H & H MONITORING, INC.

CARBON MONOXIDE EMISSIONS COMPLIANCE TESTING
ZURN WOOD FIRED BOILER
HMI HARDWOODS LLC
CLINTON, MICHIGAN

PREPARED FOR:

HMI HARDWOODS LLC
CLINTON, MICHIGAN

SUBMITTED:

February 8, 2019
PROJECT NUMBER 1808-002

PREPARED BY:

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1.0 INTRODUCTION

HMI Hardwoods LLC (HMIH) retained H & H Monitoring, Inc. (HHMI) to conduct carbon monoxide (CO) emissions compliance testing at the HMIH facility in Clinton, Michigan. Messrs. Daniel L. Hassett and Brad Wallace performed the fieldwork for this study on January 15, 2019. Messrs. David Patterson and Brian Carley and Ms. Stephanie Weems with Michigan Department of Environmental Quality (MDEQ) Air Quality Division provided observation of the testing activities. Mr. Ron Steele with HMIH provided coordination of the test activities with process operations.

The purpose of this project is to provide CO emissions data pursuant to a written request by MDEQ AQD and to demonstrate compliance with Permit Application Number 460-85.

The following sections of this report detail the results obtained and describe the techniques used in the performance of this study. A description of the process tested is presented in Section 2.0. A summary of sampling and analytical procedures used during the study is provided in Section 3.0. A discussion of the test results is presented in Section 4.0. A summary of the quality assurance procedures is presented in Section 5.0. The result Table presents the results of the testing. Figures 1 through 3 contain diagrams of the test port and traverse point locations, and sampling trains. Appendix A presents the test methods example calculation used for the emissions study. Appendix B contains quality assurance information. Appendix C contains copies of the field and calculation data sheets. Appendix D contains raw analyzer data. Appendix E contains the process information. Appendix F contains a copy of the test plan and MDEQ acceptance letter.

2.0 PROCESS DESCRIPTION

The Zurn Wood-Fired Boiler is a 28 MMBTU boiler (fueled using wood tailings from trimming and sawing operations at the plant. A mixture of dry and wet wood materials is combined and fed via screw-type conveyor systems to the stoker-style boiler feed. Emissions are controlled using a multi-clone separator for particulate matter collection.

A copy of boiler operating data recorded during the test and estimated fuel feed rate is included in Appendix E.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

Triplicate 60-minute test runs were performed during normal maximum operating parameters for Boiler B001. Emission parameters tested included CO, O_2, and CO_2. It should be noted that no moisture content or air flow determinations were required for this test series. The source testing procedures utilized during this study were conducted in accordance with U.S. Environmental Protection Agency (USEPA) Test Methods, as presented in 40 CFR, Part 60, Appendix A. A description of these methods is presented below.

Method 1, ***Sample and Velocity Traverses for Stationary Sources***

This method was used to determine the appropriate number and location of traverse points at the testing locations. These determinations were based on dividing the stack cross-section into equal areas (one traverse point for each area) and the number of upstream and downstream stack diameters from the sampling ports to the nearest flow disturbance. Figure 1 presents the test port location and traverse points for the stratification test.

Method 3A, ***Gas Analysis for the Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)***

This method was used to determine the molecular weight of the flue gas. Stack gas was continuously withdrawn from the stack through a gas conditioner and a length of sample line to the analyzer. The analyzer detected the concentration of O_2 using a magnetic pressure detector and CO_2 using a non-dispersive infrared (NDIR) calibrated in a specific wavelength. The analyzer then converted the analyzer response to analog voltage that was recorded at 2-second intervals over each test period.

Before the testing, the analyzers were calibrated using USEPA Protocol 1 gas standards. Calibration error and system bias checks were performed before the test series. Calibration drift was performed following each test run.

Dry molecular weight of the stack gas was calculated based on the assumption that the primary constituents are oxygen, carbon dioxide, and nitrogen (other compounds present have a negligible relative effect during calculation of molecular weight). The stack gas dry molecular weight is equal to the sum of stack gas constituent concentrations (%) multiplied by the corresponding molecular weight of that constituent.

