Source Test Report for the 2024 PEMS Relative Accuracy Audit Regenerative Thermal Oxidizer and Heat Recovery Steam Generator (EU-RTO&HRSG) Marysville Ethanol, LLC Marysville, Michigan

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MONTROSE AIR QUALITY SERVICES

STAC

ACCREDITED TO ASTM D7036 ONLY CERT #1925.01

Review and Certification

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Montrose operated in conformance with the requirements of the Montrose Quality Management System and ASTM D7036-04 during this test project.

Signature:		**Date:**	September 20, 2024
Name:	John Nestor	**Title:**	District Manager

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1.0 Introduction

1.1 Summary of Test Program

Marysville Ethanol, LLC contracted Montrose Air Quality Services, LLC (Montrose) to perform the Relative Accuracy Audit (RAA) for the Predictive Emission Monitoring Systems (PEMS) associated with the Regenerative Thermal Oxidizer and Heat Recovery Steam Generator (EU-RTO&HSRG) at the Marysville Ethanol facility (Facility ID: N7493) located in Marysville, Michigan. Testing was performed on August 30, 2024, for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit-to-Install No. 175-05D by evaluating the quality of the emissions data produced by Marysville Ethanol's PEMS in accordance with 40 CFR Part 60, Appendices B and F.

The specific objectives were to:

- Verify the relative accuracy (RA) of the EU-RTO&HRSG PEMS for nitrogen oxides (NO_x) (as NO_2) emissions (lb/MMBtu), NO_x concentration (ppmvd), and oxygen (O_2) concentration (%-Dry) in accordance with Performance Specification 16 (PS-16)
- 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)
8/30/2024	EU-RTO&HRSG	O_2	EPA 3A	3	30
8/30/2024	EU-RTO&HRSG	NO_x	EPA 7E	3	30

To simplify this report, a list of Units and Abbreviations is included in Appendix C.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 RA test results are summarized and compared to their respective regulatory requirements 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.

Table 1-2
Summary of Part 60 PEMS RATA Results

August 30, 2024

Parameter/Units	Regulatory Reference	RA	Allowable
Part 60			
Oxygen (O_2)			
% volume dry	PS-16	0.25	≤ 1.0% O_2
Nitrogen Oxides (NO_x)			
ppmvd	PS-16	5.38	≤ 20% of RM
lb/MMBtu (as NO_2)	PS-16	3.32	≤ 20% of RM

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location:	Marysville Ethanol, LLC 2512 Busha Highway Marysville, MI 48040	
Project Contact:	Aric Metevia	Susan Jack
Role:	Plant Manager	Production Manager
Company:	Marysville Ethanol	Marysville Ethanol
Telephone:	810-479-8277	810-479-8266
Email:	ametevia@marysvilleethanol.com	sjack@marysvilleethanol.com

Agency Information

Regulatory Agency:	EGLE
Agency Contact:	Jeremiah Brown
Telephone:	517-599-7825
Email:	brownJ9@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	John Nestor	Scott Brown
Title:	District Manager	Reporting Hub Manager - Midwest
Telephone:	248-548-8070	630-860-4740
Email:	jonestor@montrose-env.com	scbrown@montrose-env.com

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

Table 1-3
Test Personnel and Observers

Name	Affiliation	Role/Responsibility
John Nestor	Montrose	District Manager, QI
Jose Hernandez	Montrose	Field Technician
Aric Metevia	Marysville Ethanol	Test Coordinator

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

The Marysville Ethanol facility operates two natural gas fired 45 MMBtu/hr dryers and a 125 MMBtu/hr natural gas fired regenerative thermal oxidizer (RTO) with a heat recovery steam generator (HRSG). The RTO controls emissions from several emission units. Low-NO_x combustors minimize the emissions of nitrogen oxides from the process. The EU-RTO&HRSG were in operation during this test event.

2.2 Facility PEMS and Reference Method (RM) CEMS Descriptions

The Facility PEMS analyzer information is presented in Table 2-1, and the RM PEMS analyzer information is presented in Table 2-2.

Table 2-1
Facility PEMS Information

Measurement Type	Manufacturer	Model No.	Serial No.
EU-RTO&HRSG PEMS	CMC Solutions	TO/HRSG Stack Model	S10.65175

Table 2-2
RM CEMS Information

Analyzer Type	Manufacturer	Model No.	Serial No.	Range
O_2	Teledyne	T802	197	0-19.83%
NO_x	Teledyne	T200	727	0-90.05 ppm

2.3 Flue Gas Sampling Location

Information regarding the sampling location is presented in Table 2-3.

