1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

Occidental Chemical Corporation (OxyChem) contracted Montrose Air Quality Services, LLC (Montrose) to perform the compliance stack test sampling for the FIBC (super sack tote) and Drum Packaging (EUDGDCCFIBC) process at the OxyChem Calcium Chloride Manufacturing facility located in Ludington, Michigan. The OxyChem laboratory subsequently performed the gravimetric analysis on the collected samples. The test was conducted on June 3-4, 2020, to satisfy the emissions testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit No. MI-ROP-B1846-2014.

The specific objectives were to:

- Verify the particulate matter (PM) emissions for the S-300 spray tower scrubber serving EUDGDCCFIBC
- 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)
6/3/2020 - 6/4/3030	EUDGDCCFIBC	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	160
6/3/2020 - 6/4/3030	EUDGDCCFIBC	O_2, CO_2	EPA 3	3	160
6/3/2020 - 6/4/3030	EUDGDCCFIBC	Moisture	EPA 4	3	160
6/3/2020 - 6/4/3030	EUDGDCCFIBC	PM	EPA 5	3	160

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 sampling procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. This report also contains the gravimetric analysis performed by the OxyChem laboratory. 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 sampling was conducted by the Montrose personnel listed in Table 1-3. The gravimetric analysis was performed by the OxyChem laboratory. Sampling runs were conducted according to the test plan (protocol) dated April 28, 2020 that was submitted to and approved by EGLE.

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
EUDGDCCFIBC
JUNE 3-4, 2020

Parameter/Units	Average Results	Emission Limits
Total Particulate Matter (PM)		
lb/hr	0.2	2.3
lb/1,000 lbs-dry exhaust gas	0.03	0.10

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	Occidental Chemical Corporation OxyChem 1600 S. Madison Street Ludington, MI 49431	
Project Contact:	Steve Jones	Kathryn Nixon
Role:	Environmental Manager	Sr. Process Engineer
Company:	OxyChem	OxyChem
Telephone:	231-845-4390	231-845-4368
Email:	steven_w_jones@oxy.com	kathryn_nixon@oxy.com
Project Contact:	Marissa Knudsen	
Role:	Process Engineer	
Company:	OxyChem	
Telephone:	231-845-4371	
Email:	marissa_knudsen@oxy.com	

Agency Information

Regulatory Agency:	EGLE
Agency Contact:	Rob Dickman
Telephone:	231-878-4697
Email:	dickmanr@michigan.gov

Sampling Company Information

Sampling Firm:	Montrose Air Quality Services, LLC	
Contact:	Matthew Young	David Trahan
Title:	Client Project Manager	Project Manager, Sr. Field Tech.
Telephone:	248-548-8070	248-548-8070
Email:	myoung@montrose-env.com	dtrahan@montrose-env.com

Laboratory Information

Laboratory:	Occidental Chemical Corporation
City, State:	Ludington, MI
Method:	Gravimetric Analysis
Laboratory Contact:	Randy Haight
Title:	Senior Analytical Chemist
Telephone:	231-845-4500
Email:	randolph_haight@oxy.com

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

TABLE 1-3
SAMPLING PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
David Trahan	Montrose	Project Manager, QI
David Koponen	Montrose	Field Technician

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

2.1.1 Process Description

DG calcium chloride process: Dried calcium chloride is transported, formed into briquettes, conveyed, screened, and loaded into FIBCs (flexible intermediate bulk containers) and drums. Vacuum is maintained on the process equipment and spray tower by a fan on the discharge side of the DG calcium chloride process scrubber, S-300.

2.1.2 Operation and Control Equipment

DG calcium chloride process scrubber, S-300: A spray tower is used to remove contaminants from process air. The scrubbing fluid flow rate is monitored and automatically controlled above the Title V permit minimum. Large entrained droplets within the spray tower are removed by gravity due to low air velocity. Smaller entrained droplets are removed as the exhaust air passes through a mist elimination section. The exhaust gas is then discharged through the vent stack.

2.2 FLUE GAS SAMPLING LOCATION

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

TABLE 2-1
SAMPLING LOCATION

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EUDGDCCFIBC S-300 SV06025 Exhaust Stack	19.6	176.0 / 9.0	82.0 / 4.2	Isokinetic: 32 (8/port); each traverse point samples twice

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

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while EUDGDCCFIBC and S-300 were operating at the conditions required by the permit.

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:

- Scrubber flow rate, GPM
- ME-150 Briquetter Amps, AMPS

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. The second choice is to use stoichiometric calculations to calculate dry molecular weight. The third choice is to use an assigned value of 30.0, in lieu of actual measurements, for processes burning natural gas, coal, or oil.