Method 10, ***Determination Of Carbon Monoxide Emissions From Stationary Sources***

This method was used to measure CO emissions. Stack gas was continuously withdrawn from the stack through a gas conditioner and a length of sample line to the analyzer. The

analyzer detected the concentration of CO using a non-dispersive infrared (NDIR) calibrated in a specific wavelength. The analyzer then converted the analyzer response to analog voltage that was recorded at 2-second intervals over each test period.

Before the testing, the analyzer was calibrated using USEPA Protocol 1 gas standards. Calibration error and system bias checks were performed before the test series. Calibration drift was performed following each test run.

4.0 PRESENTATION OF RESULTS

Carbon monoxide emissions concentrations and emission rates for each test run are shown in the Table tab of this report. Detailed summaries of sampling parameters for each sample run is provided with the field data information in Appendix C.

During the emission testing, the boiler was operated at normal maximum conditions. Appendix E contains the process information collected during the testing.

Permitted limitations for CO for this source are 13.1 pounds per hour and 57.5 tons per year. The CO averages for the three test runs performed on the boiler were 6.16 pounds per hour and 26.97 tons per year.

5.0 QUALITY ASSURANCE

Where applicable, routine reference method quality control procedures were followed throughout the study. Quality assurance information for field equipment is provided in Appendix B. The procedures included, but were not limited to the following:

- Sampling equipment was calibrated according to procedures contained in the "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III," EPA 600/4-77-027b.
- The sample train was configured according to the appropriate test methods.
- Quality control checks of sample trains were performed on-site, including sample train leak checks.
- CEM sampling systems were calibrated using USEPA Protocol 1 calibration standards in accordance with applicable USEPA reference methods.
- CEM sampling system calibration error checks were all within the allowable limit of ±2% of calibration gas value.
- CEM sampling system bias checks were all within the allowable limit of ±5% of analyzer span.
- Zero and calibration drift were both within the allowable limit of ±3% of analyzer span for all test runs with the exception of Run 1 for CO. The CO instrument was re-calibrated for calibration error and system bias before Runs 2 and 3 were performed. Mr. David Patterson with MDEQ, AQD agreed that normal drift correction procedures for Run 1 are sufficient to validate the Run 1 CO data.
- It should be noted that CO concentration exceeded the analyzer range of 484 three times during Runs 2 and 3. After a discussion onsite with Mr. David Patterson with MDEQ, AQD, it was determined that the time over scale was not significant and the maximum output value of the instrument of 511 ppm would be used in calculation of run averages.

6.0 LIMITATIONS

This report is provided to HMI Hardwoods LLC in response to a limited assignment. HHMI will not provide any information contained in, or associated with, this report to any unauthorized party without expressed written consent from HMI Hardwoods LLC, unless required to do so by law or court order. HHMI accepts responsibility for the performance of the work, specified by the limited assignment, which is consistent with others within the industry, but disclaims any consequential damages arising from the information contained in this report.

This report is intended solely for the use of HMI Hardwoods LLC. The scope of services performed for this assignment may not be appropriate to comply with the requirements of other similar process operations, facilities, or regulatory agencies. Any use of the information presented in this report, for purposes other than the defined assignment, is done so at the sole risk of the user.

This emission testing survey was conducted, and report developed by the following HMMI personnel:

