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COMPLIANCE TEST REPORT

for

VOLATILE ORGANIC COMPOUNDS

UNIT 3 – FGD Stack

Monroe Power Plant
Monroe, Michigan

July 16, 2015

Prepared By
Environmental Management & Resources
Environmental Field Services Group
DTE Corporate Services, LLC
7940 Livernois H-136
Detroit, MI 48210

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EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources (EM&R), Field Services Group performed emissions testing on the Unit 3 FGD exhaust stack located at the Monroe Power Plant, in Monroe, Michigan. The testing was required by the Michigan Department of Environmental Quality (MDEQ) Permit to Install #27-13 to document stack emissions from Unit 3 FGD during normal operating conditions. Testing was conducted on July 16, 2015.

A summary of the emission test results are shown below:

Emissions Testing Summary
Unit 3 FGD Stack
Monroe Power Plant
July 16, 2015

	VOC (as propane) (lb/hr)	VOC (as propane) (lb/MMBtu)
Average	4.2	0.0006
Permit Limit	*25.9*	*0.0034*

1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EM&R), Field Services Group performed emissions testing on the Unit 3 FGD exhaust stack located at the Monroe Power Plant, in Monroe, Michigan. The testing was required by the Michigan Department of Environmental Quality (MDEQ) Permit to Install #27-13 to document stack emissions from Unit 3 FGD during normal operating conditions. Testing was conducted on July 16, 2015.

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 1-4, 25A.

The fieldwork was performed as a re-test from the April 15, 2015 compliance testing and in accordance with EPA Reference Methods and EM&R's Intent to Test[1], which was approved in a letter by Mr. David Patterson from the Michigan Department of Environmental Quality (MDEQ), dated March 18, 2015[2]. The following EM&R personnel participated in the testing program: Mr. Mark Grigereit, Principal Engineer, Mr. Fred Meinecke and Mr. Thomas Snyder, Senior Engineering Technicians. Mr. Grigereit was the project Leader. Ms. Atira Mabin, Environmental Specialist at Monroe Power Plant, provided process coordination for the testing program.

2.0 SOURCE DESCRIPTION

The Monroe Power Plant is located at 3500 E. Front Street in Monroe, Michigan. The plant has four (4) coal-fired electric generating units, referred to as Units 1, 2, 3, and 4. These units were placed in service between 1971 and 1974, and have a total electric generating capacity of 3,135 megawatts (gross). The boiler (Babcock & Wilcox) for each unit is a similar supercritical pressure, pulverized coal-fired cell burner boiler. Each boiler exhausts into a dedicated exhaust stack.

Units 1 and 4 have General Electric turbine generators, each with a rated capability of 817 gross megawatts (GMW). Units 2 and 3 have Westinghouse turbine generators, each with a rated capability of 823 GMW.

Each boiler is equipped with Research Cottrell electrostatic precipitator (ESPs), each with a rated particulate removal efficiency of 99.6%. There is a sulfur trioxide flue gas conditioning system on each unit that is only used on an "as needed basis" to lower the resistivity of the fly ash for better collection by the ESPs. None of the units are equipped with sulfuric acid mist control equipment.

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[1] MDEQ, Test Plan, Submitted February 3, 2015. (Attached-Appendix A)
[2] MDEQ, Approval Letter. (Attached-Appendix A)

Units 1 through 4 have Selective Catalytic Reduction (SCR) systems, operated to control at least 90% of the NOx emissions. The SCR's are located upstream of the respective ESP's. Each unit has a wet Flue Gas Desulfurization (FGD) Scrubber to control sulfur dioxide (SO_2), other acid gases, and particulate matter emissions.

The coal blend for Unit 3 was a 56% low-sulfur western (LSW) / 44% mid-sulfur eastern (MSE). Testing was performed while the boiler was operated at normal full load conditions (>700 GMW, approx.).

The boilers at Monroe Power Plant employ the use of continuous soot-blowing, thus a separate PM test conducted specifically during a soot-blowing period was not necessary.

