



Particulate Matter Emissions Test Report

Prepared for:

Zeeland Farm Services, Inc.

Zeeland, Michigan

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AIR QUALITY DIVISION

Source Address:

Zeeland Farm Services, Inc.
2468 84th Avenue
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Project No. 049AS-482538
December 6, 2018

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EXECUTIVE SUMMARY

Montrose Air Quality Services, LLC. (MAQS) was retained by Zeeland Farm Services, Inc. (ZFS) to conduct a compliance emissions test program on four sources at the ZFS facility in Zeeland, Michigan. Testing at the EUDRYING exhaust included measurement of particulate matter less than 2.5 microns in diameter (PM_{2.5}) and particulate matter less than 10 microns in diameter (PM₁₀) using USEPA Methods 201A and 202. Testing of EUPREPEQUIPMENT included measurement of filterable particulate matter (PM) and condensable particulate matter (CPM) using USEPA Methods 5 and 202 with all particulate matter assumed to be less than 2.5 microns in size. Testing of EUHANDLING and EUHANDLING2 included measurement of PM using USEPA Method 5. The emissions test program was completed on October 16, 17, 18, and 19, 2018.

Testing of EUHANDLING, EUHANDLING2, and EUPREPEQUIPMENT consisted of triplicate 90-minute test runs¹. Testing of EUDRYING consisted of triplicate test runs of approximately 180 minutes each. The emissions test program was required by Michigan Department of Environmental Quality Air Quality Division Renewable Operating Permit (MI-ROP-M4204-2018). The results of the emission test program are summarized by Table E-I.

Table E-I
EUDRYING, EUPREPEQUIPMENT,
EUHANDLING, and EUHANDLING2
Test Dates: October 16, 17, 18, and 19, 2018

| Test Location ID | Exhaust Gas Parameters To Be Evaluated | Emission Limit | Result |
|----------------------------|--|----------------------------------|------------------------------------|
| EUDRYING | PM | 0.03 lb/1000lb* | 0.003 lb/1000lb* |
| | PM ₁₀ (Five Stacks Combined) | 12.65 lb/hr | 0.78 lb/hr ^a |
| | PM _{2.5} (Five Stacks Combined) | 10.12 lb/hr | 0.65 lb/hr ^a |
| EUPREPEQUIPMENT (Baghouse) | PM | 0.044 lb/1000lb* | 0.006 lb/1000lb* |
| | PM ₁₀ | 5.55 lb/hr | 0.48 lb/hr |
| | PM _{2.5} | 4.44 lb/hr | 0.48 lb/hr |
| EUHANDLING | PM | 0.023 g/dscm 0.019 lb/1000lb* | 0.001 g/dscm 0.0001 lb/1000lb* |
| | PM ₁₀ | 0.86 lb/hr | 0.041 lb/hr |
| | PM _{2.5} | 0.69 lb/hr | 0.041 lb/hr |
| EUHANDLING2 | PM | 0.023 g/dscm 0.019 lb/1000lb* | 0.0006 g/dscm 0.0005 lb/1000lb* |
| | PM ₁₀ | 0.51 lb/hr | 0.014 lb/hr |
| | PM _{2.5} | 0.41 lb/hr | 0.014 lb/hr |

*: calculated on a dry basis

^a: One representative stack for EUDRYING was tested. The emission rate results have been multiplied by 5 to represent the total emissions for all five stacks combined.

¹ With the on-site approval of MDEQ, test runs for EUHANDLING were extended by two to four minutes each at the last traverse point to encompass the entire batch cycle.

1. Introduction

Montrose Air Quality Services, LLC. (MAQS) was retained by Zeeland Farm Services, Inc. (ZFS) to conduct a compliance emissions test program on four sources at the ZFS facility in Zeeland, Michigan. Testing at the EUDRYING exhaust included measurement of particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) and particulate matter less than 10 microns in diameter (PM_{10}) using USEPA Methods 201A and 202. Testing of EUPREPEQUIPMENT included measurement of filterable particulate matter (PM) and condensable particulate matter (CPM) using USEPA Methods 5 and 202 with all particulate matter assumed to be less than 2.5 microns in size. Testing of EUHANDLING and EUHANDLING2 included measurement of PM using USEPA Method 5. The emissions test program was completed on October 16, 17, 18, and 19, 2018.

Testing of EUHANDLING, EUHANDLING2, and EUPREPEQUIPMENT consisted of triplicate 90-minute test runs². Testing of EUDRYING consisted of triplicate test runs of approximately 180 minutes each. The emissions test program was required by Michigan Department of Environmental Quality Air Quality Division Renewable Operating Permit (MI-ROP-M4204-2018). The results of the emission test program are summarized by Table 1.

1.a Identification, Location, and Dates of Test

Testing was conducted at ZFS's Zeeland, Michigan plant located at 2525 84th Avenue Zeeland, Michigan 49464. Testing was conducted on October 16, 17, 18, and 19, 2018. EUPREPEQUIPMENT testing was completed on October 16. EUDRYING testing was completed on October 17 and 18. EUHANDLING testing was completed on October 17 and 18. EUHANDLING2 testing was completed on October 18 and 19.

1.b Purpose of Testing

AQD issued Renewable Operating Permit (MI-ROP-M4204-2018). This permit limits exhaust gas PM concentration for the units as summarized by Table 2.

² With the on-site approval of MDEQ, test runs for EUHANDLING were extended by two to four minutes each at the last traverse point to encompass the entire batch cycle.

1.c Source Description

Soybeans are received in one of two collection pits (EUHANDLING and EUHANDLING2). Emissions from each receiving pit are controlled by a separate baghouse to control the emissions vented to the atmosphere.

The beans are passed through a grain dryer to dry the beans (EUDRYING). A maximum capacity of approximately 3,000 bushels of soybeans can pass through the dryer per hour. EUDRYING contains five exhaust points, each controlled by a separate cyclone.

Soybeans are passed through a processing area (EUPREPEQUIPMENT) to prepare the beans before the oil is extracted. A maximum rated capacity of 1,050 tons of soybeans per day are handled, cleaned, cracked and dehulled, ground, conditioned, and flaked within this area. Emissions from the vertical seed conditioner are controlled by a cyclone, and all other equipment is controlled by a baghouse.

1.d Test Program Contacts

The contact for the source and test report is:

Brandon LaRosa
Environmental Engineer
Zeeland Farm Services, Inc.
2525 84th Ave
Zeeland, Michigan 49464
(616) 879-1715

Names and affiliations for personnel who were present during the testing program are summarized by Table 3.

2. Summary of Results

Sections 2.a through 2.d summarize the results of the emissions compliance test program.

2.a Operating Data

Operating data collected by ZFS is included in Appendix E.

2.b Applicable Permit

The applicable permit for this emissions test program is MI-ROP-M4204-2018

2.c Results

The overall results of the emission test program are summarized by Table 1.

3. Source Description

Sections 3.a through 3.e provide a detailed description of the process.

3.a Process Description

The operation of EUDRYING and EUPREPEQUIPMENT is continuous in nature. The operation of EUHANDLING and EUHANDLING2 is batch in nature. The procedure is as follows:

1. A truck containing soybeans enters the receiving building, ensuring the unloading equipment lines up with the receiving pit, and applies the brakes.
2. The truck unloads the soybeans into the pit.
3. After the truck is empty, the truck leaves the receiving building
4. A new truck enters the receiving building only after the previous truck has exited.

3.b Raw and Finished Materials

The raw and finished material for the equipment being tested is soybeans.

