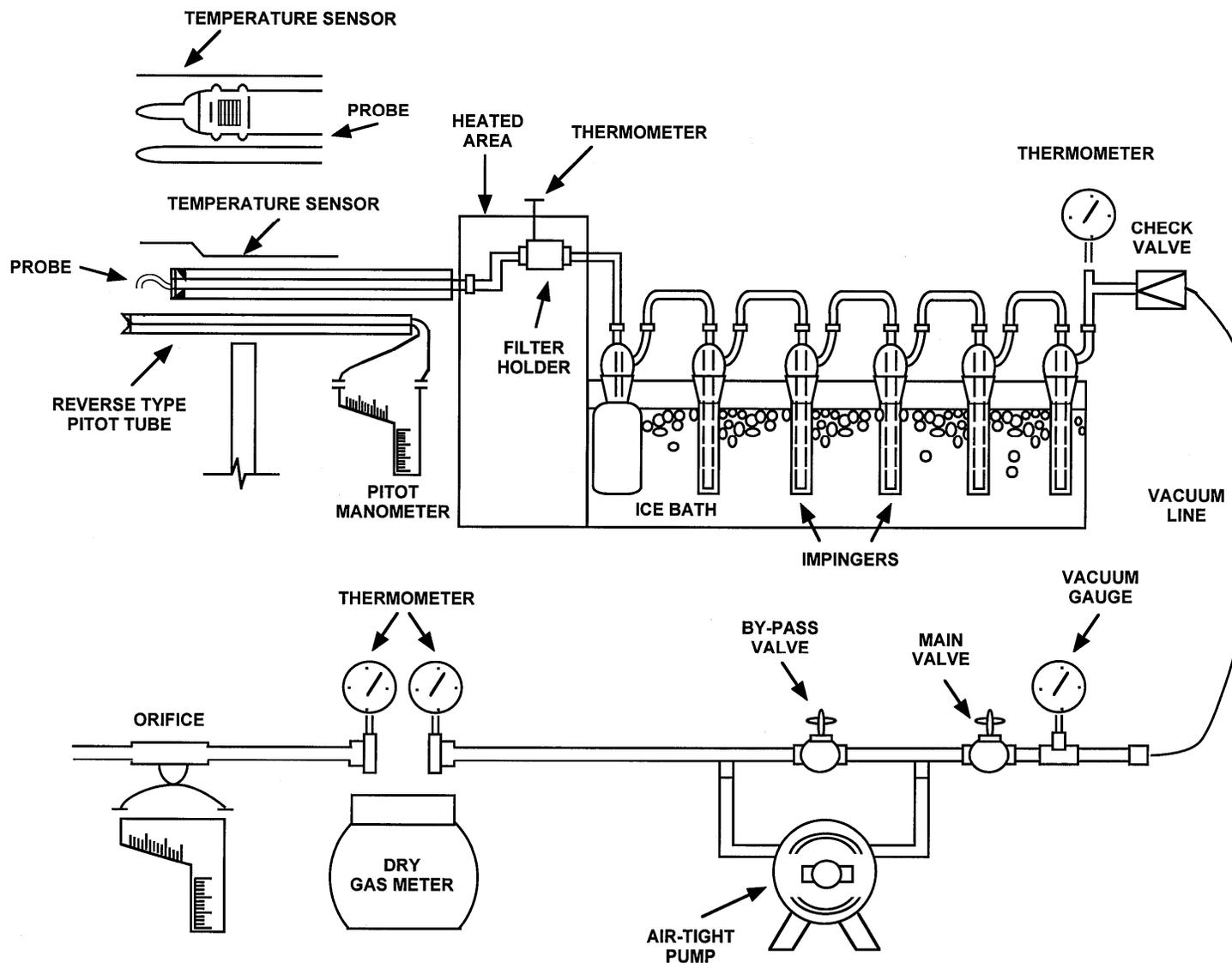


Figure 5-6: US EPA Method 29 Sampling Train

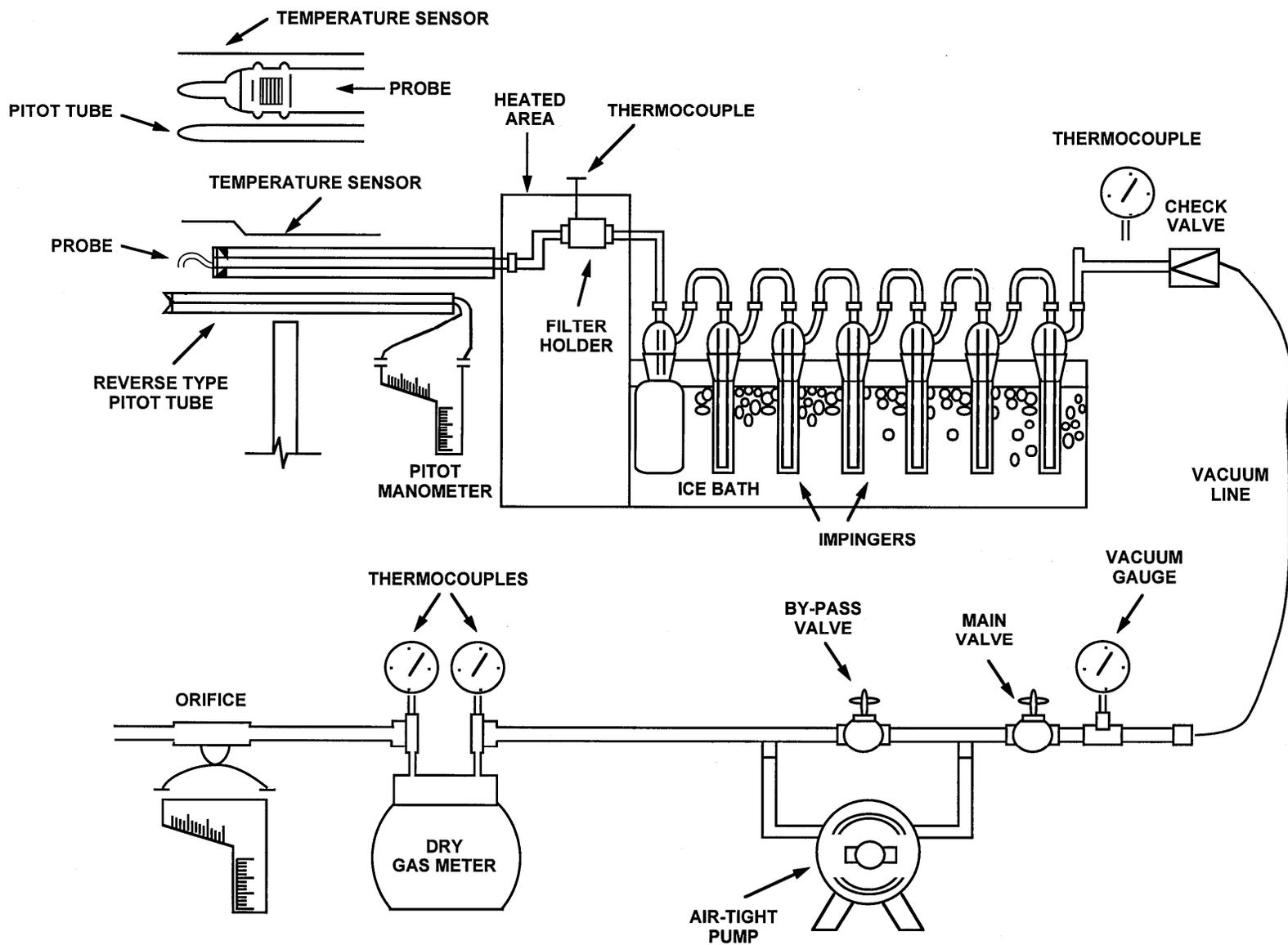


Figure 5-7: US EPA Modified Method 5 for Energetics Sampling Train

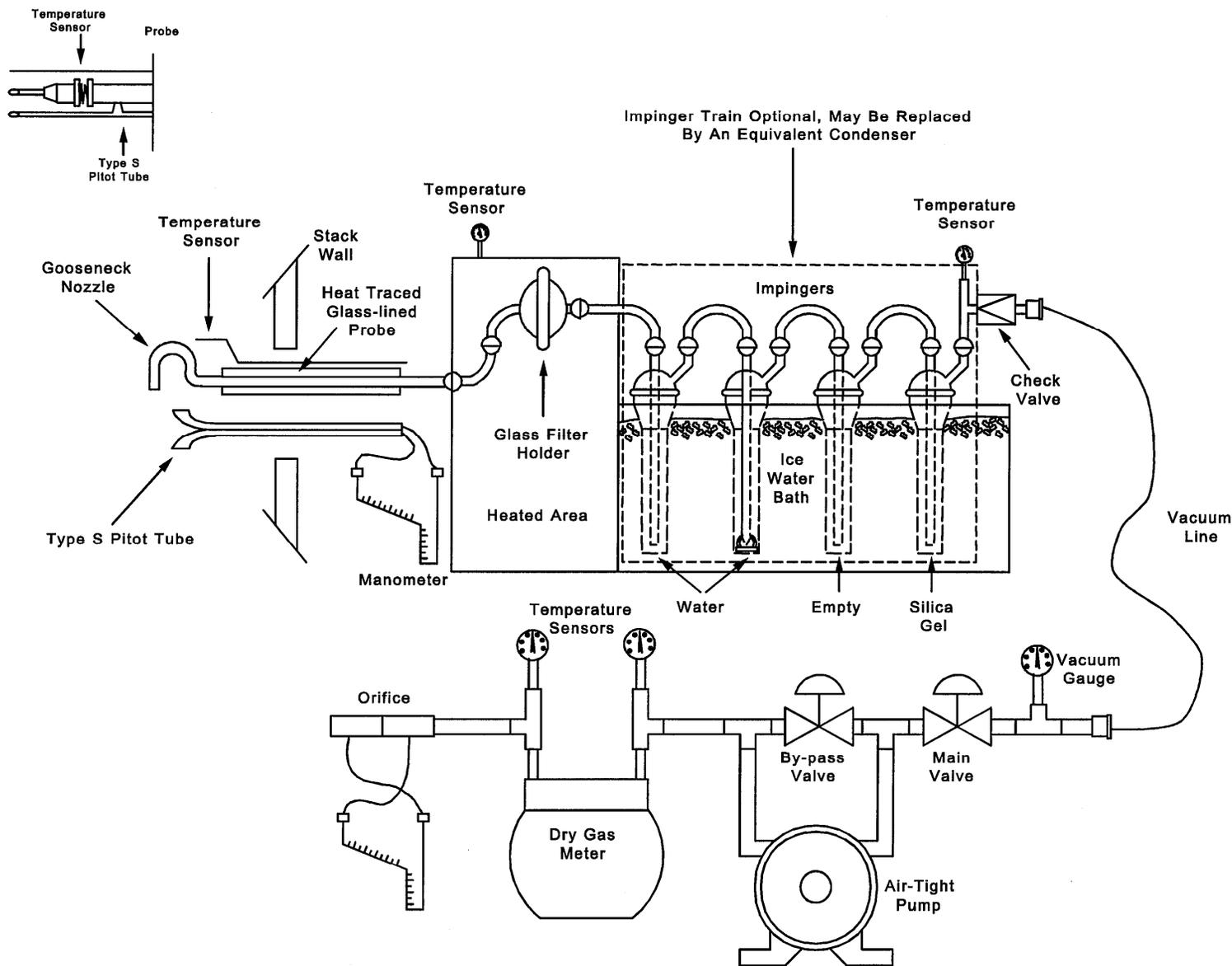


Table 5-1: Calibration Procedures for Equipment

Equipment	Reference	Procedure	Frequency
Probe Nozzles	QA Handbook, Volume III, Section 3.4.2, page 19	Measured three (3) internal diameters of the nozzle to 0.001 in and averaged Acceptance criteria: difference between high/low values ≤ 0.004 in	Every nozzle prior to use and post-test physical inspection
Pitot tubes	QA Handbook Volume III, Section 3.1.2, pages 1 to 13	Initial calibration in a wind tunnel Measured for appropriate spacing and dimensions when utilized in probe configuration Rejection criteria given on the calibration sheet	Post-test inspection for damage to the sensing heads Calibration verification performed using geometric configuration prior to subsequent test events
Thermocouples	QA Handbook, Volume III, Section 3.4.2, pages 12 to 18 and ALT Method 011	Verified against a mercury-in-glass thermometer at three (3) points including the anticipated measurement range Acceptance criteria: <ul style="list-style-type: none"> • impinger $\pm 2^\circ\text{F}$ • dry gas meter $\pm 5.4^\circ\text{F}$ • stack $\pm 1.5\%$ of stack temperature 	Initial calibration conducted using three (3) temperature points Calibration verification performed using a single temperature point prior to subsequent test events
Dry gas meters, Iso- and non-isokinetic sampling consoles	US EPA 40 CFR Part 60, Method 5, Section 10.3.1	Calibrated using a critical orifice set Acceptance criteria: <ul style="list-style-type: none"> • pre-test: $Y_i = Y \pm 0.02$ • post-test: $Y_i = Y \pm 0.05$ 	Pre-test and post-test
Field Top Loader Balance	QA Handbook, Volume III, Section 3.4.2, page 19	Calibrated with Standard Class-S weights within ± 1 g of stated value Corrective action: have manufacturer re-calibrate or adjust	Calibrated yearly by manufacturer Calibration verification performed using Class-S weights daily prior to using the balance
Probe Heating System	US EPA 40 CFR Part 60, Method 5, Section 10.4	Capable of maintaining $120^\circ\text{C} \pm 14^\circ\text{C}$ ($248^\circ\text{F} \pm 25^\circ\text{F}$)	Periodic checks of calibrated thermocouple readout during sampling
	M0030	Capable of maintaining $>130^\circ\text{C}$	
	M0040	Capable of maintaining between 130 and 140°C	

Table 5-2: Isokinetic Sampling Train Summary

Parameter	Units	C4bR1	C4bR4	C4bR5	Average
SW-846 Method 0010					
Sample Volume	dscf	141.054	132.731	120.049	131.28
Exhaust Gas Flow Rate	dscfm	675	645	598	639.33
Exhaust Gas Temperature	°F	179.3	181.8	179.5	180.20
Exhaust Gas Moisture	%	35.61	37.01	35.39	36.00
Isokinetics	%	102.99	101.32	98.95	101.09
SW-846 Method 0010 for Total Organic Compounds					
Sample Volume	dscf	138.325	129.331	117.741	128.47
Exhaust Gas Flow Rate	dscfm	651	625	581	619.00
Exhaust Gas Temperature	°F	175.1	177.4	175.1	175.87
Exhaust Gas Moisture	%	36.00	37.02	35.33	36.12
Isokinetics	%	104.12	101.87	99.90	101.96
SW-846 Method 0023A					
Sample Volume	dscf	141.772	134.909	120.088	132.26
Exhaust Gas Flow Rate	dscfm	669	639	590	632.67
Exhaust Gas Temperature	°F	178.3	180.4	178.3	179.00
Exhaust Gas Moisture	%	35.78	37.32	35.44	36.18
Isokinetics	%	103.78	103.42	99.76	102.32
US EPA Method 26A					
Sample Volume	dscf	134.179	119.365	101.279	118.27
Exhaust Gas Flow Rate	dscfm	683	648	566	632.33
Exhaust Gas Temperature	°F	177.2	179.5	177.4	178.03
Exhaust Gas Moisture	%	35.64	37.15	35.28	36.02
Isokinetics	%	97.37	104.61	101.72	101.23
US EPA Method 29					
Sample Volume	dscf	144.070	128.103	115.777	129.32
Exhaust Gas Flow Rate	dscfm	682	621	573	625.33
Exhaust Gas Temperature	°F	179.6	182.0	180.2	180.60
Exhaust Gas Moisture	%	36.01	37.20	35.53	36.25
Isokinetics	%	104.72	102.22	100.04	102.33
US EPA Modified Method 5					
Sample Volume	dscf	139.675	131.284	117.713	129.56
Exhaust Gas Flow Rate	dscfm	680	647	594	640.33
Exhaust Gas Temperature	°F	178.3	180.6	178.8	179.23
Exhaust Gas Moisture	%	35.68	36.92	35.21	35.94
Isokinetics	%	102.39	101.09	98.82	100.77

Table 5-3: Non-Isokinetic Sampling Train Summary

Parameter	C4bR1			C4bR4			C4bR5		
Barometric Pressure (inHg)	29.04			29.13			29.19		
M0030 Meter Calibration Factor	1.033			1.033			1.033		
M0030 Collection Time (hours)	Tube A: 1110-1150 hrs Tube B: 1156-1236 hrs Tube C: 1421-1501 hrs Tube D: 1508-1548 hrs			Tube A: 1735-1815 hrs Tube B: 1823-1903 hrs Tube C: 2055-2135 hrs Tube D: 2143-2223 hrs			Tube A: 1155-1235 hrs Tube B: 1243-1323 hrs Tube C: 1600-1640 hrs Tube D: 1647-1727 hrs		
Tube Pairs	Sample Volume (L, dry)	Temp. (°F)	Corrected Volume (dsL)	Sample Volume (L, dry)	Temp. (°F)	Corrected Volume (dsL)	Sample Volume (L, dry)	Temp. (°F)	Corrected Volume (dsL)
Tube A	20.86	90.75	20.05	20.87	94.13	20.00	20.33	97.63	19.40
Tube B	20.07	95.63	19.12	20.29	95.75	19.39	20.33	100.63	19.29
Tube C	20.56	95.88	19.58	19.97	87.75	19.36	21.60	97.50	20.61
Tube D	20.66	96.38	19.66	20.65	91.13	19.89	20.14	99.75	19.14
Totals	---	---	78.41	---	---	78.64	---	---	78.45
Barometric Pressure (inHg)	29.04			29.13			29.19		
Average Delta H (inwc)	1.20			1.20			1.20		
M0040 Meter Calibration Factor	1.013			1.013			1.013		
M0040 Collection Time (hours)	Bag A: 1115-1215 hrs Bag B: 1440-1540 hrs Field Blank: 1300-1400 hrs			Bag A: 1745-1845 hrs Bag B: 2154-2254 hrs Field Blank: 1948-2048 hrs			Bag A: 1155-1255 hrs Bag B: 1614-1714 hrs Field Blank: 1400-1500 hrs		
Tube Pairs	Sample Volume (L, dry)	Temp. (°F)	Corrected Volume (dsL)	Sample Volume (L, dry)	Temp. (°F)	Corrected Volume (dsL)	Sample Volume (L, dry)	Temp. (°F)	Corrected Volume (dsL)
Bag A	30.91	92.71	29.12	30.48	93.83	28.75	30.55	97.67	28.67
Bag B	30.64	103.50	28.31	30.60	90.25	29.05	30.73	97.13	28.87
Field Blank	28.37	104.17	26.18	31.04	91.58	29.39	31.19	99.96	29.15

6.0 ANALYTICAL PROCEDURES

The analytical program that was performed in support of C4b of the SDC Emissions Test consisted of the analysis of exhaust gas samples. The program used US EPA analytical methods, project-specific procedures, and laboratory-specific procedures as specified in the SAP/QAPP. A complete copy of all the analytical laboratory deliverables is located in Appendix F.

6.1 SUMMARY OF ON-SITE ANALYTICAL PROCEDURES

6.1.1 O₂ and CO₂

M3B sampling was performed to determine O₂ and CO₂ concentrations by collecting an integrated bag sample that was analyzed using an Orsat analyzer. One (1) integrated bag sample was collected during each run in conjunction with an isokinetic sampling train. Each sample was analyzed and the resulting O₂ and CO₂ values were used for all sampling trains. Each sample was collected at a constant rate resulting in a total sample volume. All Tedlar bags were leak checked prior to use.

The Orsat analyzer was successfully leak-checked prior to analysis of each sample IAW the procedures in M3B. The Orsat accuracy was checked with ambient air on a daily basis and with cylinder audits once during each condition. Two cylinders, each containing different CO₂ and O₂ concentrations were used to conduct each audit. Results of the cylinder audits are recorded on the field data sheets provided in Appendix C.

6.1.2 SO₂

SO₂ concentration was determined during each test run using a TRM CEMS operated IAW M6C. The quality of data generated by this TRM CEMS was evaluated by conducting system performance checks before testing began, by conducting calibration checks during each test run, and reviewing all data records obtained during the initial instrument performance evaluation.

During each test run, the zero and span checks of the monitors were considered verification of the quality of data received. Data was reported on one (1)-minute intervals and was archived in the TRM CEMS data acquisition system. The calibration gas used to calibrate the instrument conformed to the US EPA *Traceability Protocol for Assay and Certification of Gaseous Calibration Standards* (RTI/6960/208-01F).

6.1.3 NO_x

NO_x concentration was determined during each test run using a TRM CEMS operated IAW M7E. The quality of data generated by this TRM CEMS was evaluated by conducting system performance checks before testing began (i.e., stratification check, interference check, and NO₂ to NO conversion efficiency), by conducting calibration checks during each test run, and reviewing all data records obtained during the initial instrument performance evaluation.

During each test run, the zero and span checks of the monitors were considered verification of the quality of data received. Data was reported on one (1)-minute intervals and was archived in the TRM CEMS data acquisition system. The calibration gas used to calibrate the instrument

1 conformed to the US EPA *Traceability Protocol for Assay and Certification of Gaseous*
2 *Calibration Standards* (RTI/6960/208-01F).

3 **6.1.4 CO**

4 CO concentration was determined during each test run using a TRM CEMS operated IAW M10.
5 The quality of data generated by this TRM CEMS was evaluated by conducting system
6 performance checks before testing began, by conducting calibration checks during each test run,
7 and reviewing all data records obtained during the initial instrument performance evaluation.

8 During each test run, the zero and span checks of the monitors were considered verification of
9 the quality of data received. Data was reported on one (1)-minute intervals and was archived in
10 the TRM CEMS data acquisition system. The calibration gas used to calibrate the instrument
11 conformed to the US EPA *Traceability Protocol for Assay and Certification of Gaseous*
12 *Calibration Standards* (RTI/6960/208-01F).

13 **6.1.5 Volatile TOCs**

14 TOC sampling and analysis was accomplished by following the procedures identified and
15 referenced in "*Guidance for Total Organics, Final Report*" (EPA/600/R-96/033). Two (2)
16 separate sampling trains were employed to collect the samples necessary to make the TOC
17 determination. A M0040 sampling train was used to collect exhaust gas samples for the
18 determination of total volatile unspciated organics and a M0010 sampling train was used to
19 collect exhaust gas samples for total unspciated semivolatile and non-volatile organics.

20 For the volatile TOCs, two (2) bag samples per run were collected and analyzed on-site for C₁-C₇
21 compounds via GC/FID. The condensate collected ahead of the Tedlar bag during each run was
22 analyzed for C₄-C₇ compounds off-site, as were the samples collected with the M0010-TOC.

23 The exhaust gas samples collected into the Tedlar bags were analyzed in the field by gas
24 chromatograph (GC)/flame ionizing detector (FID). The GC was set up in the field with column
25 and conditions appropriate for the analysis of C₁ through C₇ n-alkanes. Retention times were
26 determined and a calibration was performed with certified gas standards of C₁ through C₇
27 alkanes in air or nitrogen. Compounds of interest were identified by retention times or retention
28 time ranges and quantitative analysis was performed. Results of the Tedlar bag analyses were
29 added to the volatile organics from the condensate to yield the volatile organics portion of the
30 TOC number.

31 **6.1.6 Mustard Agent in Exhaust Gas**

32 Exhaust gas samples were collected on DAAMS and analyzed IAW ANCDF Laboratory
33 Operating Procedures (LOPs) to determine the exhaust gas concentration of mustard for use in
34 determining DRE. This analysis was conducted by collecting exhaust gas samples IAW
35 AN-LOP-200. This procedure provides for non-isokinetic sampling with a 240 minute sampling
36 time. Each sample was then analyzed by GC-flame photometric detector (FPD) IAW
37 AN-LOP-120 and by mass spectrometer detector (MSD) IAW AN-LOP-130, if applicable.

1 AN-LOP-120 and -130 are GC-FPD and MSD site-specific procedures where a DAAMS tube
 2 sample is desorbed to introduce the sample into a GC. The GC is equipped with a fused-silica
 3 capillary column. The GC oven is temperature-programmed to allow separation of the target
 4 analyte, which is then detected by a FPD that is interfaced to the GC. GC-FPD quantitation is
 5 accomplished using the FPD analyte response and a pre-established calibration curve.

6 6.2 SUMMARY OF OFF-SITE ANALYTICAL PROCEDURES

7 With the exception of agent, Orsat, and M0040 (bag samples), all exhaust gas samples were
 8 analyzed by off-site laboratories. The analytical methods employed for exhaust gas samples are
 9 listed below.

10	<u>Parameter</u>	<u>Analysis Method</u>
11	Semivolatile Organics	SW-846 Method 8270C (M8270C)
12	Dioxins/Furans	SW-846 Methods 8290 (M8290)
13	Volatile Organics	SW-846 Method 8260B (M8260B)
14	Total Volatile, Semivolatile, and	"Guidance for Total Organics"
15	Nonvolatile Unspeciated Organics	EPA/600/R-96/033
16	Acid Gases	M26A
17	Particulates	US EPA Method 5 (M5)
18	Metals	SW-846 Methods 6020 (M6020), 7470A 19 (M7470A), and 7471A (M7471A)
20	Energetics	SW-846 Method 8330 (M8330)
21		

22 6.2.1 Semivolatile Organics

23 Sampling for semivolatile organics was accomplished by M0010. Preparation of the sampling
 24 train was performed IAW SW-846 Method 3542 (M3542). Analysis of the three analytical
 25 fractions of the M0010 sampling train was performed IAW M8270C by GC/MS.

26 Sample fractions were prepared for analysis IAW M3542. This method provides procedures by
 27 which the samples generated by the M0010 sampling train are separated and solvent extracted
 28 IAW SW-846 Method 3540C (M3540C) (filter and XAD/back-half rinse fractions) and
 29 SW-846 Method 3510C (M3510C) (front-half rinse and condensate/condensate rinse fractions)
 30 with method exceptions as noted in M3542. Extracts are concentrated to final volume IAW
 31 M3540C. In total, the sample fractions recovered from the M0010 sampling train prepared for
 32 analysis by M3542 yielded three (3) extracts for analysis by M8270C.

33 M8270C is a GC/mass spectrometer (MS) method where samples that have been prepared for
 34 analysis using one (1) or more of the aforementioned sample preparation procedures are
 35 introduced into a GC by injecting an aliquot of the concentrated sample extract. The GC is
 36 equipped with a fused-silica capillary column. The GC oven is temperature-programmed to
 37 allow separation of the analytes, which are then detected by a MS interfaced to the GC. Analytes
 38 eluted from the capillary column are introduced into the MS whereby identification of target
 39 analytes is accomplished by comparing their mass spectra with the electron impact spectra of
 40 authentic standards. Quantitation is accomplished by comparing the response of a major
 41 (quantitation) ion relative to an internal standard using a multi-point calibration curve.

6.2.2 Dioxins/Furans

Sampling for dioxins/furans was accomplished by M0023A. Samples were extracted and concentrated as described in the method. Analysis of the sample extracts was performed by high resolution gas chromatograph (HRGC)/high resolution mass spectrometer (HRMS) IAW M8290.

Samples were solvent extracted IAW the matrix-specific technique described in M8290 after the addition of internal standards and surrogates, as required (surrogate standards are added to the sorbent/back-half prior to sampling). Sample extracts are solvent exchanged and concentrated using a nitrogen evaporative concentrator to reduce the volume of the extract. After the concentrated samples are subject to a clean-up step, fractionated, and subject to additional clean-up steps, they are ready for analysis by M8290.

M8290 employs a HRGC column coupled to a HRMS. An aliquot of each concentrated sample extract is injected into the HRGC/HRMS system. The system is capable of performing selected ion monitoring at resolving powers of at least 10,000 (10% valley definition). Identification of the target analytes for which a C₁₃-labeled standard is available in the sample fortification and recovery standard solutions (added prior to sample analysis) is based on their elution at their exact retention time (-1 to +3 seconds from the respective internal or recovery standard signal) and simultaneous detection of the two most abundant ions in the molecular ion region. All other target analytes are identified when their relative retention times fall within their respective dioxins/furans retention time windows, as established using a column performance evaluation solution, and the simultaneous detection of the two (2) most abundant ions in the molecular ion region. The identification of octachlorodibenzofuran is based on its retention time relative to ¹³C₁₂- octachlorodibenzo-p-dioxin (CDD) and the simultaneous detection of the two most abundant ions in the molecular ion region. Confirmation is based on a comparison of the ratio of the integrated ion abundance of the molecular ion species to their theoretical abundance ratio. Quantitation of the individual congeners, total dioxins, and total furans is achieved in conjunction with the establishment of a multi-point calibration curve for each homologue, during which each calibration solution is analyzed once.

6.2.3 Volatile Organics

Sampling for selected volatile organics was accomplished by M0030. Analysis of the M0030 samples was performed IAW SW-846 Methods 5041A (M5041A) and M8260B. The sample fraction analyzed included the Tenax tubes, the Tenax/charcoal tubes, and the condensate from each run.

M5041A is a method in which the sorbent tubes are thermally desorbed by heating and purging with organic-free helium. The gaseous effluent from the tubes is bubbled through pre-purged organic-free reagent water and trapped on an analytical sorbent trap in a purge-and-trap unit. For condensate samples, a sample aliquot is placed directly into the purging chamber of the purge-and-trap unit where volatile organic constituents are purged onto the analytical sorbent trap. After desorption, the analytical sorbent trap is heated rapidly and the gas flow from the analytical trap is directed to the head of a fused-silica capillary column. The volatile organic compounds desorbed from the analytical trap are determined by M8260B.

1 M8260B is a GC/MS method where volatile compounds are introduced into a GC using
2 appropriate purge-and-trap methods. The GC is equipped with a fused-silica capillary column.
3 The GC oven is temperature-programmed to allow separation of the analytes, which are then
4 detected by a MS interfaced to the GC. Analytes eluted from the capillary column are
5 introduced into the MS whereby identification of target analytes is accomplished by comparing
6 their mass spectra with the electron impact spectra of authentic standards. Quantitation is
7 accomplished by comparing the response of a major (quantitation) ion relative to an internal
8 standard using a multi-point calibration curve.

9 **6.2.4 Total Volatile, Semivolatile, and Nonvolatile Organics**

10 TOC sampling and analysis was accomplished by following the procedures identified and
11 referenced in “*Guidance for Total Organics, Final Report*” (EPA/600/R-96/033). Two separate
12 sampling trains were employed to collect the samples necessary to make the TOC determination.
13 A M0040 sampling train was used to collect samples for the determination of the volatile
14 fraction of the TOC and a M0010 sampling train was used to collect exhaust gas samples for the
15 determination of the semivolatile and nonvolatile fractions of the TOC.

16 For the volatile fraction of the TOC, two (2) bag samples per run were collected and analyzed
17 on-site for C₁ through C₇ compounds via field GC/FID as described in Section 6.1.2. The
18 condensate collected ahead of the Tedlar bag during each run was analyzed for C₄ through C₇
19 compounds by an off-site laboratory IAW the method described in “*Guidance for Total*
20 *Organics, Final Report*” (EPA/600/R-96/033). This is GC/FID method where samples are
21 purged onto a sorbent trap and the sorbent trap is then desorbed into a GC. The GC is equipped
22 with a fused-silica capillary column. The GC oven is temperature-programmed to allow
23 separation of the analytes, which are then detected by a FID. Uniform FID response for varying
24 compound classes is assumed in this methodology. Compounds found with retention times prior
25 to the C₄ retention time are quantified with an appropriate response factor and reported as C₄
26 with the other results quantitated against a multi-point calibration curve prepared using C₅
27 through C₇ standards. Results of the condensate are added to the field determined volatile
28 organics values to yield the total volatile fraction of the TOC.

29 For the total semivolatile and nonvolatile fractions of the TOC, samples are prepared IAW
30 M0010, Appendix B. Specifically, two standards were added to each sample prior to extraction
31 to bracket the quantitation range. One (1) of the standards serves as a surrogate to provide an
32 additional QC measure for the analysis. The three extracts from the total sampling train are
33 combined prior to analysis, and the combined extract is split to allow separate analysis.

34 The total chromatographable organic (TCO) method is a capillary GC/FID method quantifying
35 chromatographable material in the 100 to 300 degrees Celsius (°C) boiling point range. An
36 aliquot of the prepared extract is injected onto a capillary GC column with a FID detector, and
37 the peak areas are summed over the retention time window that encompasses the TCO boiling
38 point range. The TCO value is determined from the multipoint calibration curve, generated with
39 hydrocarbon standards that fall within the TCO range, specifically decane, dodecane, and
40 tetradecane. The organics identified in the prescribed boiling point range are quantified and
41 summed (totaled) to obtain the TCO portion of the TOC.

1 The gravimetric (GRAV) method quantifies nonvolatile organic material with a boiling point
2 greater than 300°C. A carefully measured aliquot of the prepared extract is placed in a pre-
3 cleaned weighing pan and allowed to dry in air at room temperature, then come to complete
4 dryness in a room temperature desiccator, while exposure to dust and contaminants are
5 minimized. The residue in the pan is weighed and the mass is recorded to determine the GRAV
6 value.

7 The TOC value is reported as the sum of the volatile, semivolatile, and nonvolatile unspciated
8 organics results.

9 **6.2.5 Acid Gases**

10 Acid gas sampling and analysis were accomplished by following the procedures in M26A. A
11 small volume of each M26A sample is injected into an ion chromatograph (IC) to flush and fill a
12 constant volume sample loop. The sample is then injected into a stream of
13 carbonate-bicarbonate eluent of the same strength as the impinger solutions. The sample is
14 pumped through three different ion exchange columns and into a conductivity detector. The first
15 two columns, a precolumn or guard column and a separator column, are packed with low-
16 capacity, strongly basic anion exchanger. Ions are separated into discrete bands based on their
17 affinity for the exchange sites of the resin. The last column is a suppressor column that reduces
18 the background conductivity of the eluent to a low or negligible level and converts the anions in
19 the sample to their corresponding acids. The separated anions in their acid form are measured
20 using an electrical-conductivity cell. Anions are identified based on their retention times
21 compared to known standards. Quantitation is accomplished by measuring the peak height or
22 area and comparing it to a calibration curve generated from known standards.

23 **6.2.6 Particulates**

24 Particulates analyses were accomplished following the procedures in M5. The sampling for
25 particulate emissions was done with the M26A isokinetic sampling train. Particulate
26 determination was performed during all runs.

27 Prior to use in the field, each filter used was desiccated to a constant weight, placed in glass petri
28 dishes, and sealed with Teflon[®] tape. An identification label was placed on each dish, and the
29 weight of each filter was recorded. The beakers used for the dry-down of the acetone rinse were
30 cleaned and dried in a drying oven. The beakers were desiccated to a constant weight.

31 Analysis of the particulate samples was accomplished by: drying the front-half acetone rinses in
32 a tared beaker, desiccating, and weighing to a constant weight. The filters were desiccated and
33 weighed to a constant weight. The net weight for the front-half acetone rinse and filter was
34 determined by calculating the difference in weight. The sum of the net weights for the probe
35 wash and filter catch was used to calculate the particulate concentrations in the exhaust gas.

36 **6.2.7 Metals**

37 Metals sampling and preparation of the sampling trains for analysis were accomplished by
38 following the procedures in M29. The M29 sample preparation procedures employ acid

1 digestion using acid/reagent combinations specified in the method for each sample fraction
2 collected from the sampling train.

3 Analysis of the prepared and combined sample fractions, as specified by M29, was conducted by
4 cold vapor atomic absorption spectroscopy (CVAAS) for mercury, M7470A/M7471A, and by
5 inductively coupled plasma (ICP)/MS, M6020, for the remaining metals.

6 In the CVAAS technique used for mercury analysis (M7470A/M7471A), analysis is based on the
7 absorption of radiation at 253.7-nanometer by mercury vapor. The mercury is reduced to the
8 elemental state and aerated from solution in a closed system. The mercury vapor passes through
9 a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance is
10 measured as a function of mercury concentration.

11 M6020, used to analyze M29 samples for all target metal concentrations except mercury, is a
12 multi-element procedure that uses ICP/MS. The method measures ions produced by a radio
13 frequency ICP. Analyte species originating in the liquid sample digestate are nebulized and the
14 resulting aerosol transported by argon gas into the plasma torch of the instrument. The ions
15 produced are entrained in the plasma gas and introduced, by means of an interface, into a MS.
16 The ions produced in the plasma are sorted according to their mass-to-charge ratios and
17 quantified with a channel electron multiplier. Interferences are assessed by the analytical system
18 and valid corrections are applied. Interference correction includes compensation for background
19 ions contributed by the plasma gas, reagents, and constituents of the sample matrix.

20 **6.2.8 Energetics**

21 Sampling of energetic compounds was accomplished using a modified M5 sampling train. Each
22 sampling train yielded three fractions for preparation and four fractions for analysis: the
23 front-half rinse and filter, the condensate and impinger rinsate, and the two-section resin module.
24 The front-half rinse and filter fraction was prepared for analysis by decanting the solvent phase.
25 The condensate and condensate rinse fraction was prepared for analysis IAW
26 SW-846 Method 3535 (M3535). Each resin section was prepared for analysis by serial
27 extraction with acetonitrile. Analysis of the analytical fractions of the modified M5 train was
28 done IAW M8330 (modified) by HPLC with ultra-violet detection. The second resin section
29 results are only included in train totals when analytes are detected in the first resin section
30 analysis IAW the approved energetics procedure.

7.0 QA/QC RESULTS

QA/QC measures for this program were based on the methods employed and the specific measures outlined in the ANCDF SDC Emissions Test Plan (see Appendix B). Results of the QA/QC activities employed during the testing program are summarized in this section. All calculations were performed using standardized equations.

Field data was reduced using a personal computer with software containing validated equations. Isokinetic ratios were determined after each test run. Reduced data shown in Appendix C-3 were generated after each test run with the exception of pollutant concentrations and emission rates, which were determined after sample analyses were completed. All sampling trains were leak checked prior to, and immediately after, sampling in each port.

Exhaust gas samples were collected by URS-Austin. Sample collection, documentation, and management procedures were performed IAW the SAP/QAPP. Table 7-1 provides a summary of laboratory and field samples collected and analyzed in support of the emissions tests.

7.1 LABORATORY QUALIFICATIONS AND ANALYTICAL STANDARDS

The off-site analytical laboratories used to perform sample analysis were TestAmerica in Knoxville, Tennessee, and TestAmerica in Sacramento, California. Both laboratories have extensive experience in these methods and have conducted emissions testing at ANCDF and other chemical demilitarization facilities.

7.1.1 Data Validation

Analytical data were initially verified by the subcontractor laboratory QC and/or supervisory personnel and then subjected to validation by ANCDF-designated personnel. The field and laboratory blanks, replicate samples, and internal QC sample results were used to assess the analytical results. Designated personnel reviewed subcontractor laboratory raw analytical data to verify the calculated results. The criteria used to evaluate the analytical data includes use of approved analytical procedures, use of properly operating and calibrated instrumentation, and acceptable results from analyses of QC samples.

7.1.2 Data Reporting

All data were reported in standard units depending on the measurement and the ultimate use of the data.

