1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

AK Steel Corporation - Dearborn Works (State Registration Number: A8640) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on the Steel Pickling Process Line (EUNPKLLINE) at the AK Steel Corporation - Dearborn Plant located in Dearborn, Michigan. Testing was conducted to demonstrate compliance with Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit-to-Install (PTI) No. 120-16 and for the Steel Pickling National Emission Standards for Hazardous Air Pollutants (NESHAP), 40 CFR 63. Subpart CCC.

The specific objectives were to:

- Verify the hydrogen chloride (HCl) emissions from an exhaust stack serving EUNPKLLINE.
- 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)
2/25/2020	EUNPKLLINE	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	60
2/25/2020	EUNPKLLINE	O_2, CO_2	EPA 3	3	3
2/25/2020	EUNPKLLINE	Moisture	EPA 4	3	60
2/25/2020	EUNPKLLINE	HCl	EPA 26A	3	60

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 December 19, 2019 that was submitted to and approved EGLE.

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
EUNPKLLINE
FEBRUARY 25, 2020

Parameter/Units	Average Results	Emission Limits
Hydrogen Chloride (HCl)		
ppmvd	0.3	6.0

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	AK Steel Corporation - Dearborn Works 4001 Miller Road Dearborn, MI 48120
Project Contact:	David Pate
Role:	Senior Environmental Engineer
Company:	AK Steel Corporation - Dearborn Works
Telephone:	313-323-1261
Email:	david.pate@aksteel.com

Agency Information

Regulatory Agency:	EGLE	
Agency Contact:	Regina Angellotti	Katherine Koster
Telephone:	313-456-4692	313-456-4678
Email:	angellottir1@michigan.gov	kosterk1@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:	Enthalphy Analytical, LLC
City, State:	Durham, North Carolina
Method:	US EPA Method 26A

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

TABLE 1-3
TEST PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
Steven Smith	Montrose	Client Project Manager, QI
Benjamin Durham	Montrose	Field Technician
David Koponen	Montrose	Field Technician

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

The steel pickling process line (EUNPKLLINE) at AK Steel uses hydrochloric acid to remove metal oxides from the steel in order to provide a smooth, clean surface for use as hot roll steel and/or to perform subsequent cold forming operations. The Pickle line consists of four acid tubs in series. Fresh acid is added to the fourth tub and cascades from the fourth tank to the first tank, countercurrent to the direction of travel of the steel. The Pickle line emissions are controlled by a packed bed water scrubber with a rating of 14,125 acfm.

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.)	
EUNPKLLINE Scrubber Exhaust Stack	30.0	296.0 / 9.9	360.0 / 12.0	Isokinetic: 12 (6/port)

Sample location(s) were 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 Appendix A.1 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 production rate for this test was an average of 218 TPH.

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:

- Tank Concentration, (g/l)
- Tank Temperature, (°C)
- Recirculation and Millwater Makeup Flow Rate, (m^3/hr)
- Mist Eliminator and Tower Packing DP, (Kpa)

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.1.

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.

