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Assessment of the LV-S2 & LV-S3 Stack Sampling Probe Locations for Compliance with ANSI/HPS N13.1-1999

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September 2014

U.S. DEPARTMENT OF ENERGY

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under Contract DE-AC05-76RL01830

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Pacific Northwest National Laboratory
Richland, Washington 99352

Completeness of Testing

This report describes the results of work and testing specified by test plan TP-WTPSP-104. The work and any associated testing followed the quality assurance requirements outlined in the test plan. The descriptions provided in this test report are an accurate account of both the conduct of the work and the data collected. Test plan results are reported. Also reported are any unusual or anomalous occurrences that are different from expected results. The test results and this report have been reviewed and verified.

Approved:

_____ _____

Reid A. Peterson, Manager Date
WTP Support Project

Summary

This document reports on a series of tests conducted to assess the proposed air sampling locations for the Hanford Tank Waste Treatment and Immobilization Plant (WTP) Group 1-2A exhaust stacks with respect to the applicable criteria regarding the placement of an air sampling probe. The LV-C2, LV-S2, and LV-S3 exhaust stacks were tested together as a group (Test Group 1-2A). This report only covers the results of LV-S2 and LV-S3; LV-C2 will be reported on separately. Federal regulations[1] require that a sampling probe be located in the exhaust stack according to the criteria established by the American National Standards Institute/Health Physics Society (ANSI/HPS) N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities.*[2] These criteria address the capability of the sampling probe to extract a sample that represents the effluent stream.

The testing on scale models of the stacks conducted for this project was part of the River Protection Project—Waste Treatment Plant Support Program under Contract No. DE-AC05-76RL01830 according to the statement of work issued by Bechtel National, Inc. (BNI, 24590-QL-SRA-W000-00101, *N13.1-1999 Stack Monitor Scale Model Testing and Qualification*, Revision 1, 9/12/2007) and Work Authorization 09 of Memorandum of Agreement 24590-QL-HC9-WA49-00001. The internal Pacific Northwest National Laboratory (PNNL) project for this task is 53024, *Work for Hanford Contractors Stack Monitoring*. The testing described in this document was further guided by the Test Plan *Air Sampling Probe Location Tests for Waste Treatment Plant LAW LV-C2, LV-S2 and LV-S3 (Group 1-2A) Air Exhaust Systems* (TP-WTPSP-104).

The tests conducted by PNNL during 2013 on the Group 1-2A scale model systems are described in this report. The series of tests consists of various measurements taken over a grid of points in the duct cross section at the designed sampling probe locations. The ANSI/HPS N13.1-1999 qualification criteria concern the following properties of the air flowing through the ducts where the air sampling probes are to be located:

1. Uniform Air Velocity—The gas momentum across the stack cross section where the sample is extracted should be well-mixed or uniform. The uniformity is expressed as the variability of the measurements about the mean, expressed as the percent coefficient of variance (%COV). It is calculated as the standard deviation divided by the mean and expressed as a percentage—the lower the %COV value, the more uniform the velocity.
2. Angular Flow—The purpose of this test is to determine whether the air velocity vector is aligned with the sampling nozzle.
3. Uniform Concentration of Tracer Gases—A uniform contaminant concentration in the sampling plane enables the extraction of samples that represent the true concentration.

[1] Title 40 of the Code of Federal Regulations (CFR), Part 61, National Emissions Standards for Hazardous Air Pollutants (NESHAP), Subpart H, *National Emission Standard for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities*.

[2] Health Physics Society, McLean, VA 22101. The standard has been reaffirmed in 2011 and is identical to the 1999 version. The regulations have not been updated yet, so the 1999 version is still referenced.

4. Uniform Concentration of Tracer Particles—Uniformity in contaminant concentration at the sampling probe was further demonstrated using tracer particles large enough to exhibit inertial effects. Particles of 10-μm aerodynamic diameter were used.

The LV-S2 stack will have one sampling location, while the LV-S3 stack will have two sampling locations. The test results for the successfully-tested configurations are summarized in Table S.1. The details of the successful configurations are given in the report.

Table S.1. Summary of Sampling Probe Location Results for the LV-S2 and LV-S3 Scale Model Stacks

	Acceptance Criteria	Units	LV-S2	LV-S3	
			Test Port 1	Test Port 1	Test Port 2
Velocity Uniformity	≤20	%COV	4.0 – 5.5	5.1 – 8.6	5.8 – 9.3
Flow Angle	≤20	Degrees	3.1 – 5.3	2.2 – 10.7	2.1 – 10.3
Gas Tracer Uniformity	≤20	%COV	0.2 – 8.3	0.2 – 1.8	0.2 – 1.3
	≤30	Maximum % Deviation from Mean	0.6 – 19.7	0.4 – 3.9	0.4 – 1.7
Particle Tracer Uniformity	≤20	Normalized %COV	5.2 – 19.2	3.8 – 11.0	4.0 – 11.0

Based on these scale model tests, the locations proposed for the air sampling probes in each of the scale model stacks meet the requirements of the ANSI/HPS N13.1-1999 standard for velocity uniformity, flow angle, gas tracer and particle tracer uniformity. Additional velocity uniformity and flow angle tests on the actual stacks will be necessary during cold startup to confirm the validity of the scale model results in representing the actual stacks. In particular, the velocity uniformity test results for the actual stacks must be within 5 %COV of the range of results listed for the scale model so that scale model results can be said to be representative of the stack. If the velocity uniformity results on the actual stack fall within these bounds, and flow angle test results fall within qualification criteria (mean angle $\leq 20^{o}$) the scale model results may be used as a substitute for results from the actual stack.

Quality Assurance

The PNNL quality assurance (QA) program is based on the requirements defined in the U.S. Department of Energy Order 414.1D, *Quality Assurance*, and 10 CFR 830, *Energy/Nuclear Safety Management*, and Subpart A—*Quality Assurance Requirements* (a.k.a. the Quality Rule). PNNL has chosen to implement the following consensus standards in a graded approach:

- ASME NQA-1-2000, *Quality Assurance Requirements for Nuclear Facility Applications*, Part I, "Requirements for Quality Assurance Programs for Nuclear Facilities."
- ASME NQA-1-2000, Part II, Subpart 2.7, *Quality Assurance Requirements for Computer Software for Nuclear Facility Applications*.
- ASME NQA-1-2000, Part IV, Subpart 4.2, *Guidance on Graded Application of Quality Assurance (QA) Requirements for Nuclear-Related Research and Development*.

The procedures necessary to implement the requirements are documented through PNNL's "How Do I…?" (HDI), which is a system for managing the delivery of laboratory-level policies, requirements, and procedures.

The Waste Treatment Plant Support Program (WTPSP) implements an NQA-1-2000 QA program, using a graded approach as presented in NQA-1-2000, Part IV, Subpart 4.2. The WTPSP Quality Assurance manual (QA-WTPSP-0002) describes the technology life cycle stages under the WTPSP QA plan (QA-WTPSP-0001). The technology life cycle includes the progression of technology development, commercialization, and retirement in process phases of basic and applied research and development (R&D), engineering and production, and operation until process completion. The life cycle is characterized by flexible and informal QA activities in basic research, which becomes more structured and formalized through the applied R&D stages. The work described in this report has been completed under the QA Technology level of Developmental Work as the data will be used for applying for air discharge permits.

- DEVELOPMENTAL WORK—Developmental work consists of research tasks moving toward technology commercialization. These tasks still require a degree of flexibility, and there is still a degree of uncertainty that exists in many cases. The role of quality on developmental work is to make sure that adequate controls exist to support movement into commercialization.

WTPSP addresses internal verification and validation activities by conducting an Independent Technical Review of the final data report in accordance with WTPSP's procedure QA-WTPSP-0601, *Document Preparation and Change*. This review verifies that the reported results are traceable, that inferences and conclusions are soundly based, and the reported work satisfies the test plan objectives. Appendix A lists the reviewed test plan, test instructions, and calculation packages used for the tests documented in this report.

Acronyms

acfm	actual cubic feet per minute
AD	aerodynamic diameter
afpm	actual feet per minute
ANOVA	Analysis of Variance
ANSI	American National Standards Institute
Atm	Atmosphere
AOV	Analysis of Variance
ASME	American Society of Mechanical Engineers
BNI	Bechtel National, Inc.
C2V	C2V ventilation system
C5V	C5V ventilation system
CAM	continuous air monitor
CCP	computer-assisted calculation package
CFR	Code of Federal Regulations
CO_2	carbon dioxide
COV	Coefficient of variance
DOE	U.S. Department of Energy
DV	hydraulic diameter × mean velocity
EPA	U.S. Environmental Protection Agency
FA	flow angle test
FC	flow control test
ft	feet
GE	Gas equivalency
GT	gaseous tracer test
H_2O	water
HDI	“How Do I…?”
HEPA	high-efficiency particulate air (filter)
HPS	Health Physics Society
Hz	Hertz
LAW	low-activity waste
LVP	LAW secondary offgas / vessel vent process system
LV-C2	low-activity waste C2V ventilation system
LV-S2	low-activity waste C5V ventilation system
LV-S3	low-activity waste melter offgas emission unit
MaxDev	Maximum Deviation
min	minute

MS	Mean Square
N_2O	nitrous oxide
NESHAP	National Emissions Standards for Hazardous Air Pollutants
OPC	optical particle counter
%COV	percent coefficient of variation
PNNL	Pacific Northwest National Laboratory
PT	particulate tracer test
PVC	polyvinyl chloride
QA	quality assurance
R&D	research and development
RSD	relative standard deviation
scfm	standard cubic feet per minute
SF_6	sulfur hexafluoride
sfpm	standard feet per minute
TI	test instruction
VT	velocity uniformity test
WTP	Hanford Tank Waste Treatment and Immobilization Plant
WTPSP	Waste Treatment Plant Support Program

Acknowledgments

Preparing, executing, and post-processing these scale model measurements involved a number of Pacific Northwest National Laboratory staff. We would like to particularly acknowledge the support of our quality engineer, Kirsten Meier, and the administrative support from Chrissy Charron and Mona Champion. We would also like to express our appreciation to scientific staff members Carmen Arimescu, Carolyn Burns, Tristan Hay, Susan Sande, Sandra Snyder, and Yin-Fong Su, who conducted measurements under a variety of weather conditions. Additionally, Matthew Barnett, Carmen Arimescu, and Elizabeth Golovich provided technical reviews. Megan Peters provided editorial support for this report.