Table 2-3
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.)	
EU-RTO&HRSG S-10 Exhaust Stack	83.0	360 / 4.3	780 / 9.4	Gaseous: 3

See Appendix A.1 for more information.

2.4 Operating Conditions and Process Data

The PEMS RAA was performed while the EU-RTO&HRSG was operating normal full load.

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

- Facility PEMS data for each 30-minute RAA run
- HRSG steam flow, lb/hr
- Total gas usage, MMBtu/hr

3.0 Sampling and Analytical Procedures

3.1 Test Methods

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

3.1.1 EPA Method 3A - Determination of Oxygen and Carbon Dioxide in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 3A is an instrumental test method used to measure the concentration of O_2 and CO_2 in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentrations of O_2 and CO_2. The performance requirements of the method must be met to validate data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Calibration span value is 19.83% O_2
- Method Exceptions:
  - None
- Target and/or Minimum Required Sample Duration: 30 minutes

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

3.1.2 EPA Method 7E - Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)

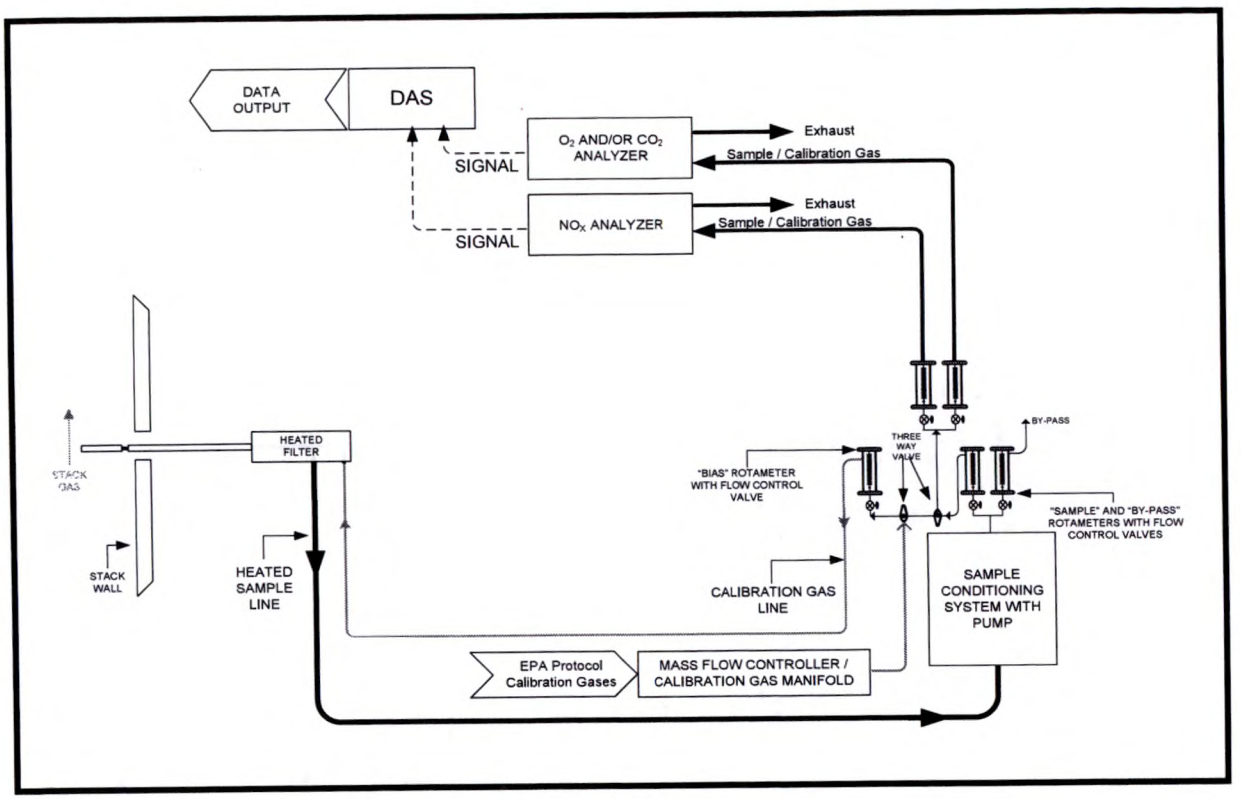
EPA Method 7E is an instrumental test method used to continuously measure emissions of NO_x as NO_2. Conditioned gas is sent to a chemiluminescent analyzer to measure the concentration of NO_x. NO and NO_2 can be measured separately or simultaneously together but, for the purposes of this method, NO_x is the sum of NO and NO_2. The performance requirements of the method must be met to validate the data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - A dry extractive sampling system is used to report emissions on a dry basis
  - Calibration span value is 90.05 ppmvd NO_x
- Method Exceptions:
  - None
- Target and/or Minimum Required Sample Duration: 30 minutes