Daniel L. Hassett
President

Brad Wallace
Site Leader

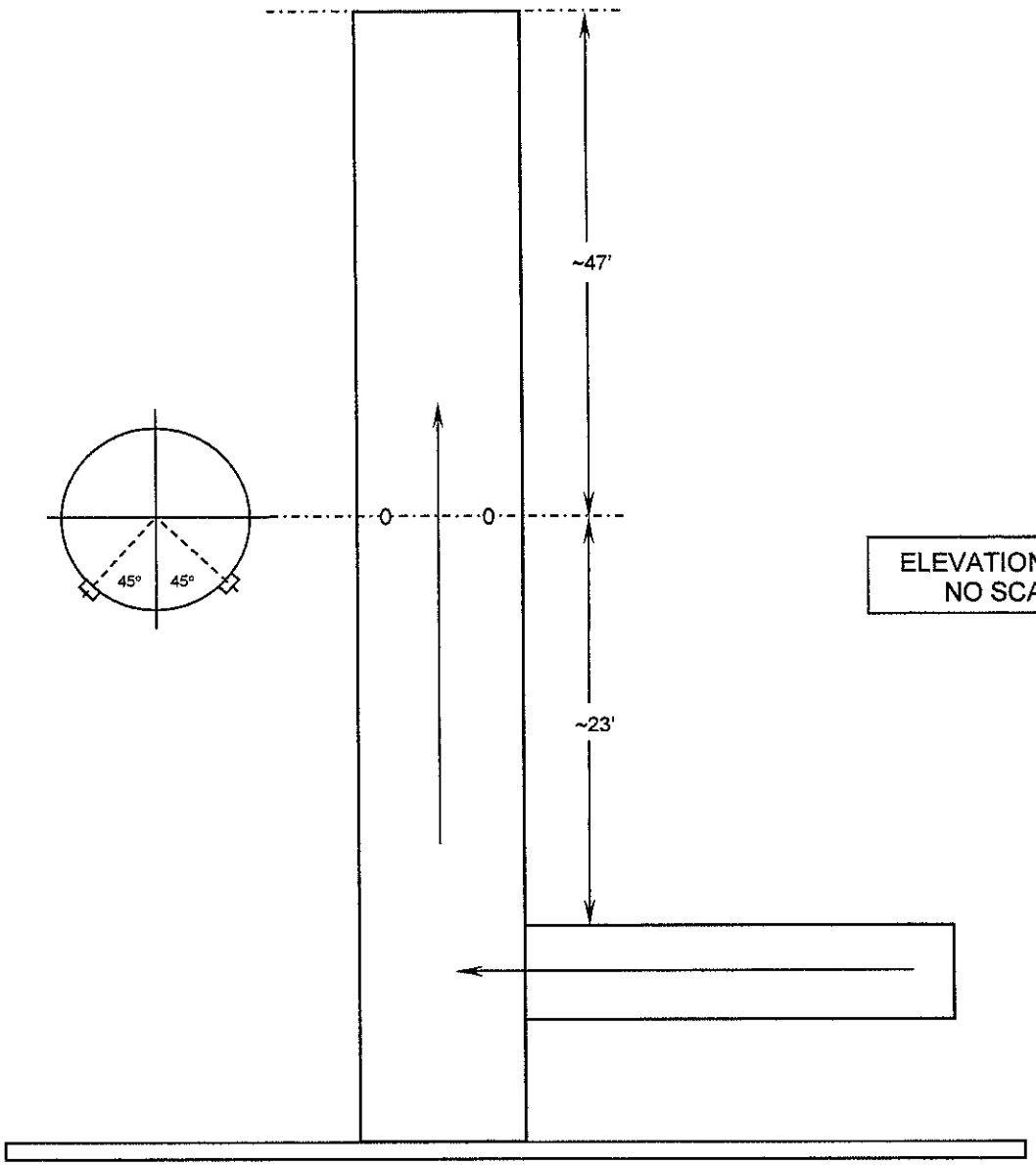
RESULTS TABLE

TABLE

CO EMISSIONS
WOOD-FIRED BOILER
HMI HARDWOODS, LLC
CLINTON, MICHIGAN
January 2019

INLET				
Run No.	**1**	**2**	**3**	**Average**
Exhaust Gas Flow (dscfm)	6,350	6,964	5,996	6,437
CARBON MONOXIDE				
Concentration (ppm)	250.39	199.4	209.5	219.8
Concentration (lb/scf)	1.820E-05	1.450E-05	1.523E-05	1.598E-05
Emission rate (lb/hr)	6.935	6.057	5.479	6.157
Emission rate (T/Yr)	30.377	26.528	23.998	26.968
Permitted Emission rate (lb/hr)				13.1
Permitted Emission rate (T/Yr)				57.5

FIGURES



Stratification Sample Point Locations	
Stack Dia.:	69.5"
Point #	Distance from Stack wall
1	2.22
2	7.30
3	13.48
4	22.45
5	47.05
6	56.02
7	62.20
8	67.28

ELEVATION VIEW
NO SCALE

FIGURE 1

TEST PORT LOCATIONS

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HMI HARDWOODS, LLC
CLINTON, MICHIGAN

DRAWN DLH 10/8/18	CHECKED
REVISED DLH 2/7/19	APPROVED
JOB NO. 1808-002	
DRAWING NUMBER 1808002-1	H & H MONITORING, INC.