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1.0 Introduction

This series of scale model tests was performed to document whether the current designs for the air monitoring locations at three of the air exhaust stacks in the Hanford Tank Waste Treatment and Immobilization Plant (WTP) meet the applicable regulatory criteria governing effluent monitoring systems. This group (Test Group 1-2A) originally consisted of 3 Low-Activity Waste (LAW) facility stacks: LV-C2, LV-S2, and LV-S3 (i.e., the emission units for the LAW C2V, LAW C5V, and LAW LVP ventilation systems, respectively). These three stacks are located at the LAW vitrification building. The LV-C2 stack, however, requires further testing and will be reported on separately.

The emissions from these low-activity waste facility air exhaust stacks may exceed the 0.1-millirem per year threshold limit given in Title 40 of the Code of Federal Regulations (CFR), Part 61, National Emissions Standards for Hazardous Air Pollutants (NESHAP), Subpart H, *National Emission Standard for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities.* The NESHAP rule requires that a sampling probe be located in the exhaust stack according to criteria established by the American National Standards Institute/Health Physics Society (ANSI/HPS) N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities.*[1] The capability of the sampling probe locations to meet this standard has been demonstrated with a series of tests on scale models. These data will be used by BNI as input to the air discharge permitting process.

This work is performed as part of the River Protection Project—Waste Treatment Plant Support Program under Contract No. DE-AC05-76RL01830 according to the statement of work issued by BNI, 24590-QL-SRA-W000-00101, N13.1-1999 Stack Monitor Scale Model Testing and Qualification, Revision 1, 09/12/2007 and Work Authorization 09 of Memorandum of Agreement 24590-QL-HC9-WA49-00001. The internal Pacific Northwest National Laboratory (PNNL) project for this task is 53024, *Work for Hanford Contractors Stack Monitoring*.

PNNL personnel conducted these scale model tests during 2013. No BNI personnel were directly involved in the tests. The BNI WTP point of contact and facility engineers provided the most current engineering input to support PNNL's tests. BNI retains responsibility for the technical design of the stack discharge and air monitoring systems.

1.1 Qualification Criteria

The qualification criteria for the location of a stack air monitoring probe are taken from ANSI/HPS N13.1-1999, Section 5.2.2 and are paraphrased as follows:

1. Uniform Air Velocity—It is important that the gas velocity be fairly uniform across the stack cross section where the sample is extracted. Consequently, the velocity is measured at several discrete points in the duct cross section at the proposed location of the sampling nozzle. The uniformity is expressed as the variability of the measurements about the mean. This is expressed using the percent coefficient of variation (%COV),[2] which is the standard deviation divided by the mean and expressed

[1] Health Physics Society, McLean, VA 22101. The standard has been reaffirmed in 2011 and is identical to the 1999 version. The regulations have not been updated yet, so the 1999 version is still referenced.

[2] *Coefficient of variation* is considered "dated" terminology. The modern terminology is *percent relative standard deviation*. However, because the standard uses the older terminology, it will likewise be used here.

as a percentage—the lower the %COV value, the more uniform the velocity. The qualification criterion is that the %COV of the air velocity must be ≤20% in the center two-thirds of the duct cross section where the sampling probe is to be located.

2. Angular Flow—Sampling nozzles are typically aligned with the axis of the stack. If the air travels through the stack in cyclonic fashion, the air velocity vector approaching a sampling nozzle could be sufficiently misaligned with the nozzle to impair extraction of particles. Consequently, the flow angle is measured at the proposed location of the sampling probe. The average of the flow angle measurements (made at the same grid of points as the velocity measurements) should not exceed 20° relative to the sampling nozzle axis.
3. Uniform Concentration of Tracer Gases—A uniform contaminant concentration in the sampling plane enables the extraction of samples that represent the true concentration within the duct. The uniformity of the concentration is first tested with a tracer gas to represent gaseous effluents. The fan is a good mixer, so injecting the tracer downstream of the fan provides worst-case results. The qualification criteria are that 1) the %COV of the measured tracer gas concentration is ≤20% across the center two-thirds of the duct cross section at the sampling location, and that 2) the concentrations at all the measurement points cannot deviate from the mean by >30%.
4. Uniform Concentration of Tracer Particles—The second set of tests addressing contaminant concentration uniformity at the sampling position uses tracer particles large enough to exhibit inertial effects. Tracer particles of 10-μm aerodynamic diameter (AD) are used by default unless it is known that larger contaminant particles will be present in the airstream. The qualification criterion is that the %COV of particle concentration is ≤20% across the center two-thirds of the duct at the sampling location.

Tests to determine if criteria 1 through 4 were met were conducted on two scale models of the LV-S2 and LV-S3 at the proposed sampling locations along the exhaust ducts. By conducting tests on scale models of the exhaust systems, the designed air sampling locations can be qualified before cold commissioning, and compensatory measures could be made in the design if testing results were not satisfactory. All of the tracer concentration, velocity, and flow angle measurements were made using the same grid of points in a given cross section of the duct. The ANSI/HPS N13.1-1999 standard sets additional qualification criteria for the use of a scale model as a substitute for the actual stack:

- The scale model and its sampling location must be geometrically similar to the actual stack.
- The product of the hydraulic diameter and the mean velocity (DV) for the scale model must be within a factor of six of the DV for the actual stack.
- The Reynolds number for the actual and model stacks must be >10,000.
- The scale model results are considered valid if it is further shown that:
  - The velocity profile in the actual stack meets the uniformity criterion (%COV ≤20%).
  - The velocity uniformity COV values for the actual and model stacks agree within 5 %COV.
  - The flow angle criterion (with a mean value less than or equal to 20°) is met.

The tests to determine the validity of the scale model testing will be performed during cold startup testing on the actual WTP stacks under separate test plans. The scale model testing conducted, as well as the results of these tests, are described in subsequent sections of this report.

2.0 LV-S2 and LV-S3 Stacks

2.1 Stack Geometry

In the LV-S2 and LV-S3 stacks, the designed sampling probes will be located in horizontal sections of duct. Figure 2.1 and Figure 2.2 show the layout for each of the two stack designs, from the fan outlet to the outlet of the vertical duct. Figure 2.3 and Figure 2.4 show the scale model layout for each stack design. The simplified models are based on assumptions about the necessary simulation detail. These assumptions are listed below:

- Geometric simulation of the components upstream of the backdraft damper was ignored. Backdraft damper blades do not usually open fully. The partially open blades direct the air velocity vector toward one side of the duct, resulting in considerable disruption to the air flow. Consequently, it was assumed that the air velocity and tracer uniformity downstream of the dampers would not be greatly influenced by equipment upstream of the dampers. This assumption has not been tested; however, this assumption had the benefit of reducing the cost of the models by using a single fan/filter/heater arrangement and the elimination of the control damper.
- Components several duct diameters downstream of the sampling point are not modeled. It was assumed that the only effect of any components downstream of the sampling probe location would be to slightly change the pressure at the sampling port. While this assumption was not tested, stack components generally do not significantly influence flow patterns upstream.

The same fans were used for each of the two scale models. The fans were connected to a flexible duct that was connected to the backdraft damper. The backdraft damper was connected to each of the scale models for testing.

For both of the scale model stacks, Test Port 1 (Figure 2.3 and Figure 2.4) represents the planned location for the record sampling systems (Figure 2.1 and Figure 2.2) according to the current WTP BNI designs.[1,2] The LV-S3 system has a second test port, located approximately seven duct diameters downstream of Test Port 1, which is the planned location for the continuous air monitor system. Both scale model systems have an additional Particle Reference Port located five duct diameters downstream of the last Test Port. This was used for a fixed-position OPC used to monitor the output of the aerosol generator during the particle tracer uniformity testing.

The ratio of the prototype dimensions to the scale model dimensions varies with each system. Each scale model was constructed with a primary duct diameter of 12 in. for convenience and to maintain the ability to re-use the duct sections for subsequent stack designs. Table 2.1 lists the diameter of the actual stack with the scaling factor for the 12-in. scale model diameter. The calculations of the key scale model dimensions were performed in spreadsheets and then verified and validated in accordance with appropriate quality assurance (QA) procedures. ANSI/HPS N13.1-1999 requires that the models be geometrically similar to the actual stacks. Acceptable deviations in key dimensions of the scale model arising from scaling and fabrication errors are within about ±5% for cross-sectional dimensions and about

[1] Haukur Hazen (BNI) to Dean Kurath (PNNL), CCN 252037 "Transmittal of CCN 251800 Documentation Supporting ANSI/HPS N13.1-1999 LAW C5V (LV-S2) Scale Model Testing," dated October 2, 2012.
[2] Haukur Hazen (BNI) to Dean Kurath (PNNL), CCN 251525 "Transmittal of CCN 249983 Documentation Supporting ANSIIHPS N13.1-1999 LAW LVP (LV-S3) Scalie Model Testing," dated September 7, 2012.

25% of a duct diameter in overall length between the sampling point and the flow disturbances. These deviations would have less impact on the test results than the normal standard deviation of repeat tests. The key scale model dimensions for the as-built scale models were measured and recorded by testing staff.