7.2 FIELD QC SUMMARY

7.2.1 Calibration Procedures

Prior to the field sampling effort, the field sampling equipment was calibrated. Copies of the calibration documentation were on-site during the emissions test and are included in Appendix D. Calibrations were performed as described in the US EPA publications "*Quality Assurance Handbook for Air Pollution Measurement Systems; Volume III - Stationary Source*

1 *Specific Methods,*” (EPA-600/4-77-027b) and US EPA 40 CFR Part 60, Appendix A. Field
2 sampling equipment that required calibration included the sample metering system, nozzles,
3 thermocouples, pitot tubes, and the barometer. Calibration documentation for process control
4 equipment and facility CEMS are also included in Appendix D.

5 **7.2.2 Equipment Leak Checks**

6 Prior to sampling, each isokinetic sampling train was leak checked IAW the procedures outlined
7 in M5 and/or the applicable sampling method. During the course of each test run, a leak check
8 was conducted before and after sampling in each port. Leakage rates for each isokinetic
9 sampling train were recorded on the appropriate field data sheets (see Appendix C-2). Table 7-2
10 summarizes the leak check results recorded for each isokinetic sampling train.

11 The M0030 sampling train leak checks were performed between the three (3)-way valve
12 downstream of the probe and the pump. The acceptance criteria used for each M0030 leak check
13 was a leakage rate of < 0.1 inches of mercury (inHg) as shown on the vacuum gauge after one (1)
14 minute. All M0030 leak checks met acceptance criteria and were recorded on the appropriate
15 field data sheets.

16 The M0040 sampling train initial and final leak check for each bag sample collected was
17 performed between the probe and the vacuum pump. The acceptance criteria used for each
18 M0040 leak check was a leakage rate of < 0.1 inHg as shown on the vacuum gauge after one (1)
19 minute. All M0040 leak checks for each bag sample submitted for analysis from each run met
20 acceptance criteria and were recorded on the appropriate field data sheets.

21 **7.2.3 Field Blanks**

22 Field blanks for exhaust gas sampling methods were collected during the field sampling program
23 IAW the ANCDF SDC Emissions Test Plan.

24 **7.3 SAMPLE MANAGEMENT**

25 This section presents the sample preservation, transportation and receiving, holding times,
26 traceability, and chain-of-custody (COC) documentation.

27 **7.3.1 Sample Preservation**

28 The exhaust gas samples were preserved by storing them on ice, as required, until packaged for
29 shipment to the off-site laboratories. Samples requiring cooling were packed with ice to
30 maintain temperatures within the required range for shipment to the laboratory. All shipments
31 arrived at the laboratories at temperatures prescribed in the SAP/QAPP.

32 **7.3.2 Sample Traceability**

33 Sample traceability procedures were employed IAW the ANCDF SDC Emissions Test Plan to
34 document the identity of each sample and its handling from its first existence as a sample until
35 analysis and data reduction was completed. Custody records traced a sample from its collection

1 through all transfers of custody until it was transferred to the analytical laboratory. Internal
2 laboratory records then documented the custody of the sample through its final disposition.

3 Sample integrity was maintained throughout all sampling and analysis programs. IAW SW-846
4 guidance, a sample was considered to be under a person's custody if the sample was:

- 5 • In that person's physical possession,
- 6 • In view of that person after acquiring possession,
- 7 • Secured by that person so that no one could tamper with the sample, and/or
- 8 • Secured by that person in an area that was restricted to authorized personnel.

9 These criteria were used to define the meaning of “custody” and to ensure the integrity of the test
10 program samples from collection to data reporting. Restricted access to the samples was an
11 integral part of the COC procedure. Samples were held within sight of the samplers or sample
12 custodian or kept in sealed and secured containers at all times. Custody seals were applied to
13 each sample container and/or the shipping container used to ship the samples to the off-site
14 laboratories.

15 **7.3.3 Sample Transportation and Receiving**

16 The exhaust gas samples were stored on-site until they were transported via chartered aircraft or
17 delivered by URS-Austin personnel to the respective TestAmerica laboratories. For chartered
18 aircraft deliveries, a laboratory representative met the aircraft or URS-Austin sample custodian
19 and secured custody of the samples directly from the URS-Austin sample custodian that
20 accompanied the samples during transport. Upon receipt at the laboratories, the samples were
21 logged into the laboratory sample tracking system with a unique laboratory sample number.

22 **7.3.4 Sample Shipping**

23 Samples were packaged, transported, and shipped IAW applicable US Department of
24 Transportation, International Air Transportation Authority, and US EPA regulations. A COC
25 form accompanied the samples. The COC form listed the parameters to be analyzed by the
26 laboratory for each sample and the total number and type of samples shipped for analysis.
27 Authorized laboratory personnel acknowledged receipt of shipment by signing and dating the
28 COC form and returning a copy to URS-Austin.

29 **7.3.5 Sample Holding Times**

30 The sample preservation requirements and holding times are presented in Table A-10 of the
31 SAP/QAPP. The sampling personnel preserved the samples by keeping them in a cooler packed
32 with ice, during the transport, as required. Sample temperatures were monitored upon receipt at
33 the laboratory. Holding times were monitored by keeping track of the day(s) from the time the
34 samples were collected to the time that they were prepared, extracted, and/or analyzed. All
35 samples met the holding time requirements as specified in Table A-10 of the SAP/QAPP.

1 **7.3.6 COC Documentation**

2 **7.3.6.1 Labeling**

3 Sample identification labels were used to ensure the required information was entered in the
4 field. Exhaust gas sample labels were affixed to the appropriate container at the time of sample
5 recovery. All samples collected were labeled with a preprinted sample label. Minor
6 discrepancies between the sample name listed on the label and the name listed on the COC were
7 resolved and the required analyses were performed.

8 **7.3.6.2 Field Logbook**

9 Information pertinent to the sampling was recorded in a sampling log. Entries were made in
10 indelible ink and corrections generally followed the error correction protocol of one (1) line
11 through the error, initial of the person performing the correction, and the date of the correction.
12 Sampling personnel also recorded required information using the appropriate field data sheets. A
13 copy of the field logbook and field data sheets is provided in Appendix C.

14 **7.3.6.3 COC Forms**

15 To establish the documentation necessary to trace sample possession from the time of collection,
16 a COC form was filled out and accompanied every sample or group of individually identified
17 samples. Each person who had custody signed the COC form.

18 **7.4 SAMPLE COLLECTION**

19 Exhaust gas sampling procedures were performed using the methods listed in Section 5.3.
20 Isokinetic samples (M0010, M0010-TOC, M0023A, MM5E, M26A, and M29) and
21 non-isokinetic samples (M0030 and M0040) were collected from ports located in the exhaust
22 duct that extends between the induced draft fan and stack. The number and location of exhaust
23 gas sampling points were determined IAW the procedures specified in M1. The sampling port
24 locations met the requirements for acceptable distances from flow disturbances as specified in
25 M1, and all traverse points were at least one-half ($\frac{1}{2}$) inch from the inner wall of the duct.

26 Verification of the absence of cyclonic flow in the sampling duct was performed on 12/04/10,
27 with no cyclonic flow present. Cyclonic flow data sheets can be found in Appendix C-2.
28 Calibration of the pitot tubes used for flow testing was performed IAW 40 CFR 60, Appendix A.
29 Calibration data are presented in Appendix D.

30 Prior to sampling, all sampling train glassware was cleaned as required by each respective
31 sampling method. All reagents used during sampling met the specifications of each respective
32 sampling method. All sample containers were received in sealed boxes from the vendor with
33 certificates of QA compliance IAW US EPA specifications.

34 Each sampling train was operated IAW the applicable method and SAP/QAPP requirements.
35 For the isokinetic sampling trains the time, velocity pressure, orifice pressure, stack gas
36 temperature, probe temperature, transfer line temperature (as applicable), sorbent trap inlet
37 temperature (as applicable), silica gel impinger outlet temperature, dry gas meter inlet and outlet

1 temperatures, dry gas meter volume, and sample vacuum were recorded every five (5) minutes at
2 each traverse point.

3 **7.4.1 Isokinetic Sampling**

4 For each isokinetic sampling train (i.e., M0010, M0010-TOC, M0023A, M26A, M29, and
5 MM5E) the following key sampling procedures were performed to comply with US EPA
6 requirements and the ANCDF SDC Emissions Test Plan:

- 7 • A minimum of three (3) dry standard cubic meters (dscm) total sample volume
8 was collected over a 240-minute sampling period for each run with the exception
9 of the C4bR5 M26A as noted below. The sample volume collected for each run is
10 presented in Appendix C.
- 11 • One (1) field blank sample was collected by assembling a complete sampling train
12 at the sampling area. The filter housing and probe on the blank train were heated
13 to the appropriate temperature and the train was leak checked the same number of
14 times as an actual sample train. The sample was then recovered in the same
15 manner as an actual sample.
- 16 • Sample recovery was conducted both at the sampling location and in a controlled
17 laboratory setting IAW the procedures specified in the reference method.
- 18 • For M0010, M0010-TOC, M0023A, and MM5E, the resin was packed in air-tight
19 glass traps. The resin was purchased pre-cleaned and packed by the laboratory
20 IAW the procedures specified in the reference method.
- 21 • For M0010, M0010-TOC, and M0023A the temperature of the sample gas stream
22 between the outlet of the condenser and the inlet to the resin trap was maintained
23 below 68°F (20°C).
- 24 • For M0010, M0010-TOC, M0023A, and MM5E, the temperatures of the probe,
25 transfer line, and filter were maintained between 223 and 273°F. For the M29,
26 the temperatures of the probe and filter were maintained between 223 and 273°F.
27 For the M26A, the temperatures of the probe and filter were generally maintained
28 between 248 and 273°F except as noted below. These temperatures were
29 monitored and recorded on field data sheets during each run. The field data
30 sheets are included in Appendix C-2.
- 31 • An initial and final leak check was conducted on each sampling train for each
32 traverse with a maximum allowable leak rate of 0.02 cfm over a one (1)-minute
33 time period. The initial pre-test leak check for each run was conducted at a
34 minimum vacuum of approximately 10 to 15 inHg. The leak checks performed
35 during the sampling run, at port change, and at the completion of the test were
36 conducted at a vacuum greater than or equal to the maximum value reached
37 during the sampling run. Passing leak check results were obtained in all
38 instances. The leak check results are presented in Table 7-2 and Appendix C.
- 39 • An initial and final leak check was conducted for each test run on the Type S pitot
40 tube at a minimum velocity pressure reading of 3.0 inches of water column

1 (inwc). Both the pitot impact opening and the static pressure opening on the pitot
2 tube passed the leak check.

- 3 • Isokinetic sampling rates were maintained during each of the sampling runs.
4 Percent isokinetic data for each run is presented in Appendix C.

5 During C4bR2 the M0023A nozzle was observed to have a small chip after first port sampling
6 was completed. A successful leak check was performed with the chipped nozzle in place and the
7 chipped nozzle was replaced with an identically sized nozzle to complete the run. Both nozzles
8 were recovered with the front-half of the sampling train. This circumstance does not impact the
9 validity of the C4bR2 M0023A sample.

10 The M0023A nozzle became detached from the probe assembly during the port change for
11 C4bR3. This occurred while removing the probe from the vertical port and the nozzle fell into
12 the exhaust duct and was not recoverable. This circumstance only impacts C4bR3 and no
13 samples from this run were analyzed by the off-site laboratories.

14 During C4bR4, the M26A probe temperature was 274°F, one (1) degree above the upper limit,
15 for the final 25 minutes of sampling. Neither the particulate matter nor the acid gas results are
16 expected to be impacted by this minor temperature discrepancy.

17 At the start of the second port of C4bR5, the M26A filter oven temperature was 334°F.
18 Corrective action was taken and within 15 minutes the temperature was within acceptance limits.
19 The exact duration of the over-temperature condition is uncertain but with the final first port
20 reading indicating the oven temperature was within acceptance limits, it could be no greater than
21 two (2) hours and 20 minutes. This circumstance could have led to the loss of more volatile
22 particulates that have boiling points between 273 and 334°F but has no impact on the acid gas
23 results. C4bR5 particulate matter results should be considered estimated as a result of this
24 circumstance.

25 **7.4.2 Non-Isokinetic Sampling**

26 **7.4.2.1 Volatile Organics**

27 The following key sampling procedures were performed to comply with US EPA requirements
28 and the ANCDF SDC Emissions Test Plan for M0030 sampling:

- 29 • Four (4) sets of sorbent traps and one (1) condensate sample were collected for
30 each run. Each sorbent trap set consisted of one (1) Tenax tube and one (1)
31 Tenax/charcoal tube.
- 32 • A field blank sample was collected during each run at the sampling location. The
33 end caps on the blank set of traps were removed for the period of time required to
34 exchange each pair of traps. After collection, the field blank sample was handled
35 and analyzed in the same manner as the actual sample.
- 36 • A trip blank sample set was included with the actual sample traps during shipment
37 to the site, sampling, and shipment to the laboratory. The end caps were not
38 removed from the trip blank.
- 39 • A trip blank consisting of organic-free water was included with the actual sample
40 condensates during shipment to the laboratory.

- 1 • The samples were delivered to the laboratory in a sealed cooler packed with ice.
2 Documentation of analysis and a COC form relinquishing custody of the samples
3 accompanied the samples.
- 4 • The samples were maintained at 0 to 6°C at all times, before and after sampling,
5 prior to analysis.
- 6 • Each sample was collected by drawing the exhaust gas through the train at a rate
7 of approximately 0.5 L/min for 40 minutes. Approximately 20 dry standard liters
8 (dsL) of exhaust gas sample volume were pulled through each set of traps. The
9 sample volume collected and field data sheets for each run are presented in
10 Appendix C-2.
- 11 • The cooling water used for circulating through the condensers came from an ice
12 water bath. The temperature of the sample gas stream between the outlet of the
13 first condenser and the Tenax sorbent trap and between the outlet of the second
14 condenser and the Tenax/charcoal trap was maintained below 68°F (20°C).
- 15 • An initial leak check was conducted for each sample collected, with a maximum
16 allowable leak rate of 2.5 millimeters mercury (mmHg) over a one (1)-minute
17 time period while pulling a vacuum greater than (>) 10 inHg (this value exceeds
18 the normal operating pressure). A final leak check was conducted for each
19 sample collected, with a maximum allowable leak rate of 2.5 mmHg over a one
20 (1)-minute time period while pulling a vacuum of greater than or equal to the
21 highest vacuum encountered during collection of the sample. The M0030
22 sampling train passed all leak checks. The leak check results are presented in
23 Appendix C-2.

24 **7.4.2.2 Volatile TOCs**

25 The following key sampling procedures were performed to comply with US EPA requirements
26 and the ANCDF SDC Emissions Test Plan for M0040 sampling:

- 27 • Approximately 30 L of exhaust gas was collected per bag sample collected. The
28 sample volume collected and field data sheets for each run are presented in
29 Appendix C.
- 30 • All bag samples were collected into Tedlar bags.
- 31 • One (1) condensate sample was collected per bag sample collected. Amber glass
32 septum cap vials were used to collect the condensate.
- 33 • Two (2) bag samples were collected during each run.
- 34 • A daily field blank sample was collected.
- 35 • The temperatures of the probe, filter, and valve were maintained between 130 and
36 140°C (266 and 284°F) during collection of each sample.
- 37 • The condenser temperature was maintained at a temperature of < 20°C (68°F).
38 Temperatures were recorded every five (5) minutes. Field data sheets
39 documenting the temperatures are found in Appendix C.

1 **7.4.2.3 O₂ and CO₂**

2 M3B sampling was performed to determine O₂ and CO₂ concentrations by collecting an
3 integrated bag sample that was analyzed using an Orsat analyzer.

- 4 • Integrated bag samples were collected during each run in conjunction with one (1)
5 of the isokinetic sampling trains.
- 6 • Each sample was collected at a constant rate during each traverse into a Tedlar
7 bag and leak checked prior to sampling.
- 8 • The Orsat analyzer was successfully leak checked prior to analysis of each sample
9 according to the procedures in M3B.
- 10 • Each Orsat bag sample was analyzed three times (3X) and the average was
11 calculated and used for reporting O₂ and CO₂ concentration. Orsat analysis
12 readings are recorded on field data sheets included in Appendix C-2.

13 **7.4.2.4 SO₂**

14 SO₂ was determined during each run IAW M6C. Two (2) SO₂ runs were completed for each run
15 that encompassed the sampling times of the isokinetic sampling trains.

16 A logbook was kept and calibrations, QC activities, routine maintenance, and repair activities
17 were documented for the SO₂ testing. Activities related to the pre-test checks (e.g., calibration
18 drift/error) were also recorded. All data related to SO₂ sampling and the pre-test activities were
19 logged using the DAS.

20 The analyzer was calibrated IAW M6C (references M7E). The QC measures included the use of
21 US EPA protocol calibration gases, pre- and post-test run calibrations, calibration error, and bias
22 tests. Copies of the certifications for the gas standards are provided in Appendix D and the
23 results are provided in Appendix F-1.

24 **7.4.2.5 NO_x**

25 NO_x was determined during each run IAW M7E. Two (2) NO_x runs were completed for each
26 run that encompassed the sampling times of the isokinetic sampling trains.

27 A logbook was kept and calibrations, QC activities, routine maintenance, and repair activities
28 were documented for the NO_x testing. Activities related to the pre-test checks (e.g., calibration
29 drift/error and response time tests) were also recorded. All data related to NO_x sampling and the
30 pre-test activities were logged using the DAS.

31 The analyzer was calibrated IAW M7E. The QC measures included the use of US EPA protocol
32 calibration gases, conversion efficiency, pre- and post-test run calibrations, calibration error, and
33 bias tests. Copies of the certifications for the gas standards are provided in Appendix D and the
34 results are provided in Appendix F-1.

1 **7.4.2.6 CO**

2 CO was determined during each run IAW M10. Two (2) CO runs were completed for each run
3 that encompassed the sampling times of the isokinetic sampling trains.

4 A logbook was kept and calibrations, QC activities, routine maintenance, and repair activities
5 were documented for the CO testing. Activities related to the pre-test checks (e.g., calibration
6 drift/error) were also recorded. All data related to CO sampling and the pre-test activities were
7 logged using the DAS.

8 The analyzer was calibrated IAW M10 (references M7E). The QC measures included the use of
9 US EPA protocol calibration gases, pre- and post-test run calibrations, calibration error, and bias
10 tests. Copies of the certifications for the gas standards are provided in Appendix D and the
11 results are provided in Appendix F-1.

12 **7.4.2.7 Mustard**

13 During each run a DRE DAAMS was used to collect a sample for the determination of emission
14 levels of mustard agent IAW with a site specific procedure. The flow through each tube was
15 verified prior to and after collection of each set of tubes IAW site-specific procedures.

16 There were two DRE DAAMS sampling anomalies during C4b. For C4bR2, a quality plant
17 (QP) tube was not aspirated with the samples and QP results are not available for this run. For
18 C4bR3, the DRE DAAMS sampling array was started approximately 15 minutes prior to the
19 isokinetic sampling trains commencing sampling of the second port. The DRE DAAMS
20 completed sampling at the same time as the isokinetic sampling trains and “no credit” was taken
21 for the additional sample time when determining total volume sampled for DRE calculations.

22 **7.5 DATA VALIDATION RESULTS**

23 Blank and spiked samples were analyzed IAW the QA/QC requirements specified in the ANCDF
24 SDC Emissions Test Plan. Blank samples included reagent blanks, field blanks, trip blanks, and
25 method blanks. Method blanks were used to measure any contaminants that may have been
26 introduced to the sample during sample preparation and analysis in the laboratory. Reagent
27 blanks were used to assess the cleanliness of the reagents used in the field. Field blanks were
28 used to measure any contaminants that may have been introduced to the samples from the
29 sampling equipment and sampling technique.

30 Trip blanks provide a measure of any sample contamination that may be introduced during
31 shipping of the samples from the site to the laboratory. The spike samples consisted of matrix
32 spike and matrix spike duplicates (MS/MSD), laboratory control samples and laboratory control
33 sample duplicates (LCS/LCSD, blank spikes), and surrogate spikes. These samples were used to
34 assess method performance and the recovery efficiency of the various analytical methods used in
35 this work. Exhaust gas samples are generally consumed in their entirety during the initial
36 preparation and analysis of each sample. In instances where re-extraction and/or analysis are
37 indicated in response to poor spike recovery, such action cannot be taken, as there is no
38 additional sample aliquot available.

1 Analytical precision was assessed by performing spikes and spike duplicates with the analytes of
2 interest and measuring the relative percent difference (RPD) between the duplicate analyses.
3 The recovery of the spiked samples was used to assess the bias (accuracy) of the analysis. The
4 surrogate spikes, which are authentic standards (not likely to be found in the matrix) added to
5 every organic sample prior to preparation and/or analysis, were used to provide an additional
6 measure of QC for each sample. Surrogate spikes provide data that allows items such as matrix
7 effects, gross sample-processing errors, and extraction efficiency to be assessed.

8 The following subsections summarize the QA/QC assessment for the exhaust gas samples
9 collected and analyzed.

10 **7.5.1 Semivolatile Organics**

11 During each run, a M0010 sampling train was used to collect samples for the determination of
12 emission levels of the semivolatile PICs and TICs as specified in the SAP/QAPP. M0010
13 samples collected during each run were extracted IAW M3542 and analyzed IAW M8270C. QC
14 protocols included the use of a field surrogate, which was spiked onto the XAD trap prior to
15 sampling, additional surrogates added to the samples in the laboratory prior to extraction, and
16 internal standards added prior to analysis. The preparation of the M0010 sampling train yields
17 three (3) fractions for analysis by M8270C. Table 7-3 provides a summary of the dates each
18 sample was prepared and analyzed and demonstrates all holding time requirements were
19 satisfied.

20 **GC/MS Tuning**

21 GC/MS instruments were tuned to ensure mass resolution, identification, and sensitivity. For
22 semivolatile sample analysis, instruments were tuned by analyzing decafluorotriphenylphosphine
23 at the beginning of each 12-hour period during which samples or standards are analyzed and
24 comparing the ion abundance for selected mass to electron ratios to the ion abundance criteria
25 specified in M8270C. All GC/MS instrument tunings met the criteria during analysis of the
26 samples.

27 An additional part of the M8270C tune is the system performance check on the injection port
28 inertness and column performance. These additional items were evaluated with each instrument.
29 The criteria for injection port inertness and peak tailing were met for each tune check.

30 **Instrument Calibration**

31 Requirements for instrument calibration are established to ensure the instrument is capable of
32 producing acceptable qualitative and quantitative data. Initial calibration (ICAL) demonstrates
33 the instrument is capable of producing a linear calibration curve, and continuing calibration
34 demonstrates maintenance of the linear curve on a daily basis. System performance check
35 compounds (SPCCs) and calibration check compounds (CCCs) must meet criteria specified in
36 the method for the calibration to be valid.

37 Instruments were initially calibrated by analyzing standards containing compounds of interest at
38 a minimum of five (5) concentrations. Because of the extensive target analyte list, there are two
39 (2) initial calibrations (ICALs) associated with each instrument with each ICAL containing a

1 subset of the entire target analyte list. These two (2) calibrations are referred to in the raw data
2 as the “HSL” and “AP9” lists. The concentrations of each compound were quantitated relative to
3 the closest eluting internal standard and a response factor (RF) was determined. The average
4 RFs for each compound were calculated. The four (4) SPCC compounds were checked for a
5 minimum average RF. The minimum acceptable average RF is 0.05. If the minimum RF criteria
6 are not met, all detects should be considered estimated and NDs should be flagged as “rejected”
7 (unusable).

8 The relative standard deviation (RSD) for the CCCs was calculated using the RF from the ICAL.
9 The RSD for each CCC should be < 30% for the calibration to be valid. The RSD for each
10 non-CCC should be < 15% if the average RF was used by the laboratory for quantitation. If the
11 RSD for any target analyte is > 15%, an alternate means of quantitation should be employed
12 (e.g., use of a quadratic curve). When the RSD is > 15% but < 90% all detects and NDs should
13 be considered estimated. When the RSD is > 90% all detects should be considered estimated and
14 NDs should be flagged as “rejected” (unusable).

15 The ICAL curve was checked and verified once every 12 hrs of analysis time for each target
16 compound. This verification was accomplished by analyzing a calibration standard and checking
17 the SPCCs and CCCs. The RFs for the SPCCs and target compounds were evaluated similarly
18 for both the continuing and initial calibration.

19 The CCCs were evaluated by comparing the % drift between the CCC standard concentrations
20 with the measured concentrations. The % drift for each CCC should be < 20% for the continuing
21 calibration to be valid. When the % drift is > 20% but < 90% all detects and NDs should be
22 considered estimated. When the % drift is > 90% all detects should be considered estimated and
23 NDs should be flagged as “rejected” (unusable).

24 All samples were quantitated against the same initial calibration (i.e., instrument SV5 on
25 07/07/11 [HSL] and 07/08/11 [AP9]) and all criteria were met without exception and
26 qualification of the data is not indicated. All samples were run following the same continuing
27 calibration (i.e., instrument “SV5” on 08/17/11) and all criteria were met with the exception of
28 the RSD of methyl methanesulfonate (-22.6%) and methapyrilene (-25.5%). All associated
29 sample results for methanesulfonate and methapyrilene should be considered estimated.

30 **Surrogate Standard Results**

31 Laboratory performance on individual samples was established by means of spiking activities.
32 All samples were spiked with six (6) surrogate compounds prior to sample analysis. Each XAD
33 trap was spiked with a field surrogate, 1,2-dichlorobenzene-d₄, to provide an indication of
34 possible breakthrough or loss due to sampling handling procedures.

35 Evaluation criteria for surrogates include estimating sample results when any one (1) of the
36 surrogates has recoveries outside the acceptance limits provided the recovery is $\geq 10\%$. If any
37 surrogate has < 10% recovery, sample results for that fraction may be rejected. Surrogate
38 recoveries for all field samples were within SAP/QAPP QC limits. Surrogate recoveries are
39 presented in Table 7-4.

1 **Internal Standard Performance**

2 Internal standards are monitored to ensure GC/MS sensitivity and response is stable during every
3 instrument run. Six (6) internal standards were added to each sample prior to analysis:

4 1,4-dichlorobenzene-d₄, naphthalene-d₈, acenaphthene-d₁₀, phenanthrene-d₁₀, chrysene-d₁₂, and
5 perylene-d₁₂.

6 M8270C specifies that internal standard area counts for the continuing calibration standard must
7 not vary by more than a factor of two (2) (-50% to + 100%) from the associated ICAL standards
8 and the retention time (RT) must not vary by > 30 seconds. Internal standard acceptance criteria
9 for samples and blanks are not specified by M8270C. For validation purposes, samples and
10 blanks were evaluated to verify internal standard area counts did not vary by more than a factor
11 of two (2) (-50% to + 100%) from the associated continuing calibration standard and the RT did
12 not vary by > 30 seconds. Should the area response be outside the criteria, professional
13 judgment is used to assess the impact on the reported results. All internal standard area and RTs
14 were found to have met acceptance criteria for all continuing calibrations, samples, and blanks.

15 **Method Blank Results**

16 Laboratory (method) blank samples are analyzed to determine the existence and magnitude of
17 contamination resulting from laboratory activities.

18 No target analytes were found in the laboratory blank associated with the front-half or
19 condensate fractions and qualification of the reported sample results is not indicated. The
20 laboratory blank associated with the back-half train fractions had benzoic acid (32 micrograms
21 [ug]), bis(2-ethyl hexyl)phthalate (18 ug), and di-n-butyl phthalate (15 ug) detected. These
22 analytes were found in all back-half fractions at concentrations that were ≤ five times (5X) the
23 method blank concentration. All reported results for these analytes should be considered ND at
24 the reported concentration. No other target analytes were found in the back-half fraction method
25 blank above the RL.

26 **Field Blank Results**

27 Field blanks are indicators of ambient and sample handling contamination. A field blank was
28 collected by setting up a sampling train at the sampling location, heating the train, and
29 performing leak checks. The field blank is recovered in the same manner as the field samples.

30 No target analytes were detected in the condensate fractions of the field blank. Bis(2-ethyl
31 hexyl) phthalate (3.2 ug) and di-n-butyl phthalate (5.4 ug) were found in the front-half field
32 blank fraction. Benzoic acid (16 ug), bis(2-ethyl hexyl) phthalate (25 ug) and di-n-butyl
33 phthalate (18 ug) were found in the back-half field blank fraction. The sample results are not
34 corrected for field blank contamination. However, all associated sample results for these
35 analytes should be considered estimated.

36 **Reagent Blank Results**

37 Reagent blanks are indicators of the cleanliness of the reagents and materials used in the field.
38 Reagent blanks were collected that included the filter, solvent, resin, and organic-free water.

1 No compounds were reported at or above the RL in any of the reagent blanks with the exception
2 of bis(2-ethyl hexyl) phthalate (2.8 ug) in the filter blank and benzoic acid (39 ug), bis(2-ethyl
3 hexyl) phthalate (22 ug), and di-n-butyl phthalate (11 ug) found in the in the resin blank. The
4 sample results are not corrected for reagent blank contamination. However, all associated
5 sample results for this analyte should be considered estimated.

6 **Trip Blank Results**

7 Trip blanks are indicators of ambient and sample handling contamination introduced during
8 shipping of the samples. A trip blank consisting of a resin trap was shipped with the samples to
9 the laboratory and analyzed.

10 Benzoic acid (41 ug), bis(2-ethyl hexyl) phthalate (17 ug), and di-n-butyl phthalate (8.5 ug)
11 found in the in the trip blank. These analytes were also found in the associated laboratory blank.
12 The sample results are not corrected for trip blank contamination. However, all associated
13 sample results for this analyte should be considered estimated.

14 **LCS Results**

15 LCS/LCSDs were analyzed to provide information on the accuracy of the analytical method and
16 on laboratory performance. All LCS/LCSD recoveries and RPD were within SAP/QAPP QC
17 limits. The results of the LCS/LCSD analyses are presented in Table 7-5.

18 **7.5.2 Semivolatile and Nonvolatile TOCs**

19 Exhaust gases were collected for semivolatile and nonvolatile total organics IAW M0010-TOC.
20 The following subsections discuss the semivolatile and nonvolatile total organic analysis. The
21 preparation of the M0010-TOC sampling train yields one (1) fraction that is split and analyzed
22 by for semivolatile and nonvolatile TOCs. Table 7-6 provides a summary of the dates each
23 sample was prepared and analyzed and demonstrates all holding time requirements were
24 satisfied.

25 **Instrument Calibration**

26 Requirements for instrument calibration are established to ensure the instrument is capable of
27 producing acceptable qualitative and quantitative data. ICAL demonstrates the instrument is
28 capable of acceptable performance prior to sample analysis, and continuing calibration sample
29 analyses verify that the ICAL is still valid. A multi-point calibration curve was prepared to
30 determine an average RF for the C₈-C₁₇ range. Instrument calibration met all acceptance criteria.

31 For the nonvolatile total organics the analytical balance was calibrated using three (3) different
32 weights before and after sample analysis. These performance checks demonstrate that the
33 analytical balance was in control and capable of producing valid results.

34 **Surrogate Standard Results**

35 For the semivolatile total organics analysis, laboratory performance on individual samples is
36 established by means of spiking samples with known concentrations of selected compounds. All

1 samples were spiked with n-heptadecane as a surrogate compound prior to sample analysis.
2 Surrogates are not used with the nonvolatile total organics analysis.

3 Evaluation criteria for the surrogate include estimating sample results when any surrogate has a
4 recovery $\geq 10\%$, but below the lower SAP/QAPP QC limit. If any surrogate has $< 10\%$
5 recovery, concentrations of detected compounds are qualified as estimated and compounds with
6 concentrations $<$ method detection limit (MDL) are rejected. All surrogate recoveries were
7 within acceptance limits. Qualification of the results based on surrogate recovery is not
8 indicated. Surrogate recoveries are shown in Table 7-6.

9 **Method Blank Results**

10 A method blank was prepared and analyzed along with the field samples to determine the
11 existence and magnitude of contamination resulting from laboratory activities. The method
12 blank results also reflect the background level of artifacts present in resin.

13 The semivolatile fraction method blank showed that there was contamination below the RL of
14 0.15 milligrams (mg) at a reported concentration of 0.10 mg. The nonvolatile method blank
15 showed contamination above the RL at a reported concentration 3.7 mg. All semivolatile and
16 nonvolatile total organic sample results should be considered estimated and biased high.

17 **Field Blank Results**

18 Field blanks are indicators of ambient and sample handling contamination. A field blank was
19 collected by setting up a sampling train, bringing the train to the sampling location, heating the
20 train, and performing leak checks. The field blank is recovered in the same manner as the field
21 samples.

22 The semivolatile fraction of the field blank showed contamination at 1.5 mg. The sample results
23 are not corrected for field blank contamination. The nonvolatile fraction of the field blank
24 showed no contamination. The sample results are not corrected for field blank contamination.
25 However, all semivolatile total organic sample results should be considered estimated and biased
26 high considering the contamination present in the field blank.

27 **Reagent Blank Results**

28 Reagent blanks are indicators of the cleanliness of the reagents and materials used in the field.
29 Reagent blanks were collected that included the filter, solvent, and organic-free water.

30 The semivolatile fraction of the reagent blank showed contamination at 1.7 mg. The nonvolatile
31 fraction showed contamination at 1.9 mg. The sample results are not corrected for reagent blank
32 contamination. However, all semivolatile and nonvolatile total organic sample results should be
33 considered estimated and biased high considering the contamination present in the field blank.

1 **Trip Blank Results**

2 Trip blanks are indicators of ambient and sample handling contamination introduced during
3 shipping of the samples. A trip blank consisting of a resin trap was shipped with the samples to
4 the laboratory.

5 The semivolatile fraction of the trip blank showed contamination at 2.0 mg. No nonvolatile
6 organics were found above the RL. The sample results are not corrected for trip blank
7 contamination. However, all semivolatile total organic sample results should be considered
8 estimated and biased high considering the contamination present in the trip blank.

9 **LCS Results**

10 LCSs are samples of known concentration that are prepared and analyzed along with the
11 samples. The LCS is used to monitor the overall performance of the preparation and analysis
12 process. The LCSs are presented in Table 7-7. All LCS results were within SAP/QAPP QC
13 limits.

14 **7.5.3 Dioxins/Furans**

15 During each run, a M0023A sampling train was used to collect samples for the determination of
16 emission levels of dioxins/furans as specified in the SAP/QAPP.

17 M0023A samples collected during each run were extracted IAW M0023A and analyzed IAW
18 M8290 for dioxins/furans. QC protocols included the use of field surrogates, which were spiked
19 onto the XAD trap prior to sampling, additional surrogates, and internal standards added to the
20 samples in the laboratory prior to extraction and analysis. The preparation of the M0023A
21 sampling train for dioxin/furan analysis yields two (2) fractions for analysis: the front-half
22 which includes the front-half rinse and particulate filter and the back-half which includes the
23 XAD trap and solvent rinse from the XAD trap forward to the back-half of the filter housing.
24 Table 7-8 provides a summary of the dates each sample was prepared and analyzed and
25 demonstrates all holding time requirements were satisfied.

26 **GC/MS Tuning**

27 GC/MS instruments were tuned to ensure mass resolution, identification, and sensitivity. For
28 dioxin/furan sample analysis, instruments were tuned by analyzing perfluorokerosene prior to
29 each 12-hour period during which samples or standards were analyzed and comparing the mass
30 resolution for selected mass to electron ratios to the mass resolution criteria of 10,000 (10%
31 valley definition). All GC/MS instrument tunes met the criteria during analysis of the samples.

32 **Instrument Calibration**

33 Requirements for instrument calibration are established to ensure the instrument is capable of
34 producing acceptable qualitative and quantitative data for target compounds. ICAL demonstrates
35 that the instrument is capable of producing a linear curve, and continuing calibration
36 demonstrates maintenance of the linear curve on a daily basis.

1 Instruments were initially calibrated by analyzing standards containing compounds of interest at
2 five (5) concentrations. The concentrations of each compound were quantitated relative to the
3 closest eluting internal standard, and RFs and average RFs for each compound were calculated.

4 The RSD for labeled and unlabeled dioxin/furan standards should be $\leq 30\%$ and $\leq 20\%$,
5 respectively, for the calibration to be valid. The ICAL curve was checked and verified once
6 every 12 hours of analysis time for each target compound. This verification was accomplished
7 by analyzing a calibration standard and checking target analytes and internal standards. The RFs
8 for the target compounds were evaluated similarly for both the continuing and the initial
9 calibration.

10 The target analytes were evaluated by comparing the % drift between the standard concentrations
11 with the measured concentrations. The % drift for labeled and unlabeled dioxin/furan standards
12 should be $\leq 30\%$ and $\leq 20\%$, respectively, for the beginning continuing calibration to be valid
13 and $\leq 35\%$ and $\leq 25\%$, respectively, for the ending continuing calibration to be valid.

14 All ICAL and continuing calibration criteria were met and qualification of the sample results is
15 not indicated.

16 **Internal and Surrogate Standard Results**

17 Laboratory performance on individual samples was established by means of spiking activities.
18 All samples were spiked with nine (9) internal standard compounds prior to sample analysis.
19 Evaluation criteria for internal standards include estimating sample results when any one (1) of
20 the internal standards have recoveries outside the acceptance limits provided the recovery is
21 $\geq 10\%$. If any internal standard has $< 10\%$ recovery, associated sample results for that fraction
22 may be rejected.

23 Sampling efficiencies on individual samples are established by means of spiking activities. Prior
24 to sampling, the resin traps of all samples were spiked with five (5) labeled compounds. The
25 surrogates are used to monitor efficiency and are not used in the quantitation of unlabeled
26 analytes. Prior to extraction, the same five (5) standards were spiked onto the particulate filter to
27 monitor the extraction efficiency of the front-half fraction of the sampling train. Low recoveries,
28 $< 70\%$, could be indicative of breakthrough taking place during sampling. Table 7-9 presents the
29 internal and surrogate standard recoveries for all samples.

30 All internal and surrogate standard results were within acceptance limits with the exception of
31 13c-1,2,3,4,7,8-HxCDD for samples SDC-M4B-1-M0023A-FH, SDC-M4B-1-M0023A-BH,
32 SDC-M4B-FB-M0023A-BH, and SDC-M4B-TB-M0023A-XAD. In each instance the recovery
33 was less than the lower control limit but $> 10\%$. Results for these samples should be considered
34 estimated.

35 **Method Blank Results**

36 Laboratory (method) blank samples were analyzed to determine the existence and magnitude of
37 contamination resulting from laboratory activities. No target analytes were reported at or above
38 the RL in laboratory blanks associated with the front- and back-half fractions and qualification of
39 the results was not indicated.

1 **Field Blank Results**

2 Field blanks are indicators of ambient and sample handling contamination. A field blank was
3 collected by setting up a sampling train, bringing the train to the sampling location, heating the
4 train, and performing leak checks. The field blank is recovered in the same manner as the field
5 samples. The front-half fraction of the field blank showed contamination with octa-chlorinated
6 dibenzofuran (CDF) (230 picograms [pg]). The sample results are not corrected for field blank
7 contamination. However, all octaCDF sample results should be considered estimated and biased
8 high considering the contamination present in the field blank.

9 **Reagent Blank Results**

10 Reagent blanks are indicators of the cleanliness of the reagents and materials used in the field.
11 Reagent blanks were collected that included the filter and solvents. No target analytes were
12 reported at or above the RL in any of the reagent blanks samples.

13 **Trip Blank Results**

14 Trip blanks are indicators of ambient and sample handling contamination introduced during
15 shipping of the samples. A trip blank consisting of a resin trap was shipped with the samples to
16 the laboratory and analyzed. No target analytes were reported at or above the RL in the trip
17 blank.