The exhaust stacks for each of boilers are 580 feet tall with an internal diameter of 28 feet. See Figure 1 for a diagram of the Unit 3 sampling location and stack dimension.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

Emissions measurements were conducted in accordance with procedures specified in the USEPA *Standards of Performance for New Stationary Sources* or listed as an approved *"Other Test Method"*. The sampling and analytical methods used in the testing program are indicated in the table below:

Sampling Method	Parameter	Analysis
USEPA Methods 1-2	Exhaust Gas Flow Rates	Field data analysis and reduction
USEPA Method 3A	Oxygen & CO2	Instrumental Analyzer Method
USEPA Method 4	Moisture Content	Field data analysis and reduction
USEPA Method 25A	Volatile Organic Compounds	Flame Ionization Detector

3.1 STACK GAS VELOCITY AND FLOWRATES (USEPA Methods 1-2)

3.1.1 Sampling Method

Stack gas velocity traverses were conducted in accordance with the procedures outlined in USEPA Method 1, "Sample and Velocity Traverses for Stationary Sources," and Method 2, "Determination of Stack Gas Velocity and Volumetric Flowrate." During the emissions testing, four (4) sampling ports were utilized, sampling at three (3) points per port for a total of twelve (12) sampling points. Velocity traverses were conducted in conjunction with all testing method sample collection. See Figure 2 for a diagram of the traverse/sampling points used.

A cyclonic flow check was performed on the Unit 3 FGD Stack during the initial flow monitor certification RATA. Testing at all sampling locations demonstrated that no cyclonic flow was present.

3.1.2 Method 2 Sampling Equipment

The EPA Method 2 sampling equipment consisted of a 0-10.0" incline manometer, S-type pitot tube (C_p = 0.84) and a Type-K calibrated thermocouple.

3.2 OXYGEN AND CARBON DIOXIDE (USEPA Method 3A)

3.2.1 Sampling Method

Stack gas oxygen (O_2) and carbon dioxide (CO_2) emissions were evaluated using USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The O_2 / CO_2 analyzers utilize paramagnetic sensors.

3.2.2 O_2 / CO_2 Sampling Train

The Method 3A sampling system consisted of continuously collecting a gas sample from the exhaust of the dry gas meter during each test. The sample was drawn through a Teflon® line into a Universal™ gas conditioner and into a Servomex™ 1400 O_2/CO_2 gas analyzer.

3.2.3 Sampling Train Calibration

The O_2 / CO_2 analyzer was calibrated according to procedures outlined in USEPA Method 7E. Zero, span, and mid range calibration gases were introduced directly into the analyzer to verify the instruments linearity. The O_2/CO_2 concentrations are recorded on the field data sheets.

3.3 MOISTURE DETERMINATION (USEPA Method 4)

3.3.1 Sampling Method

Determination of the moisture content of the exhaust gas was performed using the method described in USEPA Method 4, "Determination of Moisture Content in Stack Gases". The exhaust gas condensate was collected in glass impingers and the percentage of moisture was derived from calculations outlined in USEPA Method 4.

3.4 VOLATILE ORGANIC COMPOUNDS (USEPA Method 25A)

3.9.1 Sampling Method

USEPA Method 25A, "Determination of Total Hydrocarbon Emissions from Stationary Sources (Instrumental Analyzer Method)" was used to measure the Volatile Organic Compounds (VOC) emissions. The VOC analyzer utilizes a flame ionization detector (FID) to measures total organic hydrocarbon compounds (as propane).

The Method 25A sampling system (Figure 7) consisted of the following:

(1) Single point sampling probe
(2) Heated Teflon® sampling line
(3) J.U.M.109A® Total & Non-Methane gas analyzer
(4) Appropriate certified propane calibration gases
(5) Data acquisition system

Sampling was conducted at a single point in the exhaust stack. Concurrent moisture (Method 4) and exhaust flow (Method 2) sampling was conducted with the VOC sampling in order to calculate the VOC emission rates.

3.9.2 Quality Control and Assurance

In accordance with USEPA Method 25A, a 4-point (zero, low, mid, and high) calibration check was performed on the VOC analyzer. The analyzer was calibrated in the 0-50 ppm range using the following Propane (C_3H_8) calibration gases (0, 49.02, 24.81, and 12.99). Calibration drift checks were performed at the completion of each run and emissions data was drift corrected per USEPA Method 7E. Calibration gas certification sheets are located in Appendix B.

3.9.3 Data Reduction

Data was recorded at 10-second intervals and averaged in 1-minute increments. The average VOC concentration, as Propane (C_3H_8) emissions were reported in parts per million (ppm), lbs/hr and lbs/MMBtu. The 1-minute readings are presented in Appendix A.

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4.0 OPERATING PARAMETERS

The test program included the collection CEMs emission data during each emission test. CEMs data is presented in Appendix C.

