1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

ZFS Ithaca, LLC contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on the Soybean Hull Pelletizing System (EUPELLETIZING) at the ZFS Ithaca, LLC facility located in Ithaca, Michigan. The tests were conducted to satisfy the emissions testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit No. 20-17B.

The specific objectives were to:

- Verify the total particulate matter (PM) emissions at the exhaust stack of the cyclone serving EUPELLETIZING
- Verify the visible emissions (VE), as percent opacity, at the EUPELLETIZING Cyclone Exhaust Stack
- Conduct the test program with a focus on safety

Montrose performed the tests to measure the emission parameters listed in Table 1-1.

TABLE 1-1
SUMMARY OF TEST PROGRAM

Test Date(s)	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
11/10/2020	EUPELLETIZING	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	60
11/10/2020	EUPELLETIZING	O_2, CO_2	EPA 3	3	60
11/10/2020	EUPELLETIZING	Moisture	EPA 4	3	60
11/10/2020	EUPELLETIZING	Opacity*	-	3	6
11/10/2020	EUPELLETIZING	Total PM	EPA 5/202	3	60

* EPA Method 9 like observations preformed by ZFS Ithaca personnel

To simplify this report, a list of Units and Abbreviations is included in Appendix D.1. Throughout this report, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The average emission test results are summarized and compared to their respective permit limits in Table 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

The testing was conducted by the Montrose personnel listed in Table 1-3. The tests were conducted according to the test plan (protocol) dated October 7, 2020.

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
EUPELLETIZING
NOVEMBER 10, 2020

Parameter/Units	Average Results	Emission Limits
Total Particulate Matter (PM)		
gr/dscf	0.002	0.026
lb/hr	0.06	1.6
PM10*		
lb/hr	0.06	0.80
PM2.5*		
lb/hr	0.06	0.80
Visible Emissions		
% opacity as 6 min average	0.0	10

* Total PM is equivalent to PM10 and/or PM2.5

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	ZFS Ithaca, LLC 1266 E Washington Road Ithaca, MI 48847	
Project Contact:	Bridgette L. Rillema	Brandon LaRosa
Role:	Environmental Manager	Environmental Engineer
Company:	ZFS Solutions, LLC	ZFS Solutions, LLC
Telephone:	616-879-1711	616-879-1715
Email:	bridgetter@zfsinc.com	BrandonL@zfsinc.com

Agency Information

Regulatory Agency:	EGLE
Agency Contact:	Karen Kajiya-Mills
Telephone:	517-335-3122
Email:	kajiya-millsk@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	Matthew Young	Steven Smith
Title:	District Manager	Client Project Manager
Telephone:	248-548-8070	248-548-8070
Email:	myoung@montrose-env.com	ssmith@montrose-env.com

Laboratory Information

Laboratory:	Montrose
City, State:	Royal Oak, MI
Method:	EPA Method 5
Laboratory:	Enthalpy Analytical, LLC
City, State:	Durham, NC
Method:	EPA Method 202

Test personnel and observers are summarized in Table 1-3.

TABLE 1-3
TEST PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
Matt Young	Montrose	District Manager, QI
Mike Nummer	Montrose	Field Technician
Ben Durham	Montrose	Field Technician
Ryan McWhinnie	Montrose	Field Technician
Brandon LaRosa	ZFS Solutions, LLC	Observer/Visible Emissions Evaluator
Bridgette. Rillema	ZFS Solutions, LLC	Observer/Client Liaison
Matthew Karl	EGLE	Observer

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

ZFS Ithaca, LLC is a processing plant for soybeans. This plant utilizes various different processes to transport and treat the soybeans as they arrive. Emissions from the EUPELLETIZING are controlled by a cyclone. EUPELLETIZING was in operation for this testing event.

2.2 FLUE GAS SAMPLING LOCATIONS

Information regarding the sampling locations is presented in Table 2-1.