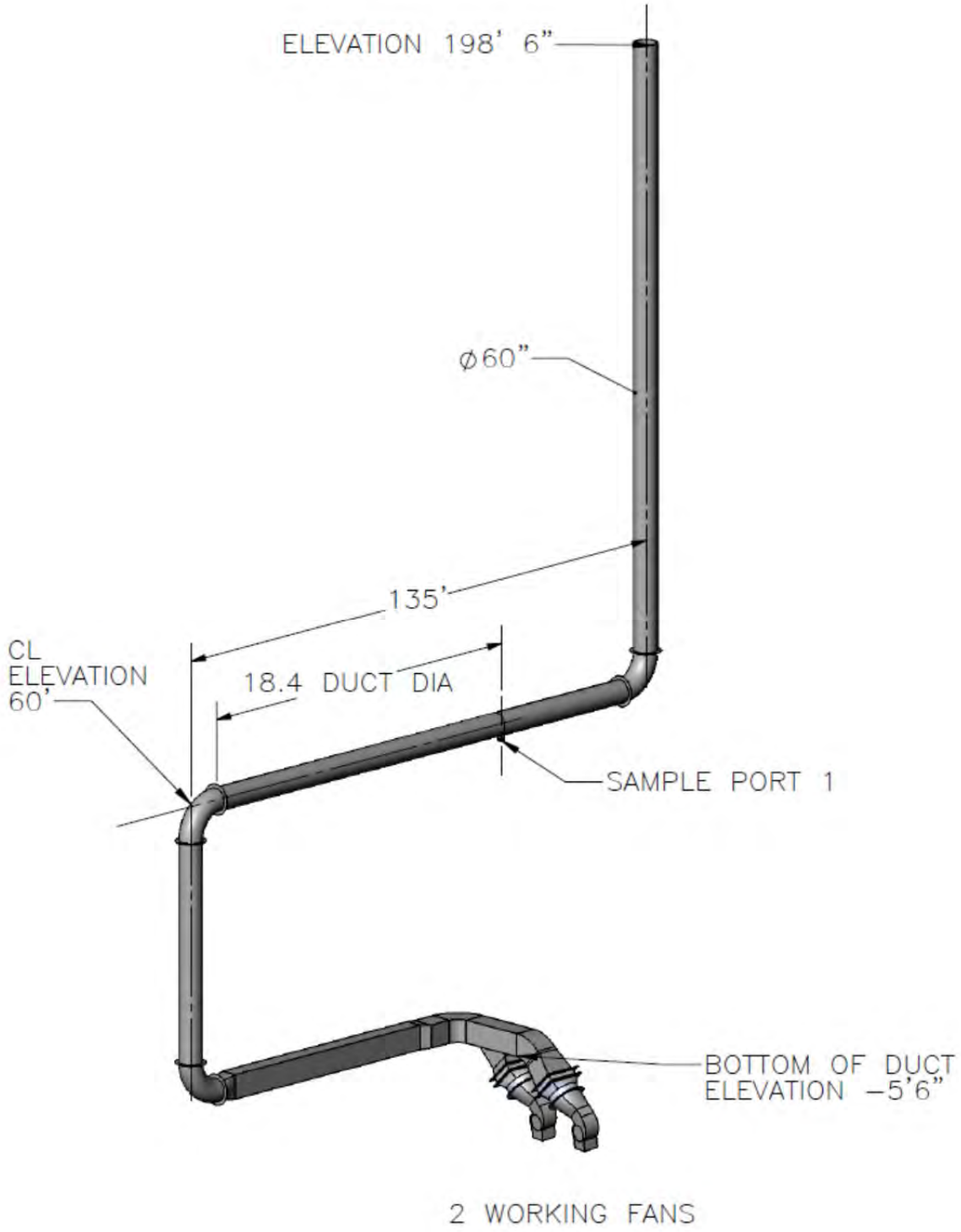


Figure 2.1. LAW C5V (LV-S2) System per Design

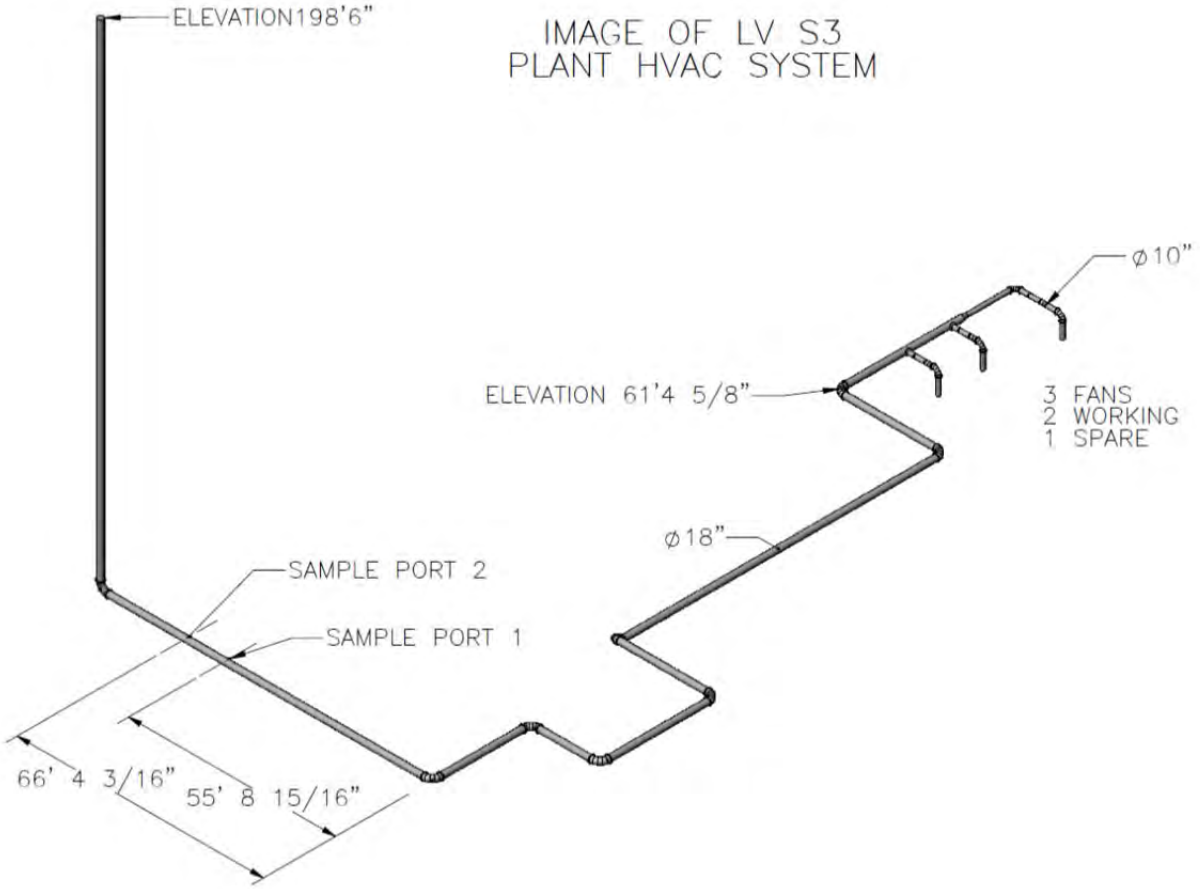


Figure 2.2. LAW LVP (LV-S3) System per Design

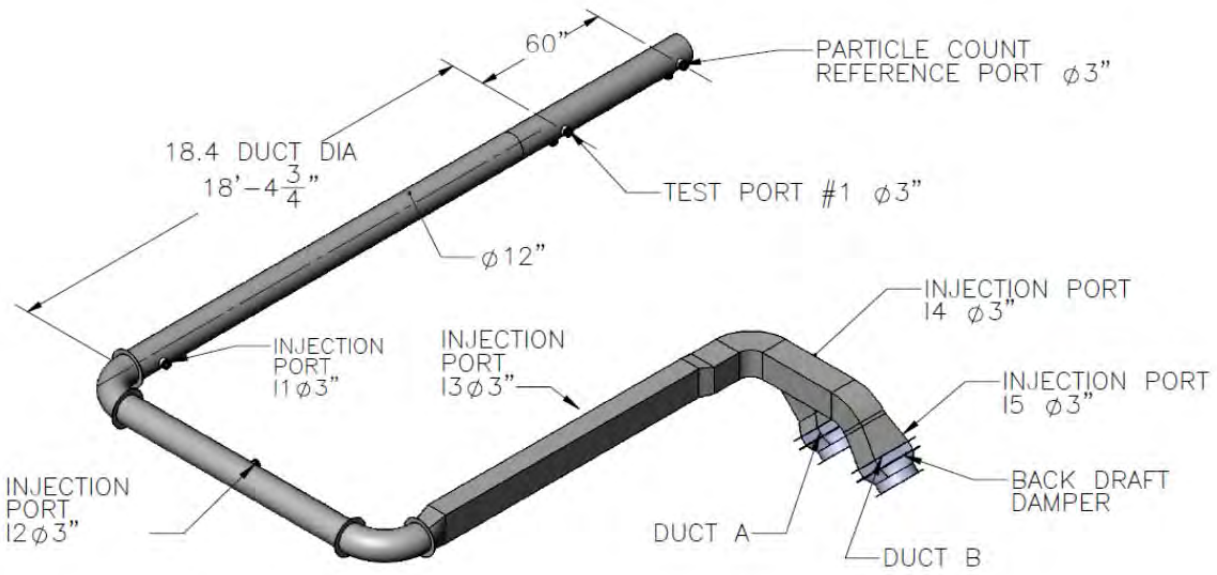


Figure 2.3. Layout of the LAW C5V (LV-S2) Scale Model Test System

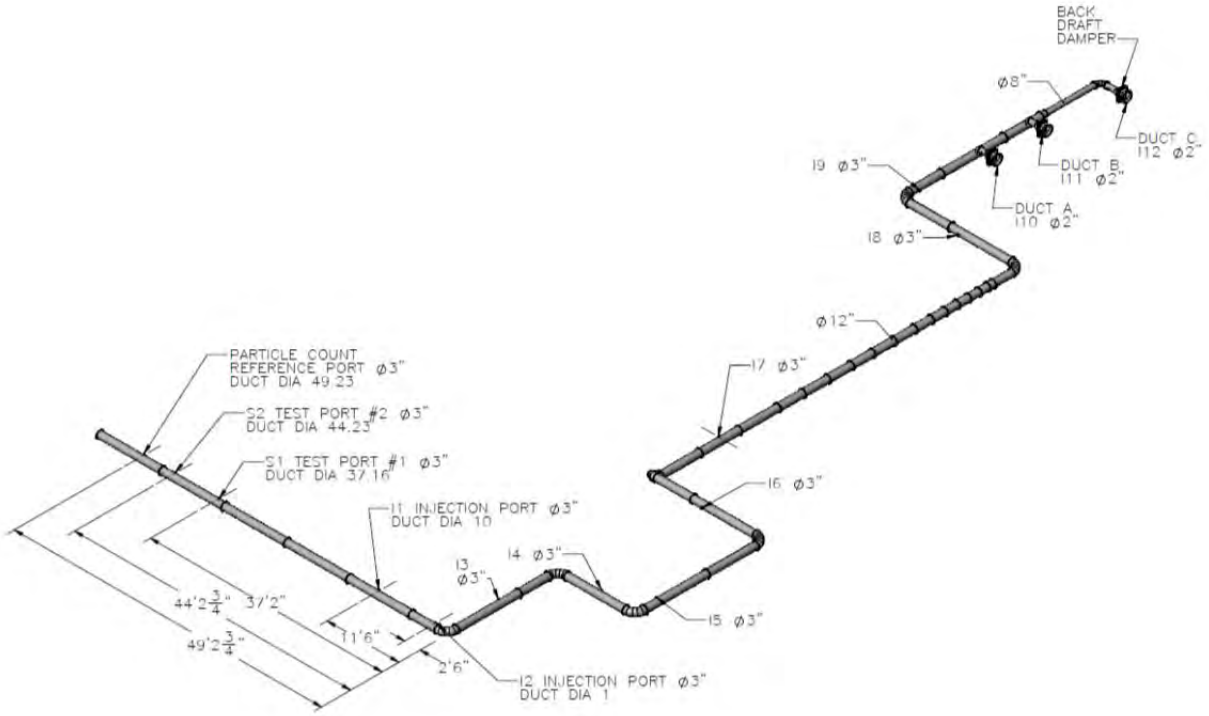


Figure 2.4. Layout of LAW LVP (LV-S3) Scale Model Test System

Table 2.1. Scaling Factor for 12-in.-Diameter Scale Model Stack

	Actual Diameter	Scaling Factor
LV-S2	60 in.	5.00
LV-S3	18 in.	1.50

2.2 Stack Flows

Tests of scale model stacks were conducted at flow rates that bracket the range of expected normal and accident flow rates and operating configurations. Various combinations of flow rates and operating fans were tested. BNI provided normal, minimum, and maximum flow rates.

Additional considerations come from the ANSI/HPS N13.1-1999 standard. The standard requires that the DV of the scale model be within a factor of six of the actual stack. For stacks with a circular cross section, this is equivalent to requiring that the ratio of flow rate to stack diameter be within a factor of six of the actual stack. The standard also requires that the Reynolds number for the prototype and model stacks must both exceed 10,000.

There are two fans available to power the LAW C5V (LV-S2) exhaust system, which exhausts the air from the C5 ventilation system of the low-activity waste facility. One fan will be operated at a time, and one will be on standby. Each fan is capable of providing the design maximum flow rate, and is equipped with an adjustable-speed drive to compensate for filter loading and pressure variations.

Three fans are available to power the LAW LVP (LV-S3) exhaust system (Figure 2.2). This system discharges air from the melter and associated process vessels. Normally, two fans will be operated at a time, and one will be on standby. However, under off- normal conditions, a single fan could be in operation. The likelihood of all three fans operating is very remote. Two fans are required to provide the maximum design flowrate and the system is equipped with adjustable-speed drives.

Table 2.2 lists the flow conditions for the actual stack as well as the scale model stack. The minimum air flow (in actual cubic feet per minute [acfm]) and air velocity (in actual feet per minute [afpm]) to achieve the assumed minimum and maximum actual stack flow are listed. The tabulated values of flow and velocity in the “Scale Model Minimum” columns are the minimum scaled values that will meet the criterion listed in Section 1.1 that the DV product be within a factor of six of the prototype. The scale model Reynolds numbers are calculated for those minima. One of the qualification criteria listed in Section 1.1 is that the Reynolds number for both the actual and scale model stack must be greater than 10,000. Therefore, the Reynolds numbers for the actual and scale model stacks at the minimum and maximum flow rates are included in Table 2.2. The conditions prescribed for these scale model tests fulfill the criterion of a Reynolds number greater than 10,000.

As listed in Section 1.1, the qualification criteria include a constraint on the DV value of the scale model relative to the actual stack. For comparison between the tests on the scale models and the acceptable DV range, DV values are tabulated in Table 2.3. They are calculated for each of the three flow conditions for each stack. The acceptable DV range (1/6 to 6X that of the actual stack) is quite large, and the upper end of the range is impractical with real-world blowers. Usually, during testing, an upper velocity approximately equal to that of the actual stack is selected for use. With the use of variable frequency drives to control the blowers, the velocity corresponding to the lower end of the DV range is practical, and this velocity (or a slightly higher velocity) is typically used.

Table 2.2. Summary of Flow Parameters for Scale Model Stacks