5.0 DISCUSSION OF RESULTS

Table 1 presents the Volatile Organic Compound (VOC) emission testing results. The VOC emissions are presented in parts per million (ppm), pounds per hour (lbs/hr) and pounds per Million British thermal units (lbs/MMBtu), all as propane. The average VOC emissions of 4.2 lbs/hr and 0.0006 lbs/MMBtu were below the permit limits of 25.9 lbs/hr and 0.0034 lbs/MMBtu.

The Auxiliary test data presented in the results table for each test includes the Unit Load in gross megawatts (GMW), stack temperature in degrees Fahrenheit (^{o}F), stack gas moisture in percent (%), stack gas velocity in feet per minute (ft/min), and stack gas flow rate in actual cubic feet per minute (ACFM), standard cubic feet per minute (SCFM) and dry standard cubic feet per minute (DSCFM).

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6.0 CERTIFICATION STATEMENT

"I certify that I believe the information provided in this document is true, accurate, and complete. Results of testing are based on the good faith application of sound professional judgment, using techniques, factors, or standards approved by the Local, State, or Federal Governing body, or generally accepted in the trade."

Thomas Snyder, QSTI

This report prepared by: _____

Mr. Thomas Snyder, QSTI
Senior Engineering Technician, Environmental Field Services
Environmental Management and Resources
DTE Energy Corporate Services, LLC

This report reviewed by: _____

Mr. Mark R. Grigereit, QSTI
Principal Engineer, Environmental Field Services
Environmental Management and Resources
DTE Energy Corporate Services, LLC

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TABLE NO. 1
VOLATILE ORGANIC COMPOUND (VOC) EMISSION TESTING RESULTS
Monroe Power Plant - Unit 3 FGD Stack
July 16, 2015

Test	Test Date	Test Time	Unit Load (GMW)	Stack Temperature (°F)	Stack Moisture (%)	Stack Velocity (ft/min)	Exhaust Gas Flowrates (ACFM)	(SCFM)	(DSCFM)	VOC Emissions (as propane) (ppm)[2]	(lbs/hr)[1]	(lbs/MMBtu)[1]
VOC-1	**16-Jul-15**	7:50-8:50	706.7	121.8	11.3	3,542	2,181,128	1,934,040	1,715,908	0.3	3.7	0.0005
VOC-2	**16-Jul-15**	10:11-11:11	711.5	122.1	12.0	3,569	2,197,686	1,947,606	1,713,937	0.3	3.8	0.0005
VOC-3	**16-Jul-15**	11:37-12:37	712.0	121.5	11.1	3,503	2,156,777	1,913,269	1,700,480	0.4	5.0	0.0007
	Average:		***710.1***	***121.8***	***11.5***	***3,538***	***2,178,530***	***1,931,638***	***1,710,108***	***0.3***	***4.2***	***0.0006***