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.

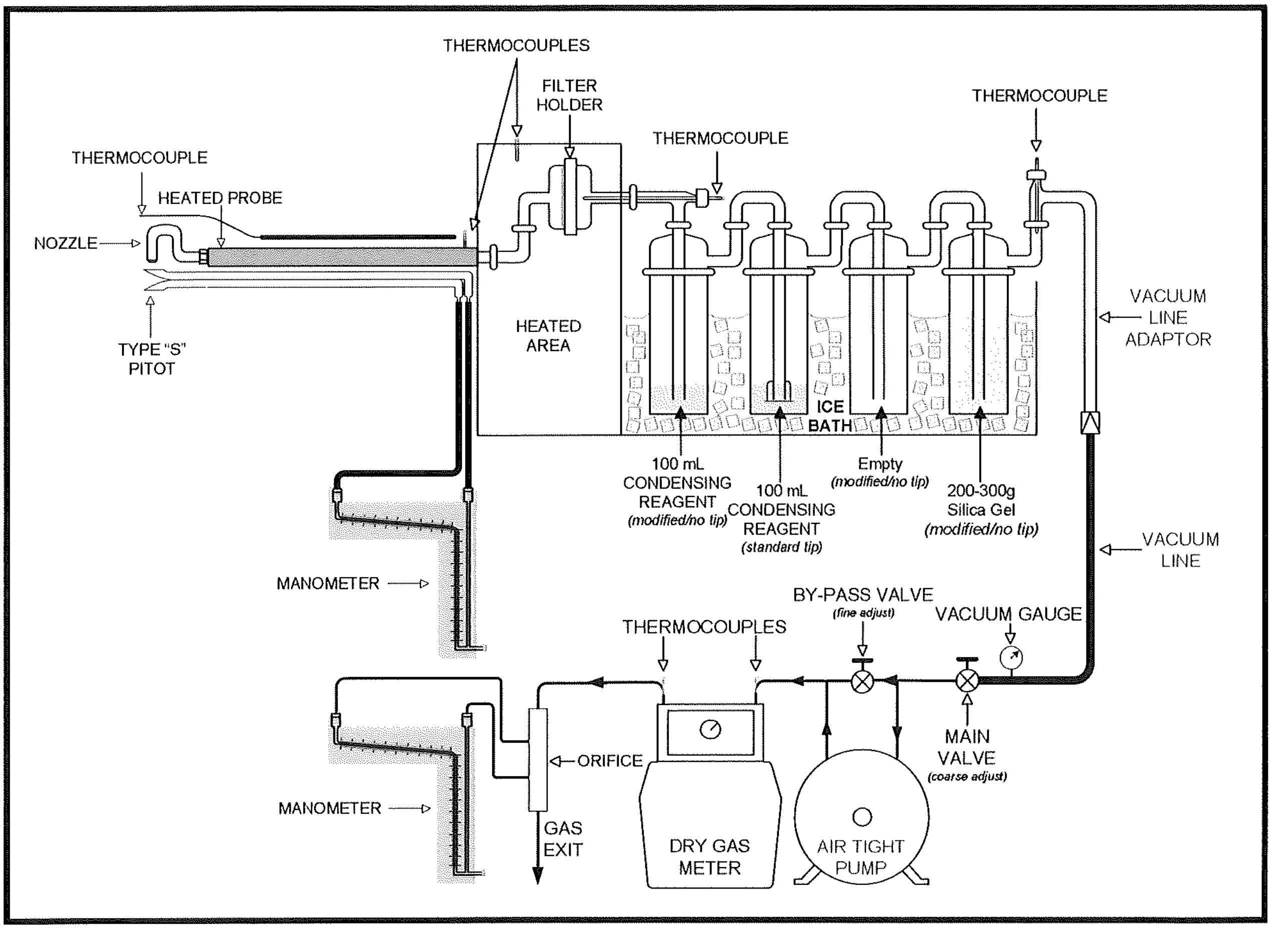
Moisture sampling is performed as part of the pollutant sample train. The typical sampling system is detailed in Figure 3-1.

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

EPA Method 5 is a manual, isokinetic method used to measure FPM 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.

FIGURE 3-1
US EPA METHOD 5 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

EPA Method 5, Section 6.1.1.7, stipulates that the filter exit temperature be monitored and recorded during sampling to ensure it remains within the acceptable range, 248 ±25 °F. Per the method, the filter temperature sensor should be in direct contact with the gas stream. For this test event, the "filter box" temperature was monitored and recorded instead. The "filter box" temperature sensor was outside of the gas stream. The temperatures recorded with the alternate temperature sensor were within the acceptable range.