	Air Flow (acfm)		Air Velocity (afpm)		Reynolds Number	
Flow	Actual Stack	Scale Model Minimum	Actual Stack	Scale Model Minimum	Actual Stack	Scale Model Minimum
LV-S2						
Max flow	91,019	3,034	4,636	3,863	1.8E+06	3.7E+05
Normal flow	60,117	2,004	3,062	2,551	1.2E+06	2.0E+05
Min flow	35,294	1,176	1,798	1,498	7.2E+05	1.2E+05
LV-S3						
Max flow	6,258	695	3,541	885	3.3E+05	2.2E+05
Normal flow	5,631	626	3,181	797	3.0E+05	5.0E+04
Min flow	2,632	292	1,489	372	1.4E+05	2.3E+04

Both scale model stack diameters are 1 foot, so the DV values in Table 2.3 are equal to the velocity values for the scale model. For example, the LV-S2 minimum DV, which is 1498 ft^2/min, corresponds to a velocity of 1498 ft/min for the 1-ft-diameter scale model. The practical ranges of test velocities are also included in Table 2.3. As described above, the lower end of this range is defined by the minimum DV, and the upper end is practically implemented as the actual stack velocity for the given operating condition. Referring to Table 2.2, for example, the minimum LV-S2 stack velocity is 1798 ft/min, so this value is listed for the Test Velocity Range in Table 2.3. Again, the velocity value is identical to the DV value for 1-ft-diameter stacks, so the upper velocity value is the DV value. Note that, for the LV-S3 model, where the model diameter and the stack diameter are nearly the same, the ranges of test velocities overlap between the flow conditions. This allows some latitude in the operating conditions for the tests, and the full-scale stack conditions that they represent.

Table 2.3. Summary of DV Values for Scale Model Stacks

Stack	DV, ft^2/min	Min	Norm	Max
LV-S2	Actual Stack	8990	15,310	23,180
	Min. for Model	1498	2552	3863
	Max. for Model	53,940	91,860	139,080
	Test Velocity Range, ft/min	1498 - 1798	2552 - 3062	3863 - 4636
LV-S3	Actual Stack	2234	4772	5312
	Min. for Model	372	795	885
	Max. for Model	13,401	28,629	31,869
	Test Velocity Range, ft/min	372 - 1489	795 - 3181	885 - 3541

3.0 Testing Methods

The testing methods were based on the requirements of ANSI/HPS N13.1-1999. A test plan, TP-WTPSP-104, *Air Sampling Probe Location Tests for Waste Treatment Plant LAW LV-C2, LV-S2 and LV-S3 (Group 1-2A) Air Exhaust Systems*, was prepared by PNNL and approved by BNI. This plan referenced the use of PNNL procedures, which define how the test should be conducted in general. A test instruction (TI) was prepared for each test type and for each scale model stack. These TIs contain specific instructions pertaining to the tests that are not addressed in the general procedures. Such information includes the following:

- Layout of measurement points
- Locations of tracer injection points
- List of equipment and instrumentation
- Safety requirements
- List of minimum test runs
- Test description and measurement data sheets with hand entries
- Table of preliminary results.

Because the final data sheets and a description of the test methods are included in this report, the TIs are not included here. The QA program that is implemented for this project is described in Section 3.1 and a summary of the stack testing methods used for each of the four test types is presented in Section 3.2.

3.1 Quality Assurance

The PNNL QA program is based on the requirements defined in the U.S. Department of Energy Order 414.1D, *Quality Assurance,* and 10 CFR 830, *Energy/Nuclear Safety Management*, and Subpart A—*Quality Assurance Requirements* (a.k.a. the Quality Rule). PNNL has chosen to implement the following consensus standards in a graded approach:

- ASME NQA-1-2000, *Quality Assurance Requirements for Nuclear Facility Applications,* Part I, "Requirements for Quality Assurance Programs for Nuclear Facilities."
- ASME NQA-1-2000, Part II, Subpart 2.7, *Quality Assurance Requirements for Computer Software for Nuclear Facility Applications*.
- ASME NQA-1-2000, Part IV, Subpart 4.2, *Guidance on Graded Approach Application of Quality Assurance (QA) Requirements for Nuclear-Related Research and Development*.

