Consumers Energy
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MI-ROP-B2835-2020b EUBOILER2 V.2. and Appendix 5 Test Report

Consumers Energy Company
J.H. Campbell Generating Complex
17000 Croswell Street
West Olive, Michigan 49460
SRN: B2835
FRS: 110000411108

September 10, 2024

Test Date: July 30, 2024

Test performed by the Consumers Energy Company
Regulatory Compliance Testing Section
Air Emissions Testing Body
Laboratory Services Department
Work Order No. 41142204

TABLE OF CONTENTS

EXECUTIVE SUMMARY IV

1.0 INTRODUCTION 1

1.1 IDENTIFICATION, LOCATION, AND DATES OF TESTS 1
1.2 PURPOSE OF TESTING 1
1.3 BRIEF DESCRIPTION OF SOURCE 2
1.4 CONTACT INFORMATION 2

2.0 SUMMARY OF RESULTS 2

2.1 OPERATING DATA 2
2.2 APPLICABLE PERMIT INFORMATION 3
2.3 RESULTS 3

3.0 SOURCE DESCRIPTION 3

3.1 PROCESS 3
3.2 PROCESS FLOW 4
3.3 MATERIALS PROCESSED 4
3.4 RATED CAPACITY 4
3.5 PROCESS INSTRUMENTATION 5

4.0 SAMPLING AND ANALYTICAL PROCEDURES 5

4.1 DESCRIPTION OF SAMPLING TRAIN AND FIELD PROCEDURES 5
4.1.1 LOCATION AND TRAVERSE POINTS (USEPA METHOD 1) 6
4.1.2 VELOCITY AND TEMPERATURE (USEPA METHOD 2) 7
4.1.3 MOLECULAR WEIGHT (USEPA METHOD 3A) 8
4.1.4 MOISTURE CONTENT (USEPA METHOD 4) 9
4.1.5 PARTICULATE MATTER (USEPA METHOD 5) 9
4.1.6 EMISSION RATES (USEPA METHOD 19) 11

5.0 TEST RESULTS AND DISCUSSION 12

5.1 TABULATION OF RESULTS 12
5.2 SIGNIFICANCE OF RESULTS 12
5.3 VARIATIONS FROM SAMPLING OR OPERATING CONDITIONS 12
5.4 PROCESS OR CONTROL EQUIPMENT UPSET CONDITIONS 12
5.5 AIR POLLUTION CONTROL DEVICE MAINTENANCE 13
5.6 RE-TEST DISCUSSION 13
5.7 RESULTS OF AUDIT SAMPLES 13
5.7.1 PERFORMANCE AUDIT SAMPLE 13
5.7.2 REFERENCE METHOD AUDITS 13
5.8 CALIBRATION SHEETS 14
5.9 SAMPLE CALCULATIONS 14
5.10 FIELD DATA SHEETS 15
5.11 LABORATORY QUALITY ASSURANCE / QUALITY CONTROL PROCEDURES 15
5.11.1 QA/QC BLANKS 15

FIGURES

FIGURE 3-1. UNIT 2 DATA FLOW DIAGRAM 4
FIGURE 4-1. UNIT 2 DUCT CROSS SECTION AND TEST PORT/TRAVERSE POINT DETAIL 7
FIGURE 4-2. METHOD 2 SAMPLE APPARATUS 7
FIGURE 4-3. USEPA METHOD 3A SAMPLING SYSTEM 8
FIGURE 4-4. USEPA METHOD 5 SAMPLING APPARATUS 10
FIGURE 4-5. USEPA METHOD 5 SAMPLE RECOVERY SCHEME 11
FIGURE 4-6. USEPA METHOD 5 ANALYTICAL SCHEME 11

TABLES

TABLE 1-2 CONTACT INFORMATION 2
TABLE 4-1 TEST METHODS 5
TABLE 4-2 TEST MATRIX 6
TABLE 4-3 USEPA METHOD 5 IMPINGER CONFIGURATION 9
TABLE 5-1 QA/QC PROCEDURES 13
TABLE 5-2 QA/QC BLANKS 15

APPENDICES

Appendix Table 1	Particulate Matter Results
Appendix A	Sample Calculations
Appendix B	Field Data Sheets
Appendix C	Laboratory Data Sheets
Appendix D	Operating Data
Appendix E	Supporting Documentation

EXECUTIVE SUMMARY

Consumers Energy Company (Consumers Energy) Regulatory Compliance Testing Section (RCTS) conducted filterable particulate matter (PM) testing at the exhaust of coal-fired electric utility steam generating unit (EGU) EUBOILER2 (Unit 2), which generates steam to turn a turbine and generate electricity at the J.H. Campbell Generating Complex in West Olive, Michigan. The testing was performed on July 30, 2024.

The purpose of the test program was to satisfy the enduring testing requirements originating from Consent Decree (CD) Civil Action No. 14-13580, which have been incorporated into the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit (ROP) MI-ROP-B2835-2020b, and evaluate compliance with the applicable emission limits of 0.015 lb/MMBtu originating from the CD, 0.15 lb/1,000lb of exhaust gas as required by Michigan Air Pollution Control Rules R 336.1331 (Rule 331), and 0.030 lb/MMBtu from 40 CFR 63, Subpart UUUUU, *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units* (Mercury and Air Toxics Rule (MATS), Section 63.10006(b) and Table 5.

Although the results are compared to MATS PM emission limits, the test cannot be used as a MATS triennial performance test since at least 1,050 calendar days must separate performance tests and the previous MATS PM test was conducted on May 16, 2022. Thus, the MATS triennial PM testing requirements can be satisfied after March 31, 2025.

Triplicate PM test runs were conducted following the procedures in United States Environmental Protection Agency (USEPA) Reference Methods (RM) 1, 2, 3A, 4, 5, and 19 in 40 CFR 60, Appendix A. During testing, Unit 2 was operated while firing 100% western coal at maximum routine operating conditions with an average electrical output of 300 gross megawatts (MWg), equating to 100% of the 300 MWg rated output. 40 CFR §63.10007(2) describes maximum normal operating load as generally between 90 and 110 percent of design capacity but should be representative of site-specific normal operations during each test run.

There were no deviations from the approved stack test protocol or the USEPA Reference Methods therein. The Unit 2 PM results are summarized in Table E-1.