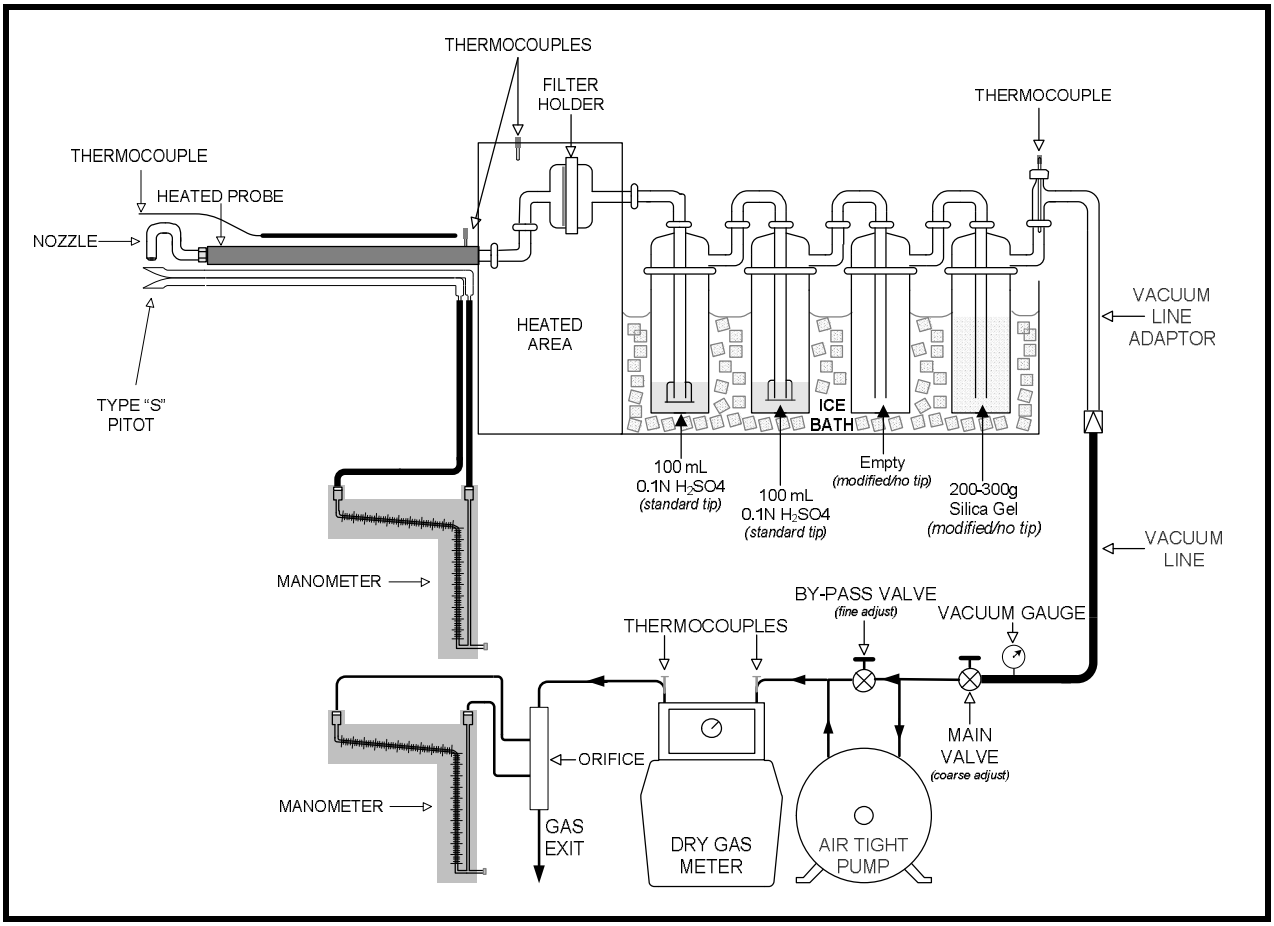
3.1.4 EPA Method 4, Determination of Moisture Content in Stack Gas

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.

3.1.5 EPA Method 26A, Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Isokinetic Method

EPA Method 26A is a manual, isokinetic method used to measure hydrogen chloride emissions from stationary sources. Gaseous and particulate pollutants are withdrawn isokinetically from the source and collected in an optional cyclone, on a filter, and in absorbing solutions. The cyclone collects any liquid droplets and is not necessary if the source emissions do not contain them; however, it is preferable to include the cyclone in the sampling train to protect the filter from any liquid present. The filter collects particulate matter including halide salts but is not routinely recovered or analyzed. Acidic and alkaline absorbing solutions collect the gaseous hydrogen halides and halogens, respectively. Following sampling of emissions containing liquid droplets, any halides/halogens dissolved in the liquid in the cyclone and on the filter are vaporized to gas and collected in the impingers by pulling conditioned ambient air through the sampling train. The hydrogen halides are solubilized in the acidic solution and form chloride (Cl^-), bromide (Br^-), and fluoride (F^-) ions. The halogens have a very low solubility in the acidic solution and pass through to the alkaline solution where they are hydrolyzed to form a proton (H^+), the halide ion, and the hypohalous acid (HClO or HBrO). Sodium thiosulfate is added to the alkaline solution to assure reaction with the hypohalous acid to form a second halide ion such that two halide ions are formed for each molecule of halogen gas. The halide ions in the separate solutions are measured by ion chromatography (IC). If desired, the particulate matter recovered from the filter and the probe is analyzed following the procedures in Method 5.

FIGURE 3-1
US EPA METHOD 26A (HALIDES) 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

Upon returning to Montrose it was determined that three probe temperature readings during Runs 2 and 3 at the EUNPKLLINE Exhaust Stack were recorded outside of the temperature range (248-273°F) specified in EPA Method 26A. Montrose personnel notified Regina Angellotti of EGLE who accepted Runs 2 and 3 as valid. See Appendix E for details.