3.c Process Capacity

The facility is permitted to process a maximum 1,050 tons of soybeans per day. The bean dryer (EUDRYER) has a maximum capacity of approximately 3,000 bushels per hour.

3.d Process Instrumentation

The process is not equipped with a continuous emission monitoring system.

4. Sampling and Analytical Procedures

Sections 4.a through 4.d provide a summary of the sampling and analytical procedures used.

4.a Sampling Train and Field Procedures

The following U.S. EPA reference test methods found in 40 CFR, Part 60, Appendix A were used:

- Method 1 - *“Sample and Velocity Traverses for Stationary Sources”*
- Method 2 - *“Determination of Stack Gas Velocity and Volumetric Flowrate”*

DEC 13 2018

- Method 3 - *“Determination of Oxygen and Carbon Dioxide Concentrations in Emissions From Stationary Sources (Fyrite Procedure)”*
- Method 4 - *“Determination of Moisture Content in Stack Gases”*

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Stack gas velocity traverses were conducted in accordance with the procedures outlined in Method 1 and Method 2. S-type pitot tubes with thermocouple assemblies, calibrated in accordance with Method 2 were used to measure exhaust gas velocity pressures (using a manometer) and temperatures during testing. The s-type pitot tube dimensions were within specified limits, therefore, a baseline pitot tube coefficient of 0.84 (dimensionless) was assigned. One stack gas velocity traverse was conducted per test run.

Cyclonic flow checks were performed at the sampling location. The existence of cyclonic flow is determined by measuring the flow angle at each sample point. The flow angle is the angle between the direction of flow and the axis of the stack. If the average of the absolute values of the flow angles is greater than 20 degrees, cyclonic flow exists.

Molecular weight determinations (Extractor) were evaluated according to USEPA Method 3, “Gas Analysis for the Determination of Dry Molecular Weight.” The equipment used for this evaluation consisted of a one-way squeeze bulb with connecting tubing and a set of Fyrite[®] combustion gas analyzers. Carbon dioxide and oxygen content were analyzed using the Fyrite[®] procedure. Moisture content was determined gravimetrically in the particulate matter testing.

To evaluate PM, PM_{2.5}, PM₁₀, and CPM mass emission rates from each stack, MAQS used the following reference test methods codified at Title 40, Part 60, Appendix A and 40, Part 51, Appendix M of the Code of Federal Regulations:

- Method 5 - *“Determination of Particulate Emissions from Stationary Sources”*
- Method 201a - *“Determination of PM₁₀ and PM_{2.5} Emissions From Stationary Sources”*
- Method 202 - *“Determination of Condensable Particulate Emissions from Stationary Sources”*

40 CFR 60, Appendix A, Method 5, *“Determination of Particulate Emissions from Stationary Sources”* and 40 CFR 51, Appendix M, Method 202, *“Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources”* were used to measure PM concentrations and calculate PM emission rates from EUPREPEQUIPMENT, EUHANDLING, and EUHANDLING2 (see Figure 1 for a schematic of the Method 5 sampling train used on EUHANDLING and EUHANDLING2 and Figure 2 for a schematic of the Method 5/202 sampling train used on EUPREPEQUIPMENT).

MAQS’s Nutech[®] Model 2010 modular isokinetic stack sampling system consists of (1) a stainless-steel nozzle, (2) a glass lined probe, (3) a heated filter holder containing a pre weighed

90-mm glass fiber filter, (4) a vertical condenser, (5) an empty pot bellied impinger, (6) an empty modified Greenburg-Smith (GS) impinger, (7) unheated filter holder with a teflon filter, (8) a second modified GS impinger with 100 ml of deionized water, and a third modified GS impinger containing approximately 300 g of silica gel desiccant, (9) a length of sample line, and (10) a Nutech[®] control case equipped with a pump, dry gas meter, and calibrated orifice.

40 CFR 51, Appendix M, Method 201A, “*Determination of PM₁₀ and PM_{2.5} Emissions From Stationary Sources*” and 40 CFR 51, Appendix M, Method 202, “*Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources*” was used to measure PM concentrations and calculate PM emission rates from EUDRYING (see Figure 3 for a schematic of the sampling train).

MAQS’s Nutech[®] Model 2010 modular isokinetic stack sampling system consists of (1) a stainless-steel nozzle, (2a) a stainless-steel PM₁₀ head, (2b) a stainless-steel PM_{2.5} head, (3) an in stack stainless-steel filter housing, (4) a borosilicate glass probe liner, (5) a vertical condenser, (6) an empty pot-bellied impinger, (7) an empty modified Greenburg-Smith (GS) impinger, (8) unheated borosilicate filter holder with a teflon filter and Teflon filter support, (9) a second modified GS impinger with 100 ml of deionized water, and a third modified GS impinger containing approximately 300 g of silica gel desiccant, (10) a length of sample line, and (11) a Nutech[®] control case equipped with a pump, dry gas meter, and calibrated orifice.

4.b Recovery and Analytical Procedures

A sampling train leak test was conducted before and after each test run. After completion of the final leak test for each test run, the filter was recovered, the nozzle, probe, PM₁₀ and PM_{2.5} head (M201A only), and front half of the filter housing was brushed and triple rinsed with acetone. The acetone rinses were collected in a pre-cleaned sample container. The impinger train was then purged with nitrogen for one hour at a flow rate of 18 liters per minute. The CPM filter were recovered and placed in a petri dish. The back half of the filter housing, the condenser, the pot-bellied impinger, the moisture drop out impinger, and the front half of the CPM filter housing and all connecting glassware was triple rinsed with deionized water which will be collected in a pre-cleaned sample container. The same glassware was then rinsed with acetone and collected in a pre-cleaned sample container labeled as the organic fraction. The glassware was then double rinsed with hexane which was added to the same organic fraction sample bottle.

MAQS labeled each container with the test number, test location, and test date, and marked the level of liquid on the outside of the container. In addition, blank samples of the acetone, DI water, hexane, and filter were collected. MAQS personnel transported all samples to MAQS’s laboratory (for filter and acetone gravimetric analysis) in Royal Oak, Michigan and the 202 samples were delivered to Enthalpy Analytical in Durham, North Carolina for analysis.

4.c Sampling Ports

Figures 4, 5, 6, and 7 show relevant sampling ports and traverse point locations.

4.d Traverse Points

The traverse points are included in the stack drawings as Figures 4, 5, 6, and 7.

5. Test Results and Discussion

Sections 5.a through 5.k provide a summary of the test results.

5.a Results Tabulation

The overall results of the emissions test program are summarized by Table 1. Detailed results for the emissions test program are summarized by Tables 4-7.

5.b Discussion of Results

The overall results of the emission test program are summarized by Table 1 and detailed in Tables 4-7.

5.c Process or Control Device Upsets

No upset conditions occurred during testing.

5.d Control Device Maintenance

Only routine maintenance activities were performed on the control devices in the three-month period prior to testing.

5.e Re-Test

The emissions test program was not a re-test.

5.f Audit Sample Analyses

Audit samples were not required for this emissions test program.

5.g Calibration Sheets

Relevant equipment calibration documents are provided in Appendix B.

5.h Sample Calculations

Sample calculations are provided in Appendix C.

5.i Field Data Sheets

Field documents relevant to the emissions test program are presented in Appendix A.

5.j Laboratory Data

MAQS personnel conducted analysis on all samples in MAQS's laboratory (for filter and acetone gravimetric analysis) in Royal Oak, Michigan and the 202 samples were analyzed by Enthalpy Analytical in Durham, North Carolina. Laboratory analytical data is provided in Appendix D.