TABLE 2-1
SAMPLING LOCATIONS

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EUPELLETIZING Cyclone Exhaust Stack	20.0	540.0 / 27.0	168.0 / 8.4	Isokinetic: 12 (6/port)

The sample location was verified in the field to conform to EPA Method 1. Acceptable cyclonic flow conditions were confirmed prior to testing using EPA Method 1, Section 11.4. See Appendices A.1 and A.2 for more information.

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while the source/units and air pollution control devices were operating at the conditions required by the permit. The unit was tested when operating as close to maximum capacity as possible.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The process data that was provided is presented in Appendix B. Data collected includes the following parameters:

- Soybeans processed during monitoring, ton
- Soybeans processed during monitoring period, ton/hr
- Estimated soybeans processed per day, ton
- Actual soybeans processed in day, ton

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 TEST METHODS

The test methods for this test program were presented previously in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

3.1.1 EPA Method 1, Sample and Velocity Traverses for Stationary Sources

EPA Method 1 is used to assure that representative measurements of volumetric flow rate are obtained by dividing the cross-section of the stack or duct into equal areas, and then locating a traverse point within each of the equal areas. Acceptable sample locations must be located at least two stack or duct equivalent diameters downstream from a flow disturbance and one-half equivalent diameter upstream from a flow disturbance.

The sample port and traverse point locations are detailed in Appendix A.

3.1.2 EPA Method 2, Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Stausscheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1.

3.1.3 EPA Method 3, Gas Analysis for the Determination of Dry Molecular Weight

EPA Method 3 is used to calculate the dry molecular weight of the stack gas using one of three methods. The first choice is to measure the percent O_2 and CO_2 in the gas stream. A gas sample is extracted from a stack by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent CO_2 and percent O_2 using either an Orsat or a Fyrite analyzer.

3.1.4 EPA Method 4, Determination of Moisture Content in Stack Gas

EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed in an ice water bath. The impingers are weighed after each run to determine the percent moisture.

The typical sampling system is detailed in Figure 3-1.

3.1.5 EPA Method 5, Determination of Particulate Matter from Stationary Sources

EPA Method 5 is a manual, isokinetic method used to measure Filterable PM emissions. The samples are analyzed gravimetrically. This method is performed in conjunction with EPA Methods 1 through 4. The stack gas is sampled through a nozzle, probe, filter, and impinger train. FPM results are reported in emission concentration and emission rate units.

The typical sampling system is detailed in Figure 3-1.