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.

TABLE 4-1
HCl EMISSIONS RESULTS -
EUNPKLLINE

Run Number	1	2	3	Average
Date	2/25/2020	2/25/2020	2/25/2020	--
Time	9:43-10:47	11:22-12:55	13:35-14:42	--
Hydrochloric Acid (HCl)				
ppmvd	0.34	0.23	0.25	0.27
lb/hr	0.017	0.011	0.012	0.013
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	123	120	120	121
moisture content, % volume*	12.8	11.7	11.6	12.1
volumetric flow rate, dscfm	8,752	8,276	8,201	8,410

*Displayed moisture content values at the EUNPKLLINE Exhaust Stack are saturated for their respective stack gas temperature and pressure.

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.

US EPA Method 26A analytical QA/QC results are included in the laboratory report. The HCl spike recovery was within the normal range of 70% to 130%.

5.2 QA/QC DISCUSSION

For sampling runs 2 and 3, three probe temperature readings were recorded outside of the necessary temperature range of 248 °F to 273 °F as specified by USA EPA Method 26A. This was discussed with Regina Angellotti of EGLE who determined that there was a minimal impact on the results. See Appendix E for additional details.

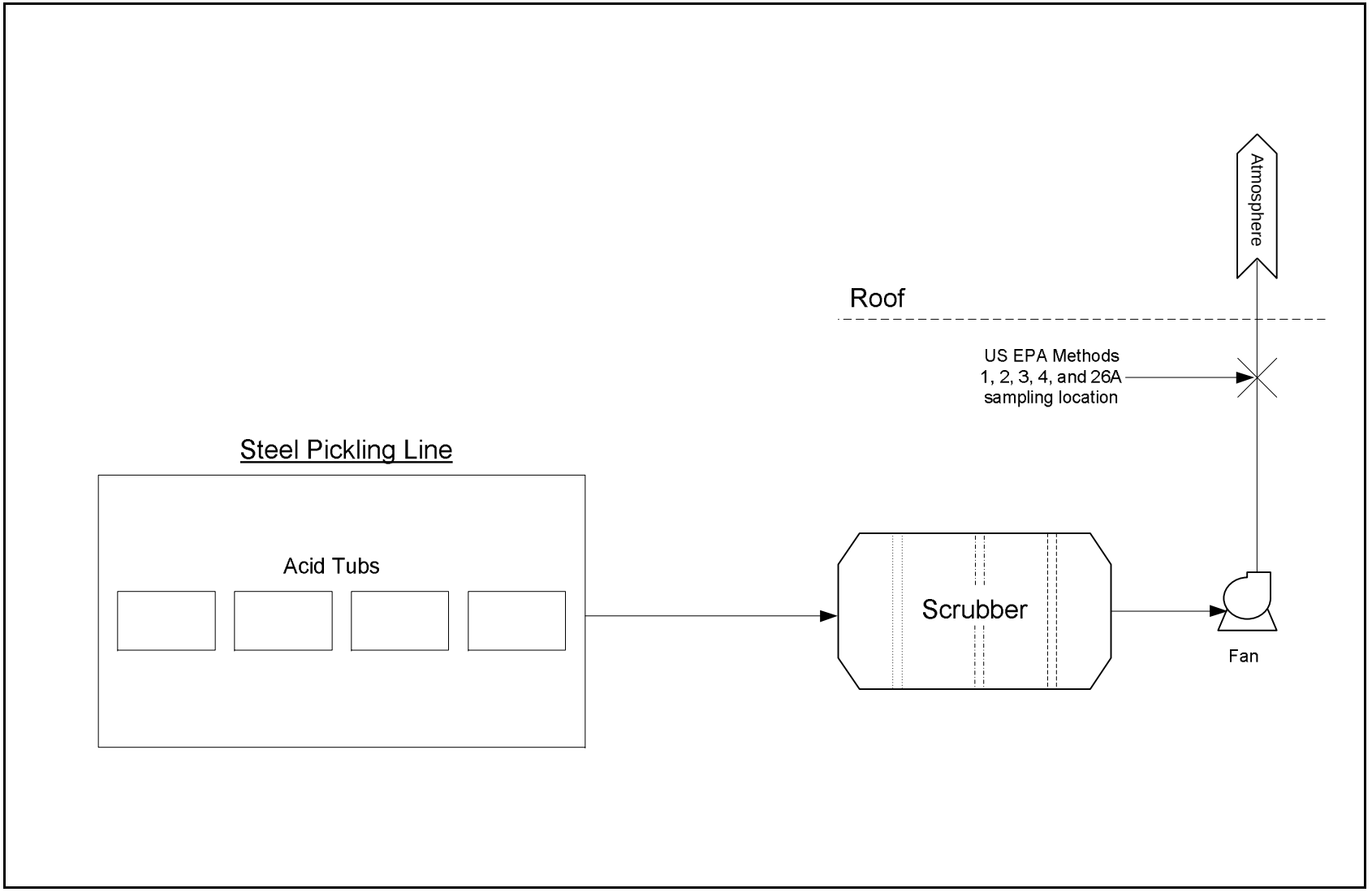
5.3 QUALITY STATEMENT

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).

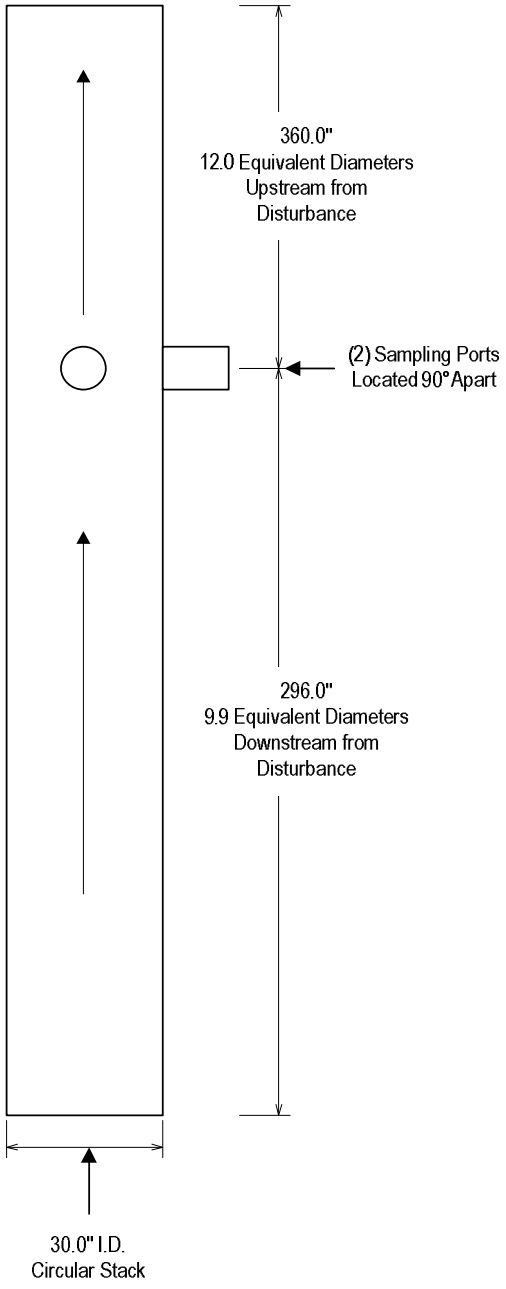
APPENDIX A
FIELD DATA AND CALCULATIONS

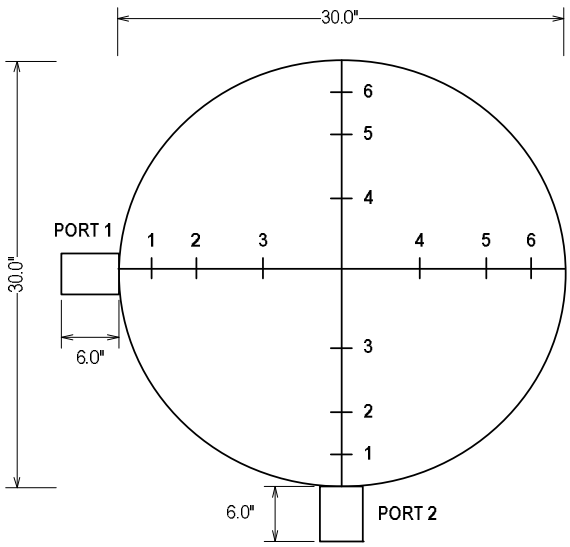
Appendix A.1
Sampling Locations

EUNPKLLINE SAMPLING LOCATION SCHEMATIC



EUNPKLLINE SCRUBBER 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	1.3	1.3
2	14.6	4.4	4.4
3	29.6	8.9	8.9
4	70.4	21.1	21.1
5	85.4	25.6	25.6
6	95.6	28.7	28.7