18 **LCS Results**

19 LCSs were analyzed to provide information on the accuracy of the analytical method and on
20 laboratory performance. The LCSs associated with the preparation and analysis of the field
21 samples are presented in Table 7-10. All LCS results were within SAP/QAPP QC limits.

22 **7.5.4 Volatile Organics**

23 During each run, a M0030 sampling train was used to collect samples for the determination of
24 emission levels of volatile PICs and TICs as specified in the SAP/QAPP. M0030 samples
25 collected during each run were analyzed IAW M5041A and M8260B. Four (4) Tenax tube
26 samples, four (4) Tenax/charcoal tube samples, and a single (1) condensate sample were
27 collected during each run. Prior to analysis, each sample was spiked with surrogate standards.
28 Each tube was prepared and analyzed separately, allowing breakthrough to be assessed.
29 Table 7-11 provides a summary of the date each sample was analyzed and demonstrates all
30 holding time requirements were satisfied.

31 **GC/MS Tuning**

32 Samples were analyzed by a GC/MS tuned to ensure mass resolution, identification, and
33 sensitivity. For volatile organic sample analyses, instruments were tuned by analyzing
34 4-bromofluorobenzene at the beginning of each 12-hour period during which samples or
35 standards were analyzed and comparing the ion abundance for selected mass to electron ratios to
36 the ion abundance criteria specified in M8260B. All associated GC/MS instrument tunings met
37 requirements prior to sample analysis.

1 Instrument Calibration

2 Requirements for instrument calibration were established to ensure the instrument was capable of
3 producing acceptable qualitative and quantitative data for target compounds. ICAL demonstrates
4 that the instrument is capable of producing a linear curve, and continuing calibration
5 demonstrates maintenance of the linear curve on a daily basis. SPCCs and CCCs must meet
6 criteria in the method for the calibration to be valid.

7 Instruments were initially calibrated by analyzing standards containing compounds of interest at
8 five (5) concentrations. The concentrations of each compound were quantitated relative to the
9 closest eluting internal standard and RFs. The average RFs for each compound were calculated.
10 The five (5) SPCC compounds were checked for a minimum average RF. The minimum
11 acceptable average RF was 0.10 for chloromethane, 1,1-dichloroethane, and bromoform. The
12 minimum acceptance average RF was 0.30 for 1,1,2,2-tetrachloroethane and chlorobenzene. If
13 the minimum RF criteria are not met, all detects should be considered estimated and NDs should
14 be flagged as “rejected”.

15 The RSD for the CCCs was calculated using the RF from the ICAL. The RSD for each CCC
16 must be < 30% for the calibration to be valid. The RSD for each non-CCC should be < 15% if
17 the average RF was used by the laboratory for quantitation. If the RSD for any target analyte is
18 > 15%, an alternate means of quantitation should be employed (e.g., use of a quadratic curve).
19 When the RSD is > 15% but < 90% all detects and NDs should be considered estimated. When
20 the RSD is > 90% all detects should be considered estimated and NDs should be flagged as
21 “rejected”.

22 The ICAL curve was checked and verified once every 12 hours of analysis time for each target
23 compound. This verification was accomplished by analyzing a calibration standard and checking
24 the SPCCs and CCCs. The RFs for the SPCCs and target compounds were evaluated similarly
25 for both the continuing and initial calibration.

26 The CCCs were evaluated by comparing the % drift between the CCC standard concentrations
27 with the measured concentrations. The % drift for each CCC should be < 20% for the continuing
28 calibration to be valid. When the % drift is > 20% but < 90% all detects and NDs should be
29 considered estimated. When the % drift is > 90% all detects should be considered estimated and
30 NDs should be flagged as “rejected”.

31 All ICAL criteria were met with the following exceptions:

- 32 • For the ICAL associated with samples SDC-M4B-1-M0030-COND,
33 SDC-M4B-2-M0030-COND, SDC-M4B-4-M0030-COND, SDC-M4B-5-M0030-COND,
34 and SDC-M4B-1-M0030-COND BK (i.e., instrument “R” on 04/15/11), the RSD for
35 target analytes was < 15% with the exception of 2-propanol (15.1%). All associated
36 sample results for 2-propanol should be considered estimated.

37 All continuing calibrations were met with the following exceptions:

- 38 • For the continuing calibration associated with samples SDC-M4B-1-M0030-COND,
39 SDC-M4B-2-M0030-COND, SDC-M4B-4-M0030-COND, SDC-M4B-5-M0030-COND,

1 and SDC-M4B-1-M0030-COND BK (i.e., instrument “R” on 08/16/11), the RSD for
2 target analytes was < 20% with the exception of dichlorodifluoromethane (50.5%),
3 chloromethane (30.3%), bromomethane (44.6%), iodomethane (45.0%), and
4 trans-1,4-dichloro-2-butene (22.1%). All associated sample results for
5 dichlorodifluoromethane should be considered estimated.

- 6 • For the continuing calibration associated with samples SDC-M4B-1-M0030-T BK,
7 SDC-M4B-1-M0030-TC BK, SDC-M4B-2-M0030-T BK, SDC-M4B-2-M0030-TC BK,
8 SDC-M4B-4-M0030-T BK, SDC-M4B-4-M0030-TC BK, SDC-M4B-5-M0030-T BK,
9 SDC-M4B-5-M0030-TC BK, SDC-M4B-TB-M0030-T1, SDC-M4B-TB-M0030-TC1,
10 SDC-M4B-2-M0030-T1, SDC-M4B-2-M0030-TC1, SDC-M4B-2-M0030-T2,
11 SDC-M4B-2-M0030-TC2, SDC-M4B-2-M0030-T3, SDC-M4B-2-M0030-TC3,
12 SDC-M4B-2-M0030-T4, and SDC-M4B-2-M0030-TC4, (i.e., instrument “Z” on
13 08/15/11), the RSD for target analytes was < 20% with the exception of
14 dichlorodifluoromethane (44.3%), acetone (-20.3%), 2-propanol (-72.2%),
15 cis-1,4-dichloro-2-butene (-21.9%), and trans-1,4-dichloro-2-butene (-26.2%). All
16 associated sample results for these compounds should be considered estimated.
- 17 • For the continuing calibration associated with samples SDC-M4B-5-M0030-T1,
18 SDC-M4B-5-M0030-TC1, SDC-M4B-5-M0030-T2, SDC-M4B-5-M0030-TC2,
19 SDC-M4B-5-M0030-T3, SDC-M4B-5-M0030-TC3, SDC-M4B-5-M0030-T4, and
20 SDC-M4B-5-M0030-TC4, (i.e., instrument “Z” on 08/17/11), the RSD for target analytes
21 was < 20% with the exception of dichlorodifluoromethane (52.0%) and 2-propanol
22 (-67.3%). All associated sample results for these compounds should be considered
23 estimated.

24 The ICAL establishes a linear range with an upper limit determined by the highest ICAL
25 standard. When the initial analysis of a sample has a concentration of any analyte that exceeds
26 the ICAL range, the sample should be diluted and reanalyzed if possible. For M0030, neither
27 dilution nor reanalysis is possible as the sample is used in its entirety during the initial analysis.
28 For M0030, analyte concentrations that exceed the linear range but do not saturate the detector
29 should be considered estimated and those that do saturate the detector should be rejected. All
30 reported results were within the linear range of the instrument on which they were analyzed.

31 **Surrogate Standard Results**

32 Laboratory performance on individual samples was established by means of spiking activities.
33 four (4) surrogate compounds prior to sample analysis – dibromofluoromethane,
34 1,2-dichloroethane-d₄, toluene-d₈, and 4-bromofluorobenzene.

35 Evaluation criteria for surrogates include estimating sample results when any one (1) of the
36 surrogates has recoveries outside the acceptance limits provided the recovery is $\geq 10\%$. If any
37 surrogate has < 10% recovery, sample results for that fraction may be rejected. Surrogate
38 recoveries are presented in Table 7-11. All surrogate recoveries were within acceptance limits
39 and qualification of the data is not indicated.

40 It is noted that the laboratory evaluated the surrogate recoveries using statistically derived limits
41 that were more stringent than those indicated in the SAP/QAPP. The laboratory developed limits

1 for both sorbent tubes and condensate. When the sorbent tube surrogate recoveries are evaluated
2 using the laboratory derived limits there is no change in the assessment. Table 7-11 lists the
3 acceptance limits specified in the SAP/QAPP.

4 **Internal Standard Results**

5 Internal standards are monitored to ensure GC/MS sensitivity and response is stable during every
6 instrument run. Three (3) internal standards were added to each sample prior to analysis:
7 fluorobenzene, chlorobenzene-d₅, and 1,4-dichlorobenzene-d₄.

8 M8260B specifies that internal standard area counts for the continuing calibration standard must
9 not vary by more than a factor of two (2) (-50% to + 100%) from the associated ICAL standards
10 and the RT must not vary by > 30 seconds. Internal standard acceptance criteria for samples and
11 blanks are not specified by M8260B. For validation purposes, samples and blanks were
12 evaluated to verify that internal standard area counts did not vary by a factor of two (2) (-50% to
13 + 100%) from the associated continuing calibration standard and the RT did not vary
14 by > 30 seconds. Should the area response be outside the criteria, professional judgment is used
15 to assess the impact on the reported results. Internal standard area and RT were found to have
16 met acceptance criteria for all samples.

17 **Method Blank Results**

18 Laboratory (method) blank samples were analyzed to determine the existence and magnitude of
19 contamination resulting from laboratory activities.

20 Acetone, chloromethane, methylene chloride, and toluene were found in one (1) or more of the
21 method blanks. Field samples have not been corrected for method blank contamination, thus
22 providing the most conservative emissions results. However, all associated sample results for
23 the aforementioned analytes should be considered estimated.

24 **Field Blank Results**

25 Field blanks are indicators of ambient and sample handling contamination. A field blank was
26 collected with each run.

27 Acetone, chloromethane, chlorobenzene, hexane, methylene chloride, and toluene were detected
28 in one (1) or more field blanks. Field samples have not been corrected for field blank
29 contamination, thus providing the most conservative emissions results. However, all associated
30 sample results for the aforementioned analytes should be considered estimated.

31 **Trip Blank Results**

32 A trip blank is an indicator of ambient and sample handling contamination introduced during
33 shipping of media and samples. A trip blank consists of a Tenax tube, a Tenax/charcoal tube,
34 and reagent water in a septum cap vial that were shipped with the samples to the laboratory and
35 analyzed.

1 Acetone, methylene chloride, and toluene were detected in the Tenax and Tenax/charcoal trip
2 blank samples. Field samples have not been corrected for trip blank contamination, thus
3 providing the most conservative emissions results. However, all associated results for the
4 aforementioned analytes should be considered estimated.

5 Acetone, 1,2-dichloropropane, cis-1,3-dichloropropene, methylene chloride, tetrachloroethene,
6 and toluene were detected in the condensate trip blank sample. Field samples have not been
7 corrected for trip blank contamination, thus providing the most conservative emissions results.
8 However, all associated results for the aforementioned analytes should be considered estimated.

9 **LCS/LCSD Results**

10 For the Tenax and Tenax/charcoal tubes, the entire sample is consumed with each analysis and it
11 is not possible to provide MS/MSDs. For the condensate fraction, a single sample container is
12 provided to the laboratory and though the entire sample is not consumed, the laboratory
13 procedure does not provide for replicate analyses from the same container. For these samples,
14 LCS/LCSDs were prepared in the laboratory by spiking blanks with known concentrations of
15 selected compounds provided by an independent vendor. The LCS/LCSD results are
16 summarized in Table 7-12. QC objectives were met in all instances and qualification of the data
17 is not indicated.

18 It is noted that the SAP/QAPP requires five (5) compounds to be spiked and evaluated for
19 LCS/LCSD pairs. The laboratory spiking solution contains more than the five (5) required
20 compounds. Only the five (5) compounds indicated in the SAP/QAPP were considered when
21 evaluating the useability of the data with respect to LCS/LCSD performance.

22 **Breakthrough**

23 The results of compounds detected on the front and back tubes of each M0030 pair were
24 evaluated for breakthrough to determine if a compound may have exceeded the absorbing
25 capacity of the tube pair. According to EPA/625/6-89/023, breakthrough is indicated when
26 > 30% of a compound detected on the front tube is present in the back tube. The breakthrough
27 analysis does not apply when < 75 nanograms (ng) is detected on the back tube. With the
28 exceptions noted below, breakthrough determination was not required as no target analytes were
29 detected on both the front and back tube when a compound was present on the back tube at a
30 concentration of ≥ 75 ng for any sample.

31 The chloromethane results from C4bR1-Sets 1/2/3/4, C4bR4-Sets 1/2/3/4, and C4bR5-Sets
32 1/2/3/4, meet the US EPA's definition of breakthrough as reportable concentrations were found
33 on the corresponding Tenax tube and > 75 ng was detected on each Tenax/charcoal tube.
34 Chloromethane is a common analysis artifact and is often detected in laboratory, field, and trip
35 blanks. Considering the actual concentrations detected on the Tenax tubes and typical blank
36 results, it is not believed that these results are indicative of actual breakthrough. However, all
37 associated sample results for chloromethane should be considered estimated.

38 The acetone results from C4bR1-Sets 2/3/4, C4bR2-Sets 2/3/4, C4bR4-Sets 1/2/3/4, and
39 C4bR5-Sets 1/2/3/4, meet the US EPA's definition of breakthrough as reportable concentrations
40 were found on the corresponding Tenax tube and > 75 ng was detected on each Tenax/charcoal

1 tube. Acetone is a common analysis contaminant and is often detected in laboratory, field, and
2 trip blanks. Considering the actual concentrations detected on the Tenax tubes and typical blank
3 results, it is not believed that these results are indicative of actual breakthrough. However, all
4 associated sample results for acetone should be considered estimated.

5 The methylene chloride results from C4bR1-Sets 1/2/3/4, C4bR2-Sets 1/2/3/4,
6 C4bR4-Sets 1/2/4, and C4bR5-Sets 1/2/3/4, meet the US EPA's definition of breakthrough as
7 reportable concentrations were found on the corresponding Tenax tube and > 75 ng was detected
8 on each Tenax/charcoal tube. Methylene chloride is a common field and laboratory contaminant
9 and was detected in associated laboratory, field, and trip blanks. Considering the actual
10 concentrations detected on the Tenax tubes and the associated blank results, it is not believed that
11 these results are indicative of actual breakthrough. However, all associated sample results for
12 methylene chloride should be considered estimated.

13 The vinyl chloride results from C4bR1-Sets 1/2/3/4, C4bR4-Sets 1/2/3/4, and
14 C4bR5-Sets 1/2/3/4, meet the US EPA's definition of breakthrough as reportable concentrations
15 were found on the corresponding Tenax tube and > 75 ng was detected on each Tenax/charcoal
16 tube. Considering the actual concentrations detected on the Tenax tubes, it is not believed that
17 these results are indicative of actual breakthrough. However, all associated sample results for
18 vinyl chloride should be considered estimated.

19 The 2-butanone results from C4bR2-Sets 2/3/4, meet the US EPA's definition of breakthrough as
20 reportable concentrations were found on the corresponding Tenax tube and > 75 ng was detected
21 on each Tenax/charcoal tube. Considering the actual concentrations detected on the Tenax tubes,
22 it is not believed that these results are indicative of actual breakthrough. However, all associated
23 sample results for 2-butanone should be considered estimated.

24 The chloroform results from C4bR2-Sets 1/2/3/4, meet the US EPA's definition of breakthrough
25 as reportable concentrations were found on the corresponding Tenax tube and > 75 ng was
26 detected on each Tenax/charcoal tube. Considering the actual concentrations detected on the
27 Tenax tubes, it is not believed that these results are indicative of actual breakthrough. However,
28 all associated sample results for chloroform should be considered estimated.

29 The carbon tetrachloride results from C4bR2-Sets 1/2/3/4, meet the US EPA's definition of
30 breakthrough as reportable concentrations were found on the corresponding Tenax tube and
31 > 75 ng was detected on each Tenax/charcoal tube. Considering the actual concentrations
32 detected on the Tenax tubes, it is not believed that these results are indicative of actual
33 breakthrough. However, all associated sample results for carbon tetrachloride should be
34 considered estimated.

35 **7.5.5 Volatile TOCs**

36 Exhaust gases were sampled for volatile total organics IAW M0040. The following subsections
37 discuss the volatile total organic analysis.

1 **Instrument Calibration (Bag Analysis)**

2 Requirements for instrument calibration were established to ensure the instrument was capable of
3 producing acceptable qualitative and quantitative data for target compounds. ICAL demonstrates
4 that the instrument is capable of producing a linear curve and continuing calibration
5 demonstrates maintenance of the linear curve on a daily basis.

6 The field GC was calibrated on 08/09/11 and all ICAL acceptance criteria of 5% RSD for RT and
7 area responses were satisfied. A continuing calibration verification (CCV) was analyzed at the
8 beginning of each analytical sequence with the exception of 08/09/11 where samples were
9 analyzed after the initial calibration was completed. The acceptance criterion for CCV analysis
10 is $\pm 10\%$ for RT and area responses. All CCV analyses were within acceptance limits and
11 qualification of the reported results is not indicated

12 **LCS Results (Bag Analysis)**

13 LCSs were analyzed to provide information on the accuracy of the analytical method and on
14 laboratory performance. The CCV conducted at the beginning of each analytical sequence
15 served as the LCS for each day with the exception of 08/09/11 where samples were analyzed
16 after the initial calibration was completed. For 08/09/11, the mid-point standard analyses served
17 as the LCS. The results of the LCSs are presented in Table 7-14. All LCS recoveries were
18 within the acceptance limits and qualification of the sample results is not indicated.

19 **Field Spike Results (Bag Analysis)**

20 A field spike is a field-collected sample that is spiked with a known quantity of one (1) or more
21 target analytes. The field spike provides information about the effect of each sample matrix on
22 the analysis procedure. The results of the field spike are presented in Table 7-15. The field
23 spike recovery was within the acceptance limits and qualification of the sample results is not
24 indicated.

25 **Field Blank Results (Bag Analysis)**

26 Field blanks are Tedlar bags filled with nitrogen that are sampled in the same manner as a field
27 sample. The blanks act as an indicator of contamination that may occur during field sampling.
28 A daily field blank was collected IAW SAP/QAPP requirements.

29 For C4b, contamination was observed in each field blank that was collected. Methane (C_1),
30 ethane (C_2), and hexane (C_6) was found in all field blanks. Propane (C_3) was found in the C4bR1
31 and C4bR2 field blanks. These analytes were found in all field samples. Field sample results are
32 not corrected for field blank contamination. However, all reported C_1 , C_2 , C_3 , and C_6 results
33 should be considered estimated. It is noted that for all runs, C_6 was detected and has been
34 reported to be a system contaminant. As previously noted, though field sample results are not
35 corrected for field blank contamination, all reported C_6 sample results should be considered
36 estimated.

1 **Trip Blank Results (Bag Analysis)**

2 A trip blank is a Tedlar bag that is filled with nitrogen in the field laboratory, carried to the
3 sampling location, and returned to the field laboratory for analysis. Trip blanks were collected
4 during each test condition and used to assess the existence and magnitude of contamination
5 resulting from ambient conditions. C₁, C₂, C₃, and C₆ were detected in the trip blanks collected
6 on 08/09/11 and 08/10/11. Field sample results are not corrected for trip blank contamination.
7 However, all reported C₁, C₂, C₃, and C₆ sample results should be considered estimated.

8 **Instrument Calibration (Condensate Analysis)**

9 A multi-point calibration curve of pentane (C₅) through heptane (C₇) was prepared to determine
10 an average RF factor for each carbon range. IAW the method requirements, C₄ is reported using
11 the C₅ RF. A CCV and blank are analyzed every 10 samples. The CCV must be within 15% for
12 the calibration to be valid. The continuing calibration and RT window criteria were met for the
13 method.

14 **Method Blank Results (Condensate Analysis)**

15 A method blank was analyzed to determine the existence and magnitude of contamination
16 resulting from laboratory activities. All method blank results were < RL and qualification of the
17 results is not indicated.

18 **Surrogate Standard Results (Condensate Analysis)**

19 Laboratory performance on individual samples was established by means of spiking samples
20 with known concentrations of selected compounds. All samples were spiked with n-octane as a
21 surrogate compound prior to sample analysis.

22 Evaluation criteria for the surrogate include estimating sample results if the surrogate recovery is
23 outside the acceptance limits provided the recovery is $\geq 10\%$. If the surrogate has < 10%
24 recovery, sample results may be rejected. Surrogate recoveries are presented in Table 7-13. All
25 objectives were met, and qualification of the data is not indicated.

26 **LCS Results (Condensate Analysis)**

27 LCSs were prepared in the laboratory by filling sample containers with reagent water spiked with
28 known concentrations of selected compounds. A LCS was analyzed in duplicate to provide
29 information on the accuracy of the analytical method and on laboratory performance. The results
30 of the LCS are presented in Table 7-16. All objectives were met and qualification of the data is
31 not indicated.

32 **Field Blank Results (Condensate Analysis)**

33 Condensate field blanks represent the collected reagent water rinse during recovery of each field
34 blank. The blanks act as an indicator of contamination that may occur during field sampling. A
35 daily field blank was collected resulting in one (1) field blank for each run of the performance
36 test.

1 C5 contamination (0.026 ug) was observed in the C4bR5 field blank. Field samples are not
2 corrected for field blank contamination. However, all reported C4bR5 sample results for the C₅
3 (30 to 60°C) boiling point range should be considered estimated.

4 **Trip Blank Results (Condensate Analysis)**

5 Trip blanks are sample vials filled with reagent water that are packaged with the field samples
6 for shipment to the off-site laboratory. Trip blanks may be used to determine the existence and
7 magnitude of contamination resulting from ambient conditions. For C4b, a condensate trip blank
8 was not provided to the laboratory for analysis. Reported sample results are not impacted by this
9 circumstance.

10 **7.5.6 Acid Gases**

11 During each run, a M26A sampling train was used to collect samples for the determination of
12 acid gas emission levels. The samples were analyzed IAW procedures identified in the sampling
13 and analysis method, M26A. Table 7-17 provides a summary of the dates each sample was
14 collected and analyzed and demonstrates all holding time requirements were satisfied.

15 **Instrument Calibration**

16 Requirements for instrument calibration are established to ensure the instrument is capable of
17 producing acceptable qualitative and quantitative data. ICAL demonstrates the instrument is
18 capable of acceptable performance prior to sample analysis, and continuing calibration sample
19 analyses verify that the ICAL is still valid.

20 The IC was calibrated IAW M26A, using a minimum of five (5) points for the ICAL. The
21 correlation coefficient for chloride and fluoride were > 0.995 for each ICAL curve. Initial and
22 continuing calibration verification sample results were within the acceptable control limits of 90
23 to 110% recovery.

24 **Duplicate Injections**

25 Duplicate injections of the samples were performed to ensure the precision of the reported result.
26 The duplicate injections of each sample should be within 5% RPD when sample results are > 5X
27 the RL. No field sample results were > 5X the RL and RPD was not evaluated.

28 It is noted that the matrix spikes were not analyzed in duplicate. No target analytes were found
29 in any of the samples and the reported results are not impacted by this circumstance.

30 **Method Blank Results**

31 Laboratory (method) blank samples were analyzed to determine the existence and magnitude of
32 contamination resulting from laboratory activities. No target analytes were detected at or above
33 the MDL in any of the laboratory blanks. No qualification of samples was performed based on
34 laboratory blank results.

1 **Field and Reagent Blank Results**

2 Reagent blanks are indicators of reagent contamination. Field blanks are indicators of reagent
3 and ambient contamination that may have contaminated the sample. No target analytes were
4 detected at or above the MDL in the field and reagent blanks.

5 **LCS Results**

6 LCSs were samples of known concentration that are prepared and analyzed along with the field
7 samples. The LCSs were used to monitor the overall performance of the analysis process. The
8 results of the LCS analyses are summarized in Table 7-18. All objectives were met, and
9 qualification of the data was not necessary.

10 **MS/MSD Results**

11 The MS/MSD sample results provide information about the effect of each sample matrix on the
12 analysis procedure. The MS/MSD results are summarized in Table 7-19. All objectives were
13 met, and qualification of the data was not necessary.

14 **7.5.7 Particulates**

15 A M26A sampling train was used to collect samples for the determination of emission levels of
16 particulates. The samples were analyzed for particulates gravimetrically IAW M5. QC
17 measures included the use of Class-S weights to verify the accuracy of the analytical balance, the
18 collection and analysis of blank samples, and replicate weighings of each sample collected.

19 All sample analyses were completed within the holding times specified in the SAP/QAPP. The
20 balance calibration was verified prior to each use as required and replicate weighings were
21 performed and meet QC requirements.

22 There was field blank contamination observed that would have biased the reported results.
23 Particulate was present in both the field blank filter (0.0007 g) and solvent rinses (0.0008 g).
24 Particulate was also present in the reagent blank filter (0.0003 g) and acetone (0.0005 g). All
25 sample results should be considered estimated and may be biased high.

26 **7.5.8 Trace Metals**

27 During each run, a M29 sampling train was used to collect samples for the determination of
28 emission levels of metals as indicated in the SAP. The analysis of the samples for mercury was
29 performed IAW M7470A. All other metals analysis was performed IAW M6020. Instrument
30 calibration and calibration verification for each method employed was performed IAW method
31 requirements.

32 **Instrument Tune**

33 The ICP/MS instrument was tuned prior to each analytical sequence to ensure mass resolution,
34 identification, and sensitivity. The results of each tune show that the ICP/MS achieved a mass

1 resolution of < 1.0 atomic mass units (amu) at 10% peak height and met the mass calibration of
2 < 0.1 amu from the expected value.

3 **Instrument Calibration**

4 Instrument calibration was performed to ensure the instrument was capable of producing
5 acceptable quantitative data. ICAL demonstrated that the instrument was capable of acceptable
6 performance prior to sample analysis and continuing calibration sample analyses verified that the
7 ICAL was still valid. As allowed by M6020, the instrument was periodically recalibrated during
8 the run to ensure accurate quantitation of target analytes.

9 M6020, ICP/MS, was used for the analysis of aluminum, antimony, arsenic, barium, beryllium,
10 boron, cadmium, chromium, cobalt, copper, lead, manganese, nickel, potassium, selenium,
11 silver, thallium, tin, uranium, vanadium, and zinc. M7470A, CVAAS, was used for the
12 determination of mercury. The ICP/MS and CVAAS were calibrated IAW M6020 and M7470A,
13 respectively. Initial and continuing calibration verification sample results were within the
14 acceptable control limits of 90 to 110% recovery for ICP/MS and 80 to 120% for CVAAS
15 throughout the analysis of all exhaust gas samples.

16 **Internal Standard Results**

17 M6020 requires the use of internal standards. Internal standards were added to each sample
18 analyzed by M6020. Internal standard intensities fell between 30 and 130% of the internal
19 standard intensities in the first standard used during calibration. As the method allows the
20 instrumented to be re-sloped during the course of a sequence, internal standard recoveries are
21 calculated using the standard used for re-sloping, as applicable. Internal standard recoveries for
22 each field sample met the recovery objectives.

23 **Interference Check Samples**

24 M6020 requires interference check samples (ICSs) to be analyzed at the beginning of each
25 analytical sequence. Two (2) check sample solutions are run, an "A" solution (i.e., ICSA)
26 containing only interfering elements at high concentrations and an "AB" solution (i.e., ICSAB),
27 containing all analytes of interest including the interfering elements. The EPA's validation
28 guidelines are written for a modified procedure that requires an additional ICS at the end of each
29 analytical sequence. M6020 does not require an ending ICS analysis and the review criteria
30 applied only considered the required ICS. It is noted that aluminum is present in the
31 ICSA/ICSAB solutions at a concentration that is at the upper range of the instrument. As such,
32 aluminum saturated the detector and a valid value is not reportable for several analyses.
33 Interferences may still be assessed despite this circumstance. The ICS results were within $\pm 20\%$
34 of the true value for all analytes in the ICS solutions for each run analyzed.

35 M7470A has no interference check sample requirements.

36 **Method Blank Results**

37 Method blanks were analyzed to determine the existence and magnitude of contamination
38 resulting from laboratory handling of the samples. Method blank results for are summarized in

1 Table 7-20. No target elements were detected above the RL though there were instances where
2 target metals were found between the RL and MDL. Qualification of the reported results is not
3 indicated.

4 **Field and Reagent Blank Results**

5 Reagent blanks are indicators of the quality of the reagents used in the preparation and recovery
6 of the sampling trains. Field blanks are indicators of reagent and ambient contamination that
7 may have occurred in the field. The results of reagent and field blank are presented in
8 Table 7-20.

9 M29 allows for correction of the field sample results for reagent blank contribution. However,
10 the field sample results were not corrected for reagent blank metals content, which allows for
11 reporting the most conservative metals emissions data. Reported “total catch” results should be
12 considered biased high for those metals identified in Table 7-20 that were found in the field and
13 reagent blanks.

14 **LCS Results**

15 LCSs are samples of known concentration that were prepared and analyzed along with the field
16 samples. The LCSs were used to monitor the overall performance of the preparation and
17 analysis process. The results of the LCSs are summarized in Table 7-21. All objectives were
18 met and qualification of the data was not necessary.

19 It is noted that while the SAPP/QAPP requires an LCS to be performed, the laboratory prepared
20 and analyzed an LCS and LCSD with the front-half fraction. Results of the LCS/LCSD for the
21 front-half fraction have been included in this report.

22 **MS/MSD Results**

23 The MS/MSD sample results provide information about the effect of each sample matrix on the
24 preparation and analysis procedure. For the M29 sampling train, the MS/MSDs are
25 post-digestion spike/post-digestion spike duplicates for the front- and back-half fractions of the
26 sampling train as the sample cannot be split and separate aliquots spiked prior to sample
27 preparation. Only the back-half mercury fraction has an MS/MSD that is prepared by spiking
28 sample aliquots prior to digestion. The MS/MSD results are summarized in Table 7-22.

29 All MS/MSD recoveries and RPDs were within acceptance limits and qualification of the
30 reported sample results is not indicated.

31 **Serial Dilution Results**

32 Serial dilution, or dilution test, is required by M6020 and is used to determine whether
33 significant physical or chemical interferences exist attributable to sample matrix. If the analyte
34 concentration is 100 times (100X) greater than the concentration in the MDL the serial dilution
35 results should be within 10% of the original determination. The laboratory conducted serial
36 dilution analysis with each analytical batch per instrument as required.

1 All serial dilution results were within acceptance limits with the exception of copper (15.3%) and
2 zinc (10.9%) in the back-half fraction serial dilution. All front-half fraction copper and zinc
3 results are > 50 times (50X) the MDL and should be considered estimated with the exception of
4 the C4bR5 zinc result (it is < 50X the MDL) which should not be qualified.

5 **7.5.9 Energetics**

6 Exhaust gases were sampled for energetic compounds using the MM5E. The laboratory
7 provided preloaded and surrogate spiked (3,4-dinitrotoluene) XAD traps, and the impinger
8 fraction of the sampling train was spiked by URS-Austin prior to sampling with surrogate.
9 Following any necessary extraction, the sampling train components were analyzed for energetic
10 compounds using M8330, HPLC. Table 7-23 provides a summary of the dates each sample was
11 prepared and analyzed and demonstrates all holding time requirements were satisfied. The
12 following subsections discuss the energetic analysis.

13 **Instrument Calibration**

14 Instrument calibration was performed to ensure that the instrument was capable of producing
15 acceptable quantitative data. ICAL demonstrates that the instrument is capable of acceptable
16 performance prior to sample analysis, and continuing calibration sample analyses verify that the
17 ICAL is still valid. Instrument calibration met all acceptance criteria.

18 **Surrogate Standard Results**

19 Laboratory performance on individual samples was established by field spiking impinger and
20 XAD samples with known concentrations of 3,4-dinitrotoluene. No further surrogate spiking
21 was performed in the laboratory for the field samples. The method blanks, LCSs, and LCSDs
22 associated with the impinger and XAD fractions were spiked with equivalent concentrations of
23 3,4-dinitrotoluene prior to extraction at the laboratory.

24 Evaluation criteria for the surrogate include estimating sample results when any surrogate has a
25 recovery $\geq 10\%$, but below the lower QC limit. If any surrogate has < 10% recovery reported,
26 concentrations may be rejected. Surrogate recoveries are presented in Table 7-23. The reported
27 surrogate recoveries for the XAD fraction represent the combined recovery from all extractions
28 performed. All recovery objectives were met, and qualification of the data is not indicated.

29 **Method Blank Results**

30 A method blank was prepared and analyzed along with the field samples to determine the
31 existence and magnitude of contamination resulting from laboratory activities. The method
32 blank results also reflect the background level of artifacts present in the resin. No target analytes
33 were detected in any of the method blanks and qualification of the data is not indicated.

34 **Field Blank Results**

35 Field blanks are indicators of ambient and sample handling contamination. A field blank was
36 collected by setting up a sampling train, bringing the train to the sampling location, heating the

1 train, and performing leak checks. The field blank is recovered in the same manner as the field
2 samples. No target analytes were detected in any field blank fraction.

3 **Reagent Blank Results**

4 Reagent blanks are indicators of the cleanliness of the reagents and materials used in the field.
5 Reagent blanks were collected that included the filter, solvent, and reagent water. No target
6 analytes were detected in any of the reagent blanks samples.

7 **Trip Blank Results**

8 Trip blanks are indicators of ambient and sample handling contamination introduced during
9 shipping of the samples. A trip blank consisting of a resin trap was shipped with the samples to
10 the laboratory and analyzed. No target analytes were detected in the trip blank samples.

11 **LCS Results**

12 LCSs were analyzed to provide information on the accuracy of the analytical method and on
13 laboratory performance. The results of the LCSs are presented in Table 7-24. All objectives
14 were met for all fractions and qualification of the data is not indicated.

15 **7.5.10 Mustard**

16 A DRE DAAMS was used to collect a sample for the determination of emission levels of HD
17 agent. The DRE DAAMS samples collected during each run of C4b were analyzed IAW a site-
18 specific procedures.

19 QC measures included the use of quality laboratory (QL) and QP samples. QL samples are
20 sample tubes that are spiked with a known quantity of mustard and used to verify the initial
21 calibration on a daily basis. QP samples are sample tubes that are spiked with the mustard prior
22 to sampling, loaded into the sampling array, and aspirated for the same amount of time as the
23 DRE sample tube. The results were reported, reviewed, and validated in accordance with the
24 approved ANCDF SDC Emissions Test Plan requirements. The mustard DRE DAAMS data
25 report is provided in Appendix G.

26 The sampling data and laboratory reports have been reviewed and validated by designated
27 ANCDF personnel. All sample analyses were completed within the required holding time.

28 The QL samples analyzed at the beginning and end of each analytical sequence meet the site
29 specific procedure requirements.

30 The QP samples aspirated with C4bR1, C4bR4, and C4bR5 yielded percent recoveries that were
31 within acceptance limits. A QP was not aspirated with the C4bR2 samples and recovery data is
32 not available. No HD agent was found in the C4bR2 samples, or any of the C4b samples.
33 Despite the C4bR2 sample results being consistent with the sample results obtained during the
34 other test runs (e.g., agent was not detected and each chromatogram displayed similar non-agent
35 artifacts), the C4bR2 results should be considered estimated. A summary table presented in
36 Appendix G lists QP recoveries by sample as reported by the laboratory.

1 **7.6 CONCLUSIONS**

2 **7.6.1 Comparability of Analytical Data**

3 IAW the ANCDF SDC Emissions Test Plan, standardized methodologies (e.g., approved US
4 EPA sample collection procedures and site specific procedures) were employed to collect
5 samples and generate data in common units. Samples were analyzed using the US EPA
6 approved procedures described in the ANCDF SDC Emissions Test Plan. For this reason,
7 ANCDF considers the results generated during this test to be comparable to other results
8 collected using the same methodologies and procedures.

9 **7.6.2 Representativeness of Analytical Data**

10 Based on a review of the sampling and analysis results, ANCDF considers the exhaust gas
11 sample results to be representative. The exhaust gas sampling locations met US EPA
12 specifications for distance from flow disturbances and absence of cyclonic flow was
13 demonstrated at the isokinetic sampling locations. Approved US EPA sampling methods were
14 used to collect all exhaust gas samples and the analytical procedures specified in the ANCDF
15 SDC Emissions Test Plan were employed in their analysis.

16 **7.6.3 Completeness of Analytical Data**

17 The ANCDF SDC Emissions Test Plan identified obtaining a minimum of three (3) complete
18 exhaust gas sample sets the critical measurement. Based on a review of the sampling and
19 analysis results ANCDF considers the exhaust gas sample results to be complete. Exhaust gas
20 samples from a minimum of three (3) test runs were collected and analyzed. No field samples
21 were wholly rejected or flagged as unusable during the data validation process.

22 On an individual analyte basis, there were a total of 3,078 individual analytes planned to be
23 reported for the field samples collected from C4bR1, C4bR4, and C4bR5. None of the 3,078
24 individual analytes were reported to be unusable. With all 3,078 individual analytes reported to
25 be usable, this represents a completeness of 100%.

26 **7.6.4 Analytical Data Usability**

27 The analytical data generated from the C4b field samples is valid and considered usable for their
28 intended purposes. Results qualified as estimated can be used as long as the limitations of the
29 results are understood.