Table E-1
Summary of JHC EUBOILER2 Test Results

Pollutant	Units	Average Result	Limit	Underlying Applicable Requirement
PM	lb/MMBtu	**0.0005**	**0.030** **0.015**[a]	40 CFR 63.9991 40 CFR Part 63, Subpart UUUUU, Table 2.1.a
			0.015 **0.010**[b]	"U.S. V CONSUMERS ENERGY COMPANY, CIVIL ACTION 14-13580, E.D. MICH., 2014" paragraph 144; Act 451, Section 324.5503(b)
	lb/1,000 lb exhaust gas @ 50% EA	**0.0004**	**0.15**	R 336.1331(1)(c)

[a] Limit to qualify for low emitting EGU (LEE) status.
[b] Limit allowing PM testing to be performed every other year, rather than every year, provided that two of the most recently completed test results are equal to or less than 0.010 lb/MMBtu.

The test results indicate EUBOILER2 PM emissions comply with the applicable limits of 0.15 lb/1,000 lb exhaust gas, corrected to 50% excess air as listed in ROP Part C, EUBOILER2 emission unit condition I.1, the enduring Consent Decree limit of 0.015 lb/MMBtu listed in

condition I.5, and the reduced testing frequency limit of 0.010 lb/MMBtu, as well as, the applicable ROP Part C, FGMATS_U12 flexible group conditions I.1. of 0.030 lb/MMBtu and the MATS LEE listed in I.4. of 0.015 lb/MMBtu.

Detailed results are presented in Appendix Table 1. Sample calculations, field data sheets, and laboratory data are presented in Appendices A, B, and C. Boiler operating data and supporting documentation are provided in Appendices D and E.

1.0 INTRODUCTION

This report summarizes the results of compliance filterable particulate matter (PM) air emissions testing conducted July 30, 2024, on EUBOILER2, operating at the Consumers Energy J.H. Campbell Generating Complex in West Olive, Michigan.

This document follows the EGLE format described in the November 2019, *Format for Submittal of Source Emission Test Plans and Reports*. Please exercise due care when reproducing portions of this report, as critical substantiating documentation and/or other information may be omitted or taken out of context.

1.1 IDENTIFICATION, LOCATION, AND DATES OF TESTS

Consumers Energy Regulatory Compliance Testing Section (RCTS) conducted PM testing at the dedicated exhaust of coal-fired boiler EUBOILER2 (Unit 2) operating at the J.H. Campbell Generating Complex in West Olive, Michigan. A test protocol was submitted to EGLE on March 27, 2024. Jeremy Howe, EGLE Technical Programs Unit Supervisor, approved the protocol vie email dated April 19, 2024. A copy of the approval, as well as a previous EPA approval, can be found in Appendix E of this report. Testing was performed July 30, 2024.

1.2 PURPOSE OF TESTING

The purpose of the test program was to satisfy the enduring testing requirements originating from Consent Decree (CD) Civil Action No. 14-13580, which have been incorporated in Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit (ROP) MI-ROP-B2835-2020b, and evaluate compliance with the applicable emission limits of 0.015 lb/MMBtu originating from the CD, 0.15 lb/1,000lb of exhaust gas as required by Michigan Air Pollution Control Rules R 336.1331, and 0.030 lb/MMBtu from 40 CFR 63, Subpart UUUUU, *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units* (Mercury and Air Toxics Rule (MATS), Section 63.10006(b) and Table 5.

Although the results are compared to MATS PM emission limits, the test cannot be used as a MATS triennial performance test since at least 1,050 calendar days must separate performance tests and the previous MATS PM test was conducted on May 16, 2022.

The applicable emission limits are presented in Table 1-1.

Table 1-1
Applicable Emission Limits

Pollutant	Units	Limit	Underlying Applicable Requirement
PM	lb/MMBtu	0.030 0.015[a]	40 CFR 63.9991 40 CFR Part 63, Subpart UUUUU, Table 2.1.a
		0.015 0.010[b]	"U.S. V CONSUMERS ENERGY COMPANY, CIVIL ACTION 14-13580, E.D. MICH., 2014" paragraph 144; Act 451, Section 324.5503(b)
	lb/1,000 lb exhaust gas @ 50% EA	0.15	R 336.1331(1)(c)

[a] Limit to qualify for low emitting EGU (LEE) status.
[b] Limit allowing PM testing to be performed every other year, rather than every year, provided that two of the most recently completed test results are equal to or less than 0.010 lb/MMBtu.

1.3 Brief Description of Source

EUBOILER2 is a coal-fired EGU that operates as needed to provide electricity to the regional grid and Consumers Energy customers.

1.4 Contact Information

Table 1-2 presents the names, addresses, and telephone numbers of the contacts for information regarding the test and the test report, and names and affiliation of personnel involved in conducting the testing.

Table 1-2
Contact Information

Program Role	Contact	Address
EGLE AQD Emissions Measurement Representative	Jeremy Howe Technical Programs Unit Supervisor 231-878-6687 howej1@michigan.gov	EGLE Technical Programs Unit 525 W. Allegan, Constitution Hall, 2nd Floor S Lansing, Michigan 48933-1502
EGLE AQD District Supervisor	Heidi Hollenbach Air Quality Manager 616-540-1136 hollenbachh@michigan.gov	EGLE Grand Rapids District Office 350 Ottawa Avenue NW, Unit 10 Grand Rapids, Michigan 49503-2316
Responsible Official	Nathan J. Hoffman Executive Director of Fossil Generation 616-738-5436 nathan.hoffman@cmsenergy.com	Consumers Energy Company J.H. Campbell Generating Complex 17000 Croswell Street West Olive, Michigan 49460
Site Environmental	Joseph Firlit Manager of Engineering Support 616-738-3260 joseph.firlit@cmsenergy.com	Consumers Energy Company J.H. Campbell Generating Complex 17000 Croswell Street West Olive, Michigan 49460
CEMS Technician	Roger Vargo Sr Equipment Technician 616-738-3270 roger.vargo@cmsenergy.com	Consumers Energy Company J.H. Campbell Generating Complex 17000 Croswell Street West Olive, Michigan 49460
Test Team Representative	Thomas Schmelter, QSTI Principal Lab Technical Analyst 616-738-3234 thomas.schmelter@cmsenergy.com	Consumers Energy Company L&D Training Center 17010 Croswell Street West Olive, Michigan 49460

2.0 SUMMARY OF RESULTS

2.1 Operating Data

The boiler fired 100% western coal during the test event and operated at a maximum routine operating condition of 300 gross megawatts (MWg), equating to 100% of the 300 MWg rated output. 40 CFR §63.10007(2) describes maximum normal operating load as generally between 90 and 110 percent of design capacity but should be representative of site-specific normal operations during each test run.