MEASUREMENT UNCERTAINTY STATEMENT

Both qualitative and quantitative factors contribute to field measurement uncertainty and should be taken into consideration when interpreting the results contained within this report. Whenever possible, MAQS personnel reduce the impact of these uncertainty factors through the use of approved and validated test methods. In addition, MAQS personnel perform routine instrument and equipment calibrations and ensure that the calibration standards, instruments, and equipment used during test events meet, at a minimum, test method specifications as well as the specifications of our Quality Manual and ASTM D 7036-04. The limitations of the various methods, instruments, equipment, and materials utilized during this test have been reasonably considered, but the ultimate impact of the cumulative uncertainty of this project is not fully identified within the results of this report.

Limitations

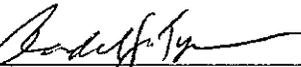
All testing performed was done in conformance to the ASTM D7036-04 standard. The information and opinions rendered in this report are exclusively for use by Johns Manville. MAQS will not distribute or publish this report without Johns Manville's consent except as required by law or court order. MAQS accepts responsibility for the competent performance of its duties in executing the assignment and preparing reports in accordance with the normal standards of the profession, but disclaims any responsibility for consequential damages.

This report was prepared by:



Paul Diven
Project Manager

This report was reviewed by:



Randal Tysar
District Manager

Table 4
Particulate Matter Emission Rates

| Company Source Designation Test Date | ZFS EU Drying | | | Average |
|---|------------------|------------|------------|----------|
| | 10/17/2018 | 10/17/2018 | 10/18/2018 | |
| Meter/Nozzle Information | | | | |
| | P-1 | P-2 | P-3 | Average |
| Meter Temperature Tm (F) | 62.9 | 68.0 | 73.5 | 68.1 |
| Meter Pressure - Pm (in. Hg) | 29.5 | 29.5 | 29.8 | 29.6 |
| Measured Sample Volume (Vm) | 68.9 | 69.1 | 71.3 | 69.8 |
| Sample Volume (Vm-Std ft3) | 68.8 | 68.3 | 70.5 | 69.2 |
| Sample Volume (Vm-Std m3) | 1.95 | 1.93 | 2.00 | 1.96 |
| Condensate Volume (Vw-std) | 1.688 | 1.457 | 1.716 | 1.620 |
| Gas Density (Ps(std) lbs/ft3) (wet) | 0.0739 | 0.0739 | 0.0739 | 0.0739 |
| Gas Density (Ps(std) lbs/ft3) (dry) | 0.0745 | 0.0745 | 0.0745 | 0.0745 |
| Total weight of sampled gas (m g lbs) (wet) | 5.20 | 5.16 | 5.33 | 5.23 |
| Total weight of sampled gas (m g lbs) (dry) | 5.13 | 5.09 | 5.25 | 5.16 |
| Nozzle Size - An (sq. ft.) | 0.000179 | 0.000179 | 0.000179 | 0.000179 |
| Isokinetic Variation - I | 92.0 | 92.4 | 88.6 | 91.0 |
| Stack Data | | | | |
| Average Stack Temperature - Ts (F) | 86.2 | 84.6 | 89.3 | 86.7 |
| Molecular Weight Stack Gas- dry (Md) | 28.8 | 28.8 | 28.8 | 28.8 |
| Molecular Weight Stack Gas-wet (Ms) | 28.6 | 28.6 | 28.6 | 28.6 |
| Stack Gas Specific Gravity (Gs) | 0.987 | 0.988 | 0.987 | 0.987 |
| Percent Moisture (Bws) | 2.40 | 2.09 | 2.38 | 2.29 |
| Water Vapor Volume (fraction) | 0.0240 | 0.0209 | 0.0238 | 0.0229 |
| Pressure - Ps (in. Hg) | 29.4 | 29.4 | 29.7 | 29.5 |
| Average Stack Velocity - Vs (ft/sec) | 42.4 | 42.0 | 43.6 | 42.7 |
| Area of Stack (ft2) | 8.3 | 8.3 | 8.3 | 8.3 |
| Exhaust Gas Flowrate | | | | |
| Flowrate ft ³ (Actual) | 21,090 | 20,902 | 21,699 | 21,230 |
| Flowrate ft ³ (Standard Wet) | 20,015 | 19,895 | 20,687 | 20,199 |
| Flowrate ft ³ (Standard Dry) | 19,536 | 19,479 | 20,195 | 19,737 |
| Flowrate m ³ (standard dry) | 553 | 552 | 572 | 559 |
| Total Filterable Particulate Weights (mg) | | | | |
| Total filterable PM greater than 10µ | 1.44 | 1.1 | 2.7 | 1.7 |
| Total filterable PM between 10µ and 2.5µ | 1 | 0.1 | 1 | 0.7 |
| Total filterable PM less than 2.5µ* | 0 | 0.1 | 0.9 | 0.3 |
| Total Filterable PM2.5 | 0.0 | 0.1 | 0.9 | 0.3 |
| Total Filterable PM10 | 1.0 | 0.2 | 1.9 | 1.0 |
| Total Filterable PM | 2.4 | 1.3 | 4.6 | 2.8 |
| Total Condensible Particulate Weights (mg) | | | | |
| Organic Condensible Particulate | 0.7 | 0.7 | 1.7 | 1.0 |
| Inorganic Condensible Particulate | 3.9 | 3.7 | 4.1 | 3.9 |
| Condensible Blank Correction | 1.7 | 1.7 | 1.7 | 1.7 |
| Total Condensible Particulate | 2.9 | 2.7 | 4.1 | 3.2 |
| Total Filterable and Condensible Particulate | 5.3 | 4.0 | 8.7 | 6.0 |
| Filterable Particulate Concentration | | | | |
| lb/1000 lb (wet) | 0.001 | 0.001 | 0.002 | 0.001 |
| lb/1000 lb (dry) | 0.001 | 0.001 | 0.002 | 0.001 |
| mg/dscm (dry) | 1.3 | 0.7 | 2.3 | 1.4 |
| gr/dscf | 0.0005 | 0.0003 | 0.0010 | 0.0006 |
| Filterable Particulate Emission Rate | | | | |
| lb/hr | 0.09 | 0.05 | 0.18 | 0.11 |
| Condensible Particulate Concentration | | | | |
| lb/1000 lb (wet) | 0.001 | 0.001 | 0.002 | 0.001 |
| lb/1000 lb (dry) | 0.001 | 0.001 | 0.002 | 0.001 |
| mg/dscm (dry) | 1.5 | 1.4 | 2.0 | 1.6 |
| gr/dscf | 0.0006 | 0.0006 | 0.0009 | 0.0007 |
| Condensible Particulate Emission Rate | | | | |
| lb/hr | 0.11 | 0.10 | 0.15 | 0.12 |
| Total Particulate Concentration | | | | |
| lb/1000 lb (wet) | 0.002 | 0.002 | 0.004 | 0.003 |
| lb/1000 lb (dry) | 0.002 | 0.002 | 0.004 | 0.003 |
| mg/dscm (dry) | 2.7 | 2.0 | 4.3 | 3.0 |
| gr/dscf | 0.0012 | 0.0009 | 0.0019 | 0.0013 |
| Total Particulate Emission Rate | | | | |
| lb/hr | 0.20 | 0.15 | 0.33 | 0.23 |
| Total PM10 Concentration | | | | |
| lb/1000 lb (wet) | 0.0016 | 0.0012 | 0.0025 | 0.002 |
| lb/1000 lb (dry) | 0.002 | 0.001 | 0.003 | 0.002 |
| mg/dscm (dry) | 2.0 | 1.5 | 3.0 | 2.2 |
| gr/dscf | 0.0009 | 0.0006 | 0.0013 | 0.0009 |
| Total PM10 Emission Rate | | | | |
| lb/hr | 0.15 | 0.11 | 0.23 | 0.16 |
| Total PM2.5 Concentration | | | | |
| lb/1000 lb (wet) | 0.001 | 0.001 | 0.002 | 0.001 |
| lb/1000 lb (dry) | 0.001 | 0.001 | 0.002 | 0.002 |
| mg/dscm (dry) | 1.5 | 1.4 | 2.5 | 1.8 |
| gr/dscf | 0.0006 | 0.0006 | 0.0011 | 0.0008 |
| Total PM2.5 Emission Rate | | | | |
| lb/hr | 0.11 | 0.10 | 0.19 | 0.13 |