Table 7-1: Field and Laboratory Sample Identification Cross Reference Guide

Laboratory Sample No.	Field Sample No.	Test Run No.	Sampling Date	Analytical Testing Parameters												
				Semivolatile Organics	Semivolatile Unspeciated and Gravimetric Organics	Dioxins/Furans	Volatile Organics	Volatile Unspeciated Organics	Hydrogen Chloride/Fluoride	Total Chlorine	Particulates	Trace Metals	Energetics			
G1H140412-001	SDC-M4B-1-M0010-SEMIS-FH	C4bR1	08/09/11	X												
G1H140412-002	SDC-M4B-1-M0010-SEMIS-BH	C4bR1	08/09/11	X												
G1H140412-003	SDC-M4B-1-M0010-SEMIS-COND	C4bR1	08/09/11	X												
G1H140412-004	SDC-M4B-2-M0010-SEMIS-FH	C4bR2	08/10/11	X												
G1H140412-005	SDC-M4B-2-M0010-SEMIS-BH	C4bR2	08/10/11	X												
G1H140412-006	SDC-M4B-2-M0010-SEMIS-COND	C4bR2	08/10/11	X												
G1H140412-007	SDC-M4B-4-M0010-SEMIS-FH	C4bR4	08/12/11	X												
G1H140412-008	SDC-M4B-4-M0010-SEMIS-BH	C4bR4	08/12/11	X												
G1H140412-009	SDC-M4B-4-M0010-SEMIS-COND	C4bR4	08/12/11	X												
G1H140412-010	SDC-M4B-5-M0010-SEMIS-FH	C4bR5	08/13/11	X												
G1H140412-011	SDC-M4B-5-M0010-SEMIS-BH	C4bR5	08/13/11	X												
G1H140412-012	SDC-M4B-5-M0010-SEMIS-COND	C4bR5	08/13/11	X												
G1H140412-013	SDC-M4B-FB-M0010-SEMIS-FH	---	08/08/11	X												
G1H140412-014	SDC-M4B-FB-M0010-SEMIS-BH	---	08/08/11	X												
G1H140412-015	SDC-M4B-FB-M0010-SEMIS-IMPINGER RINSE	---	08/08/11	X												
G1H140412-016	SDC-M4B-RB-M0010-SEMIS-FILTER	---	08/10/11	X												
G1H140412-017	SDC-M4B-RB-M0010-SEMIS-XAD	---	08/10/11	X												
G1H140412-018	SDC-M4B-RB-M0010-SEMIS-MECL/MEOH	---	08/10/11	X												
G1H140412-019	SDC-M4B-RB-M0010-SEMIS-WATER	---	08/10/11	X												
G1H140412-020	SDC-M4B-TB-M0010-SEMIS-XAD	---	08/10/11	X												
H1H140409-001	SDC-M4B-1-M0010-TOE-COMBINED	C4bR1	08/09/11			X										
H1H140409-002	SDC-M4B-2-M0010-TOE-COMBINED	C4bR2	08/10/11			X										

Table 7-1: Field and Laboratory Sample Identification Cross Reference Guide (Continued)

Laboratory Sample No.	Field Sample No.	Test Run No.	Sampling Date	Analytical Testing Parameters											
				Semivolatile Organics	Semivolatile Unspeciated and Gravimetric Organics	Dioxins/Furans	Volatile Organics	Volatile Unspeciated Organics	Hydrogen Chloride/Fluoride	Total Chlorine	Particulates	Trace Metals	Energetics		
H1H140409-004	SDC-M4B-4-M0010-TOE-COMBINED	C4bR4	08/12/11		X										
H1H140409-005	SDC-M4B-5-M0010-TOE-COMBINED	C4bR5	08/13/11		X										
H1H140409-006	SDC-M4B-FB-M0010-TOE-COMBINED	---	08/08/11		X										
H1H140409-007	SDC-M4B-RB-M0010-TOE-COMBINED	---	08/10/11		X										
H1H140409-008	SDC-M4B-TB-M0010-TOE-XAD	---	08/10/11		X										
G1H140411-001	SDC-M4B-1-M0023A-FH	C4bR1	08/09/11			X									
G1H140411-002	SDC-M4B-1-M0023A-BH	C4bR1	08/09/11			X									
G1H140411-003	SDC-M4B-2-M0023A-FH	C4bR2	08/10/11			X									
G1H140411-004	SDC-M4B-2-M0023A-BH	C4bR2	08/10/11			X									
G1H140411-005	SDC-M4B-4-M0023A-FH	C4bR4	08/12/11			X									
G1H140411-006	SDC-M4B-4-M0023A-BH	C4bR4	08/12/11			X									
G1H140411-007	SDC-M4B-5-M0023A-FH	C4bR5	08/13/11			X									
G1H140411-008	SDC-M4B-5-M0023A-BH	C4bR5	08/13/11			X									
G1H140411-009	SDC-M4B-FB-M0023A-FH	---	08/08/11			X									
G1H140411-010	SDC-M4B-FB-M0023A-BH	---	08/08/11			X									
G1H140411-011	SDC-M4B-RB-M0023A-FILTER	---	08/10/11			X									
G1H140411-012	SDC-M4B-RB-M0023A-XAD	---	08/10/11			X									
G1H140411-013	SDC-M4B-RB-M0023A-MECL,TOL,ACE	---	08/10/11			X									
G1H140411-014	SDC-M4B-TB-M0023A-XAD	---	08/10/11			X									
H1H150402-001	SDC-M4B-1-M0030-T1	C4bR1	08/09/11				X								
H1H150402-002	SDC-M4B-1-M0030-TC1	C4bR1	08/09/11				X								
H1H150402-003	SDC-M4B-1-M0030-T2	C4bR1	08/09/11				X								

Table 7-1: Field and Laboratory Sample Identification Cross Reference Guide (Continued)

Laboratory Sample No.	Field Sample No.	Test Run No.	Sampling Date	Analytical Testing Parameters										
				Semivolatile Organics	Semivolatile Unspeciated and Gravimetric Organics	Dioxins/Furans	Volatile Organics	Volatile Unspeciated Organics	Hydrogen Chloride/Fluoride	Total Chlorine	Particulates	Trace Metals	Energetics	
H1H150402-004	SDC-M4B-1-M0030-TC2	C4bR1	08/09/11				X							
H1H150402-005	SDC-M4B-1-M0030-T3	C4bR1	08/09/11				X							
H1H150402-006	SDC-M4B-1-M0030-TC3	C4bR1	08/09/11				X							
H1H150402-007	SDC-M4B-1-M0030-T4	C4bR1	08/09/11				X							
H1H150402-008	SDC-M4B-1-M0030-TC4	C4bR1	08/09/11				X							
H1H150402-009	SDC-M4B-1-M0030-T BK	---	08/09/11				X							
H1H150402-010	SDC-M4B-1-M0030-TC BK	---	08/09/11				X							
H1H150402-011	SDC-M4B-1-M0030-COND	C4bR1	08/09/11				X							
H1H150402-012	SDC-M4B-1-M0030-COND BK	---	08/09/11				X							
H1H150402-013	SDC-M4B-2-M0030-T1	C4bR2	08/10/11				X							
H1H150402-014	SDC-M4B-2-M0030-TC1	C4bR2	08/10/11				X							
H1H150402-015	SDC-M4B-2-M0030-T2	C4bR2	08/10/11				X							
H1H150402-016	SDC-M4B-2-M0030-TC2	C4bR2	08/10/11				X							
H1H150402-017	SDC-M4B-2-M0030-T3	C4bR2	08/10/11				X							
H1H150402-018	SDC-M4B-2-M0030-TC3	C4bR2	08/10/11				X							
H1H150402-019	SDC-M4B-2-M0030-T4	C4bR2	08/10/11				X							
H1H150402-020	SDC-M4B-2-M0030-TC4	C4bR2	08/10/11				X							
H1H150402-021	SDC-M4B-2-M0030-T BK	---	08/10/11				X							
H1H150402-022	SDC-M4B-2-M0030-TC BK	---	08/10/11				X							
H1H150402-023	SDC-M4B-2-M0030-COND	C4bR2	08/10/11				X							
H1H150402-035	SDC-M4B-4-M0030-T1	C4bR4	08/12/11				X							
H1H150402-036	SDC-M4B-4-M0030-TC1	C4bR4	08/12/11				X							

Table 7-1: Field and Laboratory Sample Identification Cross Reference Guide (Continued)

Laboratory Sample No.	Field Sample No.	Test Run No.	Sampling Date	Analytical Testing Parameters										
				Semivolatile Organics	Semivolatile Unspeciated and Gravimetric Organics	Dioxins/Furans	Volatile Organics	Volatile Unspeciated Organics	Hydrogen Chloride/Fluoride	Total Chlorine	Particulates	Trace Metals	Energetics	
H1H150402-037	SDC-M4B-4-M0030-T2	C4bR4	08/12/11				X							
H1H150402-038	SDC-M4B-4-M0030-TC2	C4bR4	08/12/11				X							
H1H150402-039	SDC-M4B-4-M0030-T3	C4bR4	08/12/11				X							
H1H150402-040	SDC-M4B-4-M0030-TC3	C4bR4	08/12/11				X							
H1H150402-041	SDC-M4B-4-M0030-T4	C4bR4	08/12/11				X							
H1H150402-042	SDC-M4B-4-M0030-TC4	C4bR4	08/12/11				X							
H1H150402-043	SDC-M4B-4-M0030-T BK	---	08/12/11				X							
H1H150402-044	SDC-M4B-4-M0030-TC BK	---	08/12/11				X							
H1H150402-045	SDC-M4B-4-M0030-COND	C4bR4	08/12/11				X							
H1H150402-046	SDC-M4B-5-M0030-T1	C4bR5	08/13/11				X							
H1H150402-047	SDC-M4B-5-M0030-TC1	C4bR5	08/13/11				X							
H1H150402-048	SDC-M4B-5-M0030-T2	C4bR5	08/13/11				X							
H1H150402-049	SDC-M4B-5-M0030-TC2	C4bR5	08/13/11				X							
H1H150402-050	SDC-M4B-5-M0030-T3	C4bR5	08/13/11				X							
H1H150402-051	SDC-M4B-5-M0030-TC3	C4bR5	08/13/11				X							
H1H150402-052	SDC-M4B-5-M0030-T4	C4bR5	08/13/11				X							
H1H150402-053	SDC-M4B-5-M0030-TC4	C4bR5	08/13/11				X							
H1H150402-054	SDC-M4B-5-M0030-T BK	---	08/13/11				X							
H1H150402-055	SDC-M4B-5-M0030-TC BK	---	08/13/11				X							
H1H150402-056	SDC-M4B-5-M0030-COND	C4bR5	08/13/11				X							
H1H150402-057	SDC-M4B-TB-M0030-T1	---	08/13/11				X							
H1H150402-058	SDC-M4A-TB-M0030-TC1	---	08/13/11				X							

Table 7-1: Field and Laboratory Sample Identification Cross Reference Guide (Continued)

Laboratory Sample No.	Field Sample No.	Test Run No.	Sampling Date	Analytical Testing Parameters										
				Semivolatile Organics	Semivolatile Unspecified and Gravimetric Organics	Dioxins/Furans	Volatile Organics	Volatile Unspecified Organics	Hydrogen Chloride/Fluoride	Total Chlorine	Particulates	Trace Metals	Energetics	
H1H150401-001	SDC-M4B-1A-M0040-TOE-COND	C4bR1	08/09/11					X						
H1H150401-002	SDC-M4B-1B-M0040-TOE-COND	C4bR1	08/09/11					X						
H1H150401-003	SDC-M4B-1FB-M0040-TOE-COND	C4bR1	08/09/11					X						
H1H150401-004	SDC-M4B-2A-M0040-TOE-COND	C4bR2	08/10/11					X						
H1H150401-005	SDC-M4B-2B-M0040-TOE-COND	C4bR2	08/10/11					X						
H1H150401-006	SDC-M4B-2FB-M0040-TOE-COND	C4bR2	08/10/11					X						
H1H150401-010	SDC-M4B-4A-M0040-TOE-COND	C4bR4	08/12/11					X						
H1H150401-011	SDC-M4B-4B-M0040-TOE-COND	C4bR4	08/12/11					X						
H1H150401-012	SDC-M4B-4FB-M0040-TOE-COND	C4bR4	08/12/11					X						
H1H150401-013	SDC-M4B-5A-M0040-TOE-COND	C4bR5	08/13/11					X						
H1H150401-014	SDC-M4B-5B-M0040-TOE-COND	C4bR5	08/13/11					X						
H1H150401-015	SDC-M4B-5FB-M0040-TOE-COND	C4bR5	08/13/11					X						
G1H140414-001	SDC-M4B-1-M5/26A-PNR	C4bR1	08/09/11									X		
G1H140414-002	SDC-M4B-1-M5/M26A-FILT	C4bR1	08/09/11									X		
G1H140414-003	SDC-M4B-1-M5/26A-ACDIMP	C4bR1	08/09/11						X					
G1H140414-004	SDC-M4B-1-M5/26A-ALKIMP	C4bR1	08/09/11							X				
G1H140414-005	SDC-M4B-2-M5/26A-PNR	C4bR2	08/10/11									X		
G1H140414-006	SDC-M4B-2-M5/M26A-FILT	C4bR2	08/10/11									X		
G1H140414-007	SDC-M4B-2-M5/26A-ACDIMP	C4bR2	08/10/11						X					
G1H140414-008	SDC-M4B-2-M5/26A-ALKIMP	C4bR2	08/10/11							X				
G1H140414-009	SDC-M4B-4-M5/26A-PNR	C4bR4	08/12/11									X		
G1H140414-010	SDC-M4B-4-M5/26A-FILT	C4bR4	08/12/11									X		

Table 7-1: Field and Laboratory Sample Identification Cross Reference Guide (Continued)

Laboratory Sample No.	Field Sample No.	Test Run No.	Sampling Date	Analytical Testing Parameters										
				Semivolatile Organics	Semivolatile Unspeciated and Gravimetric Organics	Dioxins/Furans	Volatile Organics	Volatile Unspeciated Organics	Hydrogen Chloride/Fluoride	Total Chlorine	Particulates	Trace Metals	Energetics	
G1H140414-011	SDC-M4B-4-M5/26A-ACDIMP	C4bR4	08/12/11							X				
G1H140414-012	SDC-M4B-4-M5/26A-ALKIMP	C4bR4	08/12/11								X			
G1H140414-013	SDC-M4B-5-M5/26A-PNR	C4bR5	08/13/11									X		
G1H140414-014	SDC-M4B-5-M5/26A-FILT	C4bR5	08/13/11									X		
G1H140414-015	SDC-M4B-5-M5/26A-ACDIMP	C4bR5	08/13/11							X				
G1H140414-016	SDC-M4B-5-M5/26A-ALKIMP	C4bR5	08/13/11								X			
G1H140414-017	SDC-M4B-FB-M5/26A-PNR	---	08/08/11									X		
G1H140414-018	SDC-M4B-FB-M5/26A-FILT	---	08/08/11									X		
G1H140414-019	SDC-M4B-FB-M5/26A-ACDIMPA	---	08/08/11							X				
G1H140414-020	SDC-M4B-FB-M5/26A-ALKIMP	---	08/08/11								X			
G1H140414-021	SDC-M4B-RB-M5/26A-ACE	---	08/10/11									X		
G1H140414-022	SDC-M4B-RB-M5/26A-FILT	---	08/10/11									X		
G1H140414-023	SDC-M4B-RB-M5/26A-ACDIMP	---	08/10/11							X				
G1H140414-024	SDC-M4B-RB-M5/26A-ALKIMP	---	08/10/11								X			
G1H140414-014	SDC-M4B-RB-M5/26A-WATER	---	08/10/11							X				
G1H140413-001	SDC-M4B-1-M29-FH	C4bR1	08/09/11										X	
G1H140413-002	SDC-M4B-1-M29-BH	C4bR1	08/09/11										X	
G1H140413-003	SDC-M4B-2-M29-FH	C4bR2	08/10/411										X	
G1H140413-004	SDC-M4B-2-M29-BH	C4bR2	08/10/411										X	
G1H140413-005	SDC-M4B-4-M29-FH	C4bR4	08/12/11										X	
G1H140413-006	SDC-M4B-4-M29-BH	C4bR4	08/12/11										X	
G1H140413-007	SDC-M4B-5-M29-FH	C4bR5	08/13/11										X	

Table 7-1: Field and Laboratory Sample Identification Cross Reference Guide (Continued)

Laboratory Sample No.	Field Sample No.	Test Run No.	Sampling Date	Analytical Testing Parameters										
				Semivolatile Organics	Semivolatile Unspeciated and Gravimetric Organics	Dioxins/Furans	Volatile Organics	Volatile Unspeciated Organics	Hydrogen Chloride/Fluoride	Total Chlorine	Particulates	Trace Metals	Energetics	
G1H140413-008	SDC-M4B-5-M29-BH	C4bR5	08/13/11										X	
G1H140413-009	SDC-M4B-FB-M29-FH	---	08/08/11										X	
G1H140413-010	SDC-M4B-FB-M29-BH	---	08/08/11										X	
G1H140413-011	SDC-M4B-RB-M29-FH	---	08/10/11										X	
G1H140413-012	SDC-M4B-RB-M29-BH	---	08/10/11										X	
G1H140140-001	SDC-M4B-1-MM5E-PNR/FILT	C4bR1	08/09/11											X
G1H140140-002	SDC-M4B-1-MM5E-XAD-TOP	C4bR1	08/09/11											X
G1H140140-004	SDC-M4B-1-MM5E-COND	C4bR1	08/09/11											X
G1H140140-005	SDC-M4B-2-MM5E-PNR/FILT	C4bR2	08/10/11											X
G1H140140-006	SDC-M4B-2-MM5E-XAD-TOP	C4bR2	08/10/11											X
G1H140140-008	SDC-M4B-2-MM5E-COND	C4bR2	08/10/11											X
G1H140140-009	SDC-M4B-4-MM5E-PNR/FILT	C4bR4	08/12/11											X
G1H140140-010	SDC-M4B-4-MM5E-XAD-TOP	C4bR4	08/12/11											X
G1H140140-012	SDC-M4B-4-MM5E-COND	C4bR4	08/12/11											X
G1H140140-013	SDC-M4B-5-MM5E-PNR/FILT	C4bR5	08/13/11											X
G1H140140-014	SDC-M4B-5-MM5E-XAD-TOP	C4bR5	08/13/11											X
G1H140140-016	SDC-M4B-5-MM5E-COND	C4bR5	08/13/11											X
G1H140140-017	SDC-M4B-FB-MM5E-PNR/FILT	---	08/11/11											X
G1H140140-018	SDC-M4B-FB-MM5E-XAD-TOP	---	08/11/11											X
G1H140140-020	SDC-M4B-FB-MM5E-COND	---	08/11/11											X
G1H140140-021	SDC-M4B-RB-MM5E-PNR/FILT	---	08/10/11											X
G1H140140-022	SDC-M4B-RB-MM5E-XAD-TOP	---	08/10/11											X

Table 7-1: Field and Laboratory Sample Identification Cross Reference Guide (Continued)

Laboratory Sample No.	Field Sample No.	Test Run No.	Sampling Date	Analytical Testing Parameters										
				Semivolatile Organics	Semivolatile Unspeciated and Gravimetric Organics	Dioxins/Furans	Volatile Organics	Volatile Unspeciated Organics	Hydrogen Chloride/Fluoride	Total Chlorine	Particulates	Trace Metals	Energetics	
G1H140140-024	SDC-M4B-RB-MM5E-COND	---	08/10/11											X
G1H140140-025	SDC-M4B-TB-MM5E-XAD-TOP	---	08/10/11											X

Table 7-2: Leak Checks

Run	Sample Train	Initial		Port Change				Final	
		VAC (inHg)	Rate (cf)	VAC (inHg)	Rate (cf)	VAC (inHg)	Rate (cf)	VAC (inHg)	Rate (cf)
C4bR1	M0010	15	0.005	11	0.006	11	0.005	15	0.000
	M0010-TOC	15	0.002	13	0.004	13	0.004	15	0.005
	M0023A	15	0.008	11	0.006	11	0.005	12	0.005
	M26A	15	0.006	10	0.002	10	0.004	11	0.003
	M29	11	0.002	12	0.002	12	0.002	12	0.002
	MM5E	15	0.006	14	0.006	14	0.008	13	0.005
C4bR4	M0010	15	0.002	12	0.001	12	0.003	11	0.001
	M0010-TOC	17	0.003	10	0.000	10	0.0025	13	0.005
	M0023A	16	0.008	12	0.006	13	0.006	12	0.003
	M26A	16	0.0025	7	0.003	5.5	0.001	7	0.000
	M29	16	0.0025	12	0.003	12	0.004	13	0.003
	MM5E	15	0.005	12	0.004	10	0.004	12	0.005
C4bR5	M0010	15	0.005	11	0.003	11	0.003	11	0.004
	M0010-TOC	15	0.003	8	0.004	11	0.005	13	0.003
	M0023A	15	0.006	11	0.003	16	0.004	9	0.003
	M26A	15	0.003	7	0.002	13	0.004	5	0.003
	M29	16	0.004	13	0.004	13	0.005	13	0.004
	MM5E	15	0.003	12	0.003	10	0.003	15	0.004

Table 7-3: Semivolatile Organic Sample Holding Time Summary

Sample Name	Sample Date	Preparation Date	Analysis Date	Collection to Extraction (Days)	Extraction to Analysis (Days)
SDC-M4B-1-M0010-SEMIS-FH	08/09/11	08/15/11	08/18/11	6	3
SDC-M4B-1-M0010-SEMIS-BH	08/09/11	08/15/11	08/18/11	6	3
SDC-M4B-1-M0010-SEMIS-COND	08/09/11	08/16/11	08/17/11	7	1
SDC-M4B-2-M0010-SEMIS-FH	08/10/11	08/15/11	08/18/11	5	3
SDC-M4B-2-M0010-SEMIS-BH	08/10/11	08/15/11	08/18/11	5	3
SDC-M4B-2-M0010-SEMIS-COND	08/10/11	08/16/11	08/17/11	6	1
SDC-M4B-4-M0010-SEMIS-FH	08/12/11	08/15/11	08/18/11	3	3
SDC-M4B-4-M0010-SEMIS-BH	08/12/11	08/15/11	08/18/11	3	3
SDC-M4B-4-M0010-SEMIS-COND	08/12/11	08/16/11	08/18/11	4	2
SDC-M4B-5-M0010-SEMIS-FH	08/13/11	08/15/11	08/18/11	2	3
SDC-M4B-5-M0010-SEMIS-BH	08/13/11	08/15/11	08/18/11	2	3
SDC-M4B-5-M0010-SEMIS-COND	08/13/11	08/16/11	08/18/11	3	2
SDC-M4B-FB-M0010-SEMIS-FH	08/08/11	08/15/11	08/18/11	7	3
SDC-M4B-FB-M0010-SEMIS-BH	08/08/11	08/15/11	08/18/11	7	3
SDC-M4B-FB-M0010-SEMIS-CONDENSER RINSE	08/08/11	08/16/11	08/18/11	8	2
SDC-M4B-RB-M0010-SEMIS-FILT	08/10/11	08/15/11	08/18/11	5	3
SDC-M4B-RB-M0010-SEMIS-XAD	08/10/11	08/15/11	08/18/11	5	3
SDC-M4B-RB-M0010-SEMIS-MECL/MEOH	08/10/11	08/16/11	08/18/11	6	2
SDC-M4B-RB-M0010-SEMIS-WATER	08/10/11	08/16/11	08/18/11	6	2
SDC-M4B-TB-M0010-SEMIS-XAD	08/10/11	08/15/11	08/18/11	5	3
INTRA-LAB BLANK (MLNM71AA)	---	08/15/11	08/18/11	---	3
INTRA-LAB BLANK (MLNM71AE)	---	08/15/11	08/18/11	---	3
INTRA-LAB BLANK (MLNNJ1AA)	---	08/16/11	08/17/11	---	1
CHECK SAMPLE (MLNM71AC)	---	08/15/11	08/18/11	---	3
DUPLICATE CHECK (MLNM71AD)	---	08/15/11	08/18/11	---	3
CHECK SAMPLE (MLNNJ1AC)	---	08/16/11	08/17/11	---	1
DUPLICATE CHECK (MLNNJ1AD)	---	08/16/11	08/17/11	---	1

SAP/QAPP Limit: 14 days from collection to extraction and 40 days from extraction to analysis

Table 7-4: Semivolatile Surrogate Standard Results

Sample Name	1,2-DichlorobenzeneD-d ₄	2-Fluorobiphenyl	2-Fluorophenol	NitrobenzeneD-d ₅	Phenol-d ₅	Terphenyl-d ₁₄	2,4,6-Tribromophenol
	SAP/QAPP Limit (%)						
	10-136	35-122	10-108	15-118	10-121	35-120	10-154
SDC-M4B-1-M0010-SEMIS-FH	---	66	62	64	69	85	91
SDC-M4B-1-M0010-SEMIS-BH	58	71	62	64	71	85	96
SDC-M4B-1-M0010-SEMIS-COND	---	56	39	52	30	90	97
SDC-M4B-2-M0010-SEMIS-FH	---	71	65	68	71	87	82
SDC-M4B-2-M0010-SEMIS-BH	56	70	60	65	68	83	97
SDC-M4B-2-M0010-SEMIS-COND	---	65	43	61	33	93	99
SDC-M4B-4-M0010-SEMIS-FH	---	72	59	68	73	86	64
SDC-M4B-4-M0010-SEMIS-BH	61	74	64	67	74	88	95
SDC-M4B-4-M0010-SEMIS-COND	---	54	36	51	24	86	94
SDC-M4B-5-M0010-SEMIS-FH	---	65	61	63	67	85	84
SDC-M4B-5-M0010-SEMIS-BH	54	73	58	66	68	88	101
SDC-M4B-5-M0010-SEMIS-COND	---	54	38	52	27	88	93
SDC-M4B-FB-M0010-SEMIS-FH	---	71	67	69	77	88	83
SDC-M4B-FB-M0010-SEMIS-BH	52	75	58	65	68	89	93
SDC-M4B-FB-M0010-SEMIS-CONDENSER RINSE	---	71	46	69	31	89	89
SDC-M4B-RB-M0010-SEMIS-FILT	---	62	61	60	66	89	93
SDC-M4B-RB-M0010-SEMIS-XAD	48	66	53	55	60	87	98
SDC-M4B-RB-M0010-SEMIS-MECL/MEOH	---	79	56	78	39	89	93
SDC-M4B-RB-M0010-SEMIS-WATER	---	79	46	76	29	88	94
SDC-M4B-TB-M0010-SEMIS-XAD	52	75	58	61	68	92	101
INTRA-LAB BLANK (MLNM71AA)	---	66	64	63	69	85	92
INTRA-LAB BLANK (MLNM71AE)	53	71	54	62	65	88	99
INTRA-LAB BLANK (MLNNJ1AA)	---	63	40	66	25	88	84
CHECK SAMPLE (MLNM71AC)	---	79	68	72	78	85	103
DUPLICATE CHECK (MLNM71AD)	---	82	69	72	81	88	104
CHECK SAMPLE (MLNNJ1AC)	---	83	56	81	36	86	104
DUPLICATE CHECK (MLNNJ1AD)	---	79	46	71	31	91	101

Note: 1,2-Dichlorobenzene-d₄ is a field surrogate that is only added to the resin trap. As such, only back-half sample fractions have a recovery reported for this surrogate.

Table 7-5: Semivolatile LCS Results

Spiked Compound	Concentration (ug)			Recovery (%)		RPD (%)	SAP/QAPP Limits (%)			
	True	LCS	LCSD	LCS	LCSD		Recovery		RPD	
Laboratory ID:	G1H150000197C/G1H150000197L									
Acenaphthene	100	77.9	80.1	78	80	2.8	57	-	113	35
4-Chloro-3-methylphenol	100	90.2	90.2	90	90	0.02	42	-	126	35
2-Chlorophenol	100	65.4	66.4	65	66	1.5	52	-	110	35
1,4-Dichlorobenzene	100	59.7	59.6	60	60	0.13	50	-	108	35
2,4-Dinitrotoluene	100	97.3	98.3	97	98	1.1	62	-	113	35
4-Nitrophenol	100	95.8	95.1	96	95	0.75	10	-	145	35
N-Nitrosodi-n-propylamine	100	71.6	74.1	72	74	3.5	46	-	123	35
Pentachlorophenol	100	105	105	105	105	0.28	11	-	135	35
Phenol	100	80.6	80.4	81	80	0.21	20	-	119	35
Pyrene	100	85.8	89.6	86	90	4.4	47	-	155	35
1,2,4-Trichlorobenzene	100	67.2	66	67	66	1.8	49	-	112	35
Laboratory ID:	G1H150000200C/G1H150000200L									
Acenaphthene	100	82.0	80.6	82	81	1.7	57	-	113	35
4-Chloro-3-methylphenol	100	85.1	86.5	85	86	1.6	42	-	126	35
2-Chlorophenol	100	74.3	63	74	63	16	52	-	110	35
1,4-Dichlorobenzene	100	64.7	53.8	65	54	19	50	-	108	35
2,4-Dinitrotoluene	100	99.3	99.6	99	100	0.22	62	-	113	35
4-Nitrophenol	100	43.5	42.6	43	43	2.0	10	-	145	35
N-Nitrosodi-n-propylamine	100	78.1	69.2	78	69	12	46	-	123	35
Pentachlorophenol	100	98.0	90.5	98	90	7.9	11	-	135	35
Phenol	100	40.6	35.4	41	35	14	20	-	119	35
Pyrene	100	87.8	90.8	88	91	3.4	47	-	155	35
1,2,4-Trichlorobenzene	100	68.9	59.5	69	60	15	49	-	112	35

Table 7-6: Semivolatile TOC Holding Time and Surrogate Standard Results

Sample	Sample Date	Preparation Date	Analysis Date	Collection to Extraction (Days)	Extraction to Analysis (Days)	n-Heptadecane (%)
SDC-M4B-1-M0010-TOE-COMBINED	08/09/11	08/14/11	08/18/11	5	4	107
SDC-M4B-2-M0010-TOE-COMBINED	08/10/11	08/14/11	08/18/11	4	4	115
SDC-M4B-4-M0010-TOE-COMBINED	08/12/11	08/14/11	08/18/11	2	4	115
SDC-M4B-5-M0010-TOE-COMBINED	08/13/11	08/14/11	08/18/11	1	4	116
SDC-M4B-FB-M0010-TOE-COMBINED	08/08/11	08/14/11	08/18/11	4	4	114
SDC-M4B-RB-M0010-TOE-COMBINED	08/10/11	08/14/11	08/18/11	4	4	117
SDC-M4B-TB-M0010-TOE-XAD	08/10/11	08/14/11	08/18/11	4	4	125
H1H140000-010 (MB)	---	08/14/11	08/17/11	---	3	104
H1H140000-010 (LCS)	---	08/14/11	08/17/11	---	3	105
H1H140000-010 (LCSD)	---	08/14/11	08/17/11	---	3	102

SAP/QAPP Limit: 14 days from collection to extraction
 40 days from extraction to analysis
 Recovery = 50 to 150%;

Table 7-7: Semivolatile TOC LCS Results

Sample ID	Concentration (mg)			Recovery (%)		RPD (%)
	True	LCS	LCSD	LCS	LCSD	
Total Chromatographic Organics						
H1H140000-010	0.225	0.313	0.267	139	119	16
Gravimetric Organics						
H1H140000-011	2.50	2.53	2.13	101	85	17

SAP/QAPP Limits: Recovery = TCO: 40 to 120%, GRAV: 50 to 150%
 RPD = TCO: ≤ 50%, GRAV: ≤ 35%

Table 7-8: Dioxin/Furan Sample Holding Time Summary

Sample Name	Sample Date	Preparation Date	Analysis Date	Collection to Extraction (Days)	Extraction to Analysis (Days)
SDC-M4B-1-M0023A-FH	08/09/11	08/15/11	08/17/11	6	2
SDC-M4B-1-M0023A-BH	08/09/11	08/15/11	08/17/11	6	2
SDC-M4B-2-M0023A-FH	08/10/11	08/15/11	08/17/11	5	2
SDC-M4B-2-M0023A-BH	08/10/11	08/15/11	08/17/11	5	2
SDC-M4B-4-M0023A-FH	08/12/11	08/15/11	08/17/11	3	2
SDC-M4B-4-M0023A-BH	08/12/11	08/15/11	08/17/11	3	2
SDC-M4B-5-M0023A-FH	08/13/11	08/15/11	08/17/11	2	2
SDC-M4B-5-M0023A-BH	08/13/11	08/15/11	08/18/11	2	3
SDC-M4B-FB-M0023A-FH	08/08/11	08/15/11	08/18/11	7	3
SDC-M4B-FB-M0023A-BH	08/08/11	08/15/11	08/18/11	7	3
SDC-M4B-RB-M0023A-FILT	08/10/11	08/15/11	08/18/11	5	3
SDC-M4B-RB-M0023A-XAD	08/10/11	08/15/11	08/18/11	5	3
SDC-M4B-RB-M0023A-Ace/MeCl/Tol	08/10/11	08/15/11	08/18/11	5	3
SDC-M4B-TB-M0023A-XAD	08/10/11	08/15/11	08/18/11	5	3
INTRA-LAB BLANK(MLNJT1AA)	---	08/15/11	08/17/11	---	2
INTRA-LAB BLANK(MLNJT1AE)	---	08/15/11	08/17/11	---	2
CHECK SAMPLE(MLNJT1AC)	---	08/15/11	08/17/11	---	2
DUPLICATE CHECK(MLNJT1AD)	---	08/15/11	08/17/11	---	2

SAP/QAPP Limits: 30 days from collection to extraction
 45 days from extraction to analysis

Table 7-9: Dioxin/Furan Internal and Surrogate Standard Results

Sample Name	Internal Standards								Surrogates					
	¹³ C-2,3,7,8-TetraCDD	¹³ C-1,2,3,7,8-PentaCDD	¹³ C-1,2,3,6,7,8-HexaCDD	¹³ C-1,2,3,4,6,7,8-HeptaCDD	¹³ C-OctaCDD	¹³ C-2,3,7,8-TetraCDF	¹³ C-1,2,3,7,8-PentaCDF	¹³ C-1,2,3,6,7,8-HexaCDF	¹³ C-1,2,3,4,6,7,8-HeptaCDF	³⁷ Cl ₄ -2,3,7,8-TetraCDD	¹³ C-2,3,4,7,8-PentaCDF	¹³ C-1,2,3,4,7,8-HexaCDF	¹³ C-1,2,3,4,7,8-HexaCDD	¹³ C-1,2,3,4,7,8,9-HeptaCDF
	SAP/QAPP Limit (%)													
	40-135		25-150		40-135		25-150		70-130					
SDC-M4B-1-M0023A-FH	87	82	90	66	70	94	89	90	74	95	97	80	69	92
SDC-M4B-1-M0023A-BH	90	85	95	70	74	98	90	94	76	95	99	79	68	98
SDC-M4B-2-M0023A-FH	90	86	99	72	79	97	93	98	81	98	103	79	70	97
SDC-M4B-2-M0023A-BH	88	84	83	70	75	96	91	90	76	97	98	78	88	99
SDC-M4B-4-M0023A-FH	89	85	94	69	75	96	91	91	78	96	99	83	70	99
SDC-M4B-4-M0023A-BH	80	80	87	68	73	86	86	91	77	96	102	86	82	96
SDC-M4B-5-M0023A-FH	66	64	75	53	57	74	68	77	62	99	106	82	74	96
SDC-M4B-5-M0023A-BH	84	80	84	69	74	92	87	87	75	96	98	90	85	97
SDC-M4B-FB-M0023A-FH	88	88	84	74	78	97	92	90	79	97	99	89	89	97
SDC-M4B-FB-M0023A-BH	70	77	89	71	76	75	78	89	75	94	101	78	69	99
SDC-M4B-RB-M0023A-FILT	74	78	96	73	80	80	81	94	80	97	106	82	71	101
SDC-M4B-RB-M0023A-XAD	90	86	88	74	76	97	91	94	80	94	100	88	86	97
SDC-M4B-RB-M0023A-Ace/MeCl/Tol	88	85	77	72	78	93	88	82	78	---	---	---	---	---
SDC-M4B-TB-M0023A-XAD	87	82	89	70	75	95	87	87	75	94	96	80	66	101
INTRA-LAB BLANK(MLNJT1AA)	90	89	89	78	79	95	92	89	78	96	98	88	88	106
INTRA-LAB BLANK(MLNJT1AE)	87	87	94	72	74	92	89	90	77	95	100	82	72	98
CHECK SAMPLE(MLNJT1AC)	88	86	79	75	79	94	90	84	80	---	---	---	---	---
DUPLICATE CHECK(MLNJT1AD)	83	86	80	71	77	92	89	83	80	---	---	---	---	---

Note: **Shading** indicates a result that is outside the acceptable SAP/QAPP limit.