Refer to Appendix D for detailed operating data, which was recorded in Eastern Standard Time (EST).

2.2 Applicable Permit Information

The J.H. Campbell Generating Complex is assigned State of Michigan Registration Number (SRN) B2835 and operates in accordance with air permit MI-ROP-B2835-2020b, including the enduring performance, operation, maintenance, and control technology requirements that originated in Consent Decree (CD) Civil Action No. 14-13580, which was terminated on September 2, 2020. The air permit incorporates federal regulations and reports under Federal Registry System (FRS) identification number 110000411108.

EUBOILER2 is the emission unit identification in the permit and is also identified within the FGMATS_U12 flexible group conditions. Incorporated within the permit are the applicable requirements of 40 CFR 63, Subpart UUUUU – *National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-fired Electric Utility Steam Generating Units*.

2.3 Results

The test results indicate EUBOILER2 PM emissions comply with the applicable limits of 0.15 lb/1,000 lb exhaust gas, corrected to 50% excess air as listed in ROP Part C, EUBOILER2 emission unit condition I.1, the enduring Consent Decree limit of 0.015 lb/MMBtu listed in condition I.5, and the reduced testing frequency limit of 0.010 lb/MMBtu, as well as, the applicable ROP Part C, FGMATS_U12 flexible group conditions I.1. of 0.030 lb/MMBtu and the MATS LEE listed in I.4. of 0.015 lb/MMBtu. Refer to Table 2-1 for a summary of the test results.

Table 2-1
Summary of JHC EUBOILER2 Test Results

Pollutant	Units	Three Run Average Result	Limit	Underlying Applicable Requirement
PM	lb/MMBtu	**0.0005**	**0.030** **0.015**[a]	40 CFR 63.9991 40 CFR Part 63, Subpart UUUUU, Table 2.1.a
			0.015 **0.010**[b]	"U.S. V CONSUMERS ENERGY COMPANY, CIVIL ACTION 14-13580, E.D. MICH., 2014" paragraph 144; Act 451, Section 324.5503(b)
	lb/1,000 lb exhaust gas @ 50% EA	**0.0004**	**0.15**	R 336.1331(1)(c)

[a] Limit to qualify for low emitting EGU (LEE) status.
[b] Limit allowing PM testing to be performed every other year, rather than every year, provided that two of the most recently completed test results are equal to or less than 0.010 lb/MMBtu.

Detailed results are presented in Appendix Table 1. A discussion of the results is presented in Section 5.0. Sample calculations, field data sheets, and laboratory results are presented in Appendices A, B, and C. Boiler operating data and supporting information are provided in Appendices D and E.

3.0 SOURCE DESCRIPTION

3.1 Process

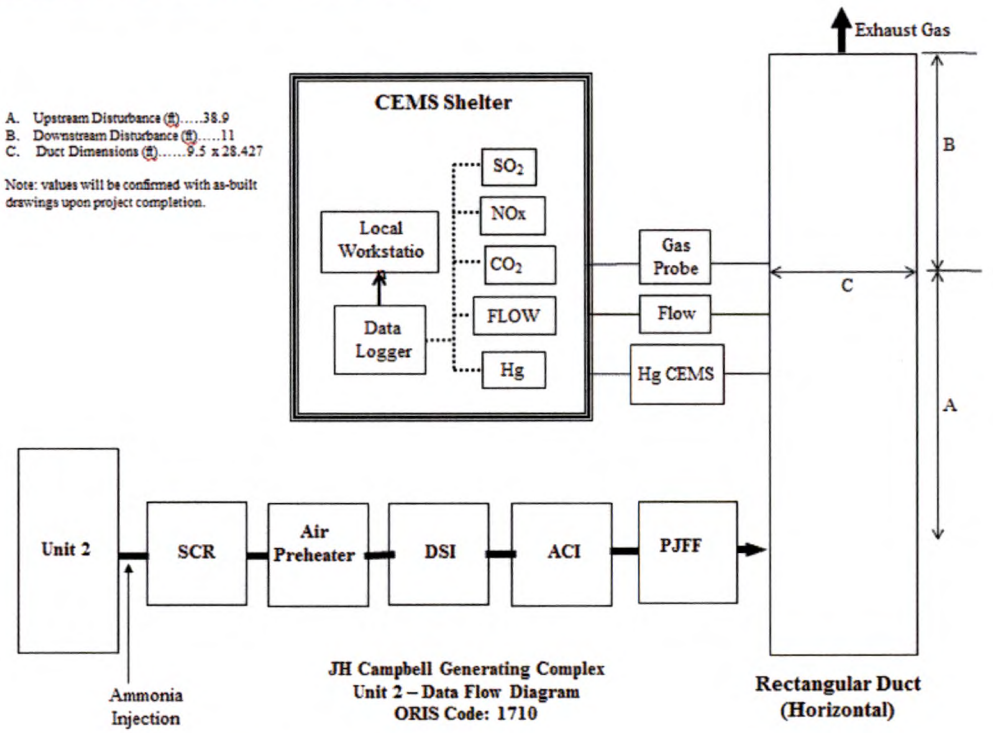
Unit 2 is a wall-fired boiler, classified as an existing unit under MATS, which combusts pulverized subbituminous coal as the primary fuel and oil as an ignition/flame stabilization fuel. The unit is also permitted to burn eastern coal blends. The source classification code

(SCC) is 10100222. Coal is fired in the furnace where the combustion heats water within boiler tubes to produce steam. The steam turns a turbine that is connected to an electricity producing generator. The electricity is routed through the transmission and distribution system to consumers.

3.2 Process Flow

The flue gas generated through coal combustion is controlled by multiple pollution control devices. The unit is equipped with low nitrogen oxides (NO_x) burners (LNB), over fire air (OFA), a selective catalytic reduction (SCR) system for NO_x control, a dry sorbent (lime) injection (DSI) system for control of sulfur dioxides (SO_2) and other acid gasses, an activated carbon injection (ACI) system for mercury (Hg) reduction, and a pulse jet fabric filter (PJFF) baghouse to control PM emissions. Post control flue gas exhausts to atmosphere through an approximately 400-feet high stack shared with EUBOILER1. Refer to Figure 3-1 for the Unit 2 Data Flow Diagram.