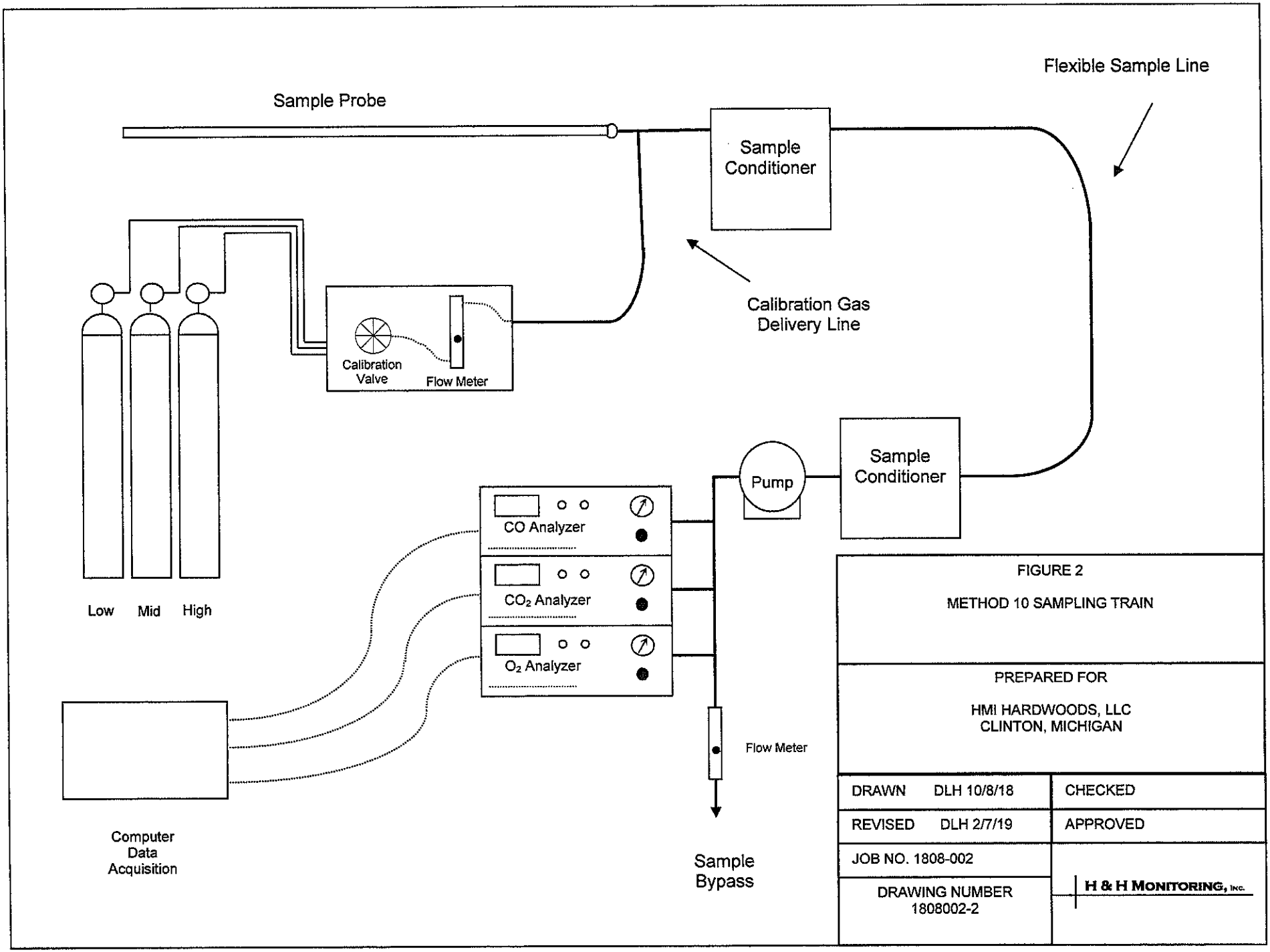

FIGURE 2

METHOD 10 SAMPLING TRAIN

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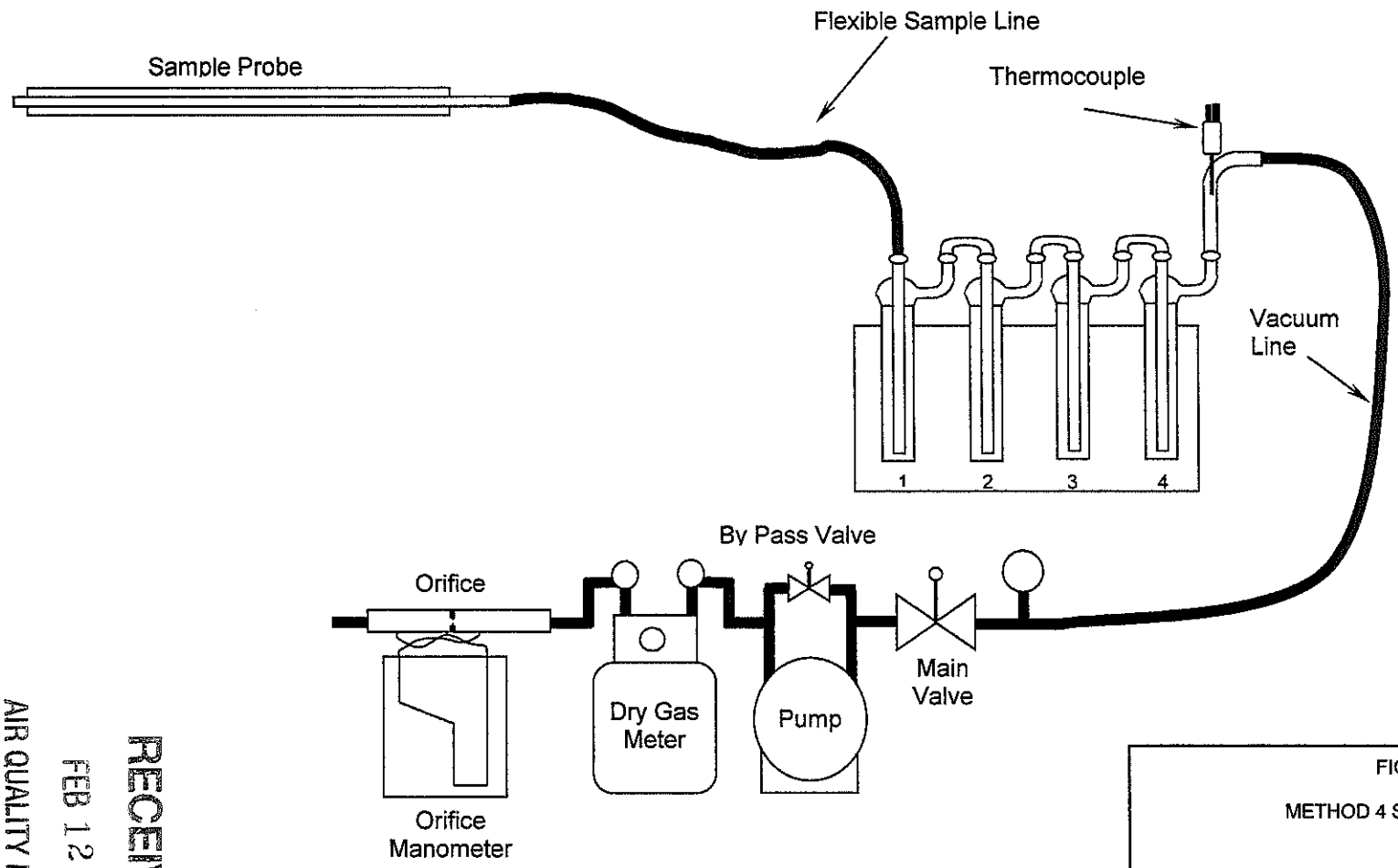
HMI HARDWOODS, LLC
CLINTON, MICHIGAN

DRAWN DLH 10/8/18	CHECKED
REVISED DLH 2/7/19	APPROVED
JOB NO. 1808-002	
DRAWING NUMBER 1808002-2	H & H MONITORING, INC.