Table 7-10: Dioxin/Furan LCS Results

Laboratory ID:	G1H150000187C/G1H150000187L					
Spiked Compound	Concentration (pg)			Recovery (%)		RPD (%)
	True	LCS	LCSD	LCS	LCSD	
2,3,7,8-TCDD	400	419	415	105	104	0.88
1,2,3,7,8-PeCDD	2,000	2,110	2,090	106	105	0.95
1,2,3,4,7,8-HxCDD	2,000	2,460	2,400	123	120	2.4
1,2,3,6,7,8-HxCDD	2,000	2,490	2,540	124	127	2.1
1,2,3,7,8,9-HxCDD	2,000	2,540	2,580	127	129	1.6
1,2,3,4,6,7,8-HpCDD	2,000	2,140	2,190	107	110	2.5
OCDD	4,000	4,470	4,480	112	112	0.18
2,3,7,8-TCDF	400	456	464	114	116	1.9
1,2,3,7,8-PeCDF	2,000	2,200	2,230	110	112	1.3
2,3,4,7,8-PeCDF	2,000	2,190	2,320	110	116	5.7
1,2,3,4,7,8-HxCDF	2,000	2,120	2,210	106	111	4.4
1,2,3,6,7,8-HxCDF	2,000	2,500	2,500	125	125	0.00
2,3,4,6,7,8-HxCDF	2,000	2,550	2,620	127	131	3.0
1,2,3,7,8,9-HxCDF	2,000	2,490	2,540	124	127	2.2
1,2,3,4,6,7,8-HpCDF	2,000	2,310	2,300	115	115	0.15
1,2,3,4,7,8,9-HpCDF	2,000	2,320	2,250	116	113	2.8
OCDF	4,000	4,280	4,360	107	109	1.7

SAP/QAPP Limits: Recovery = 50 to 150% with the following exceptions - 1,2,3,7,8,9-HexaCDD/1,2,3,4,7,8-HexaCDF (50 to 154%),
 2,3,4,6,7,8-HexaCDF (50 to 160%), and 1,2,3,7,8,9-HexaCDF (50 to 159%)
 RPD = ≤ 20%

Table 7-11: Volatile Holding Time Summary and Surrogate Standard Results

Sample Name	Sample Date	Analysis Date	Collection to Analysis (Days)	Surrogate			
				Dibromofluoromethane	1,2-Dichloroethane-d ₄	Toluene-d ₈	4-Bromofluorobenzene
				QAPP/SAP Limit (%)			
				50-150	50-150	50-150	50-150
SDC-M4B-1-M0030-COND	08/09/11	08/16/11	7	89	81	100	93
SDC-M4B-1-M0030-T1	08/09/11	08/16/11	7	96	103	101	84
SDC-M4B-1-M0030-TC1	08/09/11	08/16/11	7	97	94	97	82
SDC-M4B-1-M0030-T2	08/09/11	08/16/11	7	97	97	97	81
SDC-M4B-1-M0030-TC2	08/09/11	08/16/11	7	94	91	93	83
SDC-M4B-1-M0030-T3	08/09/11	08/16/11	7	96	97	98	85
SDC-M4B-1-M0030-TC3	08/09/11	08/16/11	7	97	96	95	79
SDC-M4B-1-M0030-T4	08/09/11	08/16/11	7	94	94	98	87
SDC-M4B-1-M0030-TC4	08/09/11	08/16/11	7	94	91	95	80
SDC-M4B-2-M0030-COND	08/10/11	08/16/11	6	95	87	96	91
SDC-M4B-2-M0030-T1	08/10/11	08/15/11	5	94	93	97	82
SDC-M4B-2-M0030-TC1	08/10/11	08/15/11	5	93	88	93	72
SDC-M4B-2-M0030-T2	08/10/11	08/15/11	5	97	100	97	86
SDC-M4B-2-M0030-TC2	08/10/11	08/15/11	5	89	90	92	72
SDC-M4B-2-M0030-T3	08/10/11	08/15/11	5	96	93	93	80
SDC-M4B-2-M0030-TC3	08/10/11	08/15/11	5	95	93	93	77
SDC-M4B-2-M0030-T4	08/10/11	08/15/11	5	93	94	95	80
SDC-M4B-2-M0030-TC4	08/10/11	08/15/11	5	94	96	96	83
SDC-M4B-4-M0030-COND	08/12/11	08/16/11	4	90	83	95	91
SDC-M4B-4-M0030-T1	08/12/11	08/16/11	4	95	99	96	83
SDC-M4B-4-M0030-TC1	08/12/11	08/16/11	4	96	95	97	78
SDC-M4B-4-M0030-T2	08/12/11	08/16/11	4	95	96	94	77
SDC-M4B-4-M0030-TC2	08/12/11	08/16/11	4	90	90	96	77
SDC-M4B-4-M0030-T3	08/12/11	08/16/11	4	96	97	96	82
SDC-M4B-4-M0030-TC3	08/12/11	08/16/11	4	93	93	99	77
SDC-M4B-4-M0030-T4	08/12/11	08/16/11	4	98	96	95	84
SDC-M4B-4-M0030-TC4	08/12/11	08/16/11	4	95	93	102	80
SDC-M4B-5-M0030-COND	08/13/11	08/16/11	3	92	84	96	93
SDC-M4B-5-M0030-T1	08/13/11	08/17/11	4	96	95	96	85
SDC-M4B-5-M0030-TC1	08/13/11	08/17/11	4	83	78	87	70
SDC-M4B-5-M0030-T2	08/13/11	08/17/11	4	96	97	100	86
SDC-M4B-5-M0030-TC2	08/13/11	08/17/11	4	92	89	94	78
SDC-M4B-5-M0030-T3	08/13/11	08/17/11	4	95	92	97	83
SDC-M4B-5-M0030-TC3	08/13/11	08/17/11	4	89	87	96	76
SDC-M4B-5-M0030-T4	08/13/11	08/17/11	4	94	94	97	84

Table 7-11: Volatile Holding Time Summary and Surrogate Standard Results (Continued)

Sample Name	Sample Date	Analysis Date	Collection to Analysis (Days)	Surrogate			
				Dibromofluoromethane	1,2-Dichloroethane-d ₄	Toluene-d ₈	4-Bromofluorobenzene
				QAPP/SAP Limit (%)			
				50-150	50-150	50-150	50-150
SDC-M4B-5-M0030-TC4	08/13/11	08/17/11	4	94	90	94	81
SDC-M4B-1-M0030-T BK	08/09/11	08/15/11	6	94	92	95	83
SDC-M4B-1-M0030-TC BK	08/09/11	08/15/11	6	93	91	95	80
SDC-M4B-2-M0030-T BK	08/10/11	08/15/11	5	92	94	100	82
SDC-M4B-2-M0030-TC BK	08/10/11	08/15/11	5	95	94	97	85
SDC-M4B-4-M0030-T BK	08/12/11	08/15/11	3	94	90	99	82
SDC-M4B-4-M0030-TC BK	08/12/11	08/15/11	3	92	90	97	85
SDC-M4B-5-M0030-T BK	08/13/11	08/15/11	2	88	91	91	80
SDC-M4B-5-M0030-TC BK	08/13/11	08/15/11	2	93	89	95	79
SDC-M4B-TB-M0030-T1	08/13/11	08/15/11	2	96	92	97	83
SDC-M4B-TB-M0030-TC1	08/13/11	08/15/11	2	93	92	98	82
SDC-M4B-1-M0030-COND BK	08/09/11	08/16/11	7	91	84	93	90
INTRA-LAB BLANK (MLM1N1AA)	---	08/15/11	---	92	92	95	74
INTRA-LAB BLANK (MLM7C1AA)	---	08/16/11	---	93	90	91	68
INTRA-LAB BLANK (MLM7J1AA)	---	08/16/11	---	90	81	96	91
INTRA-LAB BLANK (MLN651AA)	---	08/17/11	---	92	88	94	65
CHECK SAMPLE (MLM1N1AC)	---	08/15/11	---	79	80	91	68
DUPLICATE CHECK (MLM1N1AD)	---	08/15/11	---	95	95	102	79
CHECK SAMPLE (MLM7C1AC)	---	08/16/11	---	87	84	87	54
DUPLICATE CHECK (MLM7C1AD)	---	08/16/11	---	93	94	99	82
CHECK SAMPLE (MLM7J1AC)	---	08/16/11	---	93	81	97	92
DUPLICATE CHECK (MLM7J1AD)	---	08/16/11	---	94	84	94	93
CHECK SAMPLE (MLN651AC)	---	08/17/11	---	95	93	95	79
DUPLICATE CHECK (MLN651AD)	---	08/17/11	---	93	90	96	83

SAP/QAPP Limit: 14 days from sample collection to analysis

Table 7-12: Volatile LCS Results

Laboratory ID:	H1H15000015C/H1H15000015L									
Date Analyzed:	08/15/11									
Spiked Compound	Concentration (ug)			Recovery (%)		RPD (%)	QAPP/SAP Limits (%)			
	True	LCS	LCSD	LCS	LCSD		Recovery	RPD		
Benzene	0.250	0.223	0.240	89	96	7.2	50	-	150	25
1,1-Dichloroethene	0.250	0.228	0.256	91	103	12	50	-	150	25
Trichloroethene	0.250	0.253	0.271	101	108	7.0	50	-	150	25
Toluene	0.250	0.238	0.257	95	103	7.3	50	-	150	25
Chlorobenzene	0.250	0.219	0.235	87	94	7.2	50	-	150	25
Laboratory ID:	H1H150000120C/H1H150000120L									
Date Analyzed:	08/16/11									
Spiked Compound	Concentration (ug)			Recovery (%)		RPD (%)	QAPP/SAP Limits (%)			
	True	LCS	LCSD	LCS	LCSD		Recovery	RPD		
Benzene	0.250	0.231	0.249	93	100	7.5	50	-	150	25
1,1-Dichloroethene	0.250	0.260	0.257	104	103	0.96	50	-	150	25
Trichloroethene	0.250	0.268	0.274	107	110	2.4	50	-	150	25
Toluene	0.250	0.221	0.249	88	100	12	50	-	150	25
Chlorobenzene	0.250	0.186	0.240	74	96	25	50	-	150	25
Laboratory ID:	H1H150000126C/H1H150000126L									
Date Analyzed:	08/16/11									
Spiked Compound	Concentration (ug/L)			Recovery (%)		RPD (%)	QAPP/SAP Limits (%)			
	True	LCS	LCSD	LCS	LCSD		Recovery	RPD		
Benzene	10.0	10.6	10.3	106	103	2.7	50	-	150	25
1,1-Dichloroethene	10.0	10.5	10.6	105	106	0.36	50	-	150	25
Trichloroethene	10.0	10.8	10.3	108	103	5.1	50	-	150	25
Toluene	10.0	10.8	10.3	108	103	4.2	50	-	150	25
Chlorobenzene	10.0	10.3	9.85	103	99	4.6	50	-	150	25
Laboratory ID:	H1H160000071C/H1H160000071L									
Date Analyzed:	08/17/11									
Spiked Compound	Concentration (ug/L)			Recovery (%)		RPD (%)	QAPP/SAP Limits (%)			
	True	LCS	LCSD	LCS	LCSD		Recovery	RPD		
Benzene	0.250	0.244	0.248	98	99	1.8	50	-	150	25
1,1-Dichloroethene	0.250	0.262	0.255	105	102	2.5	50	-	150	25
Trichloroethene	0.250	0.282	0.272	113	109	3.5	50	-	150	25
Toluene	0.250	0.238	0.244	95	98	2.5	50	-	150	25
Chlorobenzene	0.250	0.232	0.238	93	95	2.9	50	-	150	25

Notes: Only the five (5) spiking compounds identified in the SAP/QAPP are included in the summary tables. Recovery limits from Table A-9 of the SAP/QAPP.

Table 7-13: Volatile TOC Condensate Holding Time Summary and Surrogate Standard Results

Sample	Sample Date	Preparation Date	Analysis Date	Collection to Analysis (Days)	n-Octane Recovery (%)
SDC-M4B-1A-M0040-TOE-COND	08/09/11	08/15/11	08/18/11	9	98
SDC-M4B-1B-M0040-TOE-COND	08/09/11	08/15/11	08/18/11	9	100
SDC-M4B-1FB-M0040-TOE-COND	08/09/11	08/15/11	08/18/11	9	103
SDC-M4B-2A-M0040-TOE-COND	08/10/11	08/15/11	08/18/11	8	102
SDC-M4B-2B-M0040-TOE-COND	08/10/11	08/15/11	08/18/11	8	104
SDC-M4B-2FB-M0040-TOE-COND	08/10/11	08/15/11	08/18/11	8	99
SDC-M4B-4A-M0040-TOE-COND	08/12/11	08/15/11	08/18/11	6	102
SDC-M4B-4B-M0040-TOE-COND	08/12/11	08/15/11	08/18/11	6	94
SDC-M4B-4FB-M0040-TOE-COND	08/12/11	08/15/11	08/18/11	6	95
SDC-M4B-5A-M0040-TOE-COND	08/13/11	08/15/11	08/18/11	5	98
SDC-M4B-5B-M0040-TOE-COND	08/13/11	08/15/11	08/18/11	5	98
SDC-M4B-5FB-M0040-TOE-COND	08/13/11	08/15/11	08/18/11	5	99
Method Blank (H1H150000-035)	---	08/15/11	08/18/11	---	103
LCS (H1H150000-035)	---	08/15/11	08/18/11	---	96
LCSD (H1H150000-035)	---	08/15/11	08/18/11	---	96

SAP/QAPP Limit: Recovery = 50 to 150%

Table 7-14: Volatile TOC Field Spike Results

Spike Sample:		Run 2 Bag "A"		
Compounds	Sample (ppmv)	Spike (ppmv)	Field Spike (ppmv)	Recovery (%)
C ₁ -Methane	0.852	---	0.824	---
C ₂ -Ethane	0.0743	---	0.0403	---
C ₃ -Propane	0.0532	1.06	1.10	104.1
C ₄ -Butane	0.0194	---	0.0231	---
C ₅ -Pentane	<0.014	---	<0.014	---
C ₆ -Hexane	2.58	---	2.98	---
C ₇ -Heptane	<0.049	---	<0.049	---

SAP/QAPP Limit: Recovery = 80 to 120%

Table 7-15: Volatile TOC LCS Results

Run Number: Date:		Run 1 08/09/11		Run 2 08/10/11		Run 4 08/12/11		Run 5 08/13/11	
Analyte	True (ppmv)	LCS (ppmv)	Recovery (%)	LCS (ppmv)	Recovery (%)	LCS (ppmv)	Recovery (%)	LCS (ppmv)	Recovery (%)
Methane (C ₁)	1.152	1.129	98.0	1.130	98.1	1.178	102.2	1.169	101.4
Ethane (C ₂)	1.100	1.068	97.1	1.074	97.6	1.122	102.0	1.115	101.3
Propane (C ₃)	1.100	1.081	98.3	1.084	98.5	1.135	103.2	1.128	102.5
Butane (C ₄)	1.100	1.080	98.2	1.081	98.3	1.137	103.3	1.127	102.5
Pentane (C ₅)	1.100	1.079	98.1	1.078	98.0	1.137	103.3	1.124	102.2
Hexane (C ₆)	1.100	1.076	97.8	1.062	96.6	1.142	103.8	1.117	101.6
Heptane (C ₇)	1.152	1.107	96.1	1.076	93.4	1.182	102.5	1.152	99.9

Note: Run 1 samples were analyzed on the same day as the initial calibration and an LCS was not required.

SAP/QAPP Limit: Recovery = 75 to 125%

Table 7-16: Volatile TOC Condensate LCS/LCSD Results

Sample ID:		H1H150000-035				
Analysis Date:		08/18/11				
Element	Concentration (ug/sample)			Recovery (%)		RPD (%)
	True	LCS	LCSD	LCS	LCSD	
C ₅ -Pentane	0.250	0.277	0.255	111	102	8.2
C ₆ -Hexane	0.250	0.259	0.263	104	105	1.3
C ₇ -Heptane	0.250	0.258	0.250	103	100	3.3

SAP/QAPP Limit: Recovery = 50 to 150%
RPD = 0 to 35%

Table 7-17: Acid Gas Sample Holding Time Summary

Sample Name	Sample Date	Preparation Date	Analysis Date	Collection to Analysis (Days)
SDC-M4B-1-M5/26A-ACDIMP	08/09/11	08/17/11	08/17/11	8
SDC-M4B-2-M5/26A-ACDIMP	08/10/11	08/17/11	08/17/11	7
SDC-M4B-4-M5/26A-ACDIMP	08/12/11	08/17/11	08/17/11	5
SDC-M4B-5-M5/26A-ACDIMP	08/13/11	08/17/11	08/17/11	4
SDC-M4B-FB-M5/26A-ACDIMP	08/08/11	08/17/11	08/17/11	9
SDC-M4B-RB-M5/26A-ACDIMP	08/10/11	08/17/11	08/17/11	7
SDC-M4B-RB-M5/26A-WATER	08/10/11	08/17/11	08/17/11	7
MB (G1H180000265B)	---	08/17/11	08/17/11	---
MB (G1H180000266B)	---	08/17/11	08/17/11	---
LCS (G1H180000-265)	---	08/17/11	08/17/11	---
LCS (G1H180000-266)	---	08/17/11	08/17/11	---
MS (G1H140414-003S)	08/09/11	08/17/11	08/17/11	8
MSD (G1H140414-003D)	08/09/11	08/17/11	08/17/11	8
MS (G1H140414-003S)	08/09/11	08/17/11	08/17/11	8
MSD (G1H140414-003D)	08/09/11	08/17/11	08/17/11	8
SDC-M4B-1-M5/26A-ALKIMP	08/09/11	08/18/11	08/18/11	9
SDC-M4B-2-M5/26A-ALKIMP	08/10/11	08/18/11	08/18/11	8
SDC-M4B-4-M5/26A-ALKIMP	08/12/11	08/18/11	08/18/11	6
SDC-M4B-5-M5/26A-ALKIMP	08/13/11	08/18/11	08/18/11	5
SDC-M4B-FB-M5/26A-ALKIMP	08/08/11	08/18/11	08/18/11	10
SDC-M4B-RB-M5/26A-ALKIMP	08/10/11	08/18/11	08/18/11	8
MB (G1H180000-267)	---	08/18/11	08/18/11	---
LCS (G1H180000-267)	---	08/18/11	08/18/11	---
MS (G1H140414-004S)	08/09/11	08/18/11	08/18/11	9
MSD (G1H140414-004D)	08/09/11	08/18/11	08/18/11	9

SAP/QAPP Limit: 28 days from collection to analysis

Table 7-18: Acid Gas LCS Results

Sample ID	Analysis Date	Parameter	Units	Concentration		Recovery (%)
				True	LCS	
G1H180000-267	08/18/11	Chlorine	mg	25.0	24.9	100
G1H180000-265	08/17/11	Hydrochloric Acid	mg	25.7	25.5	99
G1H180000-266	08/17/11	Hydrogen Fluoride	mg	26.3	26.1	99

SAP/QAPP Limit: Recovery = 90 to 110%

Table 7-19: Acid Gas MS/MSD Results

Sample ID	Analysis Date	Parameter	Units	Concentration				Recovery (%)		RPD (%)
				Spike	Sample	MS	MSD	MS	MSD	
G1H140414-004	08/18/11	Chlorine	mg	4.20	ND	4.11	4.11	98	98	0.09
G1H140414-003	08/17/11	Hydrochloric Acid	mg	22.0	ND	21.5	21.1	98	96	1.9
G1H140414-003	08/17/11	Hydrogen Fluoride	mg	22.5	ND	21.6	21.4	96	95	0.64

SAP/QAPP Limit: Recovery = 85 to 125%
RPD = 0 to 25%

Table 7-20: Trace Metal Blank Results

Parameter	Method Blank (ug)		Field Blank (ug)		Reagent Blank (ug)	
	Front-Half	Back-Half	Front-Half	Back-Half	Front-Half	Back-Half
Antimony	0.043	ND	0.018	ND	0.021	ND
Arsenic	0.18	0.13	ND	0.16	ND	0.14
Barium	ND	ND	2.1	1.5	1.6	0.25
Beryllium	ND	ND	0.015	ND	ND	ND
Boron	ND	ND	3.4	20.7	1.0	ND
Cadmium	ND	ND	0.035	0.023	ND	ND
Chromium	ND	ND	1.8	ND	1.3	ND
Cobalt	0.011	0.0091	0.087	0.075	0.015	ND
Copper	ND	0.038	0.60	0.63	0.40	0.38
Lead	ND	0.072	0.29	0.30	0.17	0.23
Manganese	ND	ND	0.99	0.27	0.53	0.084
Mercury (Front-Half)	0.050	---	ND	---	ND	---
Mercury (HNO ₃ /H ₂ O ₂)	---	ND	---	ND	---	0.24
Mercury (KMnO ₄)	---	0.050	---	ND	---	ND
Mercury (Empty Impinger)	---	ND	---	ND	---	ND
Mercury (HCl)	---	0.050	---	0.15	---	0.046
Nickel	ND	0.26	0.99	0.60	0.38	0.048
Phosphorus	ND	ND	ND	13.9	ND	15.5
Selenium	ND	ND	ND	ND	ND	ND
Silver	ND	ND	2.6	0.018	0.0085	ND
Thallium	ND	ND	ND	ND	ND	ND
Tin	0.29	0.97	ND	2.3	ND	1.4
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	14.0	6.0	6.8	ND

Table 7-21: Trace Metal LCS/LCSD Results

Sample ID: G1H160000188C/G1H160000188L						
Element	Concentration (ug)			Recovery (%)		RPD (%)
	True	LCS	LCSD	LCS	LCSD	
Antimony	30.0	27.6	27.1	92	90	1.9
Arsenic	30.0	27.3	27.0	91	90	1.2
Barium	30.0	26.9	26.6	90	89	1.2
Beryllium	30.0	26.5	26.5	88	88	0.07
Boron	150	141	141	94	94	0.44
Cadmium	30.0	26.7	26.5	89	88	0.63
Chromium	30.0	30.2	29.8	101	99	1.4
Cobalt	30.0	31.7	31.1	106	104	1.7
Copper	30.0	27.4	27.0	91	90	1.6
Lead	30.0	28.5	28.5	95	95	0.19
Manganese	30.0	27.7	27.3	92	91	1.4
Nickel	30.0	27.3	27.0	91	90	0.93
Phosphorus	150	132	131	88	87	1.3
Selenium	30.0	28.3	27.9	94	93	1.2
Silver	7.50	6.68	6.63	89	88	0.84
Thallium	7.50	6.80	6.73	91	90	1.1
Tin	30.0	27.3	28.4	91	95	4.0
Vanadium	30.0	29.3	29.1	98	97	0.82
Zinc	30.0	27.7	27.3	92	91	1.4
Sample ID: G1H170000163C						
Element	Concentration (ug)			Recovery (%)		RPD (%)
	True	LCS	LCSD	LCS	LCSD	
Antimony	31.4	26.1	---	83	---	---
Arsenic	31.4	24.6	---	78	---	---
Barium	31.4	28.7	---	92	---	---
Beryllium	31.4	23.9	---	76	---	---
Boron	157	133	---	85	---	---
Cadmium	31.4	25.0	---	80	---	---
Chromium	31.4	32.8	---	104	---	---
Cobalt	31.4	33.8	---	108	---	---
Copper	31.4	28.8	---	92	---	---
Lead	31.4	30.0	---	96	---	---
Manganese	31.4	29.8	---	95	---	---
Nickel	31.4	28.9	---	92	---	---
Phosphorus	157	131	---	83	---	---
Selenium	31.4	24.2	---	77	---	---
Silver	7.85	6.73	---	86	---	---
Thallium	7.85	7.17	---	91	---	---
Tin	31.4	30.4	---	97	---	---
Vanadium	31.4	30.2	---	96	---	---
Zinc	31.4	24.6	---	78	---	---
Sample ID: G1H180000145C, G1H180000147C, G1H180000148C, G1H180000146C, G1H180000149C						
Mercury	Concentration (ug)			Recovery (%)		RPD (%)
	True	LCS	LCSD	LCS	LCSD	
Front-Half	1.00	0.94	---	94	---	---
HNO ₃ /H ₂ O	1.00	1.17	---	117	---	---
KMnO ₄	1.00	0.94	---	94	---	---
Empty	1.00	1.17	---	117	---	---
HCl	1.00	0.94	---	94	---	---

SAP/QAPP Limit: Recovery = 75 to 125%
 RPD = Not Applicable

Table 7-22: Trace Metal MS/MSD Results

Sample ID:	G1H140413001S, G1H140413001D						
	Concentration (ug)				Recovery (%)		RPD (%)
	True	Sample	MS	MSD	MS	MSD	
Antimony	30.0	0.026	33.9	34.4	113	115	1.4
Arsenic	30.0	ND	27.8	28.3	93	94	1.8
Barium	30.0	3.3	35.1	35.6	106	108	1.5
Beryllium	30.0	ND	28.6	29.3	95	97	2.2
Boron	150	5.4	150	152	97	98	1.4
Cadmium	30.0	0.052	29.0	29.4	96	98	1.5
Chromium	30.0	2.0	33.8	33.9	106	106	0.48
Cobalt	30.0	0.10	30.6	30.9	102	103	1.0
Copper	30.0	1.3	31.0	31.6	99	101	1.7
Lead	30.0	0.25	34.5	35.4	114	117	2.5
Manganese	30.0	6.3	37.4	37.8	104	105	1.3
Nickel	30.0	0.95	31.0	31.3	100	101	1.0
Phosphorus	150	ND	138	140	90	91	1.3
Selenium	30.0	ND	24.7	25.2	82	84	2.0
Silver	7.50	0.50	6.50	6.62	80	82	1.8
Thallium	7.50	ND	7.82	7.96	104	106	1.7
Tin	30.0	ND	28.1	28.5	93	94	1.5
Vanadium	30.0	ND	31.5	31.8	104	105	1.0
Zinc	30.0	16.0	42.3	43.1	88	90	1.8

Sample ID:	G1H140413002S, G1H140413002D						
	Concentration (ug)				Recovery (%)		RPD (%)
	True	Sample	MS	MSD	MS	MSD	
Antimony	31.6	ND	27.0	27.2	85	86	0.98
Arsenic	31.6	0.22	25.7	25.9	81	81	0.72
Barium	31.6	1.1	33.3	33.1	102	101	0.44
Beryllium	31.6	ND	24.4	24.1	77	76	1.1
Boron	158	68.2	204	201	86	84	1.9
Cadmium	31.6	0.028	25.9	26.1	82	82	0.49
Chromium	31.6	1.0	39.4	38.8	121	119	1.5
Cobalt	31.6	0.25	39.4	38.7	124	122	1.8
Copper	31.6	1.1	33.3	33.1	102	101	0.70
Lead	31.6	0.61	34.4	34.1	107	106	1.0
Manganese	31.6	0.93	35.2	34.5	108	106	1.8
Nickel	31.6	1.4	34.0	33.2	103	101	2.3
Phosphorus	158	10.6	136	136	79	79	0.00
Selenium	31.6	ND	24.0	24.0	76	76	0.06
Silver	7.90	0.027	6.73	6.45	85	81	4.3
Thallium	7.90	ND	8.76	7.79	111	99	12
Tin	31.6	4.9	36.7	36.5	100	100	0.42
Vanadium	31.6	ND	36.0	35.2	114	111	2.4
Zinc	31.6	13.6	38.0	38.0	77	77	0.05
Mercury (HNO ₃ /H ₂ O ₂)	20.4	1.7	18.9	18.9	85	84	0.21

Note: **Shading** indicates a result that is not within the QC limits.

SAP/QAPP Limit: Recovery = 75 to 125%
 RPD = 0 to 25%

Table 7-23: Energetic Holding Time Summary and Surrogate Standard Results

Sample Name	Sample Date	Preparation Date	Analysis Date	Collection to Extraction (Days)	Extraction to Analysis (Days)	3,4-Dinitrotoluene
						QAPP/SAP Limit (%)
						70-130
SDC-M4B-1-MM5E-PNR/FILT	08/09/11	08/16/11	08/17/11	7	1	---
SDC-M4B-1-MM5E-XAD-TOP	08/09/11	08/15/11	08/17/11	6	2	67
SDC-M4B-1-MM5E-COND	08/09/11	08/15/11	08/16/11	6	1	95
SDC-M4B-2-MM5E-PNR/FILT	08/10/11	08/16/11	08/17/11	6	1	---
SDC-M4B-2-MM5E-XAD-TOP	08/10/11	08/15/11	08/17/11	5	2	65
SDC-M4B-2-MM5E-COND	08/10/11	08/15/11	08/16/11	5	1	92
SDC-M4B-4-MM5E-PNR/FILT	08/12/11	08/16/11	08/17/11	4	1	---
SDC-M4B-4-MM5E-XAD-TOP	08/12/11	08/15/11	08/17/11	3	2	64
SDC-M4B-4-MM5E-COND	08/12/11	08/15/11	08/16/11	3	1	94
SDC-M4B-5-MM5E-PNR/FILT	08/13/11	08/16/11	08/17/11	3	1	---
SDC-M4B-5-MM5E-XAD-TOP	08/13/11	08/15/11	08/17/11	2	2	75
SDC-M4B-5-MM5E-COND	08/13/11	08/15/11	08/16/11	2	1	95
SDC-M4B-FB-MM5E-PNR/FILT	08/11/11	08/16/11	08/17/11	5	1	---
SDC-M4B-FB-MM5E-XAD-TOP	08/11/11	08/15/11	08/17/11	4	2	66
SDC-M4B-FB-MM5E-COND	08/11/11	08/15/11	08/17/11	4	2	93
SDC-M4B-RB-MM5E-PNR/FILT	08/10/11	08/16/11	08/17/11	6	1	---
SDC-M4B-RB-MM5E-XAD-TOP	08/10/11	08/15/11	08/17/11	5	2	56
SDC-M4B-RB-MM5E-WATER	08/10/11	08/15/11	08/17/11	5	2	95
SDC-M4B-TB-MM5E-XAD-TOP	08/10/11	08/15/11	08/17/11	5	2	70
INTRA-LAB BLANK (MLM431AA)	---	08/15/11	08/16/11	---	1	88
INTRA-LAB BLANK (MLNPC1AA)	---	08/15/11	08/17/11	---	2	83
INTRA-LAB BLANK (MLN451AA)	---	08/16/11	08/17/11	---	1	91
CHECK SAMPLE (MLM431AC)	---	08/15/11	08/16/11	---	1	90
DUPLICATE CHECK (MLM431AD)	---	08/15/11	08/16/11	---	1	90
CHECK SAMPLE (MLNPC1AC)	---	08/15/11	08/17/11	---	2	83
DUPLICATE CHECK (MLNPC1AD)	---	08/15/11	08/17/11	---	2	84
CHECK SAMPLE (MLN451AC)	---	08/16/11	08/17/11	---	1	90
DUPLICATE CHECK (MLN451AD)	---	08/16/11	08/17/11	---	1	88

Note: For resin and condensate fractions a seven (7) day holding time to extraction is applied. For the front-half fraction a fourteen (14) day holding time to extraction is applied. For all fractions a fourteen (14) day holding time from extraction to analysis is applied. Surrogate is not added to the front-half rinse and filter fraction. As such, no recoveries are reported.

Table 7-24: Energetic LCS Results

Sample ID:	G1H15000064C/G1H15000064L					
Date Extracted:	08/15/11					
Date Analyzed:	08/16/11					
Compound	Concentration (ug)			Recovery (%)		RPD (%)
	True	LCS	LCSD	LCS	LCSD	
2,4-Dinitrotoluene	2.0	1.96	1.93	98	97	1.2
2,6-Dinitrotoluene	2.0	1.95	1.93	97	97	0.72
Nitroglycerin	2.0	1.74	1.80	87	90	3.5
2,4,6-Trinitrotoluene	2.0	1.63	1.64	82	82	0.30
HMX	2.0	1.90	1.93	95	97	1.7
RDX	2.0	2.14	2.18	107	109	1.7
Sample ID:	G1H150000210C/G1H150000210L					
Date Extracted:	08/15/11					
Date Analyzed:	08/17/11					
Compound	Concentration (ug)			Recovery (%)		RPD (%)
	True	LCS	LCSD	LCS	LCSD	
2,4-Dinitrotoluene	50.0	44.8	45.2	90	90	0.93
2,6-Dinitrotoluene	50.0	45.2	45.7	90	91	1.1
Nitroglycerin	50.0	41.1	41.0	82	82	0.19
2,4,6-Trinitrotoluene	50.0	37.3	37.9	75	76	1.6
HMX	50.0	45.7	46.4	91	93	1.5
RDX	50.0	48.7	49.2	97	98	1.2
Sample ID:	G1H160000041C/G1H160000041L					
Date Extracted:	08/16/11					
Date Analyzed:	08/17/11					
Compound	Concentration (ug)			Recovery (%)		RPD (%)
	True	LCS	LCSD	LCS	LCSD	
2,4-Dinitrotoluene	2.00	1.93	1.91	96	95	1.2
2,6-Dinitrotoluene	2.00	1.93	1.90	97	95	1.9
Nitroglycerin	2.00	1.74	1.71	87	86	1.6
2,4,6-Trinitrotoluene	2.00	1.62	1.59	81	80	1.5
HMX	2.00	1.96	1.95	98	97	0.71
RDX	2.00	2.07	2.06	103	103	0.19

SAP/QAPP Limit: Recovery = 75 to 125%
 RPD = Not specified, 50% applied

8.0 EMISSIONS TEST RESULTS SUMMARY

This section presents a summary of the results of the SDC emissions test for C4b. All supporting data are presented in the report appendices.

8.1 DAILY RUN SUMMARIES

The following are daily accounts of the on-site test activities. These summaries are presented in sequential order for the entire emissions testing effort and include the preliminary measurements. Table 8-1 presents a summary of the sampling times.

Monday, August 8, 2011 - C4b Preliminary Measurements: Preliminary velocity traverses and cyclonic flow checks were conducted at the exhaust blower duct prior to the start of the emissions test for C4b. Moisture runs were also conducted to verify the moisture content of the exhaust gas. The cyclonic flow measurements within the duct at the sampling location yielded results within specified limits. All velocity and moisture measurements were reliable indicators of actual flow and moisture conditions and did not change appreciably from run to run. The M0010, M0010 for total organic compounds (M0010-TOC), M0023A, M26A, and M29 field blank sampling trains were set-up and recovered.

Tuesday, August 9, 2011 - C4bR1: Exhaust gas sampling commenced at 1110 hrs and was paused at 1310 hrs for port change. All leak checks were successfully completed. Sampling resumed in the second port at 1420 hrs and concluded at 1620 hrs with all leak checks successfully completed. All samples were recovered, labeled, and custody-sealed.

Wednesday, August 10, 2011 - C4bR2: Exhaust gas sampling commenced at 0940 hrs and was paused at 1140 hrs for port change. All leak checks were successfully completed. Sampling resumed in the second port at 1505 hrs and concluded at 1705 hrs with all leak checks successfully completed. All samples were recovered, labeled, and custody-sealed.

Thursday, August 11, 2011 - C4bR3: Exhaust gas sampling commenced at 1130 hrs and was paused at 1330 hrs for port change. All leak checks were successfully completed. Sampling resumed in the second port at 1650 hrs and paused at 1746 hrs due to a FPI (SDC-13: CO Concentration) being incurred preventing further feed. Once the FPI was cleared, sampling resumed at 2041 hrs and concluded at 2145 hrs with all leak checks successfully completed. All samples were recovered, labeled, and custody-sealed. The MM5E field blank sample train was also set-up and recovered.

Friday, August 12, 2011 - C4bR4: Exhaust gas sampling commenced at 1735 hrs and was paused at 1935 hrs for port change. All leak checks were successfully completed. Sampling resumed in the second port at 2055 hrs and concluded at 2255 hrs with all leak checks successfully completed. All samples were recovered, labeled, and custody-sealed.

Saturday, August 13, 2011 - C4bR5: Exhaust gas sampling commenced at 1155 hrs and was paused at 1355 hrs for port change. All leak checks were successfully completed. Sampling resumed in the second port at 1600 hrs and concluded at 1800 hrs with all leak checks successfully completed. All samples were recovered, labeled, and custody-sealed.

8.2 CYCLONIC FLOW CHECK

A cyclonic flow check was conducted in two (2) ports of the exhaust blower duct on December 4, 2010, prior to the start of the Condition 1 emissions test. The ports were found to be free of cyclonic flow (< 20°) with a mean cyclonic of ~ 11°.

8.3 PERFORMANCE STANDARD RESULTS

The isokinetic and non-isokinetic sampling summary for all sampling trains required to demonstrate performance standards are summarized in Tables 5-2 and 5-3. The measured performance standards are discussed in the following sections.

8.3.1 Select Criteria Pollutant Emissions

CO concentrations were measured by the facility and TRM CEMS located on the exhaust blower duct. Control of products of incomplete combustion was demonstrated by monitoring the CO concentration (ROHA) to below the RCRA/CAA Permit limit of 100 ppmv, dry basis, corrected to 7% O₂. CO concentrations were also measured by a TRM CEMS located on the exhaust blower duct. As summarized in Table 8-2, the average ROHA CO concentrations, measured by facility and TRM CEMS, were in compliance with the RCRA/CAA Permit limit of 100 ppmv, dry basis, corrected to 7% O₂. The average instantaneous CO emission rates were also in compliance with the CAA Permit limit of 0.02 lbs/hr.

SO₂ and NO_x emissions were measured by the TRM CEMS located on the exhaust blower duct. As summarized in Table 8-2, the average SO₂ and NO_x emission rates were in compliance with the CAA Permit limit of 7.20 and 0.80 lbs/hr, respectively. Supporting information is included in Appendix F-1.

Composite exhaust gas samples were collected to determine the concentration of O₂ and CO₂ to be used in the calculation of the exhaust gas molecular weight. This calculated molecular weight was used by individual sampling trains to calculate specific parameters associated with gas flow and sampling train isokinetic percentages (see Table 5-2). In addition, the O₂ data was used to correct emission rates.

8.3.2 DRE

The DRE results are summarized in Table 8-3. The agent emissions were measured by a DAAMS that was located at the exhaust blower duct near the location where exhaust gas sampling was occurring. The four (4)-hour DAAMS tube set was analyzed for mustard agent concentration by the on-site laboratory. The DRE was calculated per the method specified in Alabama Administrative Code 335-14-5-.15(4)(a)1 as follows:

$$DRE = \left(\frac{W_{in} - W_{out}}{W_{out}} \right) \times 100$$

Where:

W_{in} = Feed rate (lbs/hr)
W_{out} = Emission rate (lbs/hr)

The feed rate was determined based on the amount of agent per hour demonstrated (see Table 3). Further, the feed rate was purity-adjusted which provides a worst-case or lowest DRE. The mustard agent DRE for all runs was in compliance with the RCRA/CAA Permit limit of 99.9999%. Supporting information is included in Appendix G.

1 **8.3.3 Semivolatile Organic Emissions**

2 Table 8-4 summarizes the semivolatile organic emissions results by test run and condition
3 average. No blank corrections have been made to the data. In instances where NDs were
4 incurred, the RL was used to calculate an emissions rate. No permitted emission limits are
5 associated with semivolatile organic emissions. A summary analytical report for semivolatile
6 organics can be found in Appendix F-2.

7 **8.3.4 Dioxin/Furan Emissions**

8 Table 8-5 summarizes the dioxin/furan emissions results by test run and condition average. No
9 blank corrections have been made to the data. In instances where NDs were incurred, the RL
10 was used to calculate an emissions rate. The US EPA TEFs were applied to the detected
11 quantities of each isomer, as well as the total congeners (EPA/100/R-10/005). For the isomer-
12 specific results, the applicable TEF was used to determine the TEQ. The dioxin/furan emission
13 rates for all runs were in compliance with the CAA Permit limit of 0.20 ng-TEQ/dscm, corrected
14 to 7% O₂ using Orsat data. A summary analytical report for dioxins/furans can be found in
15 Appendix F-3.

16 **8.3.5 Volatile Organic Emissions**

17 Table 8-6 summarizes the volatile organic emissions results by test run and condition average.
18 No blank corrections have been made to the data. In instances where NDs were incurred, the RL
19 was used to calculate an emissions rate. No permitted emission limits are associated with
20 volatile organic emissions. A summary analytical report for volatile organics can be found in
21 Appendix F-4.

22 **8.3.6 TOC Emissions**

23 Tables 8-7, 8-8, and 8-9 summarize the TOC emissions results by test run and condition average.
24 Sampling for volatile/semivolatile unspciated and gravimetric organics was conducted using the
25 M0010 and M0040 sampling trains. In instances where NDs were incurred, the RL was used to
26 calculate an emissions rate. No permitted emission limits are associated with TOC emissions. A
27 summary analytical report for volatile/semivolatile unspciated and gravimetric organics can be
28 found in Appendices F-5, F-6, and F-7.

29 **8.3.7 Acid Gases and Particulate Emissions**

30 Table 8-10 summarizes the acid gas and particulate emissions results by test run and condition
31 average. No blank corrections have been made to the data. In instances where NDs were
32 incurred, the RL was used to calculate an emissions rate. The chlorine equivalent concentrations
33 for all runs were in compliance with the CAA Permit limit of 21 ppmv, corrected to 7% O₂ using
34 Orsat data. The particulate emission rates for all runs were in compliance with the RCRA/CAA
35 Permit limit of 0.013 gr/dscf, corrected to 7% O₂ using Orsat data. A summary analytical report
36 for acid gases and particulates can be found in Appendix F-8.

37 **8.3.8 Trace Metal Emissions**

38 Table 8-11 summarizes the trace metal emissions results by test run and condition average. No
39 blank corrections have been made to the data. In instances where NDs were incurred, the RL
40 was used to calculate an emissions rate. The low-volatile (arsenic, beryllium, and chromium
41 combined), semivolatile (cadmium and lead combined), and high-volatile (mercury) metal
42 emission rates for all runs were in compliance with the CAA Permit limits of 23, 10, and

1 8.1 ug/dscm, corrected to 7% O₂ using Orsat data, respectively. A summary analytical report for
 2 trace metals can be found in Appendix F-9.

3 **8.3.9 Energetic Emissions**

4 Table 8-12 summarizes the energetic emissions results by test run and condition average. No
 5 blank corrections have been made to the data. In instances where NDs were incurred, the RL
 6 was used to calculate an emissions rate. No permitted emission limits are associated with
 7 energetic emissions. A summary analytical report for energetics can be found in Appendix F-10.

8 **8.4 FPI LIMITS**

9 Based on the C4b emission results and PDARS data, the FPI parameters were within those listed
 10 in Table 2 of the ANCDF SDC Emissions Test Plan and demonstrate that the current permitted
 11 setpoints are protective of human health and the environment.

12 Emissions tests have been performed for five (5) conditions at the SDC. C1 was for processing
 13 conventional weapons without SIC in the SFU. C2 and C3 were for processing surrogates,
 14 including metal oxides, with (C3) and without (C2) SIC in the SFU. C4a and C4b were for
 15 processing chemical agent, at low (C4a) and high (C4b) feeds, with SIC in the SFU. C3, C4a,
 16 and C4b were used for FPI determination because of the requirement to use SIC in the SFU
 17 when processing chemical agent.

18 **8.4.1 Maximum Detonation Chamber Pressure (SDC-01)**

19 The instantaneous FPI setpoint for the maximum detonation chamber pressure was 362 psi. The
 20 following detonation chamber pressures were measured during C3, C4a, and C4b emission
 21 testing:

Statistic (psi)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	2.72	2.88	2.88	2.83
Maximum	8.59	8.57	8.24	8.46
Average	5.87	6.12	6.10	6.03
Statistic (psi)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	4.54	3.25	2.80	3.53
Maximum	10.81	16.12	9.54	12.15
Average	6.57	5.64	4.10	5.44
Statistic (psi)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	7.61	3.50	0.063	3.72
Maximum	18.32	13.01	9.80	13.71
Average	10.42	6.29	2.22	6.31

22 ANCDF proposes 18 psi as the maximum instantaneous detonation chamber pressure FPI
 23 (SDC-01).

24

8.4.2 Minimum Detonation Chamber Temperature (SDC-02)

The instantaneous FPI setpoint for the minimum detonation chamber temperature was 1,000°F. The following detonation chamber temperatures were measured during C3, C4a, and C4b emission testing:

Statistic (°F)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	1,246.58	1,399.40	1,398.29	1,348.09
Maximum	1,418.57	1,401.45	1,402.85	1,407.62
Average	1,335.85	1,400.16	1,400.01	1,378.67
Statistic (°F)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	1,449.00	1,449.29	1,449.58	1,449.29
Maximum	1,450.67	1,450.67	1,450.59	1,450.64
Average	1,450.05	1,450.01	1,450.01	1,450.02
Statistic (°F)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	1,449.51	1,449.58	1,441.62	1,446.90
Maximum	1,450.67	1,450.59	1,457.40	1,452.89
Average	1,450.04	1,450.00	1,449.93	1,449.99

ANCDF proposes to retain the current limit of 1,000°F for this FPI as it is an established temperature for treatment of chemical agents. Chemical agents held at a temperature of 1,000°F for a period of 15-minutes are destroyed to the accepted 5X level. Given that no chemical munition will be within the detonation chamber for < 15-minutes, the low temperature limit of 1,000°F provides suitable protection.