Figure 3-1. Unit 2 Data Flow Diagram



3.3 Materials Processed

Unit 2 is classified as a coal-fired unit not firing low rank virgin coal as described in Table 2 to Subpart UUUUU. The unit fired 100% western coal during this test, however the unit is also capable of firing blends of eastern and low-sulfur western coal.

3.4 Rated Capacity

Unit 2 has a nominal heat input capacity of 3,560 MMBtu/hr and a gross electrical output of approximately 378 MWg while firing a blend of eastern and western coal. Unit 2 is capable of firing 100% bituminous (eastern) coal, 100% subbituminous (western) coal, and various mixtures of the two coal types, however when firing only western coal, the unit is limited to approximately 300 MWg, and the nominal heat input rating is achievable only when firing at

least 40% eastern coal with all coal mills operating. The boiler operates in a continuous manner to meet the electrical demands of Midcontinent Independent System Operator, Inc. (MISO) and Consumers Energy customers. EUBOILER2 is considered a baseload unit as it is designed to operate 24 hours per day, 365 days per year.

3.5 Process Instrumentation

The process was continuously monitored by boiler operators, environmental technicians, and data acquisition systems during testing. The following parameters were collected during testing and are included in Appendix D:

- Fuel blend; F-factor
- Heat input rate (MMBtu/hr)
- Boiler load, Gross electrical output (MWg)
- Carbon dioxide (CO_2 Vol-%)
- Opacity (%)
- Baghouse pressure drop (in. H_2O)

4.0 SAMPLING AND ANALYTICAL PROCEDURES

RCTS employed the USEPA test methods presented in Table 4-1 for particulate matter testing. The sampling and analytical procedures associated with each parameter are described in the following sections.

Table 4-1
Test Methods

Parameter	Method	USEPA Title
Sample/Traverse Point Locations	1	Sample and Velocity Traverses for Stationary Sources
Flow Rate	2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
Molecular Weight (O_2 and CO_2)	3A	Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)
Moisture Content	4	Determination of Moisture Content in Stack Gases
Filterable Particulate Matter	5	Determination of Particulate Matter Emissions from Stationary Sources
Emission Rates	19	Sulfur Dioxide Removal and Particulate, Sulfur Dioxide and Nitrogen Oxides from Electric Utility Steam Generators

4.1 Description of Sampling Train and Field Procedures

The test matrix presented in Table 4-2 summarizes the sampling and analytical methods performed for the specified parameters during this test program.

Table 4-2
Test Matrix

Date (2024)	Run	Sample Type	Start Time (EST)	Stop Time (EST)	Test Duration (min)	EPA Test Method	Comment
July 30	1	O_2/CO_2 Moisture PM	7:01	9:22	125	1 3A 4 5 19	Isokinetic sampling from 25 traverse points collected 4.042 dscm of sample volume to meet LEE minimums of 2 dscm.
	2		9:45	12:03	125		Isokinetic sampling from 25 traverse points collected 4.072 dscm of sample volume to meet LEE minimums of 2 dscm.
	3		12:22	14:42	125		Isokinetic sampling from 25 traverse points collected 4.221 dscm of sample volume to meet LEE minimums of 2 dscm.

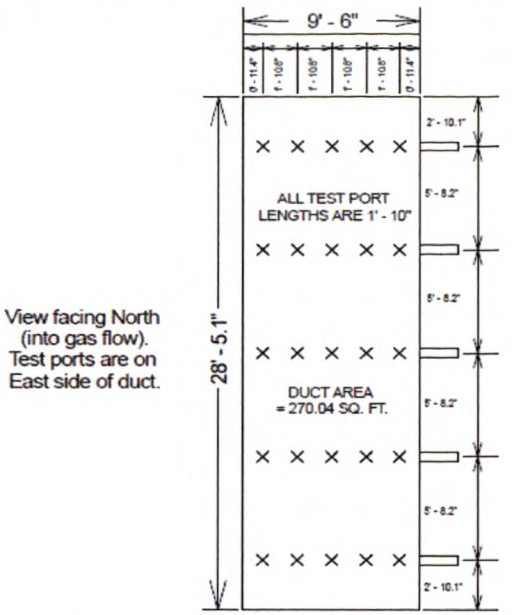
4.1.1 Location and Traverse Points (USEPA Method 1)

The number and location of traverse points for determining exhaust gas velocity and volumetric airflow was determined in accordance with USEPA Method 1, *Sample and Velocity Traverses for Stationary Sources*. Five test ports are located in the horizontal plane on the east side of the 9.5 feet by 28 feet 5.1-inch rectangular duct. The duct has an equivalent duct diameter of 14 feet 2.4 inches. The ports are situated:

- Approximately 38.9 feet or 2.7 duct diameters downstream of a duct diameter change flow disturbance, and
- Approximately 11 feet or 0.8 duct diameters upstream of flow disturbance caused by a change in duct diameter as it enters the exhaust stack.

The sample ports are 6-inches in diameter and extend 22 inches beyond the stack wall. The area of the exhaust duct was calculated, and the cross-sectional area divided into equal rectangular areas based on distances to air flow disturbances. Flue gas was sampled for five minutes at each of the five traverse points from the five sample ports for a total of 25 sample points and 125 minutes. A drawing of the Unit 2 exhaust test port and traverse point locations is presented as Figure 4-1.