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

Figure 3-1
EPA Method 3A and 7E Sampling Train



3.1.3 EPA Method 19 - Measurement of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates

EPA Method 19 is a manual method used to determine (a) PM, SO_2, and NO_x emission rates; (b) sulfur removal efficiencies of fuel pretreatment and SO_2 control devices; and (c) overall reduction of potential SO_2 emissions. This method provides data reduction procedures, but does not include any sample collection or analysis procedures.

EPA Method 19 is used to calculate mass emission rates in units of lb/MMBtu. EPA Method 19, Table 19-2 contains a list of assigned fuel factors for different types of fuels, which can be used for these calculations.

Pertinent information regarding the performance of the method is presented below:

- Method Options:

- F factor of 8,710 dscf/106 Btu is the published O_2-based F_d factor in EPA Method 19, Table 19-2

- Method Exceptions:
  - None

3.1.4 EPA Performance Specification 16 - Specifications and Test Procedures for Predictive Emission Monitoring Systems in Stationary Sources

EPA Performance Specification 16 is a specification used to evaluate the acceptability of Predictive Emission Monitoring Systems (PEMS) to show compliance with an emission limitation under 40 CFR 60, 61, or 63. These procedures are used to certify a PEMS after initial installation and periodically thereafter to ensure the system is operating properly and meets the requirements of all applicable regulations. Ongoing QA/QC tests include sensor evaluation, bias correction, quarterly Relative Accuracy Audits (RAA), and annual Relative Accuracy Test Audits (RATA).

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - None
- Method Exceptions:
  - None
- Applicable Performance Specifications - NO_x:
  - When average RM results are ≥ 10 ppm and ≤ 100 ppm, RA calculated with RM in the denominator must be < 20%
  - When average RM results are ≥ 0.02 lb/MMBtu and ≤ 0.2 lb/MMBtu, RA calculated with RM in the denominator must be ≤ 20%
- Applicable Performance Specifications – O_2:
  - When RA is calculated as the absolute mean difference between the RM and CEMS, the RA must be within 1.0% O_2

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 RA results are compared to the regulatory requirements in Table 1-2. The results of individual test runs performed are presented in Tables 4-1 through 4-3. 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.

Table 4-1
NO_x (lb/MMBtu) RAA Results -
EU-RTO&HRSG PEMS

Run No.	Date	Time	RM	PEMS	Difference	Steam Flow (lb/hr)
1	8/30/2024	08:30-09:00	0.052	0.053	-0.001	89,252.91
2	8/30/2024	09:20-09:50	0.050	0.053	-0.003	89,132.64
3	8/30/2024	10:05-10:35	0.051	0.052	-0.001	88,526.26
Averages			0.051	0.053	-0.002	88,970.60
Unit Load			Normal			
RA based on mean RM value			3.32	%		

Table 4-2
NO_x (ppmvd) RAA Results -
EU-RTO&HRSG PEMS

Run No.	Date	Time	RM	PEMS	Difference	Steam Flow (klb/hr)
1	8/30/2024	08:30-09:00	37.85	39.54	-1.69	89,252.91
2	8/30/2024	09:20-09:50	36.90	39.33	-2.43	89,132.64
3	8/30/2024	10:05-10:35	37.18	39.07	-1.89	88,526.26
Averages			37.31	39.31	-2.01	88,970.60
Unit Load			Normal			
RA based on mean RM value			5.38	%		

Table 4-3
O_2 (%-Dry) RAA Results -
EU-RTO&HRSG PEMS

Run No.	Date	Time	RM	PEMS	Difference	Steam Flow (klb/hr)
1	8/30/2024	08:30-09:00	4.98	4.77	0.21	89,252.91
2	8/30/2024	09:20-09:50	5.01	4.74	0.27	89,132.64
3	8/30/2024	10:05-10:35	4.98	4.71	0.27	88,526.26
Averages			4.99	4.74	0.25	88,970.60
Unit Load			Normal			
RA based on | mean difference |			0.25	% as O_2		

5.0 Internal QA/QC Activities

5.1 QA/QC Audits

Table 5-1 presents a summary of the gas cylinder information.