Oxy Labs performed the gravimetric analysis. The analytical work procedure is available for review upon request.

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 Table 4-1. 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.

Since more than 10% of the individual Δp readings recorded at the EUDGDCCFIBC S-300 SV06025 Exhaust Stack during each run were below 0.05 in-H_2O, a more sensitive micromanometer was utilized at this location as per EPA Method 2, Section 6.2.

TABLE 4-1
PM EMISSIONS RESULTS -
EUDGDCCFIBC

Run Number	**1**	**2**	**3**	**Average**
Date	6/3/2020	6/3/2020	6/4/2020	--
Time	8:15-11:02	11:25-14:08	7:33-10:16	--
Process Data				
S-300 Flow rate, GPM	87	87	86	87
ME-150 Briquetter Amps, AMPS	53	53	54	53
Flue Gas Parameters				
O_2, % volume dry	21.00	21.00	21.00	21.00
CO_2, % volume dry	0.00	0.00	0.00	0.00
flue gas temperature, °F	85.6	90.7	88.0	88.1
moisture content, % volume	3.34	3.94	3.50	3.59
volumetric flow rate, dscfm	1,348	1,235	1,232	1,272
Particulate Matter (PM)				
lb/hr	0.2	0.2	0.1	0.2
lb/1,000 lbs-dry exhaust gas	0.03	0.03	0.02	0.03

5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC AUDITS

The meter box and sampling train 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.