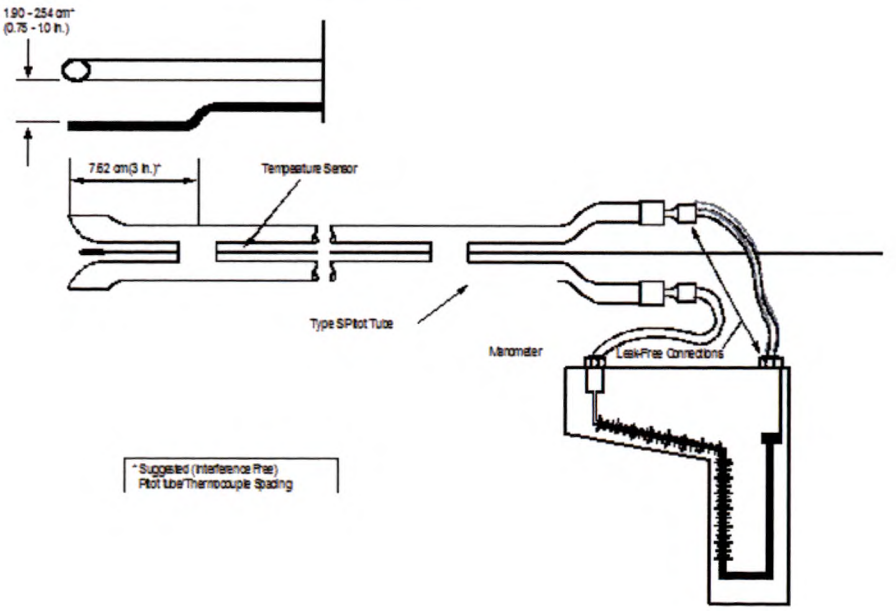
Figure 4-1. Unit 2 Duct Cross Section and Test Port/Traverse Point Detail



4.1.2 Velocity and Temperature (USEPA Method 2)

The exhaust gas velocity and temperature were measured using USEPA Method 2, *Determination of Stack Gas Temperature and Velocity (Type S Pitot Tube)*. Refer to Figure 4-2 for an example of the apparatus. The pressure differential (ΔP) across the positive impact and negative static openings of the Pitot tube were measured using an "S Type" (Stauscheibe or reverse type) Pitot tube connected to an appropriately sized oil filled inclined manometer. Exhaust gas temperatures were measured using a nickel-chromium/nickel-alumel "Type K" thermocouple and a temperature indicator.

Figure 4-2. Method 2 Sample Apparatus



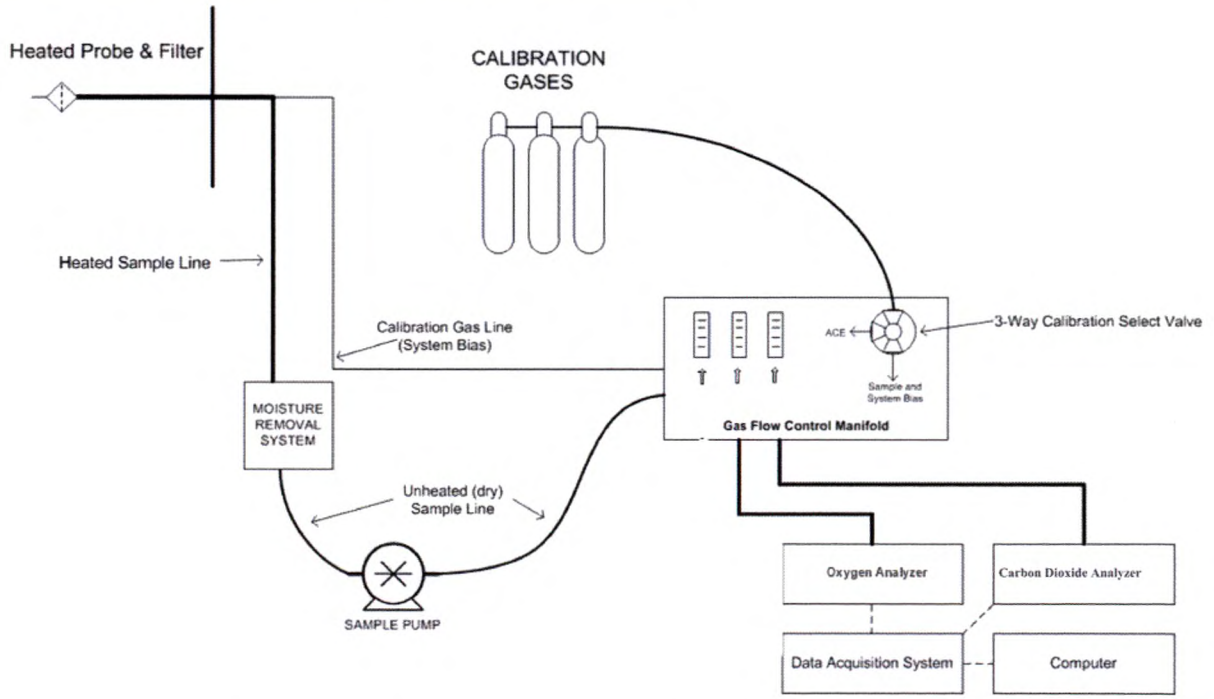
Appendix B of this report includes cyclonic flow test data as verification of the absence of cyclonic flow at the sample location. Method 1, § 11.4.2 states "if the average (null angle) is greater than 20°, the overall flow condition in the stack is unacceptable, and alternative methodology...must be used." The average null yaw angle measured at the Unit 2 exhaust on August 23, 2016, was measured to be 3.4°, thus meeting the less than 20° requirement. In the absence of ductwork and/or stack configuration changes, this null angle information is considered to be valid and additional cyclonic flow verification was not performed.

4.1.3 Molecular Weight (USEPA Method 3A)

Oxygen and carbon dioxide concentrations were measured using the sampling and analytical procedures of USEPA Method 3A, *Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure).* The measured concentrations were used to calculate emissions rates using USEPA Method 19 (refer to Section 4.1.6). The Method 3A sample probe was attached to the Method 5 sample probe to collect O_2 and CO_2 concentrations at each of the 25 traverse points simultaneously with PM measurements.

Flue gas was sampled from the stack through a stainless-steel probe, heated Teflon® sample line, and through a gas conditioning system to remove water and dry the sample before entering a sample pump, gas flow control manifold, and paramagnetic and infrared gas analyzers. Figure 4-3 depicts the Method 3A sampling system.

Figure 4-3. USEPA Method 3A Sampling System



Prior to sampling, the analyzers were calibrated by performing a calibration error test where zero-, mid-, and high-level calibration gases were introduced directly to the back of the analyzers. The calibration error check was performed to evaluate if the analyzers' responses were within ±2.0% of the calibration gas span or high calibration gas concentration. An initial system bias test was performed where the zero- and mid-calibration gases were introduced at the sample probe to measure the ability of the system to respond accurately to within ±5.0% of span.

Upon successful completion of the calibration error and initial system bias tests, sample flow rates and component temperatures were verified and the probe was inserted into the duct at the appropriate traverse point. After confirming the boiler was operating at established conditions, the test run was initiated. Oxygen and carbon dioxide concentrations were recorded at 1-minute intervals throughout the test run. Oxygen and carbon dioxide concentration data collected during port changes were excluded from the test run average.