3.1.6 EPA Method 202, Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources

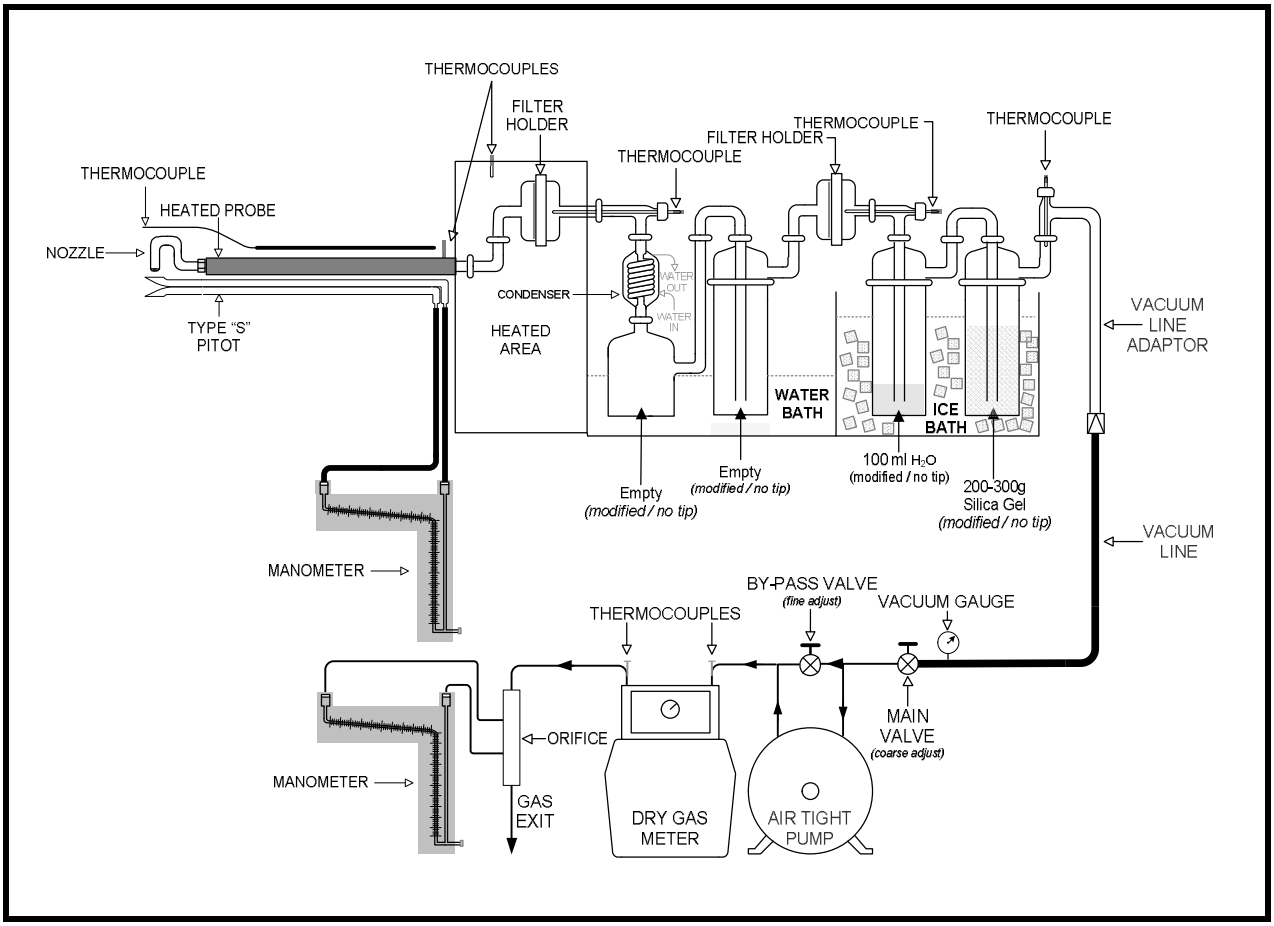
The CPM is collected in dry impingers after filterable PM has been collected on a filter maintained as specified in either Method 5 of Appendix A-3 to 40 CFR 60, Method 17 of Appendix A-6 to 40 CFR 60, or Method 201A of Appendix M to 40 CFR 51. The organic and aqueous fractions of the impingers and an out-of-stack CPM filter are then taken to dryness and weighed. The total of the impinger fractions and the CPM filter represents the CPM. Compared to the version of Method 202 that was promulgated on December 17, 1991, this method eliminates the use of water as the collection media in impingers and includes the addition of a condenser followed by a water dropout impinger immediately after the final in-stack or heated filter. This method also includes the addition of one modified Greenburg Smith impinger (backup impinger) and a CPM filter following the water dropout impinger.

CPM is collected in the water dropout impinger, the modified Greenburg Smith impinger, and the CPM filter of the sampling train as described in this method. The impinger contents are purged with nitrogen immediately after sample collection to remove dissolved SO_2 gases from the impinger. The CPM filter is extracted with water and hexane. The impinger solution is then extracted with hexane. The organic and aqueous fractions are dried and the residues are weighed. The total of the aqueous and organic fractions represents the CPM.

The potential artifacts from SO_2 are reduced using a condenser and water dropout impinger to separate CPM from reactive gases. No water is added to the impingers prior to the start of sampling. To improve the collection efficiency of CPM, an additional filter (the “CPM filter”) is placed between the second and third impingers

The typical sampling system is detailed in Figure 3-1.