5.2 QA/QC DISCUSSION

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

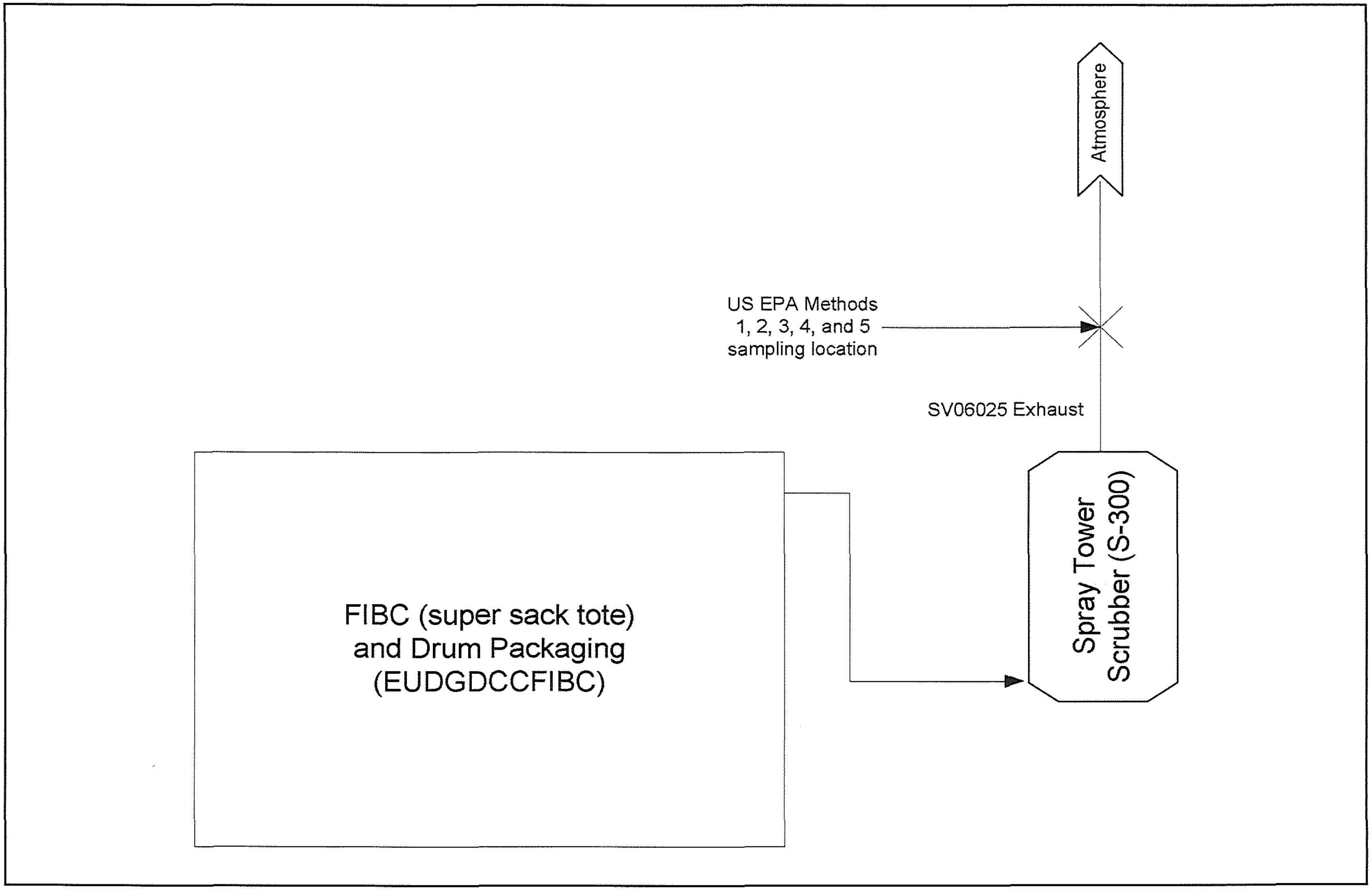
5.3 QUALITY STATEMENT

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 sampling 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).

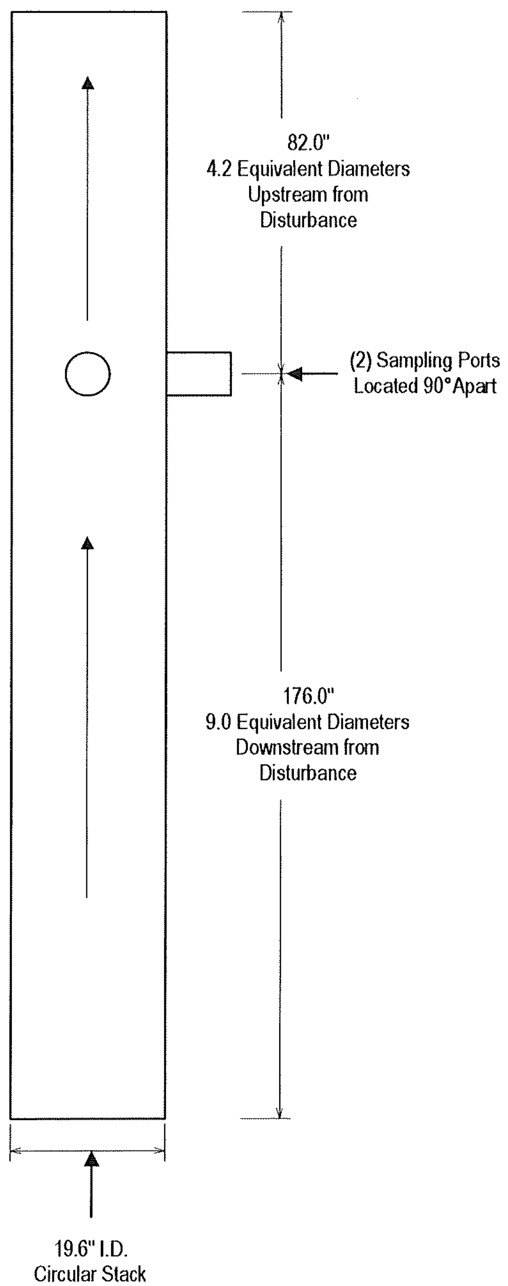
APPENDIX A
FIELD DATA AND CALCULATIONS

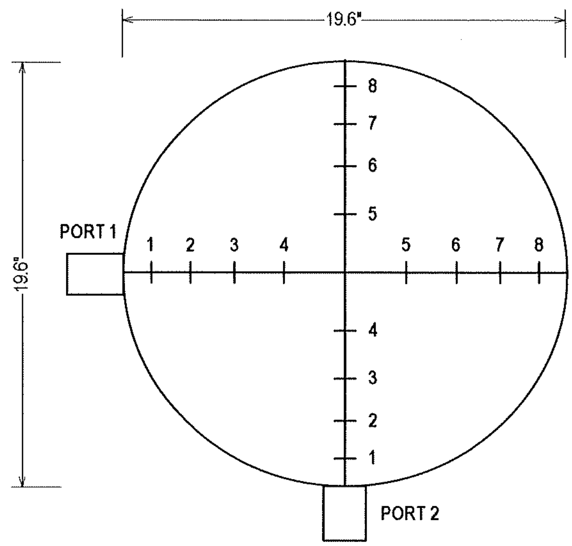
Appendix A.1
Sampling Locations

EUDGDCCFIBC SAMPLING LOCATION SCHEMATIC



EUDGDCCFIBC S-300 SV06025 EXHAUST TRAVERSE POINT LOCATION DRAWING





Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	3.2	0.6	0.6
2	10.5	2.1	2.1
3	19.4	3.8	3.8
4	32.3	6.3	6.3
5	67.7	13.3	13.3
6	80.6	15.8	15.8
7	89.5	17.6	17.6
8	96.8	19.0	19.0