At the conclusion of the test run, a post-test system bias check was performed to evaluate analyzer bias and drift between the pre- and post-test system bias checks. The system bias checks evaluate if the analyzers' bias was within ±5.0% of span and drift was within ±3.0%. The analyzer responses were used to correct the measured oxygen and carbon dioxide concentrations for analyzer drift. The corrected concentrations were used to calculate molecular weight and emission rates. Refer to Appendix E for analyzer calibration supporting documentation.

4.1.4 Moisture Content (USEPA Method 4)

The exhaust gas moisture content was measured using USEPA Method 4, *Determination of Moisture in Stack Gases* in conjunction with the Method 5 sample apparatus. Sample gas was drawn through a series of impingers immersed in an ice bath to condense and remove water from the flue gas. The amount of water condensed and collected in the impingers was measured gravimetrically and used to calculate the exhaust gas moisture content.

4.1.5 Particulate Matter (USEPA Method 5)

Filterable particulate matter samples were collected isokinetically by withdrawing a sample of the flue gas through a pre-weighed filter following the procedures of USEPA Method 5, *Determination of Particulate Matter Emissions from Stationary Sources*.

In a letter received from USEPA on April 12, 2016, in response to a February 10, 2016, request by Consumers Energy, USEPA has approved the use of USEPA Method 5 (probe and filter temperature set points at 248±25°F) as an alternative to MATS 5 (probe and filter temperature set points at 320±25°F) to avoid having to conduct compliance tests using multiple test methods.

In the Method 5 sampling apparatus, the flue gas was passed through a nozzle, heated probe, quartz-fiber filter, and into a series of impingers with the configuration presented in Table 4-3. The filter collects filterable particulate matter while the impingers collect water vapor. Figure 4-4 depicts the USEPA Method 5 sampling apparatus.

Table 4-3
USEPA Method 5 Impinger Configuration

Impinger Order (Upstream to Downstream	Impinger Type	Impinger Contents	Amount (gram)
1	Modified	Water	100
2	Greenburg-Smith	Water	100
3	Modified	Empty	0
4	Modified	Silica gel desiccant	~200-300

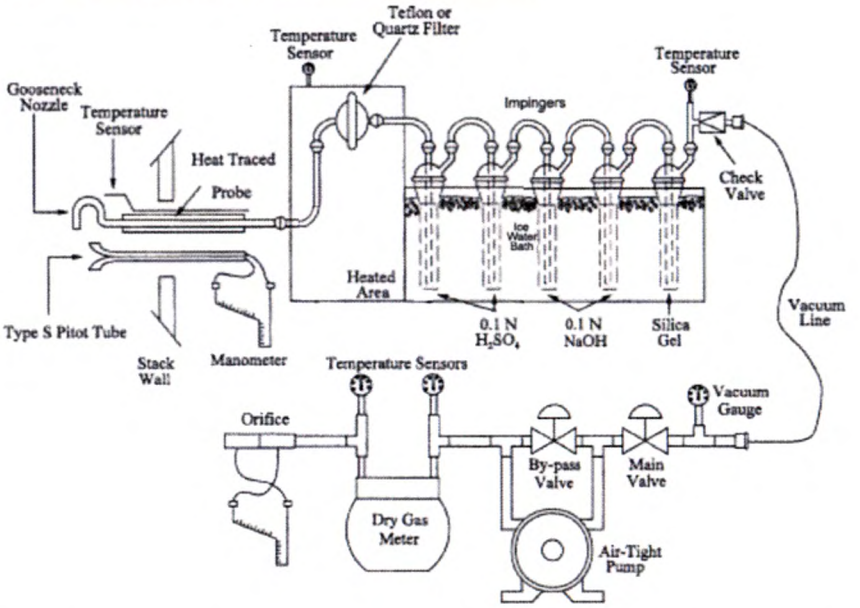
Before testing, a preliminary velocity traverse was performed and/or representative flow data from previous measurements were reviewed to calculate an ideal nozzle size that

allows isokinetic sampling to be performed. A pre-cleaned nozzle that has an inner diameter that approximates the calculated value was measured with calipers across three cross-sectional chords, rinsed and brushed with acetone and connected to the sample probe.

The impact and static pressure openings of the Pitot tube were leak checked at or above a velocity head of 3.0 inches of water for a minimum of 15 seconds. The sampling train was leak checked by capping the nozzle opening and applying a vacuum of approximately 15 inches of mercury. The dry-gas meter was monitored for approximately 1 minute to verify the leakage rate was less than 0.02 cubic foot per minute (cfm). The sample probe was then inserted into the sampling port to begin sampling.

Ice was placed around the impingers while the probe and filter temperatures were allowed to stabilize to a temperature of 248±25°F before sampling. After the desired operating conditions were coordinated with the facility, testing was initiated. Stack and sampling apparatus parameters (e.g., flue velocity, temperature) were monitored to establish the isokinetic sampling rate was within 100±10% for the duration of the test.

Figure 4-4. USEPA Method 5 Sampling Apparatus



At the conclusion of a test run and the post-test leak check, the sampling train was disassembled and the impingers and filter housing were transported to the recovery area.

The filter was recovered from the filter housing and placed in a Petri dish, sealed with Teflon tape, and labeled as "FPM Container 1." The nozzle, probe liner, and front half of the filter housing were triple rinsed with acetone to collect particulate matter. The acetone rinses were collected in pre-cleaned sample containers, sealed with Teflon tape, and labeled as "FPM Container 2." The weight of liquid collected in each impinger, including the silica gel impinger, was measured using an electronic scale; these weights were used to calculate the moisture content of the sampled flue gas. The contents of the impingers were discarded. Refer to Figure 4-5 for the USEPA Method 5 sample recovery scheme.

The sample containers, including blanks, were transported to the laboratory for analysis. The sample analysis followed USEPA Method 5 procedures as summarized in the analytical scheme presented in Figure 4-6.