The procedures necessary to implement the requirements are documented through PNNL's "How Do I…?" (HDI), which is a system for managing the delivery of laboratory-level policies, requirements, and procedures.

The Waste Treatment Plant Support Program (WTPSP) implements an NQA-1-2000 QA program, using a graded approach as presented in NQA-1-2000, Part IV, Subpart 4.2. The WTPSP Quality Assurance manual (QA-WTPSP-0002) describes the technology life cycle stages under the WTPSP QA

plan (QA-WTPSP-0001). The technology life cycle includes the progression of technology development, commercialization, and retirement in process phases of basic and applied research and development (R&D), engineering and production, and operation until process completion. The life cycle is characterized by flexible and informal QA activities in basic research, which becomes more structured and formalized through the applied R&D stages. The work described in this report has been completed under the QA Technology level of Developmental Work as the data will be used for applying for air discharge permits.

- DEVELOPMENTAL WORK—Developmental work consists of research tasks moving toward technology commercialization. These tasks still require a degree of flexibility, and there is still a degree of uncertainty that exists in many cases. The role of quality on developmental work is to make sure that adequate controls exist to support movement into commercialization.

WTPSP addresses internal verification and validation activities by conducting an Independent Technical Review of the final data report in accordance with WTPSP's procedure QA-WTPSP-0601, *Document Preparation and Change*. This review verifies that the reported results are traceable, that inferences and conclusions are soundly based, and the reported work satisfies the test plan objectives. Appendix A lists the reviewed test plan, test instructions, and calculation packages used for the tests documented in this report.

3.2 Stack Tests

The tests described in the following subsections were conducted under scale flow conditions designed for each stack, which were listed in Table 2.2. The test matrix included with the test plan described the minimum number of tests that were planned for each stack. The actual number of tests typically exceeded those planned because tests were added to confirm results that had to be repeated.

Before conducting the tests to determine whether the four qualification criteria described in Section 1.1 were met for each stack, two other measurement sets were made. First, the major features of the stack were measured. The longitudinal distances from the fans to the bends, duct reducers, and ports were determined in addition to the duct diameter at each measurement port. The second set of measurements determined the fan frequency settings needed to achieve the desired flow rates. For these measurements, the location within the duct cross section that had velocity measurements closest to the mean velocity was determined for the test port. Then, velocity measurements were made at this single measurement point at 5-Hz increments in the fan frequency setting. By developing a frequency-vs.-velocity relationship for the scale model stack, the frequency setting needed to achieve the flow conditions could be pre-determined. The data sheets from these velocity calibration tests are included in Appendices B.1 and C.1.

A common grid of measurement points in the duct cross section was used for each of the qualification criteria tests described in the following subsections. The number and distance between measurement points were based on the U.S. Environmental Protection Agency (EPA) procedure 40 CFR 60, Appendix A, Method 1, for circular stacks. For a 12-in. duct diameter, eight traverse points are required at the relative positions shown in Figure 3.1. Measurements also were made at the centerpoint. In lieu of making the two measurement points nearest to the walls at 3.2% of the duct diameter from the duct walls, the minimum distance from the wall was set to 0.5 in., as prescribed by EPA Method 1. The measurement point closest to the port was Point 1, while the point farthest from the port was Point 8.

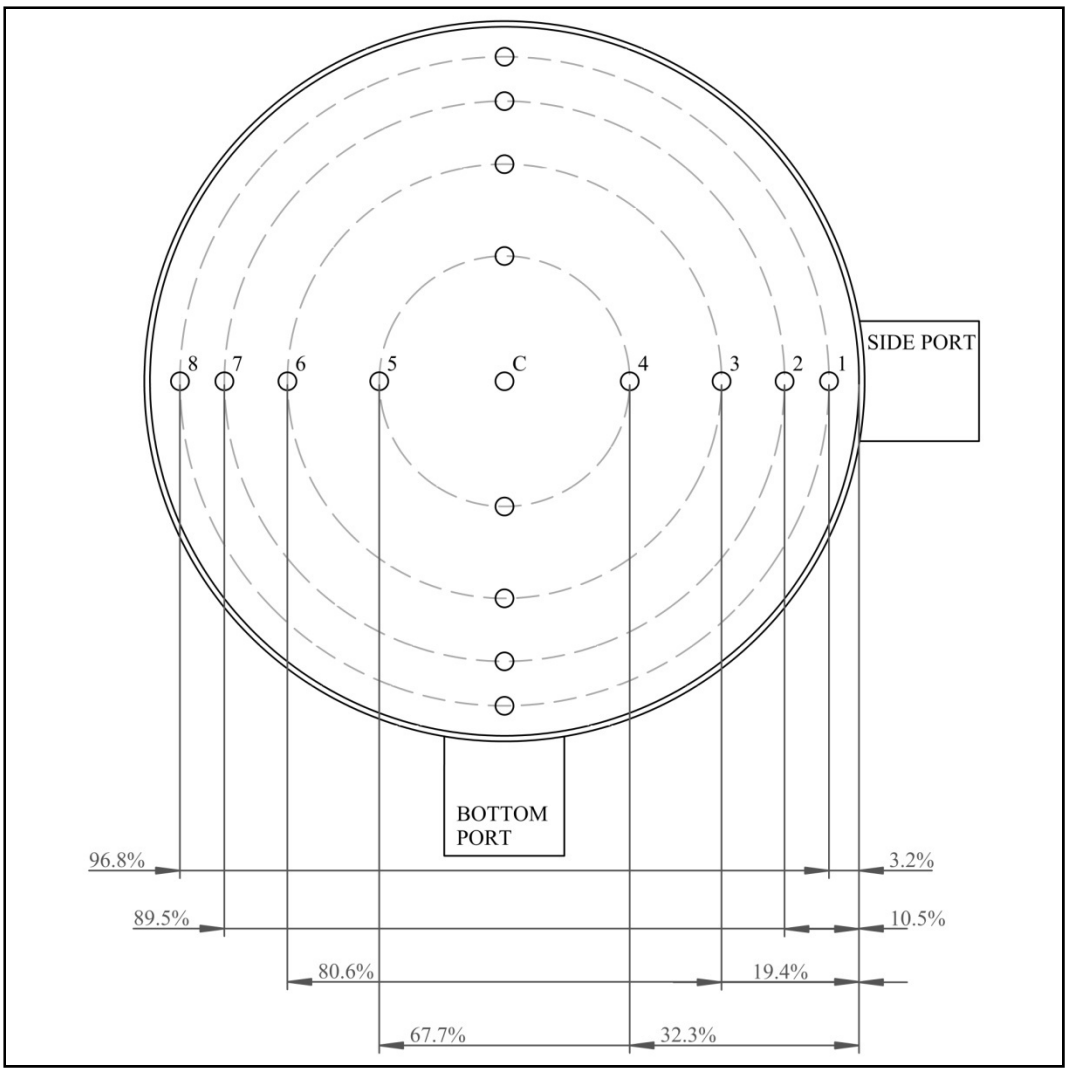


Figure 3.1. Cross Section of the Duct at the Testing Ports with Measurement Points

3.2.1 Velocity Uniformity

The uniformity of air velocity at the stack monitoring location indicates whether the momentum in the stack is well-mixed. The method used to conduct the velocity uniformity tests was based on 40 CFR 60, Appendix A, Method 1. The velocity uniformity criterion is that the %COV should be less than 20% in the center two-thirds of the duct (measurement points 2-7).

For each test run, three air velocity readings were obtained at each measurement point in the cross section of the duct. The measured velocity was the average of the three readings. The measured velocity for each point was used to determine the mean and standard deviation of the velocity across the cross-sectional plane. The %COV (a.k.a., the percent relative standard deviation) was calculated as 100 times the standard deviation divided by the mean.

Air velocity measurements were made using a handheld thermal anemometer (TSI, Inc. Model 9545, Shoreview, MN). Duct air temperature measurements also were made with the same handheld thermal

anemometer. The thermal anemometer is capable of reporting velocity in standard feet per minute (sfpm), with standard conditions defined as 1 atm and 70°F, or in actual feet per minute (afpm) using the actual air temperature measured by the thermal anemometer and the actual barometric pressure measured with another instrument and input to the anemometer. Figure 3.2 shows the thermal anemometer used for this test. The procedure EMS-JAG-04 and test instructions TI-WTPSP-114 and TI-WTPSP-120 were followed to conduct this test for the scale models.



Figure 3.2. Equipment Used for the Velocity Uniformity Test (a) Thermal Anemometer, and (b) Close-Up View of Thermal Anemometer Probe Tip

3.2.2 Flow Angle

The air velocity vector approaching the sample nozzle should be aligned with the axis of the nozzle within an acceptable range so that the sample extraction performance is not degraded. The test method is based on 40 CFR 60, Appendix A, Method 1, Section 11.4, "Verification of the Absence of Cyclonic Flow." The term "flow angle" refers to the angle between the velocity vector of the flow in the duct and the axis of the sampling nozzle. For the stack testing activities, the flow angle was measured at a grid of nine points across two axes in a cross section of the duct (see Figure 3.1). The qualification criterion for the flow angle test is that the average angle should not exceed 20°.

The flow angle measurements were made using an S-type Pitot tube (Dwyer Instruments, 160S-36, Michigan City, IN) attached by flexible tubing to a slant-tube manometer (Dwyer Instruments, 400-5, Michigan City, IN) and an angle-indicating device attached to the sampling port as shown in Figure 3.3. For this test, the S-type Pitot tube is rotated so that the planes of the two open ends of the two tubes are parallel to the long axis of the duct. The pitot tube is then rotated about its long axis until the differential

pressure across the open ends of the tubes reads zero on the manometer. The rotation angle is read from the angle-indicating device. The measured flow angle for each point is the average of three readings. These measured values are used to calculate the mean absolute value of the flow angle across the duct. The procedure EMS-JAG-05 and test instructions TI-WTPSP-115 and TI-WTPSP-121 were used to conduct this test for each of the scale models.