**Table 5
Particulate Matter Emission Rates**

| Company Source Designation Test Date | ZFS PREPEQUIPMENT | | | Average |
|--|----------------------|------------|------------|----------|
| | 10/16/2018 | 10/16/2018 | 10/16/2018 | |
| Meter/Nozzle Information | | | | |
| Meter Temperature Tm (F) | 62.9 | 67.7 | 73.0 | 67.8 |
| Meter Pressure - Pm (in. Hg) | 29.6 | 29.6 | 29.5 | 29.6 |
| Measured Sample Volume (Vm) | 83.7 | 82.9 | 83.0 | 83.2 |
| Sample Volume (Vm-Std ft3) | 82.5 | 80.8 | 80.0 | 81.1 |
| Sample Volume (Vm-Std m3) | 2.34 | 2.29 | 2.27 | 2.30 |
| Condensate Volume (Vv-std) | 2.023 | 2.056 | 2.098 | 2.059 |
| Gas Density (Ps(std) lbs/ft3) (wet) | 0.0739 | 0.0738 | 0.0738 | 0.0738 |
| Gas Density (Ps(std) lbs/ft3) (dry) | 0.0745 | 0.0745 | 0.0745 | 0.0745 |
| Total weight of sampled gas (m g lbs) (wet) | 6.24 | 6.12 | 6.06 | 6.14 |
| Total weight of sampled gas (m g lbs) (dry) | 6.15 | 6.02 | 5.96 | 6.05 |
| Nozzle Size - An (sq. ft.) | 0.000229 | 0.000229 | 0.000229 | 0.000229 |
| Isokinetic Variation - I | 100.1 | 100.4 | 100.7 | 100.4 |
| Stack Data | | | | |
| Average Stack Temperature - Ts (F) | 110.4 | 112.8 | 113.9 | 112.4 |
| Molecular Weight Stack Gas- dry (Md) | 28.8 | 28.8 | 28.8 | 28.8 |
| Molecular Weight Stack Gas-wet (Ms) | 28.6 | 28.6 | 28.6 | 28.6 |
| Stack Gas Specific Gravity (Gs) | 0.987 | 0.986 | 0.986 | 0.986 |
| Percent Moisture (Bws) | 2.39 | 2.48 | 2.56 | 2.48 |
| Water Vapor Volume (fraction) | 0.0239 | 0.0248 | 0.0256 | 0.0248 |
| Pressure - Ps ("Hg) | 29.3 | 29.3 | 29.3 | 29.3 |
| Average Stack Velocity -Vs (ft/sec) | 75.1 | 73.9 | 73.2 | 74.1 |
| Area of Stack (ft2) | 4.9 | 4.9 | 4.9 | 4.9 |
| Exhaust Gas Flowrate | | | | |
| Flowrate ft ³ (Actual) | 22,121 | 21,748 | 21,542 | 21,804 |
| Flowrate ft ³ (Standard Wet) | 20,086 | 19,629 | 19,386 | 19,700 |
| Flowrate ft ³ (Standard Dry) | 19,605 | 19,142 | 18,891 | 19,213 |
| Flowrate m ³ (standard dry) | 555 | 542 | 535 | 544 |
| Total Particulate Weights (mg) | | | | |
| Total Nozzle/Probe/Filter | 10.9 | 12.9 | 12.0 | 11.9 |
| Organic Condensable Particulate | 0.9 | 1.1 | 1.0 | 1.0 |
| Inorganic Condensable Particulate | 3.8 | 4.2 | 4.3 | 4.1 |
| Condensable Blank Correction | 1.7 | 1.7 | 1.7 | 1.7 |
| Total Condensable Particulate | 3.0 | 3.5 | 3.6 | 3.4 |
| Total Filterable and Condensable Particulate | 13.9 | 16.4 | 15.6 | 15.3 |
| Filterable Particulate Concentration | | | | |
| lb/1000 lb (wet) | 0.004 | 0.005 | 0.004 | 0.004 |
| lb/1000 lb (dry) | 0.004 | 0.005 | 0.004 | 0.004 |
| mg/dscm (dry) | 4.7 | 5.6 | 5.3 | 5.2 |
| gr/dscf | 0.0020 | 0.0025 | 0.0023 | 0.0023 |
| Filterable Particulate Emission Rate | | | | |
| lb/ hr | 0.34 | 0.41 | 0.38 | 0.38 |
| Condensable Particulate Concentration | | | | |
| lb/1000 lb (wet) | 0.001 | 0.001 | 0.001 | 0.001 |
| lb/1000 lb (dry) | 0.001 | 0.001 | 0.001 | 0.001 |
| mg/dscm (dry) | 1.3 | 1.5 | 1.6 | 1.5 |
| gr/dscf | 0.0006 | 0.0007 | 0.0007 | 0.0006 |
| Condensable Particulate Emission Rate | | | | |
| lb/ hr | 0.09 | 0.11 | 0.11 | 0.11 |
| Total Particulate Concentration | | | | |
| lb/1000 lb (wet) | 0.005 | 0.006 | 0.006 | 0.006 |
| lb/1000 lb (dry) | 0.005 | 0.006 | 0.006 | 0.006 |
| mg/dscm (dry) | 6.0 | 7.2 | 6.9 | 6.7 |
| gr/dscf | 0.0026 | 0.0031 | 0.0030 | 0.0029 |
| Total Particulate Emission Rate | | | | |
| lb/ hr | 0.44 | 0.52 | 0.49 | 0.48 |