8.4.3 Minimum Thermal Oxidizer Temperature (SDC-03)

The instantaneous FPI setpoint for the minimum thermal oxidizer temperature was 1,400°F. The following thermal oxidizer temperatures were measured during C3, C4a, and C4b emission testing:

Statistic (°F)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	1,741.34	1,750.03	1,733.59	1,741.65
Maximum	1,940.16	2,005.05	1,998.26	1,981.16
Average	1,802.23	1,805.81	1,809.77	1,805.94
Statistic (°F)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	1,759.77	1,771.66	1,772.50	1,767.97
Maximum	1,916.85	1,983.64	1,941.79	1,947.42
Average	1,806.48	1,805.50	1,809.25	1,807.08
Statistic (°F)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	1,855.83	1,723.48	1,872.88	1,817.39
Maximum	2,104.54	2,061.86	2,088.14	2,084.85
Average	1,914.09	1,914.48	1,930.36	1,919.64

ANCDF proposes 1,741°F as the instantaneous minimum thermal oxidizer temperature (SDC-03).

8.4.4 Maximum Thermal Oxidizer Pressure (SDC-04)

The instantaneous FPI setpoint for the maximum thermal oxidizer pressure was 0.0 psi. The following thermal oxidizer pressures were measured during C3, C4a, and C4b emission testing:

Statistic (psi)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	-0.136	-0.138	-0.123	-0.132
Maximum	-0.025	-0.041	-0.040	-0.035
Average	-0.069	-0.069	-0.071	-0.069
Statistic (psi)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	-0.120	-0.188	-0.098	-0.135
Maximum	-0.033	0.055	0.0080	0.010
Average	-0.071	-0.056	-0.065	-0.064
Statistic (psi)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	-0.105	-0.093	-0.095	-0.098
Maximum	-0.035	-0.043	-0.048	-0.042
Average	-0.071	-0.071	-0.071	-0.071

ANCDF proposes to retain the instantaneous maximum thermal oxidizer pressure (SDC-04) of -0.01 psi as the SDC System should be maintained under negative pressure during a feed event to minimize impacts to human health and the environment.

8.4.5 Maximum Spray Dryer Temperature (SDC-05)

The instantaneous FPI setpoint for the maximum spray dryer temperature was 500°F. The following spray dryer temperatures were measured during C3, C4a, and C4b emission testing:

Statistic (°F)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	322.42	322.96	321.56	322.31
Maximum	338.65	339.34	338.83	338.94
Average	329.91	329.91	329.77	329.86
Statistic (°F)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	314.28	308.38	319.03	313.90
Maximum	339.09	345.54	344.30	342.98
Average	330.03	329.98	329.54	329.85
Statistic (°F)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	375.24	382.03	382.03	379.77
Maximum	403.98	398.13	398.61	400.24
Average	390.25	390.14	390.15	390.18

ANCDF proposes 400°F as the instantaneous maximum spray dryer temperature (SDC-05).

8.4.6 Maximum Bag House Pressure (SDC-06)

The instantaneous FPI setpoint for the maximum bag house pressure was 0.3 psi. The following bag house pressures were measured during C3, C4a, and C4b emission testing:

Statistic (psi)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	0.045	0.053	0.060	0.053
Maximum	0.183	0.182	0.182	0.182
Average	0.129	0.132	0.131	0.131
Statistic (psi)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	0.030	0.020	0.030	0.027
Maximum	0.183	0.180	0.170	0.178
Average	0.105	0.116	0.100	0.107
Statistic (psi)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	0.060	0.070	0.060	0.063
Maximum	0.080	0.095	0.095	0.090
Average	0.069	0.086	0.084	0.080

ANCDF proposes 0.18 psi as the instantaneous maximum bag house pressure (SDC-06).

8.4.7 Minimum Acid Scrubber Flow Rate (SDC-07)

The instantaneous FPI setpoint for the minimum acid scrubber flow rate was 1.0 cfm. The following acid scrubber flow rates were measured during C3, C4a, and C4b emission testing:

Statistic (cfm)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	3.74	3.77	3.76	3.76
Maximum	4.05	4.08	4.09	4.07
Average	3.81	3.81	3.80	3.81
Statistic (cfm)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	3.17	3.17	3.16	3.17
Maximum	3.55	3.56	3.54	3.55
Average	3.25	3.26	3.24	3.25
Statistic (cfm)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	3.21	3.28	3.28	3.26
Maximum	3.58	3.67	3.33	3.53
Average	3.26	3.33	3.30	3.30

ANCDF proposes 3.2 cfm as the instantaneous minimum acid scrubber flow rate (SDC-07).

8.4.8 Minimum Quench Tower Flow Rate (SDC-08)

The instantaneous FPI setpoint for the minimum quench tower flow rate was 0.5 cfm. The following quench tower flow rates were measured during C3, C4a, and C4b emission testing:

Statistic (cfm)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	2.43	2.45	2.45	2.44
Maximum	2.59	2.59	2.59	2.59
Average	2.56	2.58	2.58	2.57

Statistic (cfm)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	2.69	2.69	2.69	2.69
Maximum	2.89	2.88	2.88	2.89
Average	2.84	2.84	2.84	2.84
Statistic (cfm)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	2.70	2.64	2.79	2.71
Maximum	2.89	2.82	2.82	2.84
Average	2.86	2.80	2.80	2.82

1 ANCDF proposes 2.4 cfm as the instantaneous minimum quench tower flow rate (SDC-08).

2 **8.4.9 Maximum Quench Tower Temperature (SDC-09)**

3 The instantaneous FPI setpoint for the maximum quench tower temperature was 190°F. The
 4 following quench tower temperatures were measured during C3, C4a, and C4b emission testing:

Statistic (°F)	Condition 3							
	C3R1		C3R2		C3R3		Average	
	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004
Minimum	141.18	141.55	145.53	145.61	146.78	146.94	144.50	144.70
Maximum	148.64	149.12	150.73	151.19	151.34	151.78	150.24	150.69
Average	145.97	146.25	147.76	148.03	148.69	148.95	147.47	147.74
Statistic (°F)	Condition 4a							
	C4aR1		C4aR2		C4aR4		Average	
	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004
Minimum	158.57	158.70	154.21	154.17	159.01	159.22	157.26	157.36
Maximum	163.92	164.43	162.74	163.16	165.04	165.42	163.90	164.34
Average	160.41	160.67	158.76	158.98	160.95	161.16	160.04	160.27
Statistic (°F)	Condition 4b							
	C4bR1		C4bR4		C4bR5		Average	
	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004	TI-34003	TI-34004
Minimum	163.43	163.61	164.67	164.77	162.38	162.61	163.49	163.66
Maximum	170.29	170.82	169.93	170.29	169.28	169.58	169.83	170.23
Average	166.55	166.85	167.19	167.43	165.10	165.31	166.28	166.53

5 ANCDF proposes 170°F as the instantaneous maximum quench tower temperature (SDC-09).

6 **8.4.10 Maximum Neutral Scrubber Temperature (SDC-10)**

7 The instantaneous FPI setpoint for the maximum neutral scrubber temperature was 200°F. The
 8 following neutral scrubber temperatures were measured during C3, C4a, and C4b emission
 9 testing:

Statistic (°F)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	160.02	164.69	164.62	163.11
Maximum	171.98	172.55	173.56	172.70
Average	168.27	170.65	171.12	170.01
Statistic (°F)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	174.94	174.65	175.00	174.86
Maximum	180.85	181.35	182.42	181.54
Average	178.35	178.19	178.76	178.43

Statistic (°F)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	163.82	167.71	164.63	165.39
Maximum	182.25	182.87	182.89	182.67
Average	178.28	179.58	177.02	178.29

1 ANCDF proposes retaining the manufacturer’s standard of 200°F as the instantaneous maximum
 2 neutral scrubber temperature (SDC-10).

3 **8.4.11 Maximum Chemical Agent Emissions (SDC-11/12)**

4 The instantaneous and ROHA FPI setpoint for the maximum chemical agent emission rate was
 5 0.03 and 0.006 mg/m³, respectively. No ACAMS alarm was incurred during C4b testing.
 6 ANCDF proposes retaining the ACAMS setpoints as it is protective of human health and the
 7 environment.

8 **8.4.12 Maximum CO Concentration (SDC-13)**

9 The ROHA FPI setpoint for the maximum CO concentration was 100 ppmv, dry basis corrected
 10 to 7% O₂. The following CO concentrations were measured during C3, C4a, and C4b emission
 11 testing:

Statistic (ppmv)	Condition 3			
	C3R1	C3R2	C3R3	Average
Minimum	0.42	0.48	0.16	0.35
Maximum	0.49	1.17	1.14	0.93
Average	0.46	0.61	0.56	0.54
Statistic (ppmv)	Condition 4a			
	C4aR1	C4aR2	C4aR4	Average
Minimum	0.14	0.14	0.14	0.14
Maximum	0.64	7.42	9.01	5.69
Average	0.19	0.99	0.52	0.57
Statistic (ppmv)	Condition 4b			
	C4bR1	C4bR4	C4bR5	Average
Minimum	0.44	0.23	0.16	0.28
Maximum	0.98	1.55	0.58	1.04
Average	0.64	0.51	0.30	0.48

12 ANCDF proposes retaining 100 ppmv, dry basis corrected to 7% O₂, as the maximum ROHA
 13 CO concentration (SDC-13) as this is a regulatory limit.

14 **8.5 PROPOSED FEED RATES**

15 ANCDF has completed all planned emissions testing for the operation of the SDC. These tests
 16 were completed in a manner consistent with the approved test plan and have provided results
 17 supportive of the goal of demonstrating compliance with applicable emissions standards and
 18 operating conditions.

19 In designing the test conditions, ANCDF conducted an evaluation of the munitions and wastes
 20 that would be destroyed in the SDC to determine an appropriate emissions test condition to
 21 evaluate the known munitions to be processed within the chemical mission. As a result of this
 22 evaluation, C3 was designed to provide a surrogate test similar to the demonstrations completed
 23 for each of the ANCDF incineration systems.

24 Due to the limited number of chemical munitions available for processing and the limited
 25 processing duration, the SDC was never able to sustain a consistent operation tempo. Therefore,

1 in support of further demonstrating the SDC technology for future applications ANCDF is going
2 to conduct a Throughput, Reliability and Maintainability (TRAM) Study for a one year period.
3 To complete this activity, the SDC will process conventional munitions which may contain
4 metals or chlorine above the levels demonstrated during the previously completed emissions
5 tests. In order to allow for processing of these munitions at rates supportive of the mission,
6 ANCDF proposes to calculate, new feed rates for the parameters listed below.

7 At present, with the exception of the MACT limitations that were applied by permit to the
8 operation of the SDC, the SDC does not have listed emissions limitations for the parameters
9 below. The SDC was permitted based on an agreement to incorporate the demonstrated
10 emissions from the SDC emissions test into the HRA and verify that these were allowable under
11 an approved combined HRA. Preliminary HRA results have been submitted but at present, a
12 final model has not been approved. As there are no current emission limits in determining an
13 acceptable boundary for this calculation, ANCDF used the MACT emission limits as a starting
14 point.

15 The MACT standards for new incinerators were applied by permit to the SDC. Within these
16 regulations, MACT contains specific emissions limits for six (6) metals. ANCDF demonstrated
17 compliance with these emissions limits during the final tests at the facility. To begin the process
18 of calculating feed rates, ANCDF calculated emissions rates for each of these MACT limits to
19 one-third (1/3) of the allowable MACT limit. This process produced a percent increase for each
20 metal of concern which was then applied to the feed rate of that metal during the test in which
21 the limit was demonstrated. The result is an increased feed rate that could produce emissions up
22 to one-third (1/3) of the allowable limit.

23 To address the remainder of the feed parameters, ANCDF evaluated the percentage increase
24 within each of the MACT categories to determine a calculation percentage for the parameters
25 that did not have specific limits. The highest and lowest percentage of increase were excluded
26 and the remainder were averaged to produced a percentage for calculation of the remaining
27 metals.

28 The table below contains the demonstrated and proposed emissions and feed rates. ANCDF is
29 currently evaluating these proposed rates within the HRA. Preliminary risk assessment runs
30 have been completed with the demonstrated rates and risks have been shown to be well within
31 the allowable limitations imposed under the HRA.

32 The results of the HRA using the proposed emissions rates will be supplied to ADEM once
33 completed. Once ADEM has approved this final report and the HRA results with the increased
34 emissions rates, ANCDF proposes to adjust allowable feed rates to the SDC to levels
35 summarized in Table 8-13. In the interim, feed rates to the SDC will be managed IAW post
36 emissions test limitations contained in the RCRA Permit.

37 **8.6 DATA FOR USE IN THE HRA**

38 The emissions rates presented in this report are proposed for modeling in the ANCDF HRA,
39 which will be submitted under separate cover. For more discussion on health risk, the current
40 ANCDF Risk Assessment Protocol should be consulted.

41 **8.7 FINAL CONCLUSIONS**

42 The SDC achieved all compliance objectives specified in the ANCDF SDC Emissions Test Plan
43 and RCRA/CAA Permits while processing mustard-filled munitions with SIC in the SFU.

Table 8-1: Sampling Time Intervals

Run	Date	First Port (hours)		Second Port (hours)	
		Start	Stop	Start	Stop
C4bR1	08/09/11	1110	1310	1420	1620
C4bR2 ⁽¹⁾	08/10/11	0940	1140	1505	1705
C4bR3 ⁽²⁾	08/11/11	1130	1330	1650 ⁽²⁾	2145
C4bR4	08/12/11	1735	1935	2055	2255
C4bR5	08/13/11	1155	1355	1600	1800

Footnotes:

- (1) C4bR2 was extracted and analyzed; however, with the exception of particulates, the results are for informational purposes only and are not used for compliance.
- (2) C4bR3 was paused from 1746 to 2041 hrs after incurring a FPI (SDC-13 - CO Concentration); thus invalidating the run. Samples associated with this run were not extracted or analyzed.

Table 8-2: Summary of Select Criteria Pollutant Emissions

Parameter	Units	C4bR1	C4bR4	C4bR5	Average	RCRA/CAA Permit Limit
Carbon Monoxide (facility CEMS) ⁽¹⁾	ppmv	0.64	0.51	0.30	0.48	100 ROHA
	lbs/hr	0.0033	0.0032	0.0011	0.0026	0.02
Carbon Monoxide (TRM CEMS)	ppmv	1.41	1.82	1.56	1.60	---
	lbs/hr	0.0041	0.0051	0.0040	0.0044	---
Sulfur Dioxide (TRM CEMS)	lbs/hr	0.00	0.00054	0.00049	0.00034	7.20
Nitrogen Oxides (TRM CEMS)	lbs/hr	0.27	0.22	0.19	0.23	0.80

Footnote:

- (1) Values summarized in table are averages. See Table 4-2 for minimum and maximum values.

Table 8-3: DRE Summary

Parameter	Units	C4bR1	C4bR4	C4bR5	Average	RCRA/CAA Permit Limit
DAAMS Tube	---	AT001119	AT001703	AT004276	---	---
Sample Collection Time	minutes	240	240	240	240	---
DAAMS Flow Rate ⁽¹⁾	sLpm	0.19	0.19	0.20	0.19	---
Total Gas Sample Volume ⁽²⁾	scm	4.56E-02	4.56E-02	4.80E-02	4.64E-02	---
Dilution Air ⁽³⁾	%	92.3	92.2	92.0	92.17	---
Percent Exhaust Gas Sampled	%	7.7	7.8	8.0	7.83	---
Total Exhaust Gas Sample Volume	scm	3.51E-03	3.56E-03	3.84E-03	3.64E-03	---
Sample Analysis Result	ng	< 3.97E-01 [ND]	< 3.97E-01 [ND]	< 3.97E-01 [ND]	< 3.97E-01 [ND]	---
Exhaust Gas Flow Rate ⁽⁴⁾	scm/hr	1,780.90	1,722.41	1,533.45	1,678.92	---
Agent Concentration	mg/scm	< 1.13E-04 [ND]	< 1.12E-04 [ND]	< 1.03E-04 [ND]	< 1.09E-04 [ND]	---
Emission Rate	lbs/hr	< 4.44E-07 [ND]	< 4.24E-07 [ND]	< 3.50E-07 [ND]	< 4.06E-07 [ND]	---
Average Agent Feed Rate	lbs/hr	62.23	56.62	51.11	56.65	---
Agent Purity ⁽⁵⁾	%	83.9	83.9	83.9	83.9	---
Purity-Adjusted Agent Feed Rate	lbs/hr	52.21	47.50	42.88	47.53	---
DRE	%	> 99.9999991 [ND]	> 99.9999991 [ND]	> 99.9999991 [ND]	> 99.9999991 [ND]	99.9999

Footnotes:

- (1) Flow rate is set prior to collection of the 4-hour DAAMS tube set and verified after the tubes have been collected. If the ending flow rate is less than the starting flow rate, then the ending (i.e., lower) flow rate is used to calculate the total exhaust gas flow rate.
- (2) Total gas sample volume represents the exhaust gas sample volume and diluent volume.
- (3) Percent dilution is set prior to collection of the 4-hour tube and verified after the tube has been collected. If the ending percent dilution is greater than the starting percent dilution, the ending (i.e., more dilute) dilution is used to calculate exhaust gas sampled.
- (4) The exhaust gas flow rate was calculated based on the average of all isokinetic sample train for the respective run.
- (5) Based on historical data, the average mustard purity of 83.9% has been used (see ANCDF SDC Emissions Test Plan, Appendix D).

Table 8-4: Semivolatile Organic Emissions Summary

Parameter		Units	C4bR1		C4bR4		C4bR5		Average	
Sample Volume		dscf	141.054		132.731		120.049		131.28	
Gas Flow Rate		dscfm	675		645		598		629.33	
Acenaphthene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Acenaphthylene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Acetophenone	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
2-Acetylaminofluorene	Total Catch	ug	< 300	ND						
	Concentration	ug/dscm	< 75.10	ND	< 79.81	ND	< 88.24	ND	< 81.05	ND
	Emission Rate	lbs/hr	< 1.90E-04	ND	< 1.93E-04	ND	< 1.98E-04	ND	< 1.94E-04	ND
	Emission Rate	g/s	< 2.39E-05	ND	< 2.43E-05	ND	< 2.49E-05	ND	< 2.44E-05	ND
4-Aminobiphenyl	Total Catch	ug	< 150	ND						
	Concentration	ug/dscm	< 37.55	ND	< 39.90	ND	< 44.12	ND	< 40.52	ND
	Emission Rate	lbs/hr	< 9.52E-05	ND	< 9.64E-05	ND	< 9.88E-05	ND	< 9.68E-05	ND
	Emission Rate	g/s	< 1.20E-05	ND	< 1.21E-05	ND	< 1.25E-05	ND	< 1.22E-05	ND
3-Amino-9-ethycarbazole	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
Aniline	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Anthracene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Aramite	Total Catch	ug	< 60	ND						
	Concentration	ug/dscm	< 15.02	ND	< 15.96	ND	< 17.65	ND	< 16.21	ND
	Emission Rate	lbs/hr	< 3.80E-05	ND	< 3.86E-05	ND	< 3.95E-05	ND	< 3.87E-05	ND
	Emission Rate	g/s	< 4.79E-06	ND	< 4.86E-06	ND	< 4.98E-06	ND	< 4.88E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
Benzidine	Total Catch	ug	<	300	ND	<	300	ND	<	300	ND
	Concentration	ug/dscm	<	75.10	ND	<	79.81	ND	<	88.24	ND
	Emission Rate	lbs/hr	<	1.90E-04	ND	<	1.93E-04	ND	<	1.98E-04	ND
	Emission Rate	g/s	<	2.39E-05	ND	<	2.43E-05	ND	<	2.49E-05	ND
Benzoic acid	Total Catch	ug	<	215	<	214	<	223	<	217.33	
	Concentration	ug/dscm	<	53.82	<	56.93	<	65.59	<	58.78	
	Emission Rate	lbs/hr	<	1.36E-04	<	1.38E-04	<	1.47E-04	<	1.40E-04	
	Emission Rate	g/s	<	1.71E-05	<	1.73E-05	<	1.85E-05	<	1.77E-05	
Benz (a) anthracene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
Benzo (b) fluoranthrene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
Benzo (j) fluoranthrene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
Benzo (k) fluoranthrene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
Benzo (g,h,i) perylene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
Benzo (a) pyrene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
Benzo (e) pyrene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average			
Benzyl alcohol	Total Catch	ug	<	21.9	<	22.2	<	22.3	<	22.13		
	Concentration	ug/dscm	<	5.48	<	5.91	<	6.56	<	5.98		
	Emission Rate	lbs/hr	<	1.39E-05	<	1.43E-05	<	1.47E-05	<	1.43E-05		
	Emission Rate	g/s	<	1.75E-06	<	1.81E-06	<	1.85E-06	<	1.80E-06		
Benzaldehyde	Total Catch	ug	<	30	ND	<	25.3	<	30	ND	<	28.43
	Concentration	ug/dscm	<	7.51	ND	<	6.73	<	8.82	ND	<	7.69
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.63E-05	<	1.98E-05	ND	<	1.84E-05
	Emission Rate	g/s	<	2.39E-06	ND	<	2.05E-06	<	2.49E-06	ND	<	2.31E-06
Benzenethiol	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND			
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND			
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND			
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND			
Biphenyl	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND	
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND	
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND	
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	
bis(2-Chloroethoxy)-methane	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND	
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND	
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND	
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	
bis(2-Chloroethyl) ether	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND	
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND	
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND	
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	
bis(2-Chloroisopropyl) ether	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND	
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND	
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND	
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	
bis(2-Ethylhexyl)-phthalate	Total Catch	ug		36.5		30.8	<	37.5	<	34.93		
	Concentration	ug/dscm		9.14		8.19	<	11.03	<	9.45		
	Emission Rate	lbs/hr		2.31E-05		1.98E-05	<	2.47E-05	<	2.25E-05		
	Emission Rate	g/s		2.91E-06		2.49E-06	<	3.11E-06	<	2.84E-06		
4-Bromophenyl phenyl ether	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND	
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND	
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND	
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND	

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
Butyl benzyl phthalate	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
2-sec-Butyl-4,6-dinitro-phenol	Total Catch	ug	<	60	ND	<	60	ND	<	60	ND
	Concentration	ug/dscm	<	15.02	ND	<	15.96	ND	<	16.21	ND
	Emission Rate	lbs/hr	<	3.80E-05	ND	<	3.86E-05	ND	<	3.87E-05	ND
	Emission Rate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.88E-06	ND
4-Chloroaniline	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
Chlorobenzilate	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
4-Chloro-3-methylphenol	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	40.52	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.68E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.22E-05	ND
1-Chloronaphthalene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
2-Chloronaphthalene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
2-Chlorophenol	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
4-Chlorophenyl phenyl ether	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
Chrysene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
4,4'-DDE	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
Diallate	Total Catch	ug	<	60	ND	<	60	ND	<	60	ND
	Concentration	ug/dscm	<	15.02	ND	<	15.96	ND	<	16.21	ND
	Emission Rate	lbs/hr	<	3.80E-05	ND	<	3.86E-05	ND	<	3.87E-05	ND
	Emission Rate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.88E-06	ND
Dibenz(a,j)acridine	Total Catch	ug	<	60	ND	<	60	ND	<	60	ND
	Concentration	ug/dscm	<	15.02	ND	<	15.96	ND	<	16.21	ND
	Emission Rate	lbs/hr	<	3.80E-05	ND	<	3.86E-05	ND	<	3.87E-05	ND
	Emission Rate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.88E-06	ND
Dibenz(a,h)anthracene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
Dibenzofuran	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
1,2-Dibromo-3-chloropropane	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
Di-n-butyl phthalate	Total Catch	ug	<	33.1	<	28.5	<	27.0	<	29.53	
	Concentration	ug/dscm	<	8.29	<	7.58	<	7.94	<	7.94	
	Emission Rate	lbs/hr	<	2.10E-05	<	1.83E-05	<	1.78E-05	<	1.90E-05	
	Emission Rate	g/s	<	2.64E-06	<	2.31E-06	<	2.24E-06	<	2.40E-06	
1,2-Dichlorobenzene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average	
N,N'-Diisopropylcarbodiimide	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Concentration	ug/dscm								
	Emission Rate	lbs/hr								
	Emission Rate	g/s								
1,3-Dichlorobenzene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
1,4-Dichlorobenzene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
3,3'-Dichlorobenzidine	Total Catch	ug	< 60	ND						
	Concentration	ug/dscm	< 15.02	ND	< 15.96	ND	< 17.65	ND	< 16.21	ND
	Emission Rate	lbs/hr	< 3.80E-05	ND	< 3.86E-05	ND	< 3.95E-05	ND	< 3.87E-05	ND
	Emission Rate	g/s	< 4.79E-06	ND	< 4.86E-06	ND	< 4.98E-06	ND	< 4.88E-06	ND
2,4-Dichlorophenol	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
2,6-Dichlorophenol	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Diethyl phthalate	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Dihydrosafrole	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Concentration	ug/dscm								
	Emission Rate	lbs/hr								
	Emission Rate	g/s								
p-Dimethylaminoazobenzene	Total Catch	ug	< 60	ND						
	Concentration	ug/dscm	< 15.02	ND	< 15.96	ND	< 17.65	ND	< 16.21	ND
	Emission Rate	lbs/hr	< 3.80E-05	ND	< 3.86E-05	ND	< 3.95E-05	ND	< 3.87E-05	ND
	Emission Rate	g/s	< 4.79E-06	ND	< 4.86E-06	ND	< 4.98E-06	ND	< 4.88E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
7,12-Dimethylbenz(a)-anthracene	Total Catch	ug	<	60	ND	<	60	ND	<	60	ND
	Concentration	ug/dscm	<	15.02	ND	<	15.96	ND	<	17.65	ND
	Emission Rate	lbs/hr	<	3.80E-05	ND	<	3.86E-05	ND	<	3.95E-05	ND
	Emission Rate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.98E-06	ND
3,3'-Dimethylbenzidine	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	44.12	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.88E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND
a,a-Dimethylphenethyl-amine	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	44.12	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.88E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND
2,4-Dimethylphenol	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
Dimethyl phthalate	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
1,3-Dinitrobenzene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
4,6-Dinitro-2-methylphenol	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	44.12	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.88E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND
2,4-Dinitrophenol	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	44.12	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.88E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND
2,4-Dinitrotoluene	Total Catch	ug	<	30	ND	<	30	ND	<	33	<
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	9.71	<
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	2.17E-05	<
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.74E-06	<

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
2,6-Dinitrotoluene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
Dioxathion	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
Diphenylamine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
1,2-Diphenylhydrazine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
Di-n-octyl phthalate	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
Ethyl methanesulfonate	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
Ethyl parathion	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	40.52	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.68E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.22E-05	ND
Fluoranthene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
Fluorene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average	
Heptachlor	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Concentration	ug/dscm								
	Emission Rate	lbs/hr								
	Emission Rate	g/s								
Hexachlorobenzene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Hexachlorobutadiene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Hexachlorocyclopentadiene	Total Catch	ug	< 150	ND						
	Concentration	ug/dscm	< 37.55	ND	< 39.90	ND	< 44.12	ND	< 40.52	ND
	Emission Rate	lbs/hr	< 9.52E-05	ND	< 9.64E-05	ND	< 9.88E-05	ND	< 9.68E-05	ND
	Emission Rate	g/s	< 1.20E-05	ND	< 1.21E-05	ND	< 1.25E-05	ND	< 1.22E-05	ND
Hexachloroethane	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Hexachlorophene	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Concentration	ug/dscm								
	Emission Rate	lbs/hr								
	Emission Rate	g/s								
Hexachloropropene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Indeno(1,2,3-cd)pyrene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Isophorone	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
Isosafrole	Total Catch	ug	<	60	ND	<	60	ND	<	60	ND
	Concentration	ug/dscm	<	15.02	ND	<	15.96	ND	<	16.21	ND
	Emission Rate	lbs/hr	<	3.80E-05	ND	<	3.86E-05	ND	<	3.87E-05	ND
	Emission Rate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.88E-06	ND
Methapyrilene	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	40.52	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.68E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.22E-05	ND
Methoxychlor	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
Methylcyclohexane	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
3-Methylcholanthrene	Total Catch	ug	<	60	ND	<	60	ND	<	60	ND
	Concentration	ug/dscm	<	15.02	ND	<	15.96	ND	<	16.21	ND
	Emission Rate	lbs/hr	<	3.80E-05	ND	<	3.86E-05	ND	<	3.87E-05	ND
	Emission Rate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.88E-06	ND
Methyl methanesulfonate	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
2-Methylnapthalene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
2-Methyl-5-nitroaniline	Total Catch	ug	<	60	ND	<	60	ND	<	60	ND
	Concentration	ug/dscm	<	15.02	ND	<	15.96	ND	<	16.21	ND
	Emission Rate	lbs/hr	<	3.80E-05	ND	<	3.86E-05	ND	<	3.87E-05	ND
	Emission Rate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.88E-06	ND
2-Methylphenol (o-Cresol)	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average	
3-Methylphenol (m-Cresol)	Total Catch	ug	< 150	ND						
	Concentration	ug/dscm	< 37.55	ND	< 39.90	ND	< 44.12	ND	< 40.52	ND
	Emission Rate	lbs/hr	< 9.52E-05	ND	< 9.64E-05	ND	< 9.88E-05	ND	< 9.68E-05	ND
	Emission Rate	g/s	< 1.20E-05	ND	< 1.21E-05	ND	< 1.25E-05	ND	< 1.22E-05	ND
Diisopropylmethylphosphonate	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
4-Methylphenol (p-Cresol)	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
Pentachloroethane	Total Catch	ug	< 150	ND						
	Concentration	ug/dscm	< 37.55	ND	< 39.90	ND	< 44.12	ND	< 40.52	ND
	Emission Rate	lbs/hr	< 9.52E-05	ND	< 9.64E-05	ND	< 9.88E-05	ND	< 9.68E-05	ND
	Emission Rate	g/s	< 1.20E-05	ND	< 1.21E-05	ND	< 1.25E-05	ND	< 1.22E-05	ND
Naphthalene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
1,4-Naphthoquinone	Total Catch	ug	< 150	ND						
	Concentration	ug/dscm	< 37.55	ND	< 39.90	ND	< 44.12	ND	< 40.52	ND
	Emission Rate	lbs/hr	< 9.52E-05	ND	< 9.64E-05	ND	< 9.88E-05	ND	< 9.68E-05	ND
	Emission Rate	g/s	< 1.20E-05	ND	< 1.21E-05	ND	< 1.25E-05	ND	< 1.22E-05	ND
1-Naphthylamine	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
2-Naphthylamine	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
5-Nitroacenaphthene	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
2-Nitroaniline	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	44.12	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.88E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND
3-Nitroaniline	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	44.12	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.88E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND
4-Nitroaniline	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	44.12	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.88E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND
Nitrobenzene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
2-Nitrophenol	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
4-Nitrophenol	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	44.12	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.88E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND
4-Nitroquinoline-1-oxide	Total Catch	ug	<	300	ND	<	300	ND	<	300	ND
	Concentration	ug/dscm	<	75.10	ND	<	79.81	ND	<	88.24	ND
	Emission Rate	lbs/hr	<	1.90E-04	ND	<	1.93E-04	ND	<	1.98E-04	ND
	Emission Rate	g/s	<	2.39E-05	ND	<	2.43E-05	ND	<	2.49E-05	ND
N-Nitroso-di-n-butylamine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND
N-Nitrosodiethylamine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.82	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.98E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.49E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
N-Nitrosodimethylamine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
N-Nitrosomethylethylamine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
N-Nitrosodiphenylamine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
N-Nitroso-di-n-propylamine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
N-Nitrosomorpholine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
N-Nitrosopiperidine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
N-Nitrosopyrrolidine	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
Pentachlorobenzene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
Pentachloronitrobenzene	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	40.52	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.68E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.22E-05	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
Pentachlorophenol	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	40.52	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.68E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.22E-05	ND
Perylene	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
Phenacetin	Total Catch	ug	<	60	ND	<	60	ND	<	60	ND
	Concentration	ug/dscm	<	15.02	ND	<	15.96	ND	<	16.21	ND
	Emission Rate	lbs/hr	<	3.80E-05	ND	<	3.86E-05	ND	<	3.87E-05	ND
	Emission Rate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.88E-06	ND
Phenanthrene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND
Phenol	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	40.52	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.68E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.22E-05	ND
1,4-Phenylenediamine	Total Catch	ug	<	300	ND	<	300	ND	<	300	ND
	Concentration	ug/dscm	<	75.10	ND	<	79.81	ND	<	81.05	ND
	Emission Rate	lbs/hr	<	1.90E-04	ND	<	1.93E-04	ND	<	1.94E-04	ND
	Emission Rate	g/s	<	2.39E-05	ND	<	2.43E-05	ND	<	2.44E-05	ND
2-Picoline	Total Catch	ug	<	60	ND	<	60	ND	<	60	ND
	Concentration	ug/dscm	<	15.02	ND	<	15.96	ND	<	16.21	ND
	Emission Rate	lbs/hr	<	3.80E-05	ND	<	3.86E-05	ND	<	3.87E-05	ND
	Emission Rate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.88E-06	ND
Pronamide	Total Catch	ug	<	60	ND	<	60	ND	<	60	ND
	Concentration	ug/dscm	<	15.02	ND	<	15.96	ND	<	16.21	ND
	Emission Rate	lbs/hr	<	3.80E-05	ND	<	3.86E-05	ND	<	3.87E-05	ND
	Emission Rate	g/s	<	4.79E-06	ND	<	4.86E-06	ND	<	4.88E-06	ND
Pyrene	Total Catch	ug	<	30	ND	<	30	ND	<	30	ND
	Concentration	ug/dscm	<	7.51	ND	<	7.98	ND	<	8.10	ND
	Emission Rate	lbs/hr	<	1.90E-05	ND	<	1.93E-05	ND	<	1.94E-05	ND
	Emission Rate	g/s	<	2.39E-06	ND	<	2.43E-06	ND	<	2.44E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average	
Pyridine	Total Catch	ug	< 60	ND						
	Concentration	ug/dscm	< 15.02	ND	< 15.96	ND	< 17.65	ND	< 16.21	ND
	Emission Rate	lbs/hr	< 3.80E-05	ND	< 3.86E-05	ND	< 3.95E-05	ND	< 3.87E-05	ND
	Emission Rate	g/s	< 4.79E-06	ND	< 4.86E-06	ND	< 4.98E-06	ND	< 4.88E-06	ND
Quinoline	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
Safrole	Total Catch	ug	< 60	ND						
	Concentration	ug/dscm	< 15.02	ND	< 15.96	ND	< 17.65	ND	< 16.21	ND
	Emission Rate	lbs/hr	< 3.80E-05	ND	< 3.86E-05	ND	< 3.95E-05	ND	< 3.87E-05	ND
	Emission Rate	g/s	< 4.79E-06	ND	< 4.86E-06	ND	< 4.98E-06	ND	< 4.88E-06	ND
1,2,4,5-Tetrachloro-benzene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
2,3,4,6-Tetrachlorophenol	Total Catch	ug	< 150	ND						
	Concentration	ug/dscm	< 37.55	ND	< 39.90	ND	< 44.12	ND	< 40.52	ND
	Emission Rate	lbs/hr	< 9.52E-05	ND	< 9.64E-05	ND	< 9.88E-05	ND	< 9.68E-05	ND
	Emission Rate	g/s	< 1.20E-05	ND	< 1.21E-05	ND	< 1.25E-05	ND	< 1.22E-05	ND
o-Toluidine	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
p-Toluidine	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND	
1,2,4-Trichlorobenzene	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND
2,4,5-Trichlorophenol	Total Catch	ug	< 30	ND						
	Concentration	ug/dscm	< 7.51	ND	< 7.98	ND	< 8.82	ND	< 8.10	ND
	Emission Rate	lbs/hr	< 1.90E-05	ND	< 1.93E-05	ND	< 1.98E-05	ND	< 1.94E-05	ND
	Emission Rate	g/s	< 2.39E-06	ND	< 2.43E-06	ND	< 2.49E-06	ND	< 2.44E-06	ND

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
2,4,6-Trichlorophenol	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	44.12	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.88E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND
1,3,5-Trinitrobenzene	Total Catch	ug	<	150	ND	<	150	ND	<	150	ND
	Concentration	ug/dscm	<	37.55	ND	<	39.90	ND	<	44.12	ND
	Emission Rate	lbs/hr	<	9.52E-05	ND	<	9.64E-05	ND	<	9.88E-05	ND
	Emission Rate	g/s	<	1.20E-05	ND	<	1.21E-05	ND	<	1.25E-05	ND
Tributylamine	Total Catch	ug	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Concentration	ug/dscm	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	lbs/hr	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
	Emission Rate	g/s	NOT FOUND		NOT FOUND		NOT FOUND		NOT FOUND		
Butanoic acid, methyl ester TIC: 623-42-7	Total Catch	ug	11.1		6.4		11		9.5		
	Concentration	ug/dscm	2.78		1.70		3.24		2.57		
	Emission Rate	lbs/hr	7.03E-06		4.11E-06		7.25E-06		6.13E-06		
	Emission Rate	g/s	8.85E-07		5.18E-07		9.13E-07		7.72E-07		
Toluene TIC: 108-88-3	Total Catch	ug	105.2		44.7		173		107.63		
	Concentration	ug/dscm	26.33		11.89		50.88		29.70		
	Emission Rate	lbs/hr	6.66E-05		2.87E-05		1.14E-04		6.98E-05		
	Emission Rate	g/s	8.39E-06		3.62E-06		1.44E-05		8.79E-06		
Dimethyl sulfoxide TIC: 67-68-5	Total Catch	ug	107		238		217		187.33		
	Concentration	ug/dscm	26.79		63.31		63.83		51.31		
	Emission Rate	lbs/hr	6.77E-05		1.53E-04		1.43E-04		1.21E-04		
	Emission Rate	g/s	8.53E-06		1.93E-05		1.80E-05		1.53E-05		
Decane TIC: 124-18-5	Total Catch	ug	42.4		40		36.2		39.53		
	Concentration	ug/dscm	10.61		10.64		10.65		10.63		
	Emission Rate	lbs/hr	2.68E-05		2.57E-05		2.39E-05		2.55E-05		
	Emission Rate	g/s	3.38E-06		3.24E-06		3.01E-06		3.21E-06		
1-Docosene TIC: 1599-67-3	Total Catch	ug	100		NO TIC		NO TIC		100		
	Concentration	ug/dscm	25.03		NO TIC		NO TIC		25.03		
	Emission Rate	lbs/hr	6.33E-05		NO TIC		NO TIC		6.33E-05		
	Emission Rate	g/s	7.98E-06		NO TIC		NO TIC		7.98E-06		
13-Docosenamide, (z)- TIC: 112-84-5	Total Catch	ug	13.5		5.3		NO TIC		9.4		
	Concentration	ug/dscm	3.38		1.41		NO TIC		2.39		
	Emission Rate	lbs/hr	8.55E-06		3.41E-06		NO TIC		5.98E-06		
	Emission Rate	g/s	1.08E-06		4.29E-07		NO TIC		7.53E-07		