Impinger #1 : 100 ml H_2O
Impinger #2 : 100 lm H_2O
Impinger #3 : Empty
Impinger #4 : Silica Gel

FIGURE 3

METHOD 4 SAMPLING TRAIN

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CLINTON, MICHIGAN

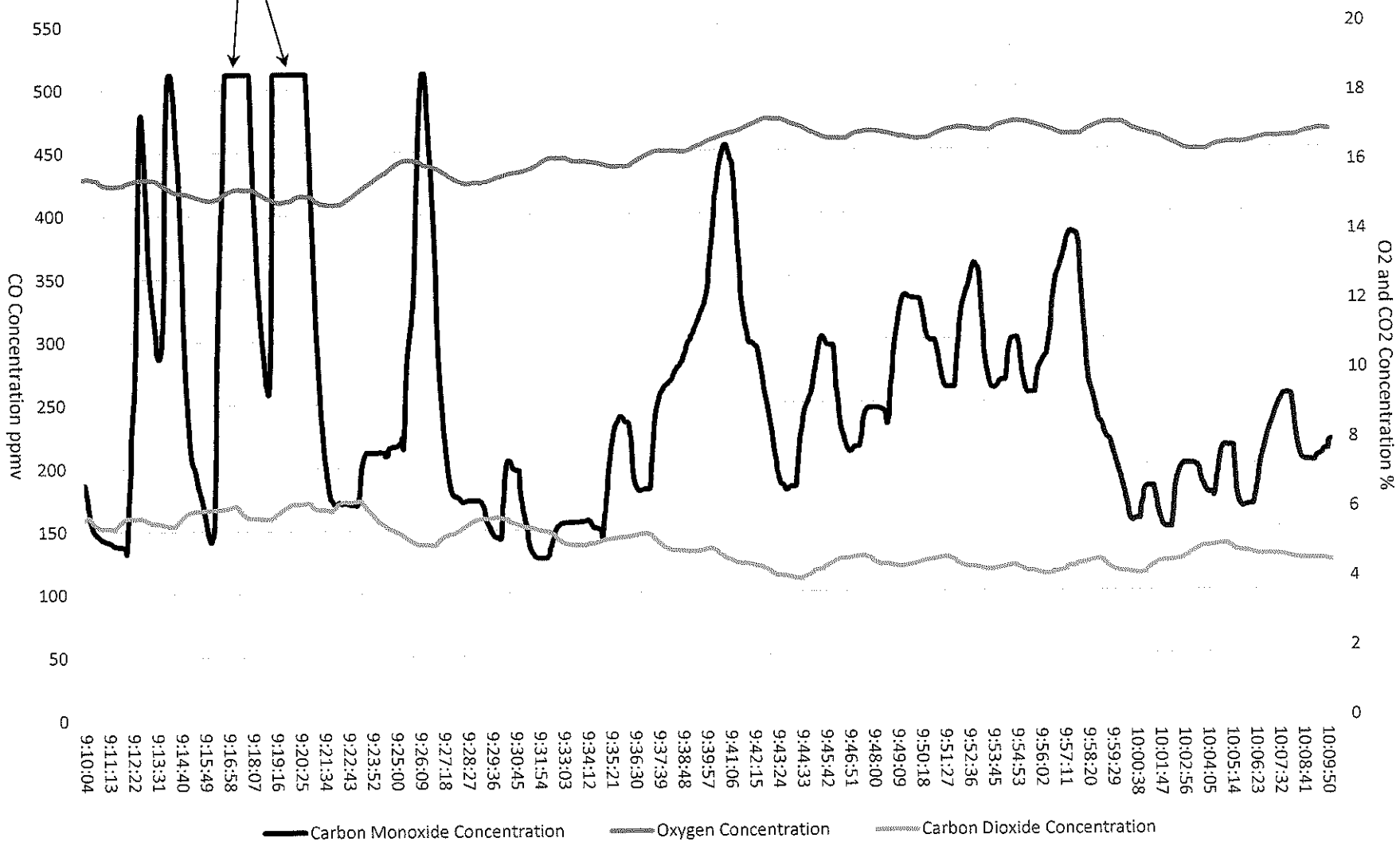
DRAWN DLH 2/7/19	DRAWING NUMBER 1808002-3
REVISED	
JOB NO. 1808-002	

H & H MONITORING, INC.

Run 1
Wood-Fired Boiler
HMI Hardwoods LLC
Clinton, Michigan
January 15, 2019

Note: CO Concentration exceeded analyzer range. A max concentration of 511.7 ppm was used in calculation of the raw average CO ppm.