Figure 4-5. USEPA Method 5 Sample Recovery Scheme

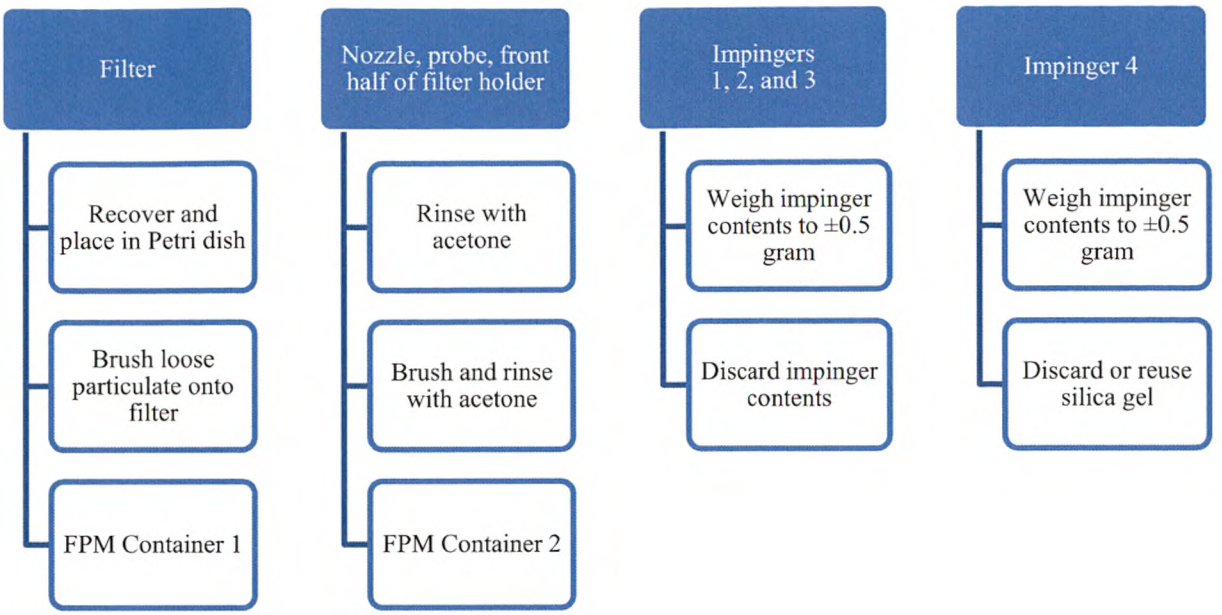
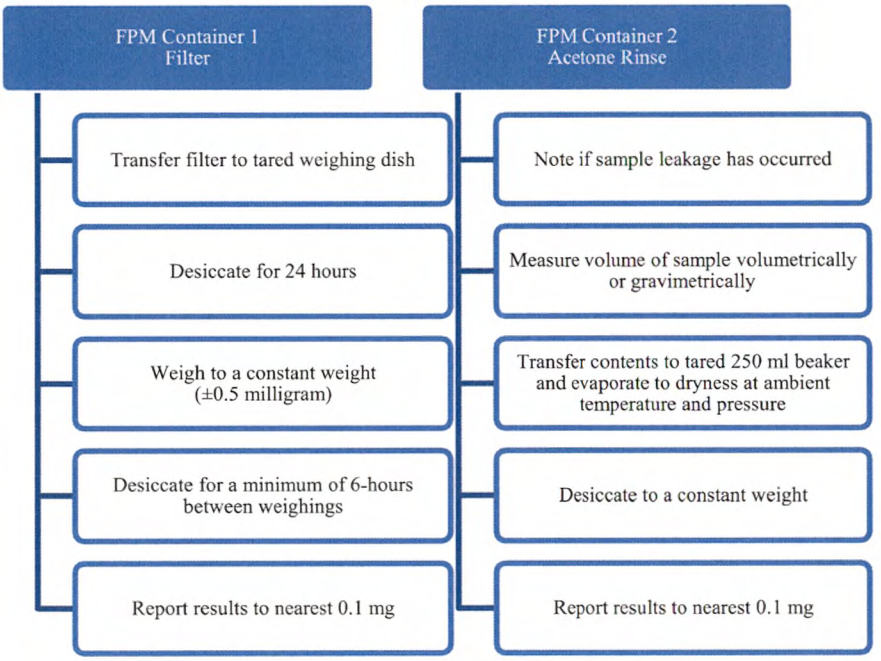


Figure 4-6. USEPA Method 5 Analytical Scheme



4.1.6 Emission Rates (USEPA Method 19)

USEPA Method 19, *Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates*, was used to calculate PM emission rates (lb/MMBtu). Measured carbon dioxide concentrations and F factors (ratios of combustion gas volumes to heat inputs) were used to calculate emission rates using equation 19-6 from the method:

USEPA Method 19 Equation 19-6

$$E = C_d F_c \frac{100}{\%CO_{2d}}$$

Where:

E	=	Pollutant emission rate (lb/MMBtu)
C_d	=	Pollutant concentration, dry basis (lb/dscf)
F_c	=	Volumes of combustion components per unit of heat content 1,840 scf CO_2/MMBtu for subbituminous coal from 40 CFR 75, Appendix F, Table 1
$\%CO_{2d}$	=	Concentration of carbon dioxide on a dry basis (%, dry)

5.0 TEST RESULTS AND DISCUSSION

The test program was performed on July 30, 2024, to satisfy the enduring testing requirements originating from Consent Decree (CD) Civil Action No. 14-13580, which have been incorporated in ROP MI-ROP-B2835-2020b, and evaluate compliance with the applicable emission limits of 0.015 lb/MMBtu originating from the CD, 0.15 lb/1,000lb of exhaust gas as required by Michigan Air Pollution Control Rules R 336.1331, and 0.030 lb/MMBtu from the MATS rule, Section 63.10006(b) and Table 5.

5.1 Tabulation of Results

Table 2-1 in Section 2 of this report summarizes the results and Appendix Table 1 contains detailed tabulation of results, process operating conditions, and exhaust gas conditions.

5.2 Significance of Results

The EUBOILER2 PM test results indicate the unit demonstrates ongoing compliance with the applicable emission limits.

5.3 Variations from Sampling or Operating Conditions

As noted on page 4 of the test protocol and consistent with ROP requirement FGMATS_U12 [SCV.4.] a target parameter for opacity during the PM test was identified. Therefore, during the Unit 2 PM test, the outlet opacity of the pulse jet fabric filters (PJFFs) was monitored and recorded, with a target opacity of two (2) or more consecutive 1-hour block average opacity values less than or equal 15% opacity. This 15% opacity target aligns with the current Unit 2 compliance assurance monitoring (CAM) requirement, which defines an excursion as "any two (2) or more consecutive 1-hour block average opacity values greater than 15%." During testing, the opacity was less than or equal to 15%. See Appendix D for Opacity results.