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1	C4bR4	C4bR5	Average
Cyclopropane, nonyl- TIC: 74663-85-7	Total Catch	ug	12	8	7.7	9.23
	Concentration	ug/dscm	3.00	2.13	2.26	2.47
	Emission Rate	lbs/hr	7.60E-06	5.14E-06	5.07E-06	5.94E-06
	Emission Rate	g/s	9.57E-07	6.48E-07	6.39E-07	7.48E-07
Tridecanal TIC: 10486-19-8	Total Catch	ug	12	NO TIC	NO TIC	12
	Concentration	ug/dscm	3.00			3.00
	Emission Rate	lbs/hr	7.60E-06			7.60E-06
	Emission Rate	g/s	9.57E-07			9.57E-07
Tetradecanal TIC: 124-25-4	Total Catch	ug	12	8.4	NO TIC	10.2
	Concentration	ug/dscm	3.00	2.23		2.62
	Emission Rate	lbs/hr	7.60E-06	5.40E-06		6.50E-06
	Emission Rate	g/s	9.57E-07	6.80E-07		8.19E-07
13-Oxabecyclo [10.1.0] tridecane TIC: 286-99-7	Total Catch	ug	13	NO TIC	NO TIC	13
	Concentration	ug/dscm	3.25			3.25
	Emission Rate	lbs/hr	8.23E-06			8.23E-06
	Emission Rate	g/s	1.04E-06			1.04E-06
Dibutyl phthalate TIC: 84-74-2	Total Catch	ug	56	NO TIC	NO TIC	56
	Concentration	ug/dscm	14.02			14.02
	Emission Rate	lbs/hr	3.54E-05			3.54E-05
	Emission Rate	g/s	4.47E-06			4.47E-06
N-hexadecanoic acid TIC: 57-10-3	Total Catch	ug	12	11	15.1	12.7
	Concentration	ug/dscm	3.00	2.93	4.44	3.46
	Emission Rate	lbs/hr	7.60E-06	7.07E-06	9.95E-06	8.21E-06
	Emission Rate	g/s	9.57E-07	8.91E-07	1.25E-06	1.03E-06
Eicosane TIC: 112-95-8	Total Catch	ug	13.4	6.5	NO TIC	9.95
	Concentration	ug/dscm	3.35	1.73		2.54
	Emission Rate	lbs/hr	8.48E-06	4.18E-06		6.33E-06
	Emission Rate	g/s	1.07E-06	5.26E-07		7.98E-07
5-Eicosene, (e)- TIC: 74685-30-6	Total Catch	ug	7.4	NO TIC	NO TIC	7.4
	Concentration	ug/dscm	1.85			1.85
	Emission Rate	lbs/hr	4.68E-06			4.68E-06
	Emission Rate	g/s	5.90E-07			5.90E-07
9-Octadecenamide, (z)- TIC: 301-02-0	Total Catch	ug	9.7	NO TIC	17.1	13.4
	Concentration	ug/dscm	2.43		5.03	3.73
	Emission Rate	lbs/hr	6.14E-06		1.13E-05	8.70E-06
	Emission Rate	g/s	7.74E-07		1.42E-06	1.10E-06

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1	C4bR4	C4bR5	Average
1-Hexacosanol TIC: 506-52-5	Total Catch	ug	29	NO TIC	NO TIC	29
	Concentration	ug/dscm	7.26			7.26
	Emission Rate	lbs/hr	1.84E-05			1.84E-05
	Emission Rate	g/s	2.31E-06			2.31E-06
Z-2-octadecen-1-ol TIC: 100013-11-1	Total Catch	ug	NO TIC	8.3	NO TIC	8.3
	Concentration	ug/dscm		2.21		2.21
	Emission Rate	lbs/hr		5.34E-06		5.34E-06
	Emission Rate	g/s		6.72E-07		6.72E-07
Octadecane TIC: 593-45-3	Total Catch	ug	NO TIC	7.4	NO TIC	7.4
	Concentration	ug/dscm		1.97		1.97
	Emission Rate	lbs/hr		4.76E-06		4.76E-06
	Emission Rate	g/s		5.99E-07		5.99E-07
Isopropyl myristate TIC: 110-27-0	Total Catch	ug	NO TIC	6.5	NO TIC	6.5
	Concentration	ug/dscm		1.73		1.73
	Emission Rate	lbs/hr		4.18E-06		4.18E-06
	Emission Rate	g/s		5.26E-07		5.26E-07
Phthalic acid, 6-ethyl-3-octyl TIC: 100031-51-7	Total Catch	ug	NO TIC	28	NO TIC	28
	Concentration	ug/dscm		7.45		7.45
	Emission Rate	lbs/hr		1.80E-05		1.80E-05
	Emission Rate	g/s		2.27E-06		2.27E-06
1-Octadecanol TIC: 112-92-5	Total Catch	ug	NO TIC	100	6.1	53.05
	Concentration	ug/dscm		26.60	1.79	14.20
	Emission Rate	lbs/hr		6.43E-05	4.02E-06	3.41E-05
	Emission Rate	g/s		8.10E-06	5.06E-07	4.30E-06
17-Pentatriacontene TIC: 6971-40-0	Total Catch	ug	NO TIC	9.1	NO TIC	9.1
	Concentration	ug/dscm		2.42		2.42
	Emission Rate	lbs/hr		5.85E-06		5.85E-06
	Emission Rate	g/s		7.37E-07		7.37E-07
Cyclotetracosane TIC: 297-03-0	Total Catch	ug	NO TIC	35	NO TIC	35
	Concentration	ug/dscm		9.31		9.31
	Emission Rate	lbs/hr		2.25E-05		2.25E-05
	Emission Rate	g/s		2.83E-06		2.83E-06
1-Triacontanol TIC: 593-50-0	Total Catch	ug	NO TIC	10	NO TIC	10
	Concentration	ug/dscm		2.66		2.66
	Emission Rate	lbs/hr		6.43E-06		6.43E-06
	Emission Rate	g/s		8.10E-07		8.10E-07

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1	C4bR4	C4bR5	Average
Octadecanoic acid, methyl este TIC: 112-61-8	Total Catch	ug	NO TIC	4	NO TIC	4
	Concentration	ug/dscm		1.06		1.06
	Emission Rate	lbs/hr		2.57E-06		2.57E-06
	Emission Rate	g/s		3.24E-07		3.24E-07
3-Eicosene, (e)- TIC: 74685-33-9	Total Catch	ug	NO TIC	5.5	NO TIC	5.5
	Concentration	ug/dscm		1.46		1.46
	Emission Rate	lbs/hr		3.54E-06		3.54E-06
	Emission Rate	g/s		4.45E-07		4.45E-07
Hexadecanal TIC: 629-80-1	Total Catch	ug	NO TIC	NO TIC	6.7	6.7
	Concentration	ug/dscm			1.97	1.97
	Emission Rate	lbs/hr			4.41E-06	4.41E-06
	Emission Rate	g/s			5.56E-07	5.56E-07
Heptadecane TIC: 629-78-1	Total Catch	ug	NO TIC	NO TIC	7.9	7.9
	Concentration	ug/dscm			2.32	2.32
	Emission Rate	lbs/hr			5.21E-06	5.21E-06
	Emission Rate	g/s			6.56E-07	6.56E-07
Benzene, 1,1'-[1,2-ethanediylb TIC: 104-66-5	Total Catch	ug	NO TIC	NO TIC	8	8
	Concentration	ug/dscm			2.35	2.35
	Emission Rate	lbs/hr			5.27E-06	5.27E-06
	Emission Rate	g/s			6.64E-07	6.64E-07
Cyclotetradecane TIC: 295-17-0	Total Catch	ug	NO TIC	NO TIC	31	31
	Concentration	ug/dscm			9.12	9.12
	Emission Rate	lbs/hr			2.04E-05	2.04E-05
	Emission Rate	g/s			2.57E-06	2.57E-06
Heneicosane TIC: 629-94-7	Total Catch	ug	NO TIC	NO TIC	5.3	5.3
	Concentration	ug/dscm			1.56	1.56
	Emission Rate	lbs/hr			3.49E-06	3.49E-06
	Emission Rate	g/s			4.40E-07	4.40E-07
1-Eicosanol TIC: 629-96-9	Total Catch	ug	NO TIC	NO TIC	95	95
	Concentration	ug/dscm			27.94	27.94
	Emission Rate	lbs/hr			6.26E-05	6.26E-05
	Emission Rate	g/s			7.89E-06	7.89E-06
1-Nonadecene TIC: 18435-45-5	Total Catch	ug	NO TIC	NO TIC	6.9	6.9
	Concentration	ug/dscm			2.03	2.03
	Emission Rate	lbs/hr			4.55E-06	4.55E-06
	Emission Rate	g/s			5.73E-07	5.73E-07

Table 8-4: Semivolatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1	C4bR4	C4bR5	Average
Pentafluoropropionic acid, oct TIC: 100028-00-7	Total Catch	ug	NO TIC	NO TIC	8.8	8.8
	Concentration	ug/dscm			2.59	2.59
	Emission Rate	lbs/hr			5.80E-06	5.80E-06
	Emission Rate	g/s			7.31E-07	7.31E-07
Phosphine imide, p,p,p-triphen TIC: 2240-47-3	Total Catch	ug	NO TIC	NO TIC	6.8	6.8
	Concentration	ug/dscm			2.00	2.00
	Emission Rate	lbs/hr			4.48E-06	4.48E-06
	Emission Rate	g/s			5.65E-07	5.65E-07
1-Hexadecanal TIC: 36653-82-4	Total Catch	ug	NO TIC	6.7	NO TIC	6.7
	Concentration	ug/dscm		1.78		1.78
	Emission Rate	lbs/hr		4.31E-06		4.31E-06
	Emission Rate	g/s		5.43E-07		5.43E-07
Cyclooctacosane TIC: 297-24-5	Total Catch	ug	NO TIC	NO TIC	33	33
	Concentration	ug/dscm			9.71	9.71
	Emission Rate	lbs/hr			2.17E-05	2.17E-05
	Emission Rate	g/s			2.74E-06	2.74E-06

Notes:

- (A) Blank corrections have not been made to these data.
- (B) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported. When identified, TICs are reported at the reported estimated concentrations.
- (C) "NOT FOUND" indicates that a non-calibrated target compound was not found using an ion-specific forward library search. An estimated RL or DL is not available for these compounds.
- (D) Note that only TICs detected in multiple runs are averaged. If detected in only a single run, that value is reported in the "Average" column. "NO TIC" is reported for the runs in which the TIC was not found. In instances where a TIC was identified more than once in one (1) or more sample fractions, the reported value represents the sum of all reported values.

Table 8-5: Dioxin/Furan Emissions Summary

Parameter	Units	C4bR1			CAA Permit Limit
Sample Volume	dscf	141.772			
Gas Flow Rate	dscfm	669			
O ₂ Level	%	13.3			
Congeners	TEF [EPA/100/R-10/005]	Measured Catch (pg)	Weighted Catch (pg)	Emission Rate (g/s)	
2,3,7,8-TetraCDD	1.0	< 3.50	ND	3.5	---
Total 2,3,7,8-TetraCDD	---	< 3.50	ND	---	2.75E-13
Total TetraCDD	---	< 3.50	ND	---	---
1,2,3,7,8 PentaCDD	1.0	< 5.7	ND	5.7	---
Total 2,3,7,8-PentaCDD	---	< 5.7	ND	---	4.48E-13
Total PentaCDD	---	< 5.7	ND	---	---
1,2,3,4,7,8 HexaCDD	0.1	< 4.10	ND	0.41	---
1,2,3,6,7,8 HexaCDD	0.1	< 3.50	ND	0.35	---
1,2,3,7,8,9 HexaCDD	0.1	< 3.5	ND	0.35	---
Total 2,3,7,8-HexaCDD	---	< 11.10	ND	---	8.73E-13
Total HexaCDD	---	< 4.1	ND	---	---
1,2,3,4,6,7,8 HeptaCDD	0.01	< 16.1	ND	0.161	---
Total 2,3,7,8-HeptaCDD	---	< 16.1	ND	---	1.27E-12
Total HeptaCDD	---	< 16.1	ND	---	---
Total OctaCDD	0.0003	< 164.0		0.0492	1.29E-11
Sum Concentration	pg ng-TEQ/dscm @ 7% O ₂			10.5202 0.0048	
2,3,7,8 TetraCDF	0.1	< 14.1		1.41	---
Total 2,3,7,8-TetraCDF	---	< 14.1		---	1.11E-12
Total TetraCDF	---	< 14.1		---	---
1,2,3,7,8 PentaCDF	0.03	< 9.7	ND	0.291	---
2,3,4,7,8 PentaCDF	0.3	< 3.7	ND	1.11	---
Total 2,3,7,8-PentaCDF	---	< 13.4	ND	---	1.05E-12
Total PentaCDF	---	< 9.7	ND	---	---
1,2,3,4,7,8 HexaCDF	0.1	< 15.1	ND	1.51	---
1,2,3,6,7,8 HexaCDF	0.1	< 3.4	ND	0.34	---
2,3,4,6,7,8 HexaCDF	0.1	< 3.7	ND	0.37	---
1,2,3,7,8,9 HexaCDF	0.1	< 3.3	ND	0.33	---
Total 2,3,7,8-HexaCDF	---	< 25.5	ND	---	2.01E-12
Total HexaCDF	---	< 15.1	ND	---	---
1,2,3,4,6,7,8 HeptaCDF	0.01	< 15.3	ND	0.153	---
1,2,3,4,7,8,9 HeptaCDF	0.01	< 9.3	ND	0.093	---
Total 2,3,7,8-HeptaCDF	---	< 24.6	ND	---	1.93E-12
Total HeptaCDF	---	< 18.3	ND	---	---
Total OctaCDF	0.0003	< 38	ND	0.0114	2.99E-12
Sum Concentration	pg ng-TEQ/dscm @ 7% O ₂			5.6184 0.0026	
Total Dioxins/Furans	ng-TEQ/dscm @ 7% O ₂			0.0074	0.20

Table 8-5: Dioxin/Furan Emissions Summary (Continued)

Parameter	Units	C4bR4			CAA Permit Limit
Sample Volume	dscf	134,909			
Gas Flow Rate	dscfm	639			
O ₂ Level	%	13.1			
Congeners	TEF [EPA/100/R-10/005]	Measured Catch (pg)	Weighted Catch (pg)	Emission Rate (g/s)	
2,3,7,8-TetraCDD	1.0	< 2.7	ND	2.7	---
Total 2,3,7,8-TetraCDD	---	< 2.7	ND	---	2.13E-13
Total TetraCDD	---	< 3.2	ND	---	---
1,2,3,7,8-PentaCDD	1.0	< 2.9	ND	2.9	---
Total 2,3,7,8-PentaCDD	---	< 2.9	ND	---	2.29E-13
Total PentaCDD	---	< 2.9	ND	---	---
1,2,3,4,7,8-HexaCDD	0.1	< 3.8	ND	0.38	---
1,2,3,6,7,8-HexaCDD	0.1	< 3.2	ND	0.32	---
1,2,3,7,8,9-HexaCDD	0.1	< 3.2	ND	0.32	---
Total 2,3,7,8-HexaCDD	---	< 10.2	ND	---	8.05E-13
Total HexaCDD	---	< 3.8	ND	---	---
1,2,3,4,6,7,8-HeptaCDD	0.01	< 8.0	ND	0.080	---
Total 2,3,7,8-HeptaCDD	---	< 8.0	ND	---	6.32E-13
Total HeptaCDD	---	< 9.2	ND	---	---
Total OctaCDD	0.0003	< 32	ND	0.0096	2.53E-12
Sum Concentration	pg ng-TEQ/dscm @ 7% O ₂			6.7096 0.0031	
2,3,7,8-TetraCDF	0.1	< 16.7		1.67	---
Total 2,3,7,8-TetraCDF	---	< 16.7		---	1.32E-12
Total TetraCDF	---	< 16.7		---	---
1,2,3,7,8-PentaCDF	0.03	< 5.2	ND	0.156	---
2,3,4,7,8-PentaCDF	0.3	< 4.1	ND	1.23	---
Total 2,3,7,8-PentaCDF	---	< 9.3	ND	---	7.34E-13
Total PentaCDF	---	< 7.4	ND	---	---
1,2,3,4,7,8-HexaCDF	0.1	< 14.0	ND	1.4	---
1,2,3,6,7,8-HexaCDF	0.1	< 2.5	ND	0.25	---
2,3,4,6,7,8-HexaCDF	0.1	< 3.4	ND	0.34	---
1,2,3,7,8,9-HexaCDF	0.1	< 3.1	ND	0.31	---
Total 2,3,7,8-HexaCDF	---	< 23.0	ND	---	1.82E-12
Total HexaCDF	---	< 14.0	ND	---	---
1,2,3,4,6,7,8-HeptaCDF	0.01	< 11.8	ND	0.118	---
1,2,3,4,7,8,9-HeptaCDF	0.01	< 8.9	ND	0.089	---
Total 2,3,7,8-HeptaCDF	---	< 20.7	ND	---	1.63E-12
Total HeptaCDF	---	< 15.2	ND	---	---
Total OctaCDF	0.0003	< 33	ND	0.0099	2.61E-12
Sum Concentration	pg ng-TEQ/dscm @ 7% O ₂			5.5729 0.0026	
Total Dioxins/Furans	ng-TEQ/dscm @ 7% O ₂			0.0057	0.20

Table 8-5: Dioxin/Furan Emissions Summary (Continued)

Parameter	Units	C4bR5			CAA Permit Limit
Sample Volume	dscf	120.088			
Gas Flow Rate	dscfm	590			
O ₂ Level	%	13.4			
Congeners	TEF [EPA/100/R-10/005]	Measured Catch (pg)	Weighted Catch (pg)	Emission Rate (g/s)	
2,3,7,8-TetraCDD	1.0	< 3.1	ND 3.1		---
Total 2,3,7,8-TetraCDD	---	< 3.1	ND ---	2.54E-13	---
Total TetraCDD	---	< 3.1	ND ---		---
1,2,3,7,8-PentaCDD	1.0	< 3.1	ND 3.1		---
Total 2,3,7,8-PentaCDD	---	< 3.1	ND ---	2.54E-13	---
Total PentaCDD	---	< 3.1	ND ---		---
1,2,3,4,7,8-HexaCDD	0.1	< 3.12	ND 0.312		---
1,2,3,6,7,8-HexaCDD	0.1	< 2.69	ND 0.269		---
1,2,3,7,8,9-HexaCDD	0.1	< 2.68	ND 0.268		---
Total 2,3,7,8-HexaCDD	---	< 8.49	ND ---	6.95E-13	---
Total HexaCDD	---	< 3.12	ND ---		---
1,2,3,4,6,7,8-HeptaCDD	0.01	< 7.6	ND 0.076		---
Total 2,3,7,8-HeptaCDD	---	< 7.6	ND ---	6.22E-13	---
Total HeptaCDD	---	< 9.7	ND ---		---
Total OctaCDD	0.0003	< 28	ND 0.0084	2.29E-12	---
Sum Concentration	pg ng-TEQ/dscm @ 7% O ₂		7.1334 0.0039		
2,3,7,8-TetraCDF	0.1	< 17.7	1.77		---
Total 2,3,7,8-TetraCDF	---	< 17.7	---	1.45E-12	---
Total TetraCDF	---	< 17.7	---		---
1,2,3,7,8-PentaCDF	0.03	< 10.7	ND 0.321		---
2,3,4,7,8-PentaCDF	0.3	< 3.4	ND 1.02		---
Total 2,3,7,8-PentaCDF	---	< 14.1	ND ---	1.15E-12	---
Total PentaCDF	---	< 10.7	ND ---		---
1,2,3,4,7,8-HexaCDF	0.1	< 16.6	ND 1.66		---
1,2,3,6,7,8-HexaCDF	0.1	< 3.4	ND 0.34		---
2,3,4,6,7,8-HexaCDF	0.1	< 4.2	ND 0.42		---
1,2,3,7,8,9-HexaCDF	0.1	< 3.5	ND 0.35		---
Total 2,3,7,8-HexaCDF	---	< 27.7	ND ---	2.27E-12	---
Total HexaCDF	---	< 16.6	ND ---		---
1,2,3,4,6,7,8-HeptaCDF	0.01	< 10.4	ND 0.104		---
1,2,3,4,7,8,9-HeptaCDF	0.01	< 9.6	ND 0.096		---
Total 2,3,7,8-HeptaCDF	---	< 20	ND ---	1.64E-12	---
Total HeptaCDF	---	< 11.8	ND ---		---
Total OctaCDF	0.0003	< 20.6	ND 0.00618	1.69E-12	---
Sum Concentration	pg ng-TEQ/dscm @ 7% O ₂		6.08718 0.0033		
Total Dioxins/Furans	ng-TEQ/dscm @ 7% O ₂		0.0072		0.20

Table 8-5: Dioxin/Furan Emissions Summary (Continued)

Parameter	Units	Average			CAA Permit Limit
Sample Volume	dscf	132.26			
Gas Flow Rate	dscfm	632.67			
O ₂ Level	%	13.27			
Congeners	TEF [EPA/100/R-10/005]	Measured Catch (pg)	Weighted Catch (pg)	Emission Rate (g/s)	CAA Permit Limit
2,3,7,8-TetraCDD	1.0	< 3.10	ND 3.10		---
Total 2,3,7,8-TetraCDD	---	< 3.10	ND ---	2.47E-13	---
Total TetraCDD	---	< 3.27	ND ---		---
1,2,3,7,8-PentaCDD	1.0	< 3.90	ND 3.90		---
Total 2,3,7,8-PentaCDD	---	< 3.90	ND ---	3.10E-13	---
Total PentaCDD	---	< 3.90	ND ---		---
1,2,3,4,7,8-HexaCDD	0.1	< 3.67	ND 0.37		---
1,2,3,6,7,8-HexaCDD	0.1	< 3.13	ND 0.31		---
1,2,3,7,8,9-HexaCDD	0.1	< 3.13	ND 0.31		---
Total 2,3,7,8-HexaCDD	---	< 9.93	ND ---	7.91E-13	---
Total HexaCDD	---	< 3.67	ND ---		---
1,2,3,4,6,7,8-HeptaCDD	0.01	< 10.57	ND 0.11		---
Total 2,3,7,8-HeptaCDD	---	< 10.57	ND ---	8.40E-13	---
Total HeptaCDD	---	< 11.67	ND ---		---
Total OctaCDD	0.0003	< 74.67	0.022	5.91E-12	---
Sum Concentration	pg ng-TEQ/dscm @ 7% O ₂		8.121 0.0039		
2,3,7,8-TetraCDF	0.1	< 16.17	1.62		---
Total 2,3,7,8-TetraCDF	---	< 16.17	---	1.29E-12	---
Total TetraCDF	---	< 16.17	---		---
1,2,3,7,8-PentaCDF	0.03	< 8.53	ND 0.26		---
2,3,4,7,8-PentaCDF	0.3	< 3.73	ND 1.12		---
Total 2,3,7,8-PentaCDF	---	< 12.27	ND ---	9.81E-13	---
Total PentaCDF	---	< 9.27	ND ---		---
1,2,3,4,7,8-HexaCDF	0.1	< 15.23	ND 1.52		---
1,2,3,6,7,8-HexaCDF	0.1	< 3.10	ND 0.31		---
2,3,4,6,7,8-HexaCDF	0.1	< 3.77	ND 0.38		---
1,2,3,7,8,9-HexaCDF	0.1	< 3.30	ND 0.33		---
Total 2,3,7,8-HexaCDF	---	< 25.40	ND ---	2.03E-12	---
Total HexaCDF	---	< 15.23	ND ---		---
1,2,3,4,6,7,8-HeptaCDF	0.01	< 12.50	ND 0.13		---
1,2,3,4,7,8,9-HeptaCDF	0.01	< 9.27	ND 0.093		---
Total 2,3,7,8-HeptaCDF	---	< 21.77	ND ---	1.74E-12	---
Total HeptaCDF	---	< 15.10	ND ---		---
Total OctaCDF	0.0003	< 30.53	ND 0.0092	2.43E-12	---
Sum Concentration	pg ng-TEQ/dscm @ 7% O ₂		5.7595 0.0028		
Total Dioxins/Furans	ng-TEQ/dscm @ 7% O ₂		0.0067		0.20

Notes:

- (A) Blank corrections have not been made to these data.
- (B) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

Table 8-6: Volatile Organic Emissions Summary

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
Sample Volume		liters	78.41		78.64		78.45		78.50		
Gas Flow Rate		dscfm	673.33		637.50		583.67		631.50		
Acetone	Total Catch	ug	<	2.62	<	2.51	<	2.63	<	2.59	
	Concentration	ug/dscm	<	33.37	<	31.95	<	33.50	<	32.94	
	Emission Rate	lbs/hr	<	8.42E-05	<	7.63E-05	<	7.32E-05	<	7.79E-05	
	Emission Rate	g/s	<	1.06E-05	<	9.61E-06	<	9.23E-06	<	9.82E-06	
Benzene	Total Catch	ug	<	0.080	<	0.088	<	0.095	<	0.09	
	Concentration	ug/dscm	<	1.02	<	1.12	<	1.21	<	1.12	
	Emission Rate	lbs/hr	<	2.58E-06	<	2.69E-06	<	2.65E-06	<	2.64E-06	
	Emission Rate	g/s	<	3.26E-07	<	3.38E-07	<	3.34E-07	<	3.33E-07	
Bromodichloromethane	Total Catch	ug	<	0.22	<	0.28	<	0.21	<	0.24	
	Concentration	ug/dscm	<	2.84	<	3.62	<	2.67	<	3.05	
	Emission Rate	lbs/hr	<	7.16E-06	<	8.65E-06	<	5.84E-06	<	7.22E-06	
	Emission Rate	g/s	<	9.02E-07	<	1.09E-06	<	7.36E-07	<	9.09E-07	
Bromoform	Total Catch	ug	<	0.24	ND	<	0.24	ND	<	0.24	ND
	Concentration	ug/dscm	<	3.08	ND	<	3.08	ND	<	3.08	ND
	Emission Rate	lbs/hr	<	7.77E-06	ND	<	7.34E-06	ND	<	6.73E-06	ND
	Emission Rate	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	8.49E-07	ND
Bromomethane	Total Catch	ug	<	0.48	ND	<	0.48	ND	<	0.48	ND
	Concentration	ug/dscm	<	6.16	ND	<	6.15	ND	<	6.16	ND
	Emission Rate	lbs/hr	<	1.55E-05	ND	<	1.47E-05	ND	<	1.35E-05	ND
	Emission Rate	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND
1,3-Butadiene	Total Catch	ug	<	0.31	<	0.15	<	0.22	<	0.23	
	Concentration	ug/dscm	<	3.95	<	1.90	<	2.80	<	2.88	
	Emission Rate	lbs/hr	<	9.96E-06	<	4.54E-06	<	6.12E-06	<	6.87E-06	
	Emission Rate	g/s	<	1.26E-06	<	5.72E-07	<	7.71E-07	<	8.66E-07	
2-Butanone (Methyl Ethyl Ketone)	Total Catch	ug	<	1.338	<	1.36	<	1.04	<	1.25	
	Concentration	ug/dscm	<	17.07	<	17.28	<	13.23	<	15.86	
	Emission Rate	lbs/hr	<	4.30E-05	<	4.13E-05	<	2.89E-05	<	3.78E-05	
	Emission Rate	g/s	<	5.42E-06	<	5.20E-06	<	3.65E-06	<	4.76E-06	
Carbon Disulfide	Total Catch	ug	<	0.17	<	0.27	<	0.32	<	0.26	
	Concentration	ug/dscm	<	2.21	<	3.48	<	4.07	<	3.26	
	Emission Rate	lbs/hr	<	5.59E-06	<	8.32E-06	<	8.91E-06	<	7.60E-06	
	Emission Rate	g/s	<	7.04E-07	<	1.05E-06	<	1.12E-06	<	9.58E-07	
Carbon Tetrachloride	Total Catch	ug	<	1.24	<	3.24	<	1.78	<	2.09	
	Concentration	ug/dscm	<	15.85	<	41.24	<	22.69	<	26.60	
	Emission Rate	lbs/hr	<	4.00E-05	<	9.85E-05	<	4.96E-05	<	6.27E-05	
	Emission Rate	g/s	<	5.04E-06	<	1.24E-05	<	6.25E-06	<	7.90E-06	

Table 8-6: Volatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
Chlorobenzene	Total Catch	ug	<	0.096	<	0.10	<	0.088	<	0.096	
	Concentration	ug/dscm	<	1.22	<	1.32	<	1.13	<	1.22	
	Emission Rate	lbs/hr	<	3.09E-06	<	3.16E-06	<	2.46E-06	<	2.90E-06	
	Emission Rate	g/s	<	3.89E-07	<	3.98E-07	<	3.10E-07	<	3.66E-07	
Chlorodibromomethane	Total Catch	ug	<	0.24	ND	<	0.16	<	0.16	<	0.19
	Concentration	ug/dscm	<	3.08	ND	<	2.06	<	2.05	<	2.40
	Emission Rate	lbs/hr	<	7.77E-06	ND	<	4.92E-06	<	4.48E-06	<	5.73E-06
	Emission Rate	g/s	<	9.79E-07	ND	<	6.20E-07	<	5.65E-07	<	7.21E-07
Chloroethane	Total Catch	ug	<	0.21	<	0.17	<	0.24	<	0.21	
	Concentration	ug/dscm	<	2.73	<	2.11	<	3.05	<	2.63	
	Emission Rate	lbs/hr	<	6.88E-06	<	5.05E-06	<	6.67E-06	<	6.20E-06	
	Emission Rate	g/s	<	8.66E-07	<	6.36E-07	<	8.40E-07	<	7.81E-07	
Chloroform	Total Catch	ug	<	4.43	<	3.64	<	3.43	<	3.83	
	Concentration	ug/dscm	<	56.47	<	46.25	<	43.73	<	48.81	
	Emission Rate	lbs/hr	<	1.42E-04	<	1.10E-04	<	9.56E-05	<	1.16E-04	
	Emission Rate	g/s	<	1.79E-05	<	1.39E-05	<	1.20E-05	<	1.46E-05	
Chloromethane	Total Catch	ug	<	0.83	<	0.70	<	0.79	<	0.77	
	Concentration	ug/dscm	<	10.54	<	8.85	<	10.06	<	9.81	
	Emission Rate	lbs/hr	<	2.66E-05	<	2.11E-05	<	2.20E-05	<	2.32E-05	
	Emission Rate	g/s	<	3.35E-06	<	2.66E-06	<	2.77E-06	<	2.93E-06	
2-Chloropropane	Total Catch	ug	<	0.12	ND	<	0.12	ND	<	0.12	ND
	Concentration	ug/dscm	<	1.55	ND	<	1.55	ND	<	1.55	ND
	Emission Rate	lbs/hr	<	3.91E-06	ND	<	3.70E-06	ND	<	3.67E-06	ND
	Emission Rate	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.62E-07	ND
1,2-Dibromoethane (Ethylene Dibromide)	Total Catch	ug	<	0.24	ND	<	0.24	ND	<	0.24	ND
	Concentration	ug/dscm	<	3.08	ND	<	3.08	ND	<	3.08	ND
	Emission Rate	lbs/hr	<	7.77E-06	ND	<	7.34E-06	ND	<	7.28E-06	ND
	Emission Rate	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	9.18E-07	ND
Dibromomethane	Total Catch	ug	<	0.24	ND	<	0.24	ND	<	0.24	ND
	Concentration	ug/dscm	<	3.08	ND	<	3.08	ND	<	3.08	ND
	Emission Rate	lbs/hr	<	7.77E-06	ND	<	7.34E-06	ND	<	7.28E-06	ND
	Emission Rate	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	9.18E-07	ND
cis-1,4-Dichloro-2-butene	Total Catch	ug	<	0.48	ND	<	0.48	ND	<	0.48	ND
	Concentration	ug/dscm	<	6.16	ND	<	6.15	ND	<	6.16	ND
	Emission Rate	lbs/hr	<	1.55E-05	ND	<	1.47E-05	ND	<	1.46E-05	ND
	Emission Rate	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.84E-06	ND

Table 8-6: Volatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
trans-1,4-Dichloro-2-butene	Total Catch	ug	<	0.48	ND	<	0.48	ND	<	0.48	ND
	Concentration	ug/dscm	<	6.16	ND	<	6.15	ND	<	6.16	ND
	Emission Rate	lbs/hr	<	1.55E-05	ND	<	1.47E-05	ND	<	1.46E-05	ND
	Emission Rate	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND
Dichlorodifluoromethane (Freon 12)	Total Catch	ug	<	0.23		<	0.22		<	0.21	
	Concentration	ug/dscm	<	2.96		<	2.82		<	2.63	
	Emission Rate	lbs/hr	<	7.47E-06		<	6.72E-06		<	5.76E-06	
	Emission Rate	g/s	<	9.41E-07		<	8.47E-07		<	7.25E-07	
1,1-Dichloroethane	Total Catch	ug	<	0.20		<	0.16		<	0.22	
	Concentration	ug/dscm	<	2.50		<	1.97		<	2.80	
	Emission Rate	lbs/hr	<	6.31E-06		<	4.71E-06		<	6.13E-06	
	Emission Rate	g/s	<	7.95E-07		<	5.94E-07		<	7.72E-07	
1,2-Dichloroethane	Total Catch	ug	<	0.10		<	0.11		<	0.094	
	Concentration	ug/dscm	<	1.28		<	1.38		<	1.19	
	Emission Rate	lbs/hr	<	3.22E-06		<	3.30E-06		<	2.61E-06	
	Emission Rate	g/s	<	4.05E-07		<	4.16E-07		<	3.28E-07	
trans-1,2-Dichloroethene	Total Catch	ug	<	0.098		<	0.096		<	0.097	
	Concentration	ug/dscm	<	1.25		<	1.21		<	1.24	
	Emission Rate	lbs/hr	<	3.15E-06		<	2.90E-06		<	2.71E-06	
	Emission Rate	g/s	<	3.97E-07		<	3.66E-07		<	3.41E-07	
1,1-Dichloroethene	Total Catch	ug	<	0.37		<	0.25		<	0.35	
	Concentration	ug/dscm	<	4.74		<	3.13		<	4.51	
	Emission Rate	lbs/hr	<	1.20E-05		<	7.47E-06		<	9.86E-06	
	Emission Rate	g/s	<	1.51E-06		<	9.41E-07		<	1.24E-06	
1,2-Dichloropropane (Propylene Dichloride)	Total Catch	ug	<	0.11		<	0.084		<	0.12	
	Concentration	ug/dscm	<	1.35		<	1.07		<	1.57	
	Emission Rate	lbs/hr	<	3.41E-06		<	2.55E-06		<	3.43E-06	
	Emission Rate	g/s	<	4.30E-07		<	3.21E-07		<	4.33E-07	
cis-1,3-Dichloropropene	Total Catch	ug	<	0.12	ND	<	0.11		<	0.11	
	Concentration	ug/dscm	<	1.55	ND	<	1.41		<	1.46	
	Emission Rate	lbs/hr	<	3.91E-06	ND	<	3.37E-06		<	3.19E-06	
	Emission Rate	g/s	<	4.93E-07	ND	<	4.25E-07		<	4.02E-07	
trans-1,3-Dichloropropene	Total Catch	ug	<	0.12	ND	<	0.12	ND	<	0.12	ND
	Concentration	ug/dscm	<	1.55	ND	<	1.55	ND	<	1.55	ND
	Emission Rate	lbs/hr	<	3.91E-06	ND	<	3.70E-06	ND	<	3.39E-06	ND
	Emission Rate	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.27E-07	ND

Table 8-6: Volatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average					
Ethyl Benzene	Total Catch	ug	<	0.095	<	0.12	ND	<	0.12	ND	<	0.11		
	Concentration	ug/dscm	<	1.21	<	1.55	ND	<	1.55	ND	<	1.44		
	Emission Rate	lbs/hr	<	3.06E-06	<	3.70E-06	ND	<	3.39E-06	ND	<	3.38E-06		
	Emission Rate	g/s	<	3.86E-07	<	4.66E-07	ND	<	4.27E-07	ND	<	4.26E-07		
Hexane	Total Catch	ug	<	0.22	<	0.24	<	0.23	<	0.23	<	0.23		
	Concentration	ug/dscm	<	2.78	<	3.05	<	2.87	<	2.90	<	2.90		
	Emission Rate	lbs/hr	<	7.02E-06	<	7.28E-06	<	6.28E-06	<	6.86E-06	<	6.86E-06		
	Emission Rate	g/s	<	8.84E-07	<	9.17E-07	<	7.92E-07	<	8.64E-07	<	8.64E-07		
2-Hexanone	Total Catch	ug	<	1.01	ND	<	1.01	ND	<	1.01	ND	<	1.01	ND
	Concentration	ug/dscm	<	12.86	ND	<	12.83	ND	<	12.85	ND	<	12.85	ND
	Emission Rate	lbs/hr	<	3.24E-05	ND	<	3.06E-05	ND	<	2.81E-05	ND	<	3.04E-05	ND
	Emission Rate	g/s	<	4.09E-06	ND	<	3.86E-06	ND	<	3.54E-06	ND	<	3.83E-06	ND
Iodomethane	Total Catch	ug	<	0.48	ND	<	0.48	ND	<	0.48	ND	<	0.48	ND
	Concentration	ug/dscm	<	6.16	ND	<	6.15	ND	<	6.16	ND	<	6.16	ND
	Emission Rate	lbs/hr	<	1.55E-05	ND	<	1.47E-05	ND	<	1.35E-05	ND	<	1.46E-05	ND
	Emission Rate	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND	<	1.84E-06	ND
Methylene Chloride	Total Catch	ug		3.699		2.81		3.31		3.27		3.27		
	Concentration	ug/dscm		47.17		35.70		42.19		41.68		41.68		
	Emission Rate	lbs/hr		1.19E-04		8.53E-05		9.23E-05		9.88E-05		9.88E-05		
	Emission Rate	g/s		1.50E-05		1.07E-05		1.16E-05		1.25E-05		1.25E-05		
4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	Total Catch	ug	<	1.01	ND	<	1.01	ND	<	1.01	ND	<	1.01	ND
	Concentration	ug/dscm	<	12.86	ND	<	12.83	ND	<	12.85	ND	<	12.85	ND
	Emission Rate	lbs/hr	<	3.24E-05	ND	<	3.06E-05	ND	<	2.81E-05	ND	<	3.04E-05	ND
	Emission Rate	g/s	<	4.09E-06	ND	<	3.86E-06	ND	<	3.54E-06	ND	<	3.83E-06	ND
2-Propanol	Total Catch	ug	<	22.08	ND	<	22.09	ND	<	22.08	ND	<	22.08	ND
	Concentration	ug/dscm	<	281.62	ND	<	280.93	ND	<	281.47	ND	<	281.34	ND
	Emission Rate	lbs/hr	<	7.10E-04	ND	<	6.71E-04	ND	<	6.15E-04	ND	<	6.66E-04	ND
	Emission Rate	g/s	<	8.95E-05	ND	<	8.45E-05	ND	<	7.75E-05	ND	<	8.39E-05	ND
Styrene	Total Catch	ug	<	0.12	ND	<	0.12	ND	<	0.12	ND	<	0.12	ND
	Concentration	ug/dscm	<	1.55	ND	<	1.55	ND	<	1.55	ND	<	1.55	ND
	Emission Rate	lbs/hr	<	3.91E-06	ND	<	3.70E-06	ND	<	3.39E-06	ND	<	3.67E-06	ND
	Emission Rate	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.27E-07	ND	<	4.62E-07	ND
1,1,1,2-Tetrachloroethane	Total Catch	ug	<	0.12	ND	<	0.12	ND	<	0.12	ND	<	0.12	ND
	Concentration	ug/dscm	<	1.55	ND	<	1.55	ND	<	1.55	ND	<	1.55	ND
	Emission Rate	lbs/hr	<	3.91E-06	ND	<	3.70E-06	ND	<	3.39E-06	ND	<	3.67E-06	ND
	Emission Rate	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.27E-07	ND	<	4.62E-07	ND