**Table 6
Particulate Matter Emission Rates**

| Company | ZFS | | | |
|---|--------------------------|-------------------|-------------------|----------|
| Source Designation | Pit 2/EU Handling | | | |
| Test Date | 10/17/2018 | 10/17/2018 | 10/18/2018 | |
| Meter/Nozzle Information | | | | |
| | P-1 | P-2 | P-3 | Average |
| Meter Temperature Tm (F) | 48.5 | 47.2 | 42.2 | 46.0 |
| Meter Pressure - Pm (in. Hg) | 29.5 | 29.6 | 29.9 | 29.6 |
| Measured Sample Volume (Vm) | 69.6 | 69.6 | 73.2 | 70.8 |
| Sample Volume (Vm-Std ft3) | 70.3 | 70.5 | 75.9 | 72.2 |
| Sample Volume (Vm-Std m3) | 1.99 | 2.00 | 2.15 | 2.05 |
| Condensate Volume (Vw-std) | 0.556 | 0.467 | 0.448 | 0.490 |
| Gas Density (Ps(std) lbs/ft3) (wet) | 0.0743 | 0.0743 | 0.0744 | 0.0743 |
| Gas Density (Ps(std) lbs/ft3) (dry) | 0.0745 | 0.0745 | 0.0745 | 0.0745 |
| Total weight of sampled gas (m g lbs) (wet) | 5.26 | 5.28 | 5.68 | 5.41 |
| Total weight of sampled gas (m g lbs) (dry) | 5.24 | 5.26 | 5.65 | 5.38 |
| Nozzle Size - An (sq. ft.) | 0.000229 | 0.000229 | 0.000229 | 0.000229 |
| Isokinetic Variation - I | 100.1 | 99.5 | 99.1 | 99.6 |
| Stack Data | | | | |
| Average Stack Temperature - Ts (F) | 51.8 | 51.6 | 45.0 | 49.4 |
| Molecular Weight Stack Gas- dry (Md) | 28.8 | 28.8 | 28.8 | 28.8 |
| Molecular Weight Stack Gas-wet (Ms) | 28.8 | 28.8 | 28.8 | 28.8 |
| Stack Gas Specific Gravity (Gs) | 0.993 | 0.993 | 0.994 | 0.993 |
| Percent Moisture (Bws) | 0.79 | 0.66 | 0.59 | 0.68 |
| Water Vapor Volume (fraction) | 0.0079 | 0.0066 | 0.0059 | 0.0068 |
| Pressure - Ps ("Hg) | 29.3 | 29.4 | 29.7 | 29.5 |
| Average Stack Velocity -Vs (ft/sec) | 55.3 | 55.1 | 57.4 | 55.9 |
| Area of Stack (ft2) | 3.1 | 3.1 | 3.1 | 3.1 |
| Exhaust Gas Flowrate | | | | |
| Flowrate ft ³ (Actual) | 10,422 | 10,375 | 10,805 | 10,534 |
| Flowrate ft ³ (Standard Wet) | 10,532 | 10,514 | 11,218 | 10,755 |
| Flowrate ft ³ (Standard Dry) | 10,449 | 10,445 | 11,152 | 10,682 |
| Flowrate m ³ (standard dry) | 296 | 296 | 316 | 302 |
| Total Particulate Weights (mg) | | | | |
| Nozzle/Probe/Filter | 3.0 | 1.8 | 1.5 | 2.1 |
| Total Particulate Concentration | | | | |
| lb/1000 lb (wet) | 0.001 | 0.001 | 0.001 | 0.001 |
| lb/1000 lb (dry) | 0.001 | 0.001 | 0.001 | 0.001 |
| mg/dscm (dry) | 1.5 | 0.9 | 0.7 | 1.0 |
| gr/dscf | 0.0007 | 0.0004 | 0.0003 | 0.0005 |
| g/dscm | 0.00151 | 0.00090 | 0.00070 | 0.00104 |
| Total Particulate Emission Rate | | | | |
| lb/ hr | 0.059 | 0.035 | 0.029 | 0.041 |

**Table 7
Particulate Matter Emission Rates**

| Company | ZFS | | | |
|---|----------------------------|-------------------|-------------------|----------|
| Source Designation | Pit 3/EU Handling 2 | | | |
| Test Date | 10/18/2018 | 10/18/2018 | 10/18/2018 | |
| Meter/Nozzle Information | | | | |
| | P-1 | P-2 | P-3 | Average |
| Meter Temperature Tm (F) | 50.7 | 53.8 | 58.4 | 54.3 |
| Meter Pressure - Pm (in. Hg) | 30.0 | 30.0 | 29.6 | 29.8 |
| Measured Sample Volume (Vm) | 74.9 | 74.6 | 74.5 | 74.7 |
| Sample Volume (Vm-Std ft3) | 77.1 | 76.3 | 74.6 | 76.0 |
| Sample Volume (Vm-Std m3) | 2.18 | 2.16 | 2.11 | 2.15 |
| Condensate Volume (Vw-std) | 0.547 | 0.533 | 0.552 | 0.544 |
| Gas Density (Ps(std) lbs/ft3) (wet) | 0.0743 | 0.0743 | 0.0743 | 0.0743 |
| Gas Density (Ps(std) lbs/ft3) (dry) | 0.0745 | 0.0745 | 0.0745 | 0.0745 |
| Total weight of sampled gas (m g lbs) (wet) | 5.77 | 5.71 | 5.58 | 5.69 |
| Total weight of sampled gas (m g lbs) (dry) | 5.74 | 5.69 | 5.56 | 5.66 |
| Nozzle Size - An (sq. ft.) | 0.000175 | 0.000175 | 0.000175 | 0.000175 |
| Isokinetic Variation - I | 98.7 | 99.1 | 99.7 | 99.2 |
| Stack Data | | | | |
| Average Stack Temperature - Ts (F) | 45.2 | 48.2 | 56.0 | 49.8 |
| Molecular Weight Stack Gas- dry (Md) | 28.8 | 28.8 | 28.8 | 28.8 |
| Molecular Weight Stack Gas-wet (Ms) | 28.8 | 28.8 | 28.8 | 28.8 |
| Stack Gas Specific Gravity (Gs) | 0.993 | 0.993 | 0.993 | 0.993 |
| Percent Moisture (Bws) | 0.70 | 0.69 | 0.73 | 0.71 |
| Water Vapor Volume (fraction) | 0.0070 | 0.0069 | 0.0073 | 0.0071 |
| Pressure - Ps ("Hg) | 29.7 | 29.7 | 29.4 | 29.6 |
| Average Stack Velocity -Vs (ft/sec) | 80.2 | 79.6 | 79.6 | 79.8 |
| Area of Stack (ft2) | 1.4 | 1.4 | 1.4 | 1.4 |
| Exhaust Gas Flowrate | | | | |
| Flowrate ft ³ (Actual) | 6,520 | 6,469 | 6,464 | 6,485 |
| Flowrate ft ³ (Standard Wet) | 6,770 | 6,677 | 6,492 | 6,646 |
| Flowrate ft ³ (Standard Dry) | 6,722 | 6,631 | 6,444 | 6,599 |
| Flowrate m ³ (standard dry) | 190 | 188 | 182 | 187 |
| Total Particulate Weights (mg) | | | | |
| Nozzle/Probe/Filter | 0.6 | 0.5 | 2.5 | 1.2 |
| Total Particulate Concentration | | | | |
| lb/1000 lb (wet) | 0.000 | 0.000 | 0.001 | 0.000 |
| lb/1000 lb (dry) | 0.000 | 0.000 | 0.001 | 0.0005 |
| mg/dscm (dry) | 0.3 | 0.2 | 1.2 | 0.6 |
| gr/dscf | 0.0001 | 0.0001 | 0.0005 | 0.0002 |
| g/dscm | 0.0003 | 0.0002 | 0.0012 | 0.0006 |
| Total Particulate Emission Rate | | | | |
| lb/ hr | 0.007 | 0.006 | 0.029 | 0.014 |