(1) Permit Limit = 25.9 lb/hr & 0.0034 lb/MMBtu

(2) Corrected for analyzer drift as per USEPA Method 7E

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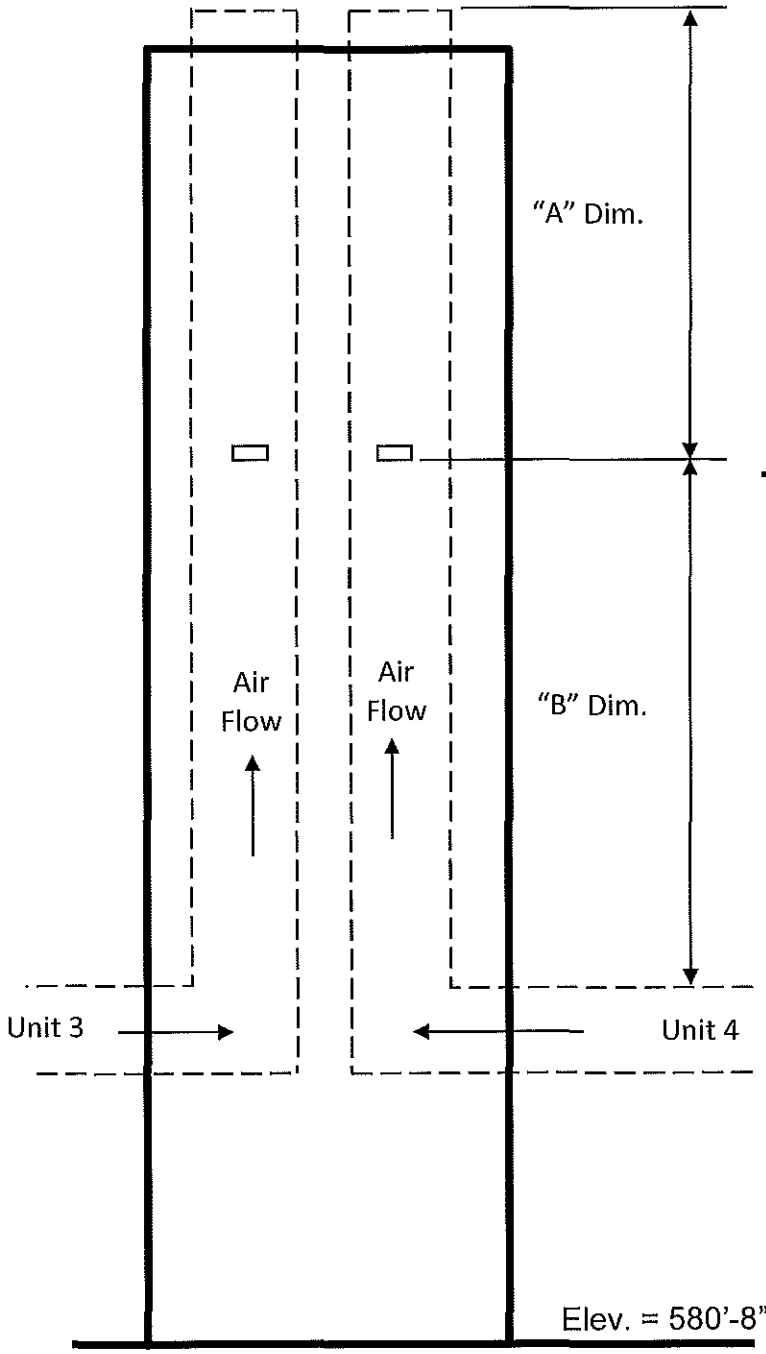
Figure 1 – Sampling Location
Monroe Power Plant - Unit 3
July 16, 2015



Details

"A" Dim = Upstream Distance
"A" Dim = 201.6'
"B" Dim = Downstream Distance
"B" Dim = 233.8'

Dia. @ Sample Location = 28'-0"

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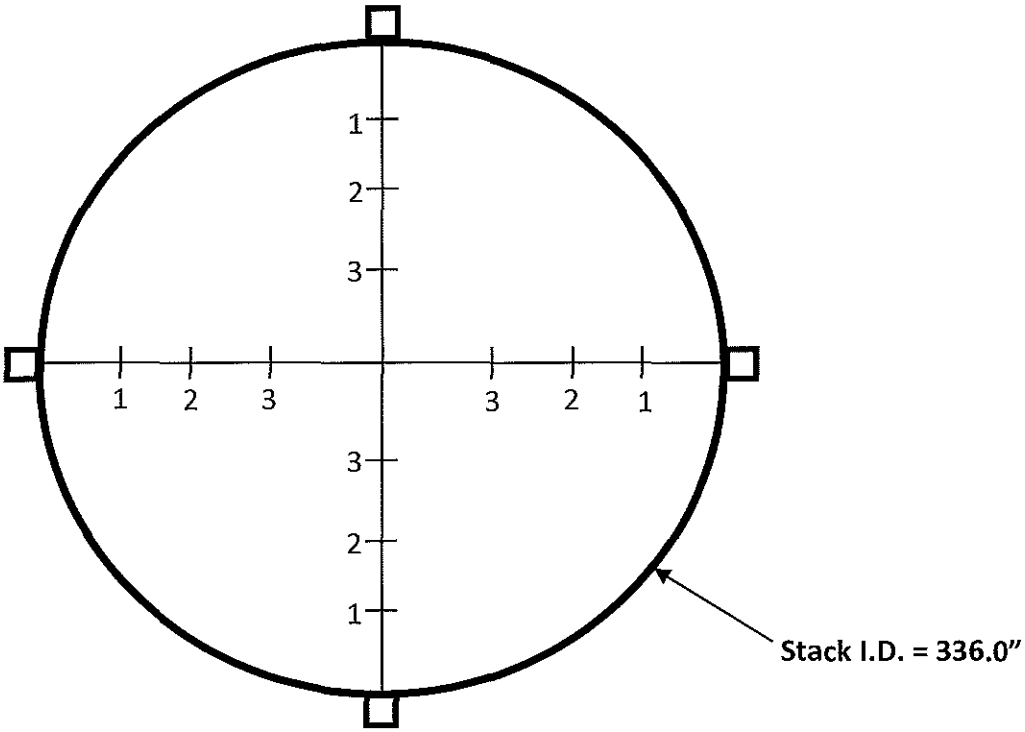
Figure 2 – Sampling Points
Monroe Power Plant - Unit 3
July 16, 2015