Figure 3.3. Equipment Used for the Flow Angle Test: (a) S-type Pitot Tube Inserted in a Test Port with the Angle-Indicating Device, (b) Slant-Tube Manometer, and (c) Openings at Tip of S-Type Pitot Tube

3.2.3 Gaseous Tracer Uniformity

The gaseous contaminant concentration uniformity was demonstrated using the tracer gas nitrous oxide (N_2O). In the past, PNNL has used sulfur hexafluoride (SF_6) gas for the gaseous tracer uniformity tests. SF_6 is a well-established gas tracer; however, it is also a potent greenhouse gas with a global warming potential 22,800 times that of CO_2. For each scale model test, approximately 1–5 pounds of SF_6 is used. Nitrous oxide is also a greenhouse gas; however its global warming potential is only 298 times that of CO_2. Although the global warming potential of N_2O is nearly two orders of magnitude lower than that of SF_6, the background concentration of N_2O is an order of magnitude greater than the detection limit of SF_6 using the available instrumentation, which increases the emission rate of N_2O relative to SF_6. Additionally, the measurement of N_2O, using the available instrumentation requires the measurement of both H_2O and CO_2, which results in an incremental increase in the measurement time and, consequently, the gas emission time. Despite these tradeoffs, an evaluation of alternative technologies and tracer gases

was performed, and substituting SF_6 with N_2O and using existing measurement equipment was found to be the most cost-effective method of reducing the global warming impact of the gaseous tracer uniformity tests. An evaluation of gaseous tracer uniformity test results using the two gases was performed under both well-mixed and poorly-mixed conditions to ensure that the results of the uniformity qualification are not impacted by the use of a different gas. An Analysis of Variance (ANOVA) showed that there were no statistically significant differences between the use of N_2O and SF_6 (see Appendix B).

A compressed gas cylinder and a flow controller were used to deliver a constant stream of N_2O into the duct. The gaseous tracer was typically injected into the duct at a point downstream of the fans. Figure 3.4 shows the injection locations with an injection probe positioned in the port. For separate test runs, the injection probe is positioned at one of five different locations in the duct cross section as illustrated in Figure 3.5 for circular ducts and in Figure 3.6 for rectangular ducts. The LV-S2 tests used both circular and rectangular duct injection locations. The LV-S3 scale model had only a circular duct injection location. For some tests, just the centerline position is used. The remaining four injection locations are within a specified distance of the duct wall. For a nominally 12-in.-diameter duct, the four "wall" injection locations were located within 2.4 in. of the wall. For a nominally 12.75 in. by 9.25 in. rectangular duct, the four "wall" injection locations are located with 2.7 in. of the corners.

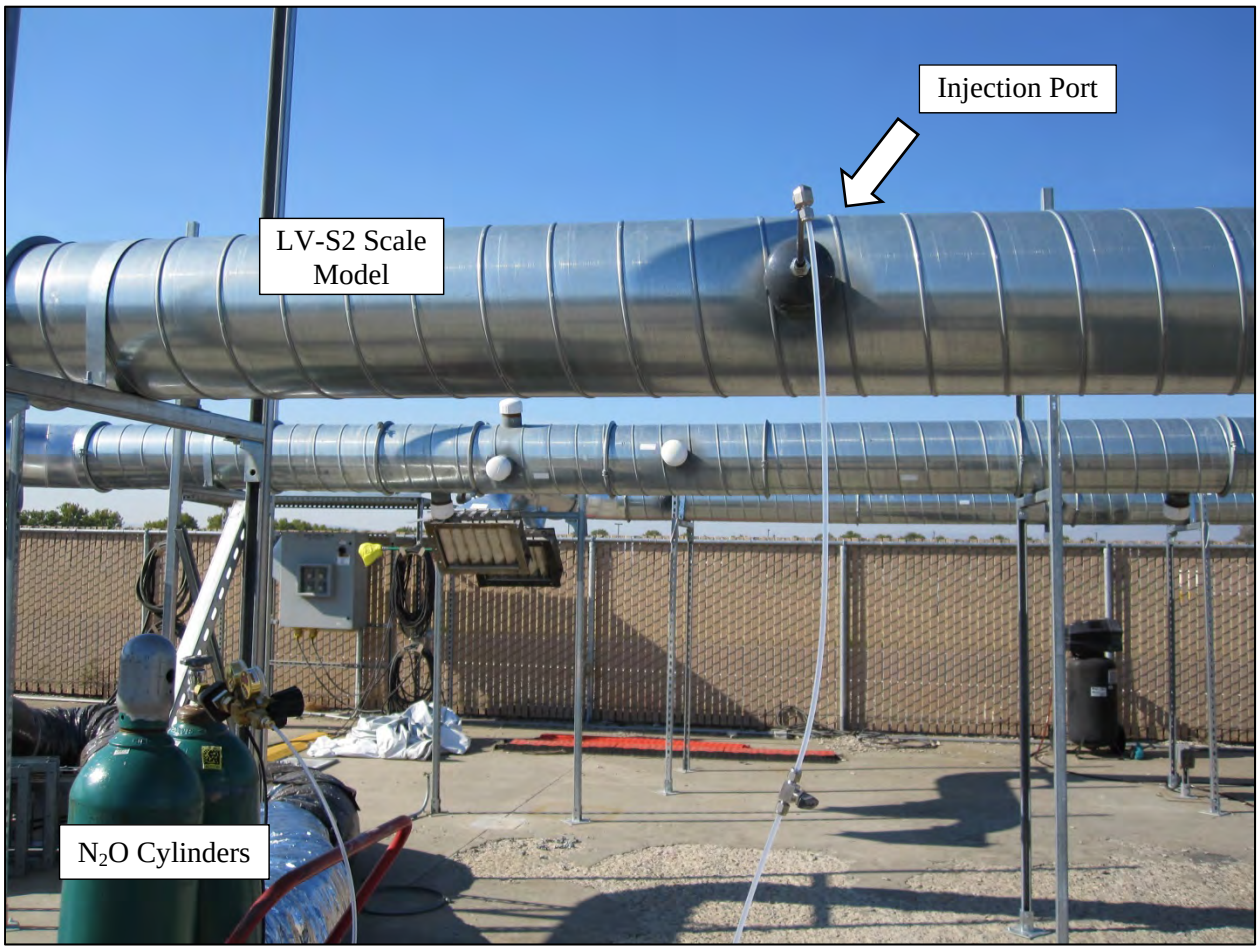


Figure 3.4. Equipment Used for the Gaseous Tracer Injection, Injection Probe Installed in the LV-S2 Scale Model, and Cylinders of Pure N_2O with Heater and Regulator

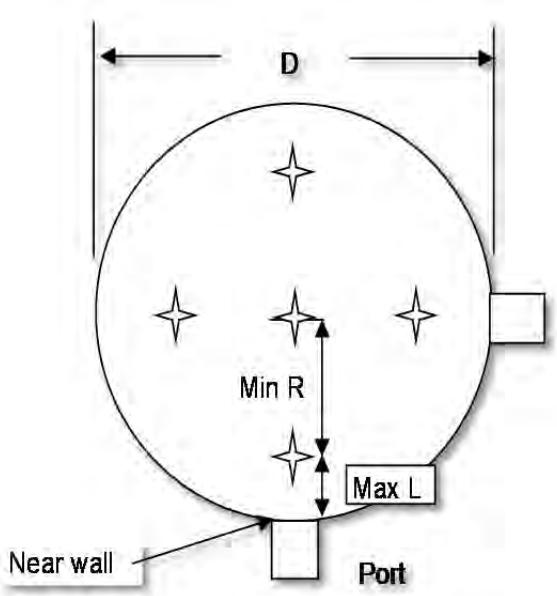


Figure 3.5. Illustration of Five Injection Points in a Circular Duct. Note: Max L is the maximum distance from the wall, which is 20% of the hydraulic diameter. Therefore, Min R, the minimum radius from the duct center, is 80% of the hydraulic diameter. In the case of a circular duct, the hydraulic diameter is equal to the physical diameter (D).

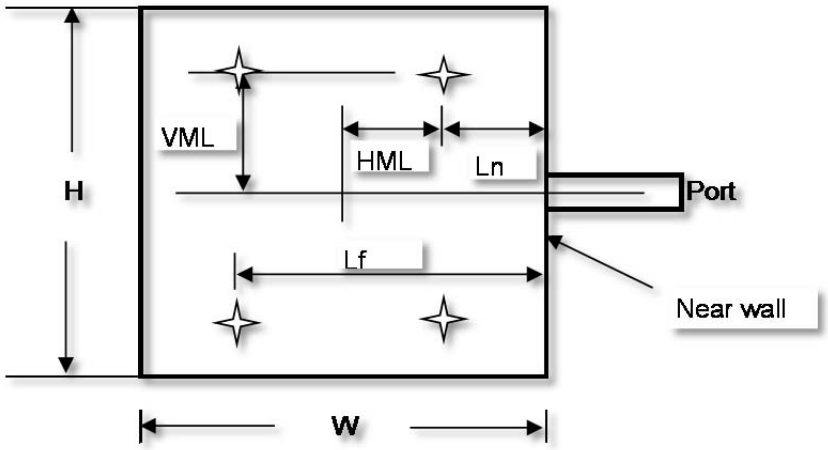


Figure 3.6. Illustration of Five Injection Points in a Rectangular Duct. Note: VML is the vertical minimum length off-center, HML is the horizontal minimum length off-center; Ln is the minimum length from near wall; and Lf is the minimum length from far wall. In the case of a rectangular duct, the hydraulic diameter is equal to four times the cross-sectional area divided by the rectangle's perimeter.