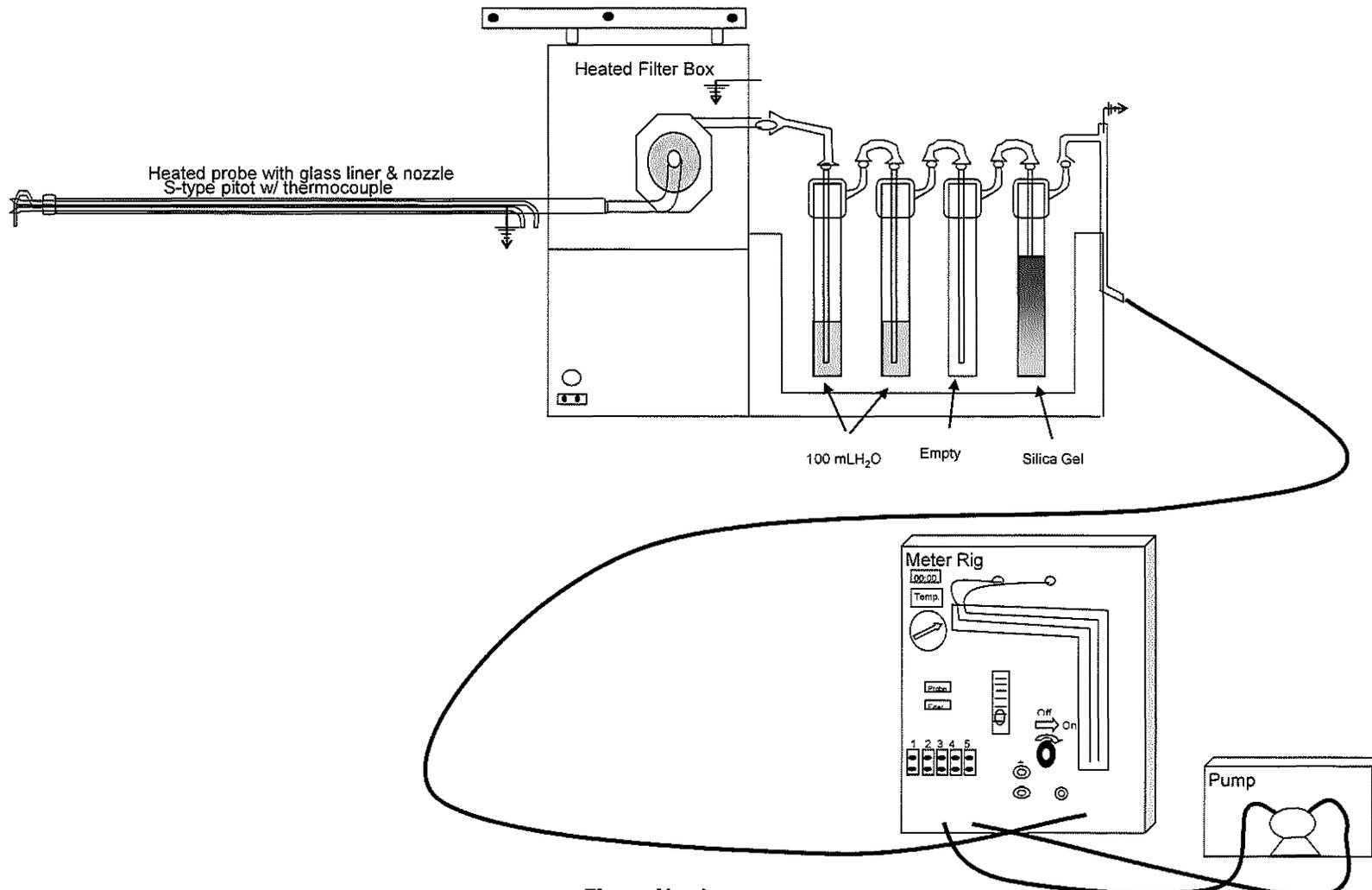


Figure No. 1

Site:
USEPA Method 5
Zeeland Farm Services
Zeeland, Michigan

Sampling Date:
October 16-18, 2018

Montrose Air Quality Services, LLC
4949 Fernlee Avenue
Royal Oak, Michigan 48073

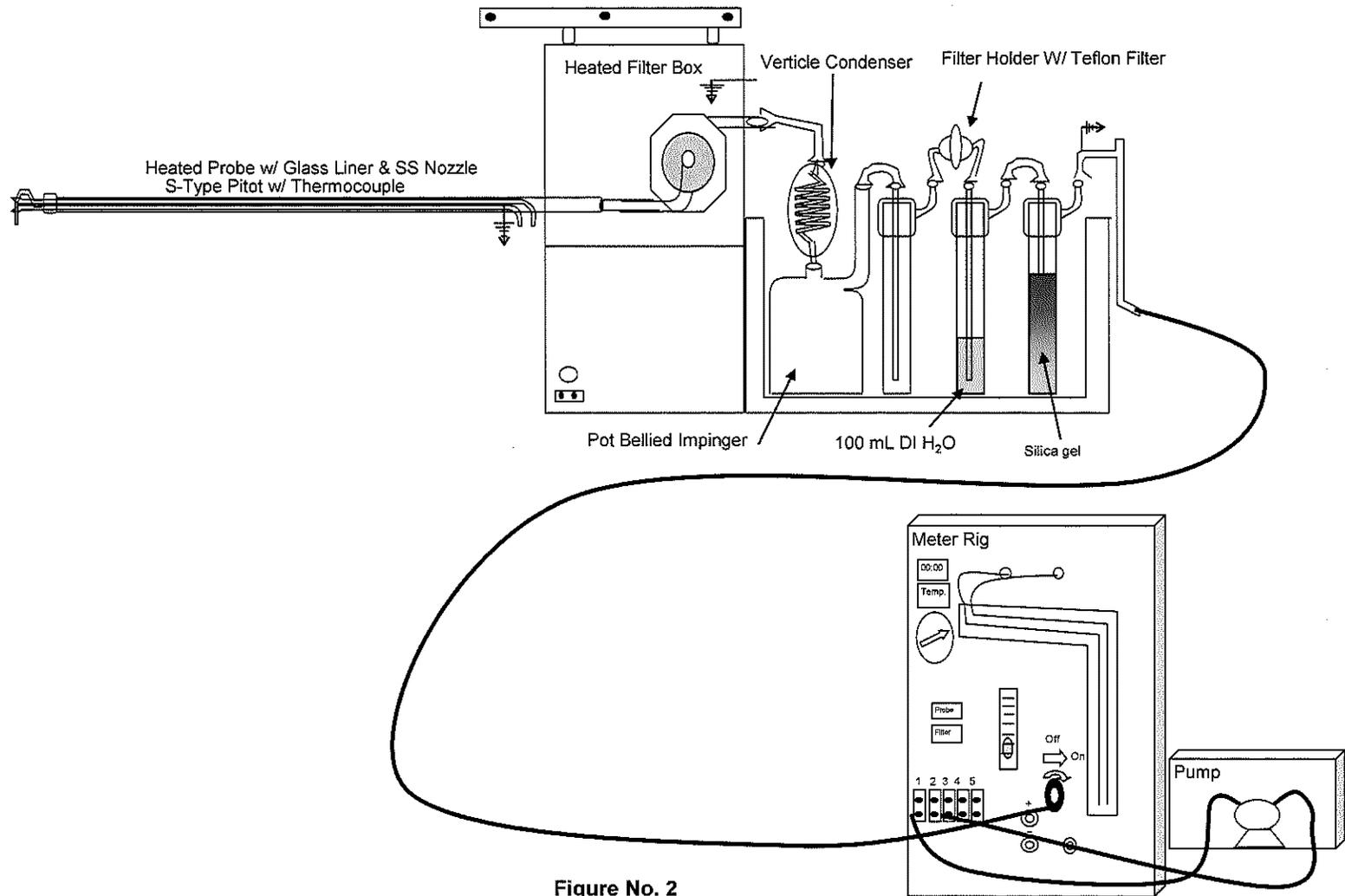


Figure No. 2

Site:
USEPA Method 5/202
Zeeland Farm Services, Inc.
Zeeland, Michigan

Sampling Date:
October 16-18, 2018

Montrose Air Quality Services, LLC.
4949 Fernlee Avenue
Royal Oak, Michigan 48073