VELOCITY / PM MEASUREMENT POINTS

Point	Distance from Inside Wall
1	14.78"
2	49.06"
3	99.46"

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Figure 3 - EPA Method 3A
Monroe Power Plant - Unit 3
July 16, 2015

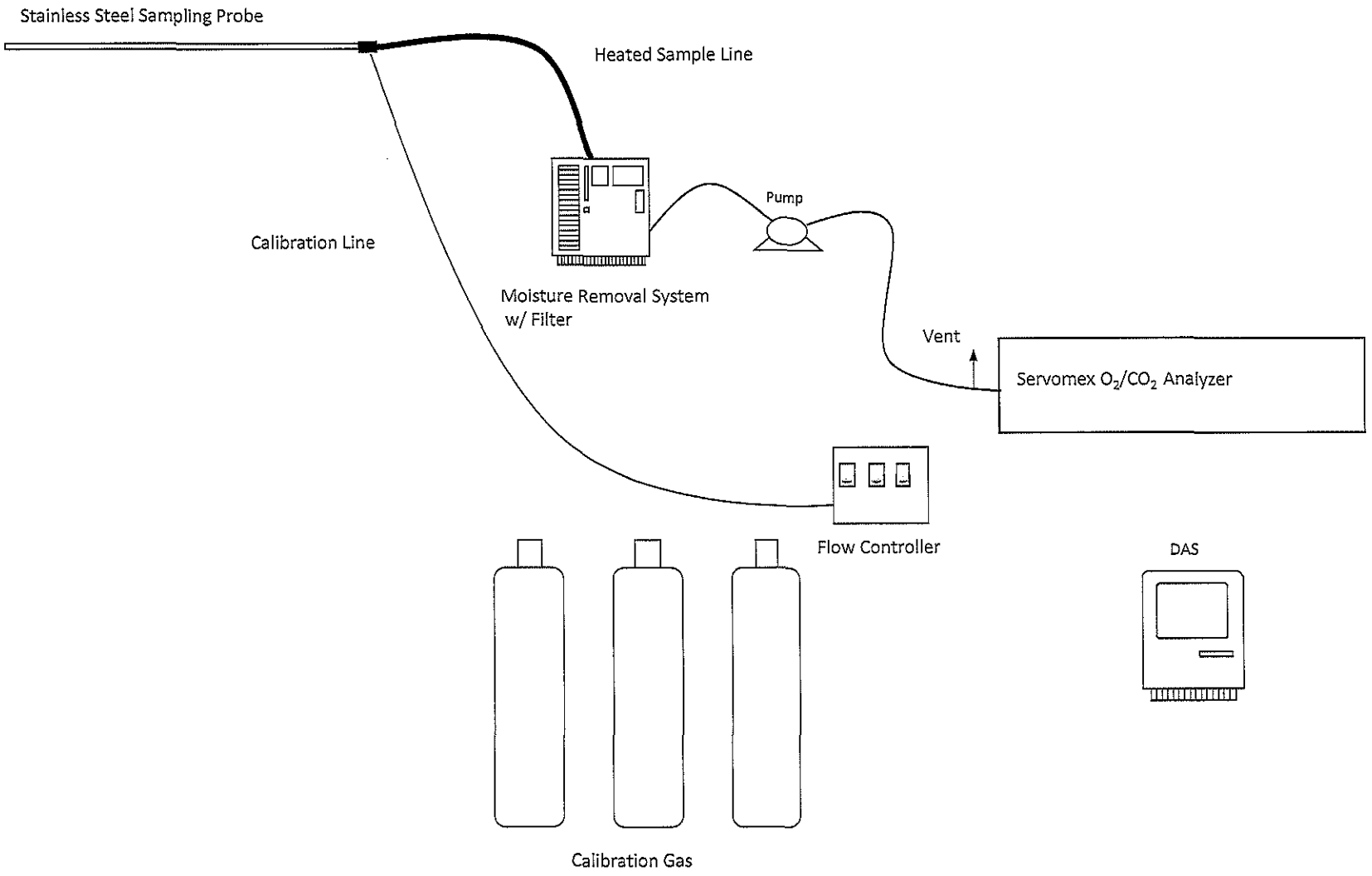

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Figure 4 - EPA Method 4
Monroe Power Plant - Unit 3
July 16, 2015