FIGURE 3-1
US EPA METHOD 5/202 SAMPLING TRAIN



3.2 PROCESS TEST METHODS

The test plan did not require that process samples be collected during this test program; therefore, no process sample data are presented in this test report.

4.0 TEST DISCUSSION AND RESULTS

4.1 FIELD TEST DEVIATIONS AND EXCEPTIONS

No field deviations or exceptions from the test plan or test methods occurred during this test program.

4.2 PRESENTATION OF RESULTS

The average results are compared to the permit limits in Table 1-2. The results of individual compliance test runs performed are presented in Tables 4-1 and 4-2. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

Visible emissions readings were evaluated by Brandon LaRosa of ZFS Solutions, LLC.

TABLE 4-1
TOTAL PM EMISSIONS RESULTS -
EUPELLETIZING

Run Number	1	2	3	Average
Date	11/10/2020	11/10/2020	11/10/2020	--
Time	8:48-9:52	10:20-11:24	11:47-12:50	--
Process Data - Soybeans Processed				
ton/hr	168.96	169.22	162.27	166.82
Flue Gas Parameters				
O_2, % volume dry	21.0	21.0	21.0	21.0
CO_2, % volume dry	0.0	0.0	0.0	0.0
flue gas temperature, °F	139	139	139	139
moisture content, % volume	10.3	10.2	10.1	10.2
volumetric flow rate, dscfm	3,228	3,606	3,704	3,512
Filterable PM				
gr/dscf	0.0012	0.0007	0.0007	0.0009
lb/hr	0.032	0.021	0.024	0.026
Condensable PM				
gr/dscf	0.0010	0.0012	0.0010	0.0011
lb/hr	0.029	0.038	0.030	0.032
Total PM				
gr/dscf	0.0022	0.0019	0.0017	0.0019
lb/hr	0.061	0.059	0.054	0.058
PM10*				
lb/hr	0.061	0.059	0.054	0.058
PM2.5*				
lb/hr	0.061	0.059	0.054	0.058

* Total PM is equivalent to PM10 and/or PM2.5

TABLE 4-2
VISIBLE EMISSIONS RESULTS -
EUPELLETIZING

Run Number	1	2	3	Average
Date	11/10/2020	11/10/2020	11/10/2020	--
Time	9:06-9:12	10:31-10:37	12:02-12:08	--
Visible Emissions				
% opacity as 6 min average	0.0	0.0	0.0	0.0

5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC AUDITS

The meter box and sampling trains used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes, minimum sample durations, and percent isokinetics met the applicable QA/QC criteria.

Fyrite analyzer audits were performed during this test in accordance with EPA Method 3, Section 10.1 requirements. The results were within ± 0.5% of the respective audit gas concentrations.

EPA Method 5 analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met, except if noted in Section 5.2. An EPA Method 5 reagent blank was analyzed. The maximum allowable amount that can be subtracted is 0.001% of the weight of the acetone blank. The blank did not exceed the maximum residue allowed.

Uncertified opacity readings using an EPA Method 9 like approach was conducted by ZFS Ithaca personnel. Readings were taken every 15 seconds for 6 minutes and made to the nearest 5% opacity.

EPA Method 202 analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met. An EPA Method 202 Field Train Recovery Blank (FTRB) was performed for each source category. The maximum allowable amount that can be subtracted is 0.002 g (2.0 mg). For this project, the FTRB had a mass of 2.3 mg, and 2.0 mg was subtracted.

5.2 QA/QC DISCUSSION

All QA/QC criteria were met during this test program.