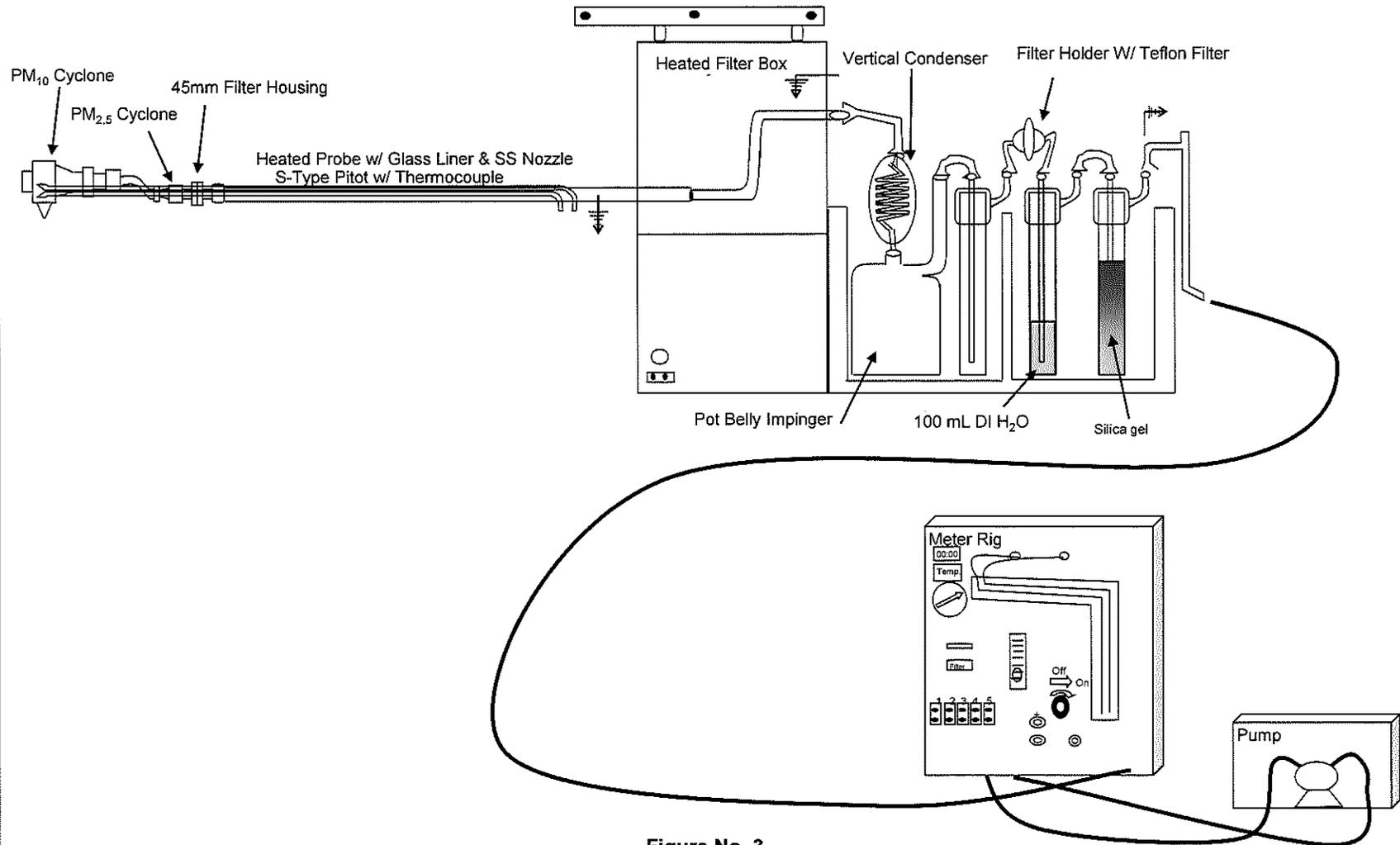


Figure No. 3

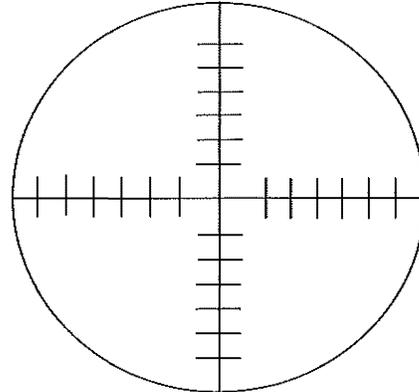
Site:
USEPA 201a/202
Zeeland Farm Services, Inc.
Zeeland, Michigan

Sampling Date:
October 16-18, 2018

Montrose Air Quality Services, LLC.
4949 Fernlee Avenue
Royal Oak, Michigan 48073

diameter = 39 inches

| Points | Distance " |
|--------|------------|
| 1 | 1.0 |
| 2 | 2.6 |
| 3 | 4.6 |
| 4 | 6.9 |
| 5 | 9.8 |
| 6 | 13.9 |
| 7 | 25.1 |
| 8 | 29.3 |
| 9 | 32.1 |
| 10 | 34.4 |
| 11 | 36.4 |
| 12 | 38.0 |



Not to Scale

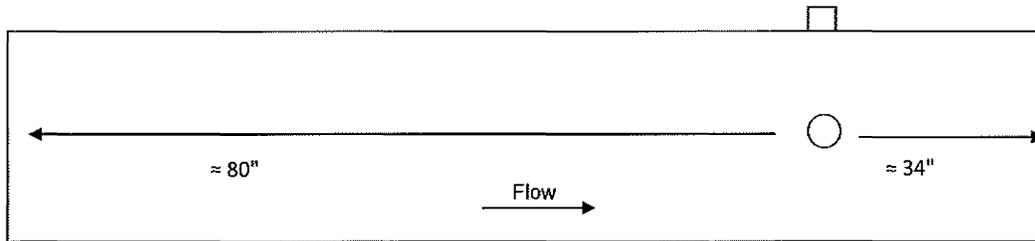


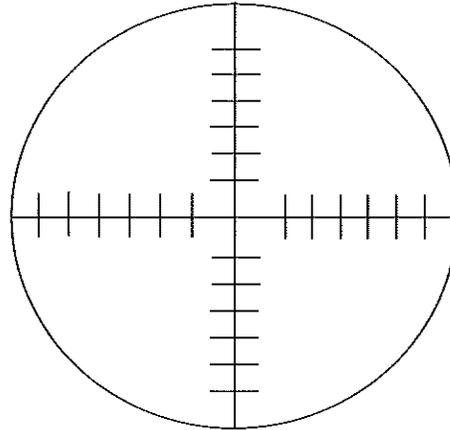
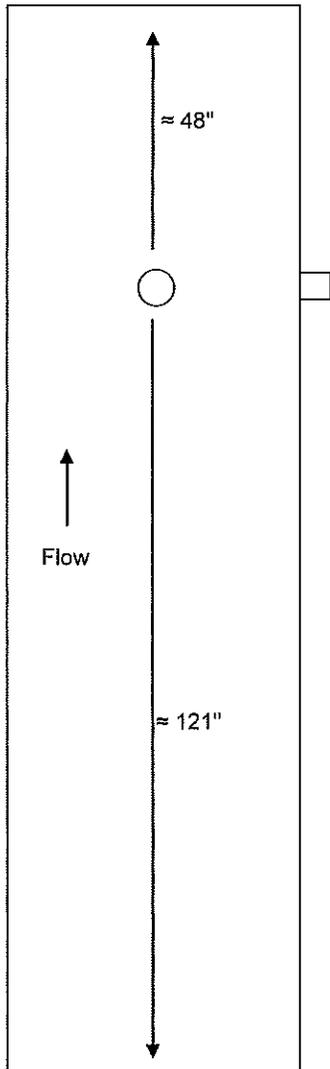
Figure No. 4