For each test run, the tracer concentration was read three times at each of the measurement points across the duct. The measured concentration for each point is the average of the three readings. These measured concentrations are used to calculate the overall mean, standard deviation, and %COV. These calculations also are performed just for the measurement points in the center two-thirds of the duct. The qualification criteria for the gaseous tracer test are that 1) the %COV should be ≤20% within the center

two-thirds of the duct, and 2) the concentration at any measurement point should not deviate from the overall mean by more than 30%.

A photoacoustic gas analyzer (Brüel & Kjær, Model 1302, Ballerup, Denmark) was used to measure tracer gas concentrations. The concentration variation is the important result for this test, so calibration bias is not important in the test results. However, the analyzer response was checked with calibration standards before and after conducting the test series (as well as weekly during the test series) to verify an adequate instrument response. The response was considered acceptable if the concentration from the instrument was within 10% of the calibration standard.

A simple probe was used to extract the sample and deliver it to the gas analyzer. A small pump drew air from within the stack through the probe. The gas analyzers then sampled the air from the sample line for analysis (Figure 3.7). The procedure EMS-JAG-01, Rev 4 and test instructions TI-WTPSP-117 and TI-WTPSP-122 were used to conduct this test for each scale model.



Figure 3.7. Equipment Used for the Gaseous Tracer Sampling: (a) Sampling Probe Installed in a Port, (b) Sampling Pump, and (c) Gas Analyzer

3.2.4 Particle Tracer Uniformity

The uniformity of the particulate contaminant concentration was demonstrated using polydisperse pump oil particles as a particle tracer. Vacuum pump oil was drawn into a spray nozzle (driven by compressed air) housed in a stainless steel chamber. These aerosol particles were injected into the duct air at an injection point downstream of the fans as shown in Figure 3.8. Figure 3.8 shows the equipment setup for an aerosol injection in the LV-S3 scale model stack. The stainless steel chamber and spray nozzle assembly is also referred to as the aerosol generator. In previous tests, an aerosol generator of similar design, except constructed out of PVC, was used. These are the first scale model tests to utilize the new all-metal aerosol generator design. The aerosol was injected at the centerline of the duct, and this test was repeated to gain some sense of the variability of the results.

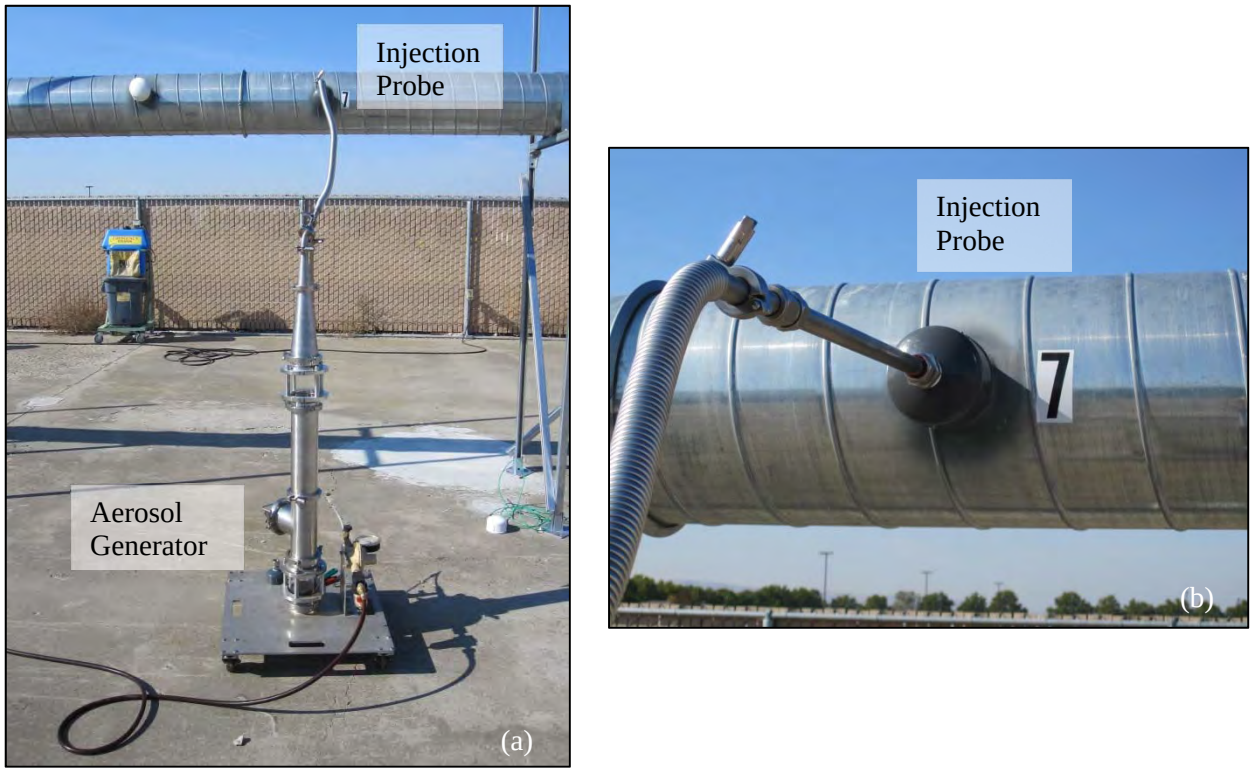


Figure 3.8. Equipment Used for Particle Injection (LV-S3). a) shows Aerosol Generator with Injection Probe placed in Injection Port 7; b) Close up of Injection Probe and Injection Port 7.

The concentration of the particles is measured at the sampling grid points with a calibrated optical particle counter (OPC) (Hach, Met-One Model 3415, Loveland, CO). A simple probe was used to extract the sample and deliver it to the OPC. Figure 3.9 shows the sampling setup with the simple probe connected to the OPC. To identify potential inconsistencies in the aerosol output, tests were conducted with a reference instrument measuring the particle concentration at a location downstream of the test port. The OPC sorts the particles into six size channels. As mentioned in Section 1.1, the particles of interest have an AD of 10 μm. Therefore, only data in the 9- to 11-μm channel of the OPC were used.

The particle concentration was read three times at each of the measurement points across the cross section of the duct. The measured concentration for each point is the average of the three readings. From these measurements, the overall mean, standard deviation, and %COV were calculated for all of the points and also just for those within the center two-thirds of the duct. The qualification criterion for the particle tracer test is that the %COV should be less than or equal to 20% within the center two-thirds of the duct. The procedure EMS-JAG-02 and test instructions TI-WTPSP-116 and TI-WTPSP-123 were used to conduct this test for the scale models.

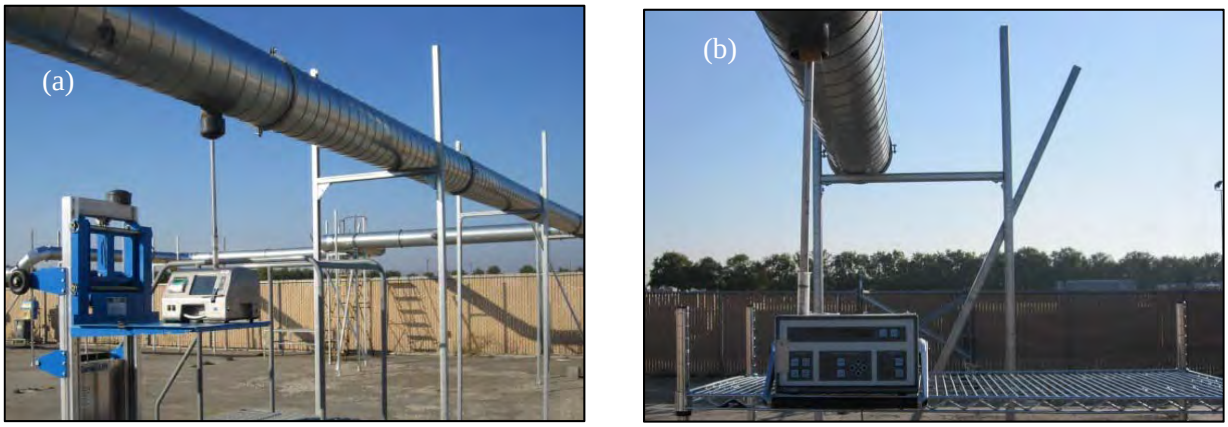


Figure 3.9. Particle Counters Used for the Particle Sampling. (a) Optical Particle Counter for Measurement Data in Bottom Port of LV-S3 Scale Model System; (b) Reference Optical Particle Counter in Bottom of LV-S3 Reference Port.

4.0 Stack Testing Results

This section summarizes the results of the stack testing activities for two scale model stacks in Group 1-2A (LV-S2 and LV-S3). The primary, reportable results are the data and data calculations to confirm that the requirements of the ANSI/HPS N13.1-1999 standard have been met. Independent reviews were performed to verify the data transcription and calculations. These calculations were performed using Excel (2007, 2010) and documented in computer-assisted calculation packages (CCPs) in accordance with WTPSP procedures. The final data sheets for the LV-S2 and LV-S3 tests are included in Appendices C and D, respectively. Appendix A contains a list of supporting documentation (such as the test plan and test instructions) used with this scale model test group. Appendix B contains documentation on gas tracer comparison and justification for switching to N_2O.

Each scale model stack underwent a series of velocity uniformity tests (designated VT), flow angle tests (designated FA), gas tracer tests (designated GT) and particle tracer tests (designated PT). Tables summarizing the results of tests for each scale model are presented in subsections of this chapter. During some tests the scale model velocity values were higher than the actual stack flow for the conditions the test was meant to represent. This is acceptable because the DV value was still within a factor of six of the stack design values, and the facility flow conditions are estimates and may vary significantly from the design conditions at times for a variety of reasons.