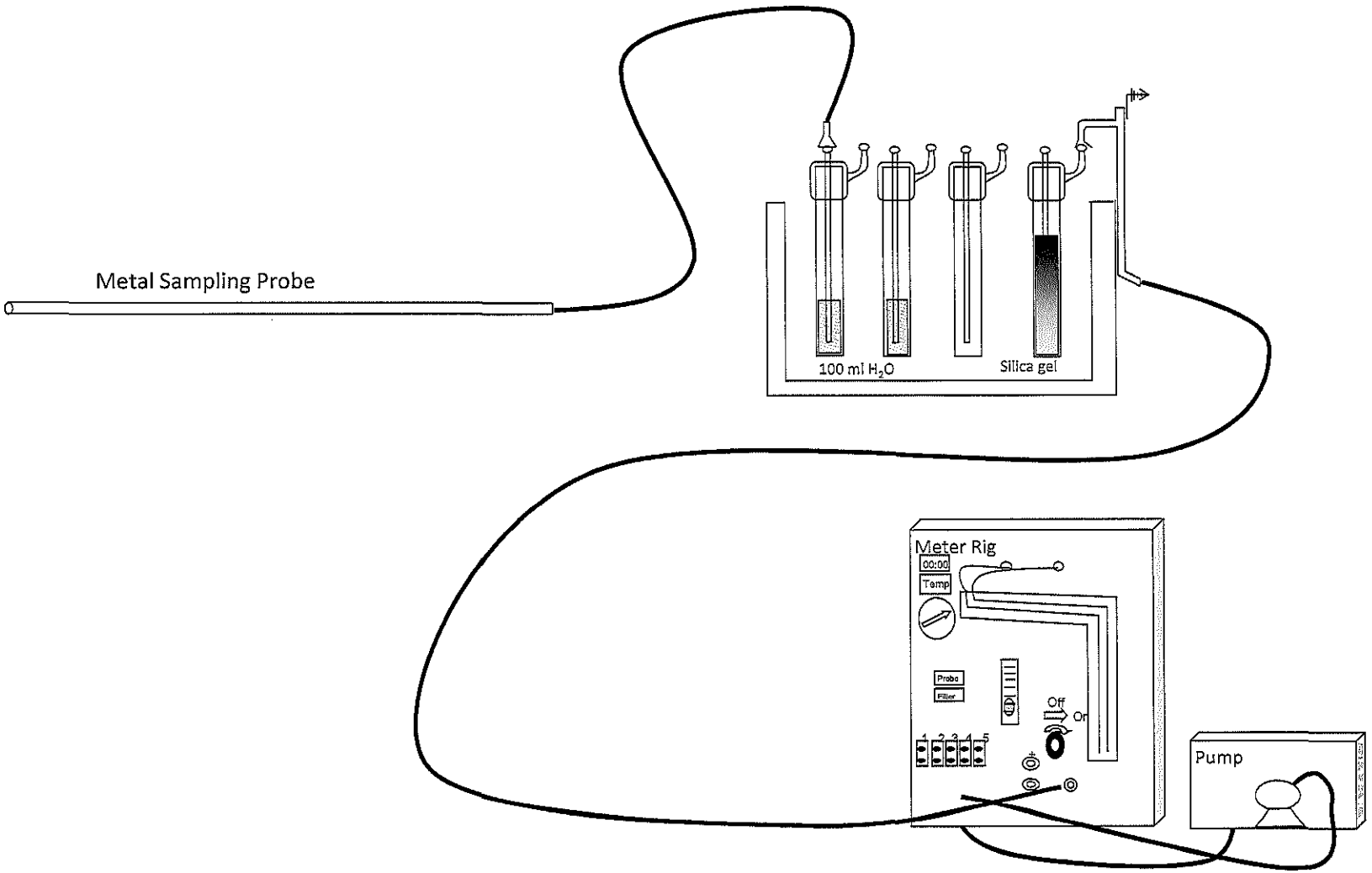

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Figure 5 - EPA Method 25A
Monroe Power Plant - Unit 3
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