Site:
EUDRYING
Zeeland Farm Services, Inc.
Zeeland, Michigan

Sampling Date:
October 16-18, 2018

Montrose Air Quality Services, LLC
4949 Fernlee Avenue
Royal Oak, Michigan 48073

diameter = 30 inches



Not to Scale

| Points | Distance " |
|--------|------------|
| 1 | 1.0 |
| 2 | 2.0 |
| 3 | 3.5 |
| 4 | 5.3 |
| 5 | 7.5 |
| 6 | 10.7 |
| 7 | 19.3 |
| 8 | 22.5 |
| 9 | 24.7 |
| 10 | 26.5 |
| 11 | 28.0 |
| 12 | 29.0 |

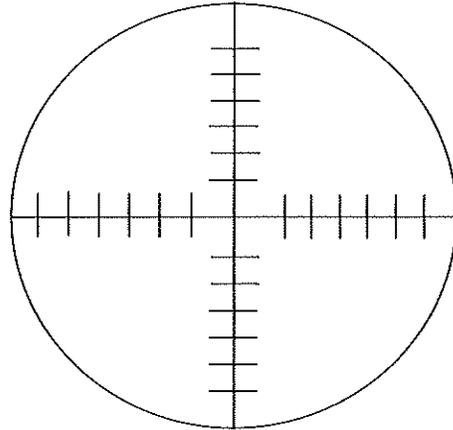
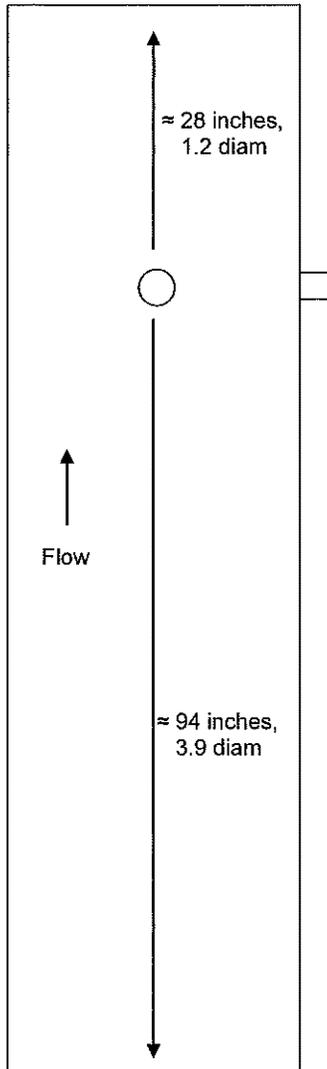
Figure No. 5

Site:
EUPREPEQUIPMENT
Zeeland Farm Services, Inc.
Zeeland, Michigan

Sampling Date:
October 16-18, 2018

Montrose Air Quality Services, LLC
4949 Fernlee Avenue
Royal Oak, Michigan 48073

diameter = 24 inches



Not to Scale

| Points | Distance " |
|--------|------------|
| 1 | 0.5 |
| 2 | 1.6 |
| 3 | 2.8 |
| 4 | 4.2 |
| 5 | 6.0 |
| 6 | 8.5 |
| 7 | 15.5 |
| 8 | 18.0 |
| 9 | 19.8 |
| 10 | 21.2 |
| 11 | 22.4 |
| 12 | 23.5 |

Figure No. 6

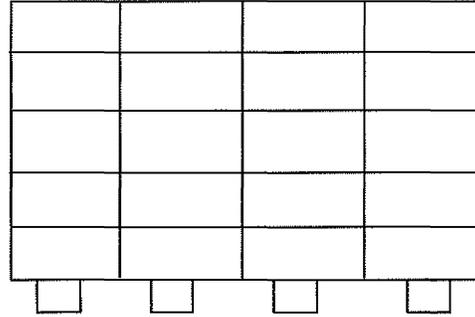
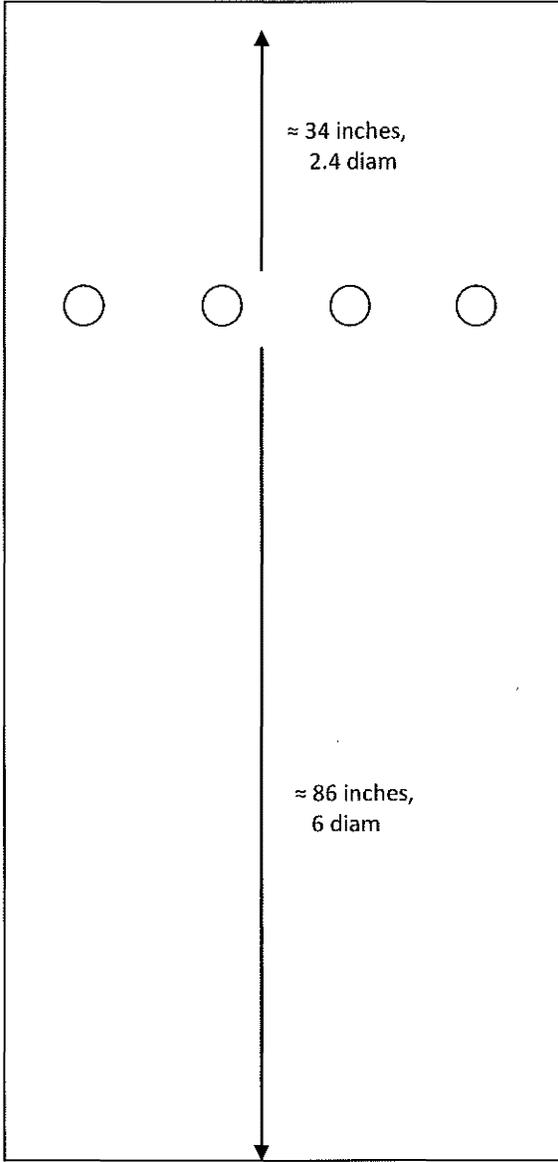
Site:
EUHANDLING
Zeeland Farm Services, Inc.
Zeeland, Michigan

Sampling Date:
October 16-18, 2018

Montrose Air Quality Services,
LLC.
4949 Fernlee Avenue
Royal Oak, Michigan 48073

Stack Dimensions:

Depth: 13 inches
Width: 16 inches



Not to Scale

| Points | Distance " |
|--------|------------|
| 1 | 1.3 |
| 2 | 3.9 |
| 3 | 6.5 |
| 4 | 9.1 |
| 5 | 11.7 |

Figure No. 7

Site:
EUHANDLING2
Zeeland Farm Services, Inc.
Zeeland, Michigan

Sampling Date:
October 16-18, 2018

Montrose Air Quality Services, LLC.
4949 Fernlee Avenue
Royal Oak, Michigan 48073