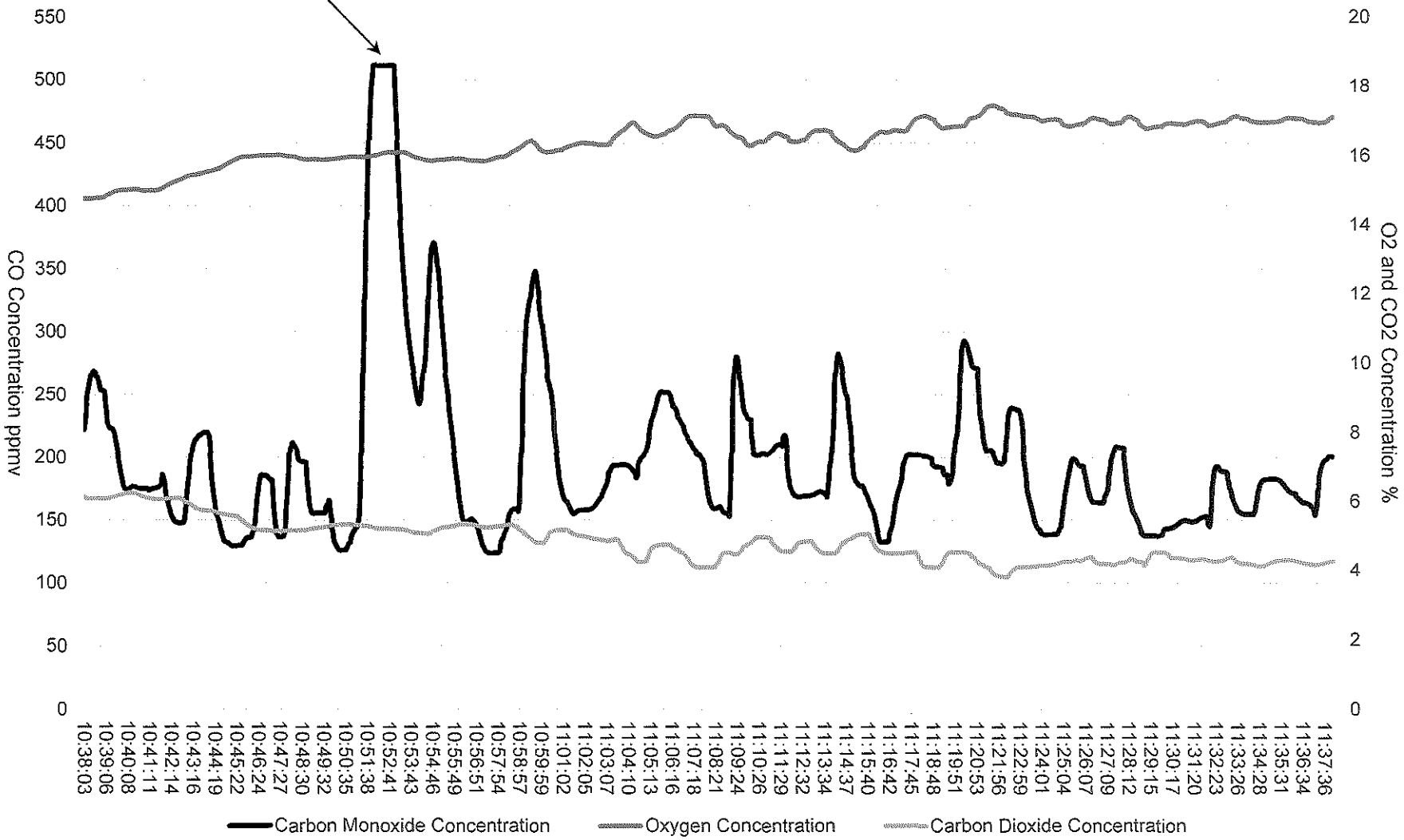
Raw Averages
CO = 258.3
O2 = 16.22
CO2 = 5.01



Note: CO Concentration exceeded analyzer range. A max concentration of 511.7 ppm was used in calculation of the raw average CO ppm.

Run 2
Wood-Fired Boiler
HMI Hardwoods LLC
Clinton, Michigan
January 15, 2019

Raw Averages
CO = 197.6
O2 = 16.39
CO2 = 4.82



Run 3
Wood-Fired Boiler
HMI Hardwoods LLC
Clinton, Michigan
January 15, 2019

Raw Averages
CO = 210.1
O2 = 16.86
CO2 = 4.32