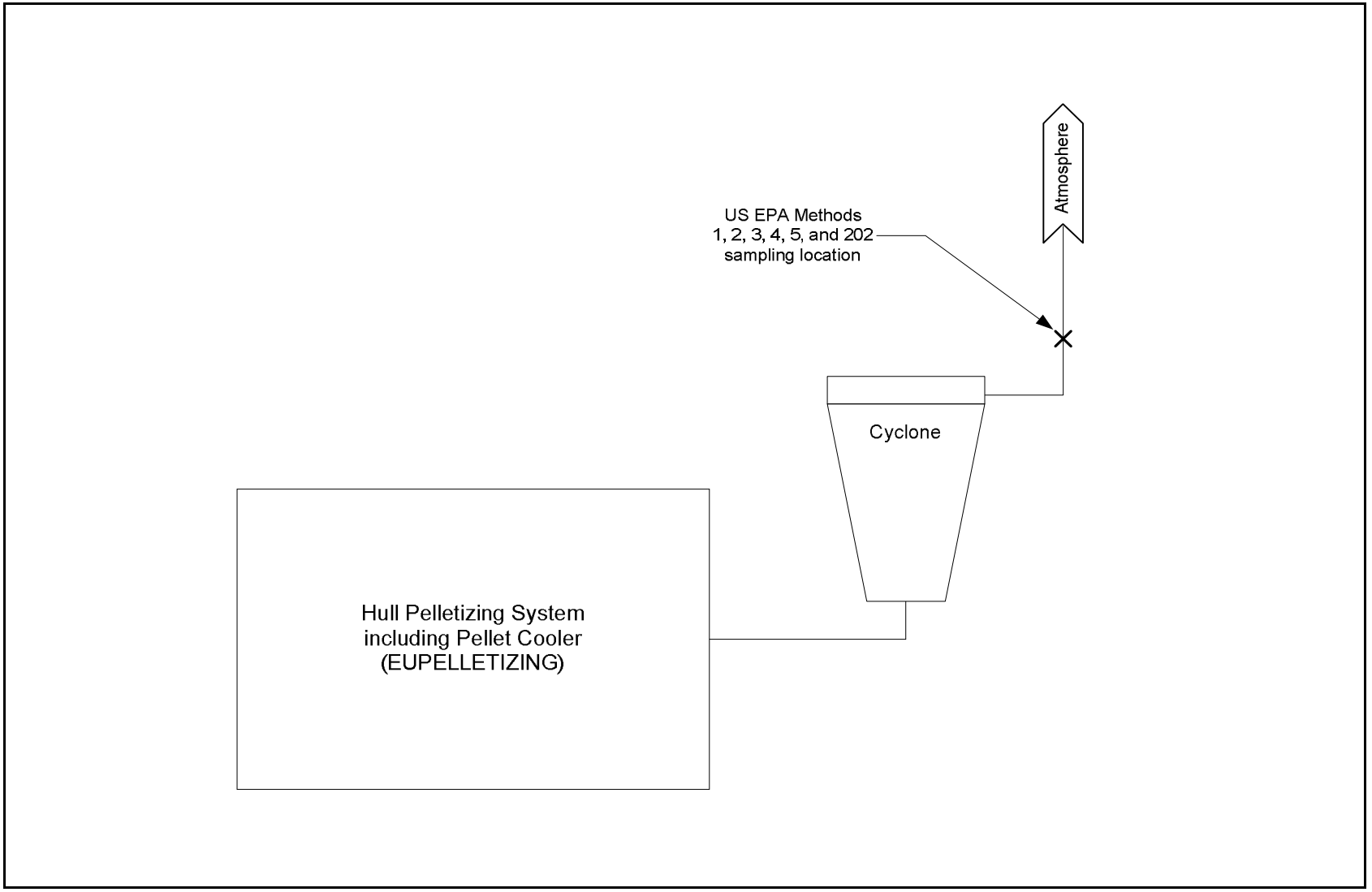
5.3 QUALITY STATEMENT

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the report appendices. The content of this report is modeled after the EPA Emission Measurement Center Guideline Document (GD-043).