Table 5-1
Part 60 Gas Cylinder Information

Gas Type	Gas Concentrations	Cylinder ID	Expiration Date
O_2, Balance N_2	10.06%	CC465758	2/5/2032
O_2, Balance N_2	19.83%	CC71658	12/13/2024
NO_x, Balance N_2	50.41 ppmv	CC217199	2/14/2032
NO_x, Balance N_2	90.05 ppmv	SG9103440BAL	4/27/2031
NO_2, Balance Air	50.32 ppmv	EB0147946	9/14/2025

EPA Method 3A and 7E calibration audits were all within the measurement system performance specifications for the calibration drift checks, system calibration bias checks, and calibration error checks.

The NO_2 to NO converter efficiency check of the analyzer was conducted per the procedures in EPA Method 7E, Section 8.2.4. The conversion efficiency met the criteria.

5.2 QA/QC Discussion

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

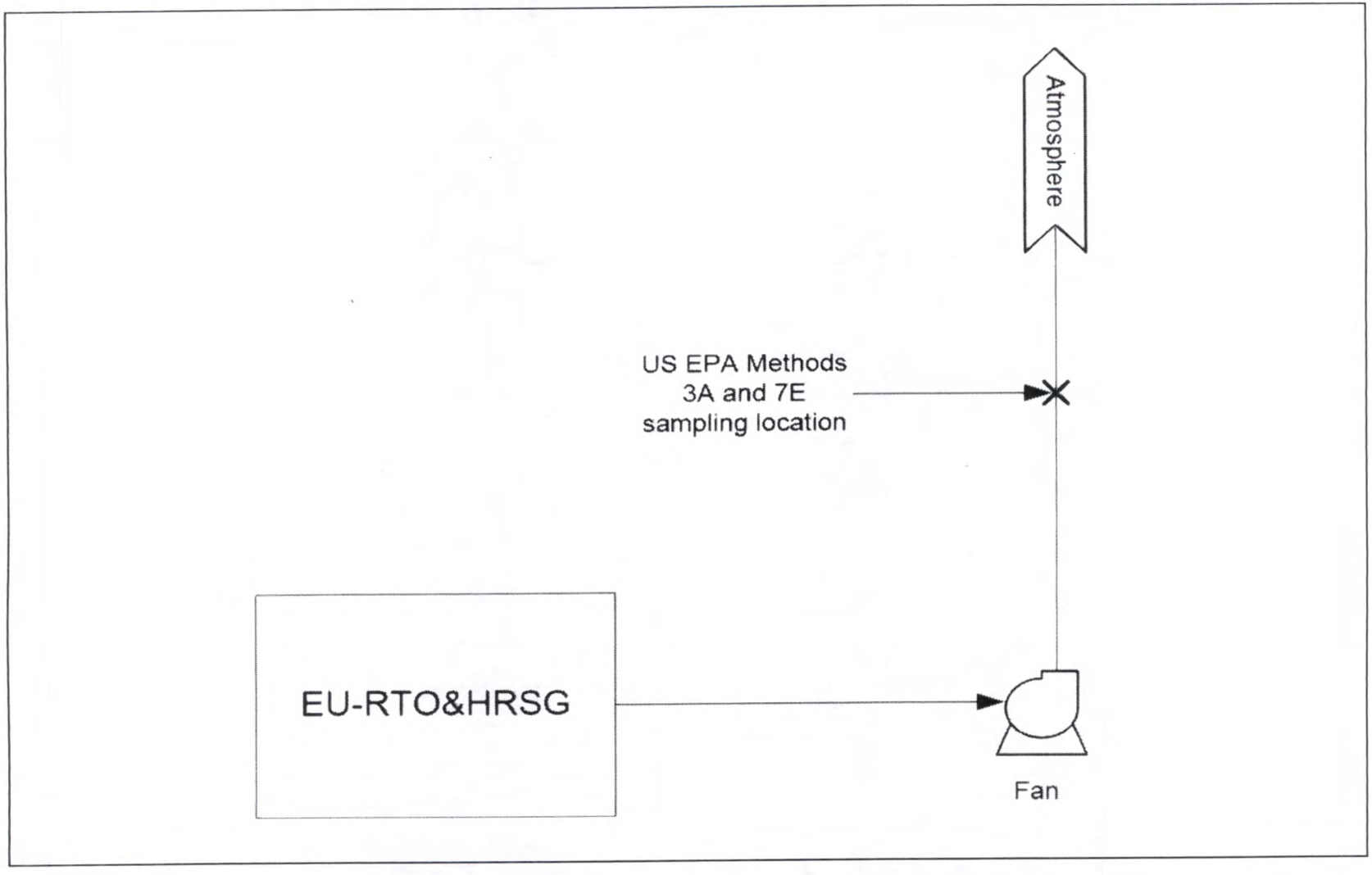
5.3 Quality Statement

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).

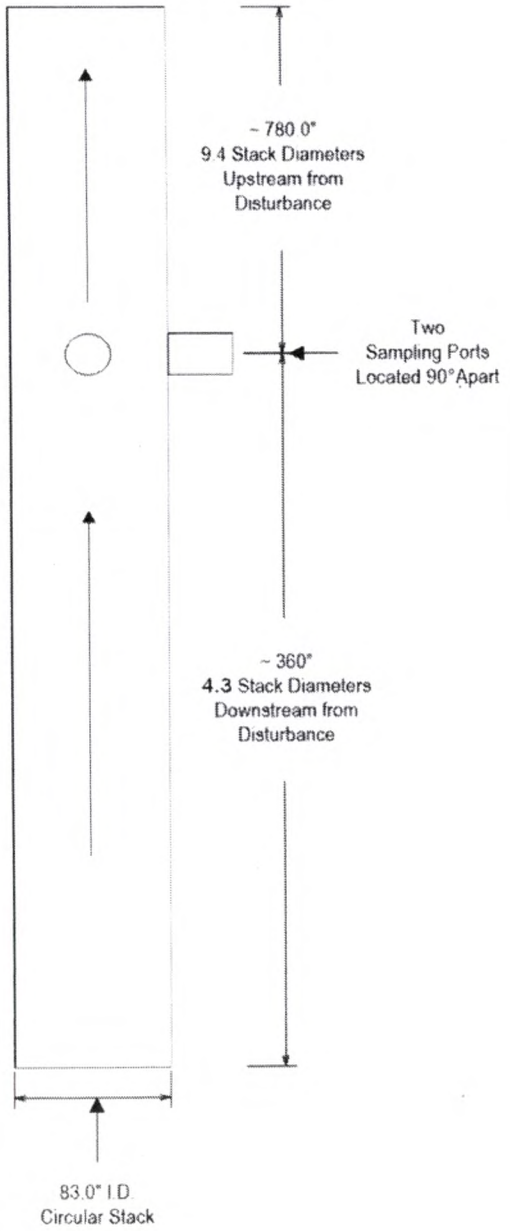
Appendix A
Field Data and Calculations

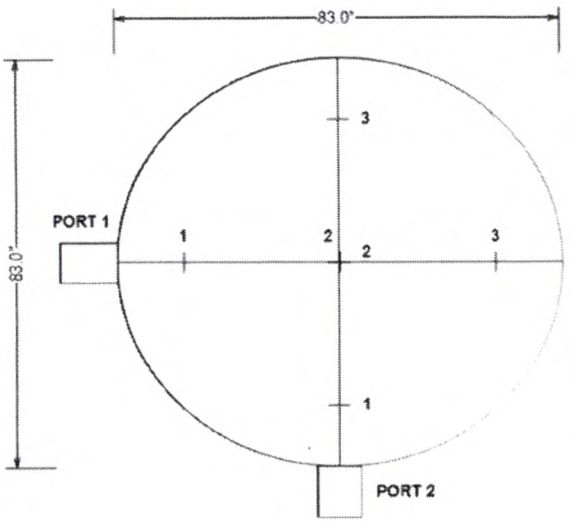
Appendix A.1
Sampling Locations

EU-RTO&HRSG SAMPLING LOCATION SCHEMATIC



EU-RTO&HRSG SV-10 EXHAUST TRAVERSE POINT LOCATION DRAWING





Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2
1	16.7	13.9	13.9
2	50.0	41.5	41.5
3	83.3	69.1	69.1