Table 8-6: Volatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
1,1,2,2-Tetrachloroethane	Total Catch	ug	<	0.24	ND	<	0.24	ND	<	0.24	ND
	Concentration	ug/dscm	<	3.08	ND	<	3.08	ND	<	3.08	ND
	Emission Rate	lbs/hr	<	7.77E-06	ND	<	7.34E-06	ND	<	6.73E-06	ND
	Emission Rate	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	8.49E-07	ND
Tetrachloroethene (Tetrachloroethylene)	Total Catch	ug	<	0.12	ND	<	0.12	ND	<	0.12	ND
	Concentration	ug/dscm	<	1.55	ND	<	1.55	ND	<	1.55	ND
	Emission Rate	lbs/hr	<	3.91E-06	ND	<	3.70E-06	ND	<	3.39E-06	ND
	Emission Rate	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.27E-07	ND
Toluene	Total Catch	ug	<	0.10		<	0.093		<	0.085	
	Concentration	ug/dscm	<	1.33		<	1.19		<	1.09	
	Emission Rate	lbs/hr	<	3.35E-06		<	2.84E-06		<	2.38E-06	
	Emission Rate	g/s	<	4.22E-07		<	3.57E-07		<	3.00E-07	
1,1,1-Trichloroethane	Total Catch	ug	<	0.11		<	0.087		<	0.094	
	Concentration	ug/dscm	<	1.42		<	1.10		<	1.20	
	Emission Rate	lbs/hr	<	3.58E-06		<	2.63E-06		<	2.62E-06	
	Emission Rate	g/s	<	4.50E-07		<	3.32E-07		<	3.30E-07	
1,1,2-Trichloroethane (Methyl Chloroform)	Total Catch	ug	<	0.24	ND	<	0.24	ND	<	0.24	ND
	Concentration	ug/dscm	<	3.08	ND	<	3.08	ND	<	3.08	ND
	Emission Rate	lbs/hr	<	7.77E-06	ND	<	7.34E-06	ND	<	6.73E-06	ND
	Emission Rate	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	8.49E-07	ND
Trichloroethene	Total Catch	ug	<	0.13		<	0.17		<	0.17	
	Concentration	ug/dscm	<	1.64		<	2.19		<	2.12	
	Emission Rate	lbs/hr	<	4.14E-06		<	5.22E-06		<	4.64E-06	
	Emission Rate	g/s	<	5.21E-07		<	6.58E-07		<	5.85E-07	
Trichlorofluoromethane (Freon 11)	Total Catch	ug	<	0.35		<	0.17		<	0.15	
	Concentration	ug/dscm	<	4.43		<	2.12		<	1.92	
	Emission Rate	lbs/hr	<	1.12E-05		<	5.07E-06		<	4.20E-06	
	Emission Rate	g/s	<	1.41E-06		<	6.39E-07		<	5.29E-07	
1,2,3-Trichloropropane	Total Catch	ug	<	0.24	ND	<	0.24	ND	<	0.24	ND
	Concentration	ug/dscm	<	3.08	ND	<	3.08	ND	<	3.08	ND
	Emission Rate	lbs/hr	<	7.77E-06	ND	<	7.34E-06	ND	<	6.73E-06	ND
	Emission Rate	g/s	<	9.79E-07	ND	<	9.25E-07	ND	<	8.49E-07	ND
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	Total Catch	ug	<	0.39		<	0.21		<	0.34	
	Concentration	ug/dscm	<	4.96		<	2.61		<	4.33	
	Emission Rate	lbs/hr	<	1.25E-05		<	6.24E-06		<	9.48E-06	
	Emission Rate	g/s	<	1.58E-06		<	7.87E-07		<	1.19E-06	

Table 8-6: Volatile Organic Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		
Vinyl Acetate	Total Catch	ug	<	0.48	ND	<	0.48	ND	<	0.48	ND
	Concentration	ug/dscm	<	6.16	ND	<	6.15	ND	<	6.16	ND
	Emission Rate	lbs/hr	<	1.55E-05	ND	<	1.47E-05	ND	<	1.35E-05	ND
	Emission Rate	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND
Vinyl Bromide	Total Catch	ug	<	0.48	ND	<	0.48	ND	<	0.48	ND
	Concentration	ug/dscm	<	6.16	ND	<	6.15	ND	<	6.16	ND
	Emission Rate	lbs/hr	<	1.55E-05	ND	<	1.47E-05	ND	<	1.35E-05	ND
	Emission Rate	g/s	<	1.96E-06	ND	<	1.85E-06	ND	<	1.70E-06	ND
Vinyl Chloride	Total Catch	ug	<	0.95		<	0.68		<	1.12	
	Concentration	ug/dscm	<	12.12		<	8.60		<	14.22	
	Emission Rate	lbs/hr	<	3.06E-05		<	2.06E-05		<	3.11E-05	
	Emission Rate	g/s	<	3.85E-06		<	2.59E-06		<	3.92E-06	
m,p-Xylene	Total Catch	ug	<	0.21		<	0.21		<	0.23	
	Concentration	ug/dscm	<	2.65		<	2.64		<	2.87	
	Emission Rate	lbs/hr	<	6.69E-06		<	6.31E-06		<	6.28E-06	
	Emission Rate	g/s	<	8.43E-07		<	7.95E-07		<	7.91E-07	
o-Xylene	Total Catch	ug	<	0.12	ND	<	0.12	ND	<	0.12	ND
	Concentration	ug/dscm	<	1.55	ND	<	1.55	ND	<	1.55	ND
	Emission Rate	lbs/hr	<	3.91E-06	ND	<	3.70E-06	ND	<	3.39E-06	ND
	Emission Rate	g/s	<	4.93E-07	ND	<	4.66E-07	ND	<	4.27E-07	ND
Ethane, 2,2-dichloro-1,1,1tri TIC: 306-83-2	Total Catch	ug		3.07			0.36			0.133	
	Concentration	ug/dscm		39.15			4.54			1.70	
	Emission Rate	lbs/hr		9.88E-05			1.08E-05			3.71E-06	
	Emission Rate	g/s		1.24E-05			1.37E-06			4.67E-07	
Allyl chloride TIC: 107-05-1	Total Catch	ug		1.14			0.53			0.60	
	Concentration	ug/dscm		14.49			6.78			7.58	
	Emission Rate	lbs/hr		3.65E-05			1.62E-05			1.66E-05	
	Emission Rate	g/s		4.60E-06			2.04E-06			2.09E-06	
1-Propene, 2-methyl- TIC: 115-11-7	Total Catch	ug		0.65			0.40			0.38	
	Concentration	ug/dscm		8.29			5.02			4.83	
	Emission Rate	lbs/hr		2.09E-05			1.20E-05			1.06E-05	
	Emission Rate	g/s		2.63E-06			1.51E-06			1.33E-06	

Notes:

- (A) No blank corrections have been made to these data. If undetected in the analysis, the DL is reported.
- (B) Results have been reported considering both the reporting and MDLs as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the reporting and MDLs are incorporated into the emission estimate as reported.
- (C) Note that only TICs detected in multiple runs are averaged. If detected in only a single run, that value is reported in the "Average" column. "NO TIC" is reported for the runs in which the TIC was not found. In instances where a TIC was identified more than once in one (1) or more sample fractions, the reported value represents the sum of all reported values.

Table 8-7: TOC Emissions Summary

Parameter	Units	C4bR1	C4bR4	C4bR5	Average
Concentration	mg/m ³	< 11.59	< 10.64	< 13.62	< 11.95
Emission Rate	lbs/hr	< 2.83E-02	< 2.49E-02	< 2.96E-02	< 2.76E-02
Emission Rate	g/s	< 3.56E-03	< 3.14E-03	< 3.73E-03	< 3.48E-03

Note: Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

Table 8-8: Semivolatile Unspecified Organic Emissions Summary

Parameter	Units	C4bR1	C4bR4	C4bR5	Average
Sample Volume	dscf	138,325	129,331	117,741	128,47
Gas Flow Rate	dscf/hr	39,043	37,524	34,835	37,134
Total Chromatographable Organics (C₈ through C₁₇)					
Total Catch	mg	1.4	1.6	1.2	1.4
Concentration	mg/m ³	0.36	0.44	0.36	0.38
Emission Rate	lbs/hr	8.71E-04	1.02E-03	7.83E-04	8.92E-04
Emission Rate	g/s	1.10E-04	1.29E-04	9.86E-05	1.12E-04
Total Gravimetric Organics					
Total Catch	mg	< 1.5 [ND]	< 1.5 [ND]	< 1.5 [ND]	< 1.5 [ND]
Concentration	mg/m ³	0.38	0.41	0.45	0.41
Emission Rate	lbs/hr	9.33E-04	9.59E-04	9.78E-04	9.57E-04
Emission Rate	g/s	1.18E-04	1.21E-04	1.23E-04	1.21E-04

Table 8-9: Volatile Unspeciated Organic Emissions Summary

Parameter	Units	C4bR1								Average							
		Bag 1		Condensate 1		Bag 2		Condensate 2		Bags		Condensates					
Gas Volume	dsL	29.12				28.31				28.72							
Flow Rate	dscf/hr	39,043				39,043				39,043							
C ₁ Concentration	ppm	1.00		---		0.927		---		0.964		---					
C ₁ Concentration	ug/m ³	667.20		---		618.49		---		642.84		---					
C ₁ Emission Rate	lbs/hr	1.63E-03		---		1.51E-03		---		1.57E-03		---					
C ₂ Concentration	ppm	0.0777		---		0.0422		---		0.060		---					
C ₂ Concentration	ug/m ³	97.17		---		52.77		---		74.97		---					
C ₂ Emission Rate	lbs/hr	2.37E-04		---		1.29E-04		---		1.83E-04		---					
C ₃ Concentration	ppm	0.0529		---		0.0283		---		0.0406		---					
C ₃ Concentration	ug/m ³	97.01		---		51.90		---		74.46		---					
C ₃ Emission Rate	lbs/hr	2.36E-04		---		1.27E-04		---		1.82E-04		---					
C ₄ Total Catch	ug	---		<	0.084	ND	---		<	0.083	ND	---					
C ₄ Concentration	ppm	0.0586		---		0.0334		---		0.046		---					
C ₄ Concentration	ug/m ³	141.65		<	2.88	ND	80.74		<	2.93	ND	111.19					
C ₄ Emission Rate	lbs/hr	3.45E-04		<	7.03E-06	ND	1.97E-04		<	7.15E-06	ND	2.71E-04					
C ₅ Total Catch	ug	---		<	0.042	ND	---		<	0.042	ND	---					
C ₅ Concentration	ppm	<	0.014	ND	---		<	0.014	ND	---		<	0.014	ND			
C ₅ Concentration	ug/m ³	<	42.01	ND	<	1.44	ND	<	42.01	ND	<	1.48	ND	<	42.01	ND	
C ₅ Emission Rate	lbs/hr	<	1.02E-04	ND	<	3.52E-06	ND	<	1.02E-04	ND	<	3.62E-06	ND	<	1.02E-04	ND	
C ₆ Total Catch	ug	---		<	0.042	ND	---		<	0.042	ND	---					
C ₆ Concentration	ppm	2.19		---		3.22		---		2.705		---					
C ₆ Concentration	ug/m ³	7,848.95		<	1.44	ND	11,540.46		<	1.48	ND	9,694.71					
C ₆ Emission Rate	lbs/hr	1.91E-02		<	3.52E-06	ND	2.81E-02		<	3.62E-06	ND	2.36E-02					
C ₇ Total Catch	ug	---		<	0.042	ND	---		<	0.042	ND	---					
C ₇ Concentration	ppm	<	0.049	ND	---		<	0.049	ND	---		<	0.049	ND			
C ₇ Concentration	ug/m ³	<	204.20	ND	<	1.44	ND	<	204.20	ND	<	1.48	ND	<	204.20	ND	
C ₇ Emission Rate	lbs/hr	<	4.98E-04	ND	<	3.52E-06	ND	<	4.98E-04	ND	<	3.62E-06	ND	<	4.98E-04	ND	
Total C₁ through C₇ Compounds																	
Concentration	ug/m ³	<	9,098.19	<	7.21	ND	<	12,590.58	<	7.38	ND	<	10,844.38	<	7.30	ND	
Concentration	ug/m ³	<	9,105.40	---		---		<	12,597.96	---		---		<	10,851.68	---	
Emission Rate	lbs/hr	<	2.22E-02	---		---		<	3.07E-02	---		---		<	2.65E-02	---	
Emission Rate	g/s	<	2.80E-03	---		---		<	3.87E-03	---		---		<	3.33E-03	---	

Table 8-9: Volatile Unspeciated Organics Emission Summary (Continued)

Parameter	Units	C4bR4								Average					
		Bag 1		Condensate 1		Bag 2		Condensate 2		Bags		Condensates			
Gas Volume	dsL	28.75				29.05				28.90					
Flow Rate	dscf/hr	37,524				37,524				37,524					
C ₁ Concentration	ppm	0.948		---		1.02		---		0.984		---			
C ₁ Concentration	ug/m ³	632.50		---		680.54		---		656.52		---			
C ₁ Emission Rate	lbs/hr	1.48E-03		---		1.59E-03		---		1.54E-03		---			
C ₂ Concentration	ppm	0.0555		---		0.0404		---		0.048		---			
C ₂ Concentration	ug/m ³	69.41		---		50.52		---		59.96		---			
C ₂ Emission Rate	lbs/hr	1.63E-04		---		1.18E-04		---		1.40E-04		---			
C ₃ Concentration	ppm	0.0303		---		0.0238		---		0.0271		---			
C ₃ Concentration	ug/m ³	55.57		---		43.65		---		49.61		---			
C ₃ Emission Rate	lbs/hr	1.30E-04		---		1.02E-04		---		1.16E-04		---			
C ₄ Total Catch	ug	---		<	0.084	ND	---		<	0.084	ND	---			
C ₄ Concentration	ppm	0.0137		---		0.0114		---		0.0126		---			
C ₄ Concentration	ug/m ³	33.12		<	2.92	ND	27.56		<	2.89	ND	30.34			
C ₄ Emission Rate	lbs/hr	7.76E-05		<	6.85E-06	ND	6.46E-05		<	6.78E-06	ND	7.11E-05			
C ₅ Total Catch	ug	---		<	0.042	ND	---		0.15		---		<	0.096	
C ₅ Concentration	ppm	<	0.014	ND	---		<	0.014	ND	---		<	0.014	ND	
C ₅ Concentration	ug/m ³	<	42.01	ND	<	1.46	ND	<	42.01	ND	5.16		<	42.01	
C ₅ Emission Rate	lbs/hr	<	9.84E-05	ND	<	3.42E-06	ND	<	9.84E-05	ND	1.21E-05		<	9.84E-05	
C ₆ Total Catch	ug	---		<	0.042	ND	---		<	0.042	ND	---		<	0.042
C ₆ Concentration	ppm	3.07		---		1.81		---		2.44		---			
C ₆ Concentration	ug/m ³	11,002.86		<	1.46	ND	6,487.03		<	1.45	ND	8,744.95			
C ₆ Emission Rate	lbs/hr	2.58E-02		<	3.42E-06	ND	1.52E-02		<	3.39E-06	ND	2.05E-02			
C ₇ Total Catch	ug	---		<	0.042	ND	---		<	0.042	ND	---		<	0.042
C ₇ Concentration	ppm	<	0.049	ND	---		<	0.049	ND	---		<	0.049	ND	
C ₇ Concentration	ug/m ³	<	204.20	ND	<	1.46	ND	<	204.20	ND	<	1.45	ND	<	204.20
C ₇ Emission Rate	lbs/hr	<	4.78E-04	ND	<	3.42E-06	ND	<	4.78E-04	ND	<	3.39E-06	ND	<	4.78E-04
Total C₁ through C₇ Compounds															
Concentration	ug/m ³	<	12,039.67	<	7.31	ND	<	7,535.51	<	10.95	<	9,787.59	<	9.13	
Concentration	ug/m ³	<	12,046.97	---		<	7,546.46	---		<	9,796.71	---			
Emission Rate	lbs/hr	<	2.82E-02	---		<	1.77E-02	---		<	2.30E-02	---			
Emission Rate	g/s	<	3.56E-03	---		<	2.23E-03	---		<	2.89E-03	---			

Table 8-9: Volatile Unspeciated Organics Emission Summary (Continued)

Parameter	Units	C4bR5								Average	
		Bag 1		Condensate 1		Bag 2		Condensate 2		Bags	Condensates
Gas Volume	dsL	28.67				28.87				28.77	
Flow Rate	dscf/hr	34,835				34,835				34,835	
C ₁ Concentration	ppm	1.04		---		1.11		---		1.075	
C ₁ Concentration	ug/m ³	693.89		---		740.59		---		717.24	
C ₁ Emission Rate	lbs/hr	1.51E-03		---		1.61E-03		---		1.56E-03	
C ₂ Concentration	ppm	0.0585		---		0.0795		---		0.069	
C ₂ Concentration	ug/m ³	73.16		---		99.42		---		86.29	
C ₂ Emission Rate	lbs/hr	1.59E-04		---		2.16E-04		---		1.88E-04	
C ₃ Concentration	ppm	0.0482		---		0.0501		---		0.0492	
C ₃ Concentration	ug/m ³	88.39		---		91.88		---		90.14	
C ₃ Emission Rate	lbs/hr	1.92E-04		---		2.00E-04		---		1.96E-04	
C ₄ Total Catch	ug	---		< 0.084	ND	---		< 0.083	ND	---	
C ₄ Concentration	ppm	0.0261		---		0.0124		---		0.0193	
C ₄ Concentration	ug/m ³	63.09		< 2.93	ND	29.97		< 2.87	ND	46.53	
C ₄ Emission Rate	lbs/hr	1.37E-04		< 6.37E-06	ND	6.52E-05		< 6.25E-06	ND	1.01E-04	
C ₅ Total Catch	ug	---		0.036		---		0.065		---	
C ₅ Concentration	ppm	< 0.014	ND	---		< 0.014	ND	---		< 0.014	ND
C ₅ Concentration	ug/m ³	< 42.01	ND	1.26		< 42.01	ND	2.25		< 42.01	ND
C ₅ Emission Rate	lbs/hr	< 9.14E-05	ND	2.73E-06		< 9.14E-05	ND	4.90E-06		< 9.14E-05	ND
C ₆ Total Catch	ug	---		< 0.042	ND	---		< 0.042	ND	---	
C ₆ Concentration	ppm	3.23		---		3.25		---		3.24	
C ₆ Concentration	ug/m ³	11,576.30		< 1.46	ND	11,647.98		< 1.45	ND	11,612.14	
C ₆ Emission Rate	lbs/hr	2.52E-02		< 3.19E-06	ND	2.53E-02		< 3.16E-06	ND	2.53E-02	
C ₇ Total Catch	ug	---		< 0.042	ND	---		< 0.042	ND	---	
C ₇ Concentration	ppm	< 0.049	ND	---		< 0.049	ND	---		< 0.049	ND
C ₇ Concentration	ug/m ³	< 204.20	ND	< 1.46	ND	< 204.20	ND	< 1.45	ND	< 204.20	ND
C ₇ Emission Rate	lbs/hr	< 4.44E-04	ND	< 3.19E-06	ND	< 4.44E-04	ND	< 3.16E-06	ND	< 4.44E-04	ND
Total C₁ through C₇ Compounds											
Concentration	ug/m ³	< 12,741.04	< 7.11			< 12,856.05	< 8.04			< 12,798.55	< 7.58
Concentration	ug/m ³	< 12,748.16	---			< 12,864.09	---			< 12,806.12	---
Emission Rate	lbs/hr	< 2.77E-02	---			< 2.80E-02	---			< 2.79E-02	---
Emission Rate	g/s	< 3.49E-03	---			< 3.53E-03	---			< 3.51E-03	---

Table 8-10: Acid Gas and Particulate Emissions Summary

Parameter	Units	C4bR1		C4bR4		C4bR5		Average		RCRA/CAA Permit Limit
Sample Volume	dscf	134.179		119.365		101.279		118.27		
Gas Flow Rate	dscfm	683		648		566		632.33		
O ₂ Level	%	13.3		13.1		13.4		13.27		
Hydrogen Chloride										
Catch	mg	< 1.1	ND	< 1.1	ND	< 0.91	ND	< 1.04	ND	---
Concentration	mg/dscm	< 0.29	ND	< 0.33	ND	< 0.32	ND	< 0.31	ND	---
Concentration	ppmv @ 7% O ₂	< 0.35	ND	< 0.38	ND	< 0.39	ND	< 0.37	ND	---
Emission Rate	lbs/hr	< 7.41E-04	ND	< 7.90E-04	ND	< 6.73E-04	ND	< 7.34E-04	ND	---
Emission Rate	g/s	< 9.33E-05	ND	< 9.95E-05	ND	< 8.48E-05	ND	< 9.25E-05	ND	---
Chlorine										
Catch	mg	< 0.21	ND	< 0.23	ND	< 0.20	ND	< 0.21	ND	---
Concentration	mg/dscm	< 0.055	ND	< 0.068	ND	< 0.070	ND	< 0.064	ND	---
Concentration	ppmv @ 7% O ₂	< 0.068	ND	< 0.082	ND	< 0.087	ND	< 0.079	ND	---
Emission Rate	lbs/hr	< 1.41E-04	ND	< 1.65E-04	ND	< 1.48E-04	ND	< 1.51E-04	ND	---
Emission Rate	g/s	< 1.78E-05	ND	< 2.08E-05	ND	< 1.86E-05	ND	< 1.91E-05	ND	---
Chloride Equivalents										
Concentration	ppmv @ 7% O ₂	< 0.42	ND	< 0.46	ND	< 0.47	ND	< 0.45	ND	21
Hydrogen Fluoride										
Catch	mg	< 1.1	ND	< 1.2	ND	< 0.93	ND	< 1.08	ND	---
Concentration	mg/dscm	< 0.29	ND	< 0.35	ND	< 0.32	ND	< 0.32	ND	---
Emission Rate	lbs/hr	< 7.41E-04	ND	< 8.62E-04	ND	< 6.87E-04	ND	< 7.63E-04	ND	---
Emission Rate	g/s	< 9.33E-05	ND	< 1.09E-04	ND	< 8.66E-05	ND	< 9.62E-05	ND	---
Particulates⁽¹⁾										
Catch, Total	mg	2.4		3.2		3.5		3.03		---
Concentration	mg/dscm	0.63		0.95		0.98		0.85		---
Concentration	mg/dscm @ 7% O ₂	1.16		1.69		1.71		1.52		---
Concentration	gr/dscf @ 7% O ₂	0.00050		0.00074		0.00074		0.00066		0.013
Emission Rate	lbs/hr	1.62E-03		2.30E-03		2.30E-03		2.07E-03		---
Emission Rate	g/s	2.04E-04		2.90E-04		2.89E-04		2.61E-04		---

Notes:

- (A) Blank corrections have not been made to these data.
- (B) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

Footnote:

- (1) Due to a sampling method deviation incurred during C4bR5, the particulate results from C4bR2 were used for compliance purposes. C4bR5 particulate results are included in Appendix H.

Table 8-11: Trace Metal Emissions Summary

Parameter		Units	C4bR1		C4bR4		C4bR5		Average	CAA Permit Limit			
Sample Volume		dscf	144.070		128.103		115.777		129.32				
Gas Flow Rate		dscfm	682		621		573		625.33				
O ₂ Level		%	13.3		13.1		13.4		13.27				
Antimony	Total Catch	ug	<	0.346	<	0.27	<	0.346	<	0.32	---		
	Concentration	ug/dscm	<	0.085	<	0.074	<	0.11	<	0.088	---		
	Emission Rate	lbs/hr	<	2.17E-07	<	1.73E-07	<	2.27E-07	<	2.05E-07	---		
	Emission Rate	g/s	<	2.73E-08	<	2.18E-08	<	2.85E-08	<	2.59E-08	---		
Arsenic	Total Catch	ug	<	0.52	<	0.394	<	0.62	ND	<	0.51	---	
	Concentration	ug/dscm	<	0.13	<	0.11	<	0.19	ND	<	0.14	---	
	Emission Rate	lbs/hr	<	3.26E-07	<	2.53E-07	<	4.06E-07	ND	<	3.28E-07	---	
	Emission Rate	g/s	<	4.10E-08	<	3.18E-08	<	5.11E-08	ND	<	4.13E-08	---	
Barium	Total Catch	ug	4.4		3.2		4.08		3.89		---		
	Concentration	ug/dscm	1.08		0.88		1.24		1.07		---		
	Emission Rate	lbs/hr	2.76E-06		2.05E-06		2.67E-06		2.49E-06		---		
	Emission Rate	g/s	3.47E-07		2.59E-07		3.37E-07		3.14E-07		---		
Beryllium	Total Catch	ug	<	0.31	ND	<	0.187	<	0.31	ND	<	0.27	---
	Concentration	ug/dscm	<	0.076	ND	<	0.052	<	0.095	ND	<	0.074	---
	Emission Rate	lbs/hr	<	1.94E-07	ND	<	1.20E-07	<	2.03E-07	ND	<	1.72E-07	---
	Emission Rate	g/s	<	2.45E-08	ND	<	1.51E-08	<	2.56E-08	ND	<	2.17E-08	---
Boron	Total Catch	ug	73.6		34.6		22.0		43.40		---		
	Concentration	ug/dscm	18.04		9.54		6.71		11.43		---		
	Emission Rate	lbs/hr	4.61E-05		2.22E-05		1.44E-05		2.76E-05		---		
	Emission Rate	g/s	5.81E-06		2.80E-06		1.81E-06		3.47E-06		---		
Cadmium	Total Catch	ug	0.080		0.138		0.055		0.091		---		
	Concentration	ug/dscm	0.020		0.038		0.017		0.025		---		
	Emission Rate	lbs/hr	5.01E-08		8.85E-08		3.60E-08		5.82E-08		---		
	Emission Rate	g/s	6.31E-09		1.11E-08		4.54E-09		7.33E-09		---		
Chromium	Total Catch	ug	3.00		5.65		2.77		3.81		---		
	Concentration	ug/dscm	0.74		1.56		0.84		1.05		---		
	Emission Rate	lbs/hr	1.88E-06		3.62E-06		1.81E-06		2.44E-06		---		
	Emission Rate	g/s	2.37E-07		4.56E-07		2.28E-07		3.07E-07		---		
Cobalt	Total Catch	ug	0.35		0.57		0.107		0.34		---		
	Concentration	ug/dscm	0.086		0.16		0.033		0.092		---		
	Emission Rate	lbs/hr	2.19E-07		3.66E-07		7.00E-08		2.18E-07		---		
	Emission Rate	g/s	2.76E-08		4.61E-08		8.83E-09		2.75E-08		---		
Copper	Total Catch	ug	2.4		3.0		2.19		2.53		---		
	Concentration	ug/dscm	0.59		0.83		0.67		0.69		---		
	Emission Rate	lbs/hr	1.50E-06		1.92E-06		1.43E-06		1.62E-06		---		
	Emission Rate	g/s	1.89E-07		2.42E-07		1.81E-07		2.04E-07		---		

Table 8-11: Trace Metal Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		CAA Permit Limit							
Lead	Total Catch	ug	0.86		0.80		0.58		0.75		---							
	Concentration	ug/dscm	0.21		0.22		0.18		0.20		---							
	Emission Rate	lbs/hr	5.39E-07		5.13E-07		3.80E-07		4.77E-07		---							
	Emission Rate	g/s	6.79E-08		6.46E-08		4.78E-08		6.01E-08		---							
Manganese	Total Catch	ug	7.23		17.0		10.85		11.69		---							
	Concentration	ug/dscm	1.77		4.69		3.31		3.26		---							
	Emission Rate	lbs/hr	4.53E-06		1.09E-05		7.10E-06		7.51E-06		---							
	Emission Rate	g/s	5.70E-07		1.37E-06		8.95E-07		9.46E-07		---							
Mercury	Total Catch	ug	2.531		<	4.351		<	3.522		<	3.47	---					
	Concentration	ug/dscm	0.62		<	1.20		<	1.07		<	0.96	---					
	Emission Rate	lbs/hr	1.58E-06		<	2.79E-06		<	2.31E-06		<	2.23E-06	---					
	Emission Rate	g/s	2.00E-07		<	3.52E-07		<	2.91E-07		<	2.81E-07	---					
Nickel	Total Catch	ug	2.35		2.85		1.96		2.39		---							
	Concentration	ug/dscm	0.58		0.79		0.60		0.65		---							
	Emission Rate	lbs/hr	1.47E-06		1.83E-06		1.28E-06		1.53E-06		---							
	Emission Rate	g/s	1.85E-07		2.30E-07		1.62E-07		1.92E-07		---							
Phosphorus	Total Catch	ug	<	25.6		<	27.7		<	27.9		<	27.07	---				
	Concentration	ug/dscm	<	6.27		<	7.64		<	8.51		<	7.47	---				
	Emission Rate	lbs/hr	<	1.60E-05		<	1.78E-05		<	1.83E-05		<	1.74E-05	---				
	Emission Rate	g/s	<	2.02E-06		<	2.24E-06		<	2.30E-06		<	2.19E-06	---				
Selenium	Total Catch	ug	<	1.72		ND	<	1.07		ND	<	1.22		ND	<	1.34	ND	---
	Concentration	ug/dscm	<	0.42		ND	<	0.29		ND	<	0.37		ND	<	0.36	ND	---
	Emission Rate	lbs/hr	<	1.08E-06		ND	<	6.86E-07		ND	<	7.99E-07		ND	<	8.54E-07	ND	---
	Emission Rate	g/s	<	1.36E-07		ND	<	8.65E-08		ND	<	1.01E-07		ND	<	1.08E-07	ND	---
Silver	Total Catch	ug	0.527		6.336		3.412		3.43		---							
	Concentration	ug/dscm	0.13		1.75		1.04		0.97		---							
	Emission Rate	lbs/hr	3.30E-07		4.06E-06		2.23E-06		2.21E-06		---							
	Emission Rate	g/s	4.16E-08		5.12E-07		2.81E-07		2.78E-07		---							
Thallium	Total Catch	ug	<	0.31		ND	<	0.31		ND	<	0.31		ND	<	0.31	ND	---
	Concentration	ug/dscm	<	0.076		ND	<	0.085		ND	<	0.095		ND	<	0.085	ND	---
	Emission Rate	lbs/hr	<	1.94E-07		ND	<	1.99E-07		ND	<	2.03E-07		ND	<	1.99E-07	ND	---
	Emission Rate	g/s	<	2.45E-08		ND	<	2.50E-08		ND	<	2.56E-08		ND	<	2.50E-08	ND	---
Tin	Total Catch	ug	<	6.4		2.81		<	3.5		<	4.24		---				
	Concentration	ug/dscm	<	1.57		0.77		<	1.07		<	1.14		---				
	Emission Rate	lbs/hr	<	4.01E-06		1.80E-06		<	2.29E-06		<	2.70E-06		---				
	Emission Rate	g/s	<	5.05E-07		2.27E-07		<	2.89E-07		<	3.40E-07		---				

Table 8-11: Trace Metal Emissions Summary (Continued)

Parameter		Units	C4bR1		C4bR4		C4bR5		Average		CAA Permit Limit			
Vanadium	Total Catch	ug	<	1.54	ND	<	1.54	ND	<	1.54	ND	<		
	Concentration	ug/dscm	<	0.38	ND	<	0.42	ND	<	0.42	ND	<		
	Emission Rate	lbs/hr	<	9.64E-07	ND	<	9.87E-07	ND	<	9.89E-07	ND	<		
	Emission Rate	g/s	<	1.22E-07	ND	<	1.24E-07	ND	<	1.28E-07	ND	<		
Zinc	Total Catch	ug		29.6			30.2			22.7		27.50		
	Concentration	ug/dscm		7.25			8.32			6.92		7.50		
	Emission Rate	lbs/hr		1.85E-05			1.94E-05			1.49E-05		1.76E-05		
	Emission Rate	g/s		2.34E-06			2.44E-06			1.87E-06		2.22E-06		
Arsenic	Concentration	ug/dscm @ 7% O ₂	<	0.23		<	0.19		<	0.35	ND	<	0.26	---
Beryllium	Concentration	ug/dscm @ 7% O ₂	<	0.14	ND	<	0.092		<	0.18	ND	<	0.14	---
Chromium	Concentration	ug/dscm @ 7% O ₂		1.34			2.78			1.57			1.90	---
Combined Total	Concentration	ug/dscm @ 7% O ₂	<	1.72		<	3.061		<	2.09		<	2.29	23
Cadmium	Concentration	ug/dscm @ 7% O ₂		0.036			0.068			0.031			0.045	---
Lead	Concentration	ug/dscm @ 7% O ₂		0.39			0.39			0.33			0.37	---
Combined Total	Concentration	ug/dscm @ 7% O ₂		0.42			0.46			0.36			0.41	10
Mercury	Concentration	ug/dscm @ 7% O ₂		1.13		<	2.14			1.99		<	1.75	8.1

Notes:

- (A) Blank corrections have not been made to these data.
- (B) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

Table 8-12: Energetic Emissions Summary

Parameter	Units	C4bR1		C4bR4		C4bR5		Average					
Sample Volume	liters	139.675		131.284		117.713		129.56					
Stack Gas Flow Rate	dscfm	680		647		594		640.33					
2,4-Dinitrotoluene	ug	<	2.35	ND	<	2.65	ND	<	2.35	ND	<	2.45	ND
	ug/dscm	<	0.59	ND	<	0.71	ND	<	0.70	ND	<	0.67	ND
	lbs/hr	<	1.51E-06	ND	<	1.73E-06	ND	<	1.57E-06	ND	<	1.60E-06	ND
	g/s	<	1.91E-07	ND	<	2.18E-07	ND	<	1.98E-07	ND	<	2.02E-07	ND
2,6-Dinitrotoluene	ug	<	2.35	ND	<	2.65	ND	<	2.35	ND	<	2.45	ND
	ug/dscm	<	0.59	ND	<	0.71	ND	<	0.70	ND	<	0.67	ND
	lbs/hr	<	1.51E-06	ND	<	1.73E-06	ND	<	1.57E-06	ND	<	1.60E-06	ND
	g/s	<	1.91E-07	ND	<	2.18E-07	ND	<	1.98E-07	ND	<	2.02E-07	ND
HMX	ug	<	2.35	ND	<	2.65	ND	<	2.35	ND	<	2.45	ND
	ug/dscm	<	0.59	ND	<	0.71	ND	<	0.70	ND	<	0.67	ND
	lbs/hr	<	1.51E-06	ND	<	1.73E-06	ND	<	1.57E-06	ND	<	1.60E-06	ND
	g/s	<	1.91E-07	ND	<	2.18E-07	ND	<	1.98E-07	ND	<	2.02E-07	ND
Nitroglycerin	ug	<	9.4	ND	<	10.5	ND	<	9.5	ND	<	9.8	ND
	ug/dscm	<	2.38	ND	<	2.82	ND	<	2.85	ND	<	2.68	ND
	lbs/hr	<	6.05E-06	ND	<	6.84E-06	ND	<	6.34E-06	ND	<	6.41E-06	ND
	g/s	<	7.63E-07	ND	<	8.62E-07	ND	<	7.99E-07	ND	<	8.08E-07	ND
RDX	ug	<	2.35	ND	<	2.65	ND	<	2.35	ND	<	2.45	ND
	ug/dscm	<	0.59	ND	<	0.71	ND	<	0.70	ND	<	0.67	ND
	lbs/hr	<	1.51E-06	ND	<	1.73E-06	ND	<	1.57E-06	ND	<	1.60E-06	ND
	g/s	<	1.91E-07	ND	<	2.18E-07	ND	<	1.98E-07	ND	<	2.02E-07	ND
2,4,6-Trinitrotoluene	ug	<	2.35	ND	<	2.65	ND	<	2.35	ND	<	2.45	ND
	ug/dscm	<	0.59	ND	<	0.71	ND	<	0.70	ND	<	0.67	ND
	lbs/hr	<	1.51E-06	ND	<	1.73E-06	ND	<	1.57E-06	ND	<	1.60E-06	ND
	g/s	<	1.91E-07	ND	<	2.18E-07	ND	<	1.98E-07	ND	<	2.02E-07	ND

Notes:

- (A) Blank corrections have not been made to these data.
- (B) Results have been reported considering both the RL and DL as reported on the laboratory results page for each fraction. To provide the most conservative emission estimates, calibrated target compounds that are not detected are reported at the RL. Values reported between the RL and MDL are incorporated into the emission estimate as reported.

Table 8-12: Proposed Feed Rates

Parameter	Demonstrated			MACT Emissions		Proposed	
	Emissions (g/s)	Feed rate (lb/hr)	Test Condition	Demonstrated (ug/dscm @ 7% O ₂)	1/3 Mact Limit	Emissions (g/s)	Feed rate (lb/hr)
Chloride	9.25E-05	25.22	C4b	0.45	7	1.44E-03	392
Antimony	5.61E-09	0.12	C3	---	---	2.55E-08	0.56
Arsenic	3.10E-08	0.11	C3	0.28	0.78	8.62E-08	0.31
Barium	1.93E-07	2.46	C3	---	---	8.76E-07	11.2
Beryllium	2.19E-08	0.00085	C3	0.20	0.56	6.09E-08	0.0024
Boron	5.53E-06	0.075	C3	---	---	2.51E-05	0.34
Cadmium	8.74E-09	0.0012	C3	0.078	0.56	6.27E-08	0.0083
Chromium	2.52E-07	0.95	C3	2.26	6.28	7.01E-07	2.64
Cobalt	1.97E-08	0.0087	C3	---	---	8.94E-08	0.039
Copper	1.64E-07	0.090	C3	---	---	7.44E-07	0.41
Lead	4.26E-08	3.59	C3	0.38	2.73	3.06E-07	25.8
Manganese	7.70E-07	0.34	C3	---	---	3.49E-06	1.53
Mercury	2.40E-07	0.014	C3	2.14	2.7	3.00E-07	0.017
Nickel	1.92E-07	0.025	C4b	---	---	8.71E-07	0.11
Phosphorus	1.77E-06	0.49	C3	---	---	8.03E-06	2.25
Selenium	6.55E-08	0.0016	C3	---	---	2.97E-07	0.0072
Silver	9.53E-07	0.0026	C3	---	---	4.32E-06	0.012
Thallium	2.19E-08	0.00033	C3	---	---	9.94E-08	0.0015
Tin	2.83E-07	0.051	C3	---	---	1.28E-06	0.23
Vanadium	1.11E-07	0.0010	C3	---	---	5.04E-07	0.0046
Zinc	2.22E-06	0.069	C4b	---	---	1.01E-05	0.31