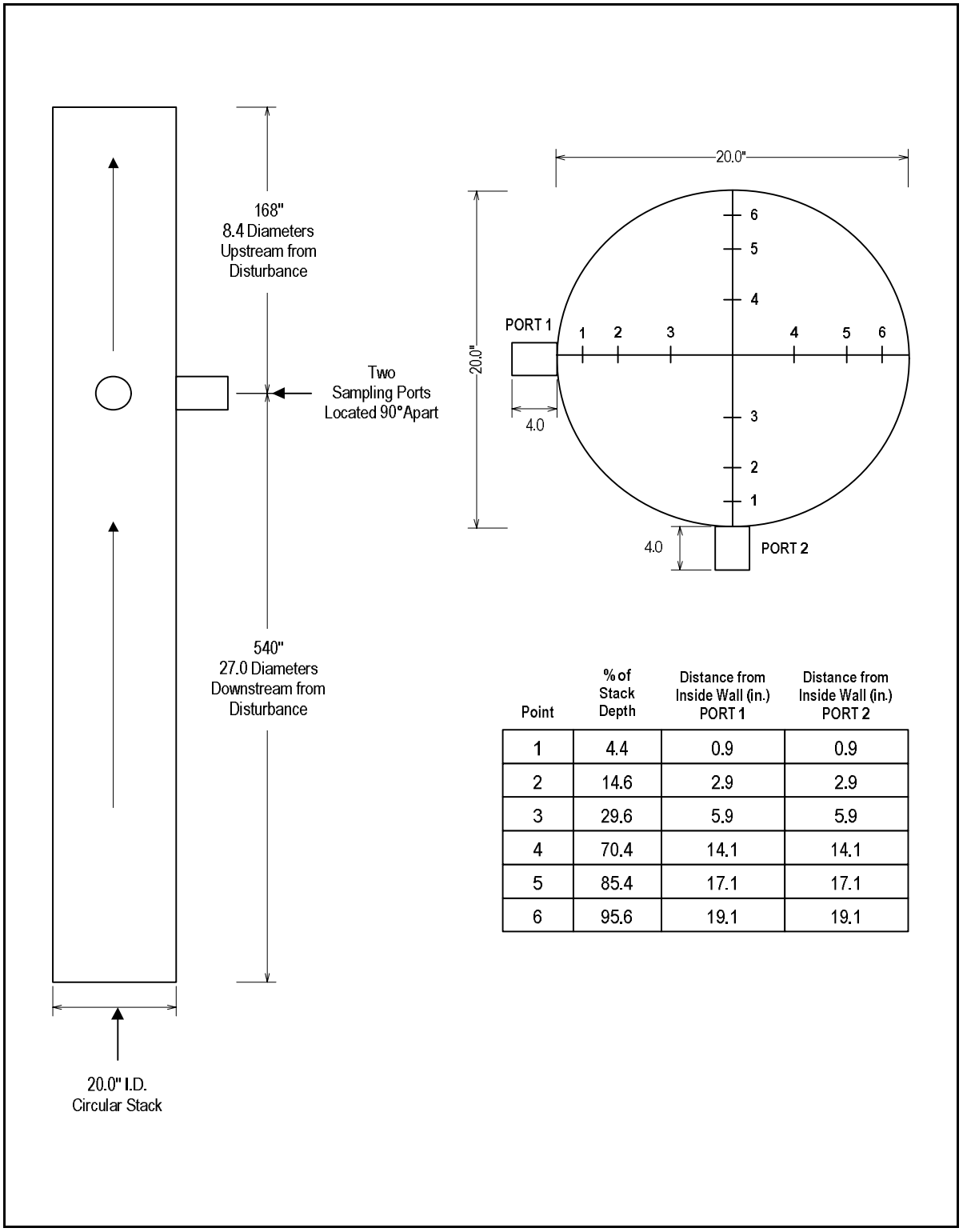
APPENDIX A
FIELD DATA AND CALCULATIONS

Appendix A.1
Sampling Locations

EUPELLETIZING PROCESS AND SAMPLING LOCATION SCHEMATIC



EUPELLETIZING EXHAUST TRAVERSE POINT LOCATION DRAWING



Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	4.4	0.9	0.9
2	14.6	2.9	2.9
3	29.6	5.9	5.9
4	70.4	14.1	14.1
5	85.4	17.1	17.1
6	95.6	19.1	19.1