5.4 Process or Control Equipment Upset Conditions

The boiler and associated control equipment were operating under routine conditions and no upsets were encountered during testing.

5.5 Air Pollution Control Device Maintenance

No significant pollution control device maintenance occurred during the three months prior to the test. Optimization of the air pollution control equipment is a continuous process to ensure compliance with regulatory emission limits.

5.6 Re-Test Discussion

Based on the results of this test program, a re-test is not required. It should be noted that JHC Unit 2 is scheduled to permanently retire on or before 5/31/2025 23:59. As the preceding date is prior to when the next round of PM testing is required under ROP Table EUBOILER2 Conditions V.1 and V2, and FGMATS_U12 Condition V.3, no further PM testing is planned to be conducted before unit retirement.

5.7 Results of Audit Samples

5.7.1 Performance Audit Sample

Performance audit (PA) samples for each test method were not available because one of the two stationary source audit program audit sample providers ceased manufacturing them. The general provisions to 40 CFR Parts 60 and 63 (see §60.8(g)(1) and §63.7(c)(2)(iii)(A)) require that the owner or operator obtain audit samples if the audit samples are "commercially available"; which is defined as two or more independent accredited audit sample providers (AASP) having blind audit samples available for purchase. Since there are no longer two providers, the requirement to obtain these audit samples is no longer in effect until such time as another independent AASP has audit samples available for purchase.

5.7.2 Reference Method Audits

The USEPA reference methods performed state reliable results are obtained by persons equipped with a thorough knowledge of the techniques associated with each method. Factors with the potential to cause measurement errors are minimized by implementing quality control (QC) and quality assurance (QA) programs into the applicable components of field testing. QA/QC components were included in this test program. Table 5-1 summarizes the primary field quality assurance and quality control activities that were performed. Refer to Appendix E for supporting documentation.

Table 5-1
QA/QC Procedures

QA/QC Activity	Purpose	Procedure	Frequency	Acceptance Criteria
M1: Sampling Location	Evaluates suitability of sampling location	Measure distance from ports to downstream and upstream flow disturbances	Pre-test	≥2 diameters downstream; ≥0.5 diameter upstream
M1: Duct diameter & dimensions	Verifies accuracy of measured stack or duct area	Review as-built drawings and field measurement	Pre-test	Agreement between field measurement & as-built dwg
M1: Cyclonic flow evaluations	Evaluate the sampling location for cyclonic flow	Measure null angles	Pre-test	≤20°
M2: Pitot tube inspection	Verifies construction and alignment of Pitot tube	Inspection	Pre- and post-test	Refer to Sections 6.1 and 10.0 of USEPA Method 2

Table 5-1
QA/QC Procedures

QA/QC Activity	Purpose	Procedure	Frequency	Acceptance Criteria
M2: Pitot tube leak check	Verifies leak free sampling system	Apply ≥3.0" H_2O pressure to Pitot tube	Pre- and post-test	Stable pressure (±0.1"H_2O) for 15 seconds
M3A: Calibration gas standards	Ensures accurate calibration standards	Traceability protocol of calibration gases	Pre-test	Calibration gas uncertainty ≤2.0%
M3A: Calibration Error	Evaluates analyzer operation	Introduce calibration gas directly into analyzers	Pre-test	±2.0% of the calibration span or ≤0.5 ppmv or ≤0.5% CO_2 or O_2 absolute difference
M3A: System Bias and Analyzer Drift	Evaluates analyzer sample system integrity and analyzer accuracy	Calibration gas introduced at the probe, upstream of all sample conditioning components	Pre- and post-test	±5.0% of the analyzer calibration span or ±0.5% absolute difference for bias and ±3.0% of analyzer calibration span for drift
M3A: Multi-point integrated sample	Ensure representative sample collection	Insert probe into stack and purge sample system	Pre-test	Collect sample no closer to the stack wall than 1.0 meter; collect samples at traverse points
M4: Field Balance Calibration Check	Evaluates field balance accuracy	Use Class 6 weight to check balance accuracy	Pre-test; before daily use	Field balance must measure Class 6 weight within ±0.5g of the certified mass
M4: Metering System	Ensures metering system and temperature sensor accuracy	Follow Method 5, Sections 10.3 and 10.5 criteria	Pre- and post-test	Meter ±2.0% of Y_d Temp Sensor ±2°F
M5: nozzle diameter measurements	Verify nozzle diameter used to calculate sample rate	Measure inner diameter across three cross-sectional chords	Pre-test	Three measurements agree within ±0.004 inch
M5: sample rate	Ensure representative sample collection	Calculate isokinetic sample rate	During and post-test	100±10% isokinetic sample rate
Minimum sample volume per run	Ensure sufficient sample volume collection	Record pre- and post-test DGM volume reading	Post-test	Consent Decree: Method 5: ≥1.70 dscm PM: ≥1 dscm LEE PM: ≥2 dscm
M5: post-test leak check	Evaluate if the collected sample was affected by system leak	Cap sample apparatus; monitor DGM	Post-test	≤0.020 cfm
M5: post-test meter audits	Evaluates accurate measurement equipment for sample volume	Calibrate DGM pre- and post-test; compare calibration factors (Y)	Pre-test	±5%

5.8 Calibration Sheets

Calibration sheets, including dry gas meter, gas protocol sheets, and analyzer quality control and assurance checks are presented in Appendix E.

5.9 Sample Calculations

Sample calculations and formulas used to compute emissions data are presented in Appendix A.

5.10 Field Data Sheets

Field data sheets are presented in Appendix B.

5.11 Laboratory Quality Assurance / Quality Control Procedures

The method specific quality assurance and quality control procedures in each method employed during this test program were followed, without deviation. Refer to Appendix C for the laboratory data sheets.

5.11.1 QA/QC Blanks

Reagent and media blanks were analyzed for the parameters of interest. The results of the blank analyses are presented in Table 5-2. Laboratory QA/QC and blank results data are contained in Appendix C.

Table 5-2
QA/QC Blanks

Sample Identification	Result	Comment
Method 5 Acetone Blank	0.5 mg	Sample volume was 200 milliliters. Acetone blank corrections were not applied.
Method 5 Filter Blank	0.9 mg	Reporting limit is 0.1 milligrams