4.1 LV-S2 Stack Results

Summary tables of the data for Test Port 1 for LV-S2 flow angle, velocity, gas tracer, and particle tracer test results are presented in the following subsections. Some test combinations were repeated (i.e., performed more than once at different times) to quantify the testing and response measurement uncertainty.

4.1.1 LV-S2 Velocity Uniformity

Table 4.1 lists the results for the velocity uniformity tests performed on the scale model LV-S2 stack. In all cases, the results were well within the criterion of %COV values $\leq$ 20%. Velocity uniformity results were typically around 5%. The velocity in the stack ranged from 1523 to 4645 afpm (1190 to 3630 acfm). Table 2.2 lists the desired range of minimum scale model flow rates as 1498 to 3863 afpm (1176 to 3034 acfm). The desired testing conditions were between the minimum scale model flow rate and the actual stack velocity. With these flow conditions, the scale model meets both the Reynolds number and DV criteria required to represent the actual stack. The completed data sheets from these tests are available in Appendix C, Subsection C.2.

Table 4.1. Summary of LV-S2 Velocity Uniformity Tests

Operating Fan	Flow Condition	Run No.	Flow (acfm)	Approx. Air Velocity (afpm)	%COV
A	Max	VT-7	3630	4645	4.1
		VT-8	3395	4345	4.6
		VT-9	3417	4373	5.5
	Min	VT-4	1294	1656	4.6
		VT-5	1294	1656	4.7
		VT-6	1306	1671	4.5
B	Max	VT-10	3541	4532	4.0
	Min	VT-1	1195	1530	5.1
		VT-2	1193	1526	5.2
		VT-3	1190	1523	5.0

Note: Individual and replicate sets of tests are alternately shaded and unshaded.

4.1.2 LV-S2 Flow Angle

Table 4.2 lists the results for the flow angle tests performed on the scale model LV-S2 stack. The results for all tests were well within the criterion of flow angle values ≤20°. Fan A flow angles ranged from 3.1° to 5.3°, while Fan B flow angles range from 3.6° to 4.9°. The completed data sheets from these tests are available in Appendix C, Subsection C.3.

Table 4.2. Summary of LV-S2 Flow Angle Tests

Operating Fan	Flow Condition	Run No.	Approx. Air Velocity (afpm)	Flow Angle (Degrees)
A	Max	FA-5	4196	3.1
		FA-6	4512	3.3
		FA-7	4504	4.3
	Min	FA-1	1680	5.3
B	Max	FA-8	4510	4.9
		FA-9	4520	4.5
		FA-10	4624	3.6
	Min	FA-2	1718	4.6
		FA-3	1630	4.1
		FA-4	1594	4.4

Note: Individual and replicate sets of tests are alternately shaded and unshaded.

4.1.3 LV-S2 Gaseous Tracer Uniformity

During the gas tracer testing, the responses of the gas analyzers were checked against calibration standards of appropriate concentrations, and the results met the requirements of the procedure. The data sheets from these calibration checks can be found in the first portion of Appendices B.3 and C.4.

The LV-S2 scale model had five injection ports, however, only two were employed during testing. They are injection port 2 (I2) and injection port 3 (I3) shown in Figure 2.3. Injection port 2 is in a circular section of duct and the five injection points within the circular duct are shown in Figure 3.5. Injection port 3 is located in a rectangular portion of the duct and the five injection points within this section of duct are illustrated in Figure 3.6.

Table 4.3 lists the results for all of the gaseous tracer uniformity tests performed on the scale model LV-S2 stack. No contingency sampling port was tested for this scale model; all tests were performed at the proposed test port location.

Gaseous uniformity tests using Fan A ranged from 1.3 to 6.9 %COV for gas injection at I2, and 0.2 to 2.9 %COV with gas injection at I3. Greater mixing, and lower %COV values are expected at I3 because it is both upstream of and separated by a bend from I2, which allows more mixing to occur. Gas uniformity tests using Fan B ranged from 1.9 to 8.3 %COV with gas injection occurring at I2 and 0.6 to 1.5 %COV with gas injection at I3. This greater difference in %COV may be due, in part, to the fact that the Fan B runs with gas injection at I3 occurred during minimum velocity fan conditions.

In all cases, the gas tracer was well-mixed, with results well within the qualification criteria of %COV values less than or equal to 20% and absolute value of maximum deviation less than or equal to 30%. COV values were typically less than 9%, with maximum deviation values typically less than 20%. The least amount of mixing was observed for the Fan B maximum flow conditions. For this condition, the COV ranged from 1.9% to 8.3%, while the deviation from the mean ranged from 4.4% to 19.7%. The completed data sheets are available in Appendix C, Subsection C.4.

Table 4.3. Summary of LV-S2 Gas Tracer Uniformity Tests

Operating Fan	Flow Condition	Injection Port & Location	Run No.	Avg Velocity (afpm)	%COV	Absolute % Max. Dev. from Mean
Fan A	Max	I2, Center	GT-16	4553	6.9	14.6
		I2, Near	GT-17	4517	1.6	4.1
		I2, Far	GT-18	4517	3.1	8.3
		I2, Bottom	GT-19	4530	3.4	8.4
		I2, Top	GT-20	4457	4.5	6.9
		I3, Center	GT-26	4635	2.2	7.6
		I3, Near Top	GT-27	4549	0.3	0.8
		I3, Far Top	GT-30	4749	1.0	1.4
		I3, Near Bottom	GT-28	4456	0.2	0.6
		I3, Far Bottom	GT-29	4421	0.6	0.8
		I3 Center	GT-32	4462	0.3	06
Fan B	Max	I2, Center	GT-7	4708	1.9	4.4
		I2, Top	GT-9	4772	6.6	15.2
		I2 Far	GT-10	4812	6.9	15.6
		I2, Near	GT-11	4688	4.8	11.5
		I2, Bottom	GT-8	4684	4.8	9.2
		I2, Far	GT-14	4578	6.7	15.7
		I2, Far	GT-15	4094	8.3	19.7
		I3, Center	GT-1	4671	0.7	1.2
Fan A	Min	I2, Center	GT-21	1758	2.6	7.2
		I2, Top	GT-23	1779	2.7	5.6
		I2, Far	GT-22	1785	3.9	10.1
		I2, Near	GT-24	1760	3.5	6.4
		I2, Bottom	GT-25	1809	1.3	4.4
		I2, Far	GT-31	1759	5.4	12.0
Fan B	Min	I3, Center	GT-2	1760	0.8	1.3
		I3, Near Top	GT-3	1784	0.6	1.5
		I3, Far Top	GT-4	1775	1.5	2.3
		I3, Near Bottom	GT-5	1731	1.4	2.8
		I3, Far Bottom	GT-6	1759	1.0	2.5
		I3, Near Bottom	GT-12	1690	0.8	1.4
		I3, Near Bottom	GT-13	1732	1.4	2.1

Note: Individual and replicate sets of tests are alternately shaded and unshaded.

4.1.4 LV-S2 Particle Tracer Uniformity

Table 4.4 lists the results of the LV-S2 particle tracer uniformity tests, which include non-normalized %COV, normalized %COV, and absolute value of the maximum deviation from the mean for each run. The column of maximum deviation from the mean is included for information only, and is not a criterion for qualifying the sampling location. The non-normalized %COV utilizes the particulate concentration data directly, while the normalized %COV results from a data adjustment that has been performed for this and previous tests based on previous test experience. Typically, a concentration bias is encountered between the two traverse directions because the probe orientation is vertical through one port and horizontal through the side port. The bias is removed by adjusting the data from the traverse with the lower concentration upward by a factor to match the concentrations at the center of the duct (the common point between the two traverses). These results were then termed "normalized." In interpreting the table of particle tracer uniformity results, the normalized data are considered the pertinent result. The non-normalized data are used in comparison to the normalized result as an indication of the concentration bias.

In all but one case (PT-2), the uniformity criterion was met. Based on the normalized %COV, the result for PT-2 was, at 20.5 %COV, just slightly higher than the 20% criterion. However, with several repeats of that test condition, it was determined that, on average, the test condition with Fan A at maximum flow and particle injection at I3 meets the tracer uniformity criterion. The four repeat tests were all less than 20 %COV, and the average of the five tests for this configuration was 18.0 %COV. The poorest mixing overall was observed under Fan A Max (I3 injection) conditions. The particulate tracer uniformity for this condition ranged from 15.1 to 20.5 %COV. Fan B maximum conditions, on the other hand, ranged from 14.4 to 17.3 %COV. Results at the minimum flow conditions were generally less than 10 %COV. The completed data sheets from these tests are available in Appendix C, Subsection C.5.

Table 4.4. Summary of LV-S2 Particle Tracer Uniformity Tests

Operating Fan	Injection Port	Flow Condition	Run No.	Avg Velocity (afpm)	Non-Normalized %COV	Normalized %COV	Absolute % Max. Dev. from Mean
A	I2	Max	PT-16	3884	24.0	18.5	73.3
			PT-17	3852	20.2	15.3	65.1
			PT-18	2966	13.1	8.9	34.2
			PT-19	4608	19.2	19.2	60.7
	I3	Max	PT-1	4543	32.7	17.9	71.4
			PT-2	4286	23.5	20.5	62.4
			PT-3	4254	21.2	19.9	71.6
			PT-20	3983	18.4	16.3	56.0
			PT-21	3747	15.1	15.1	54.2
		Min	PT-4	1547	21.8	5.8	30.5
	I2	Min	PT-15	1593	6.9	6.4	18.3
B	I2	Max	PT-11	3954	14.1	14.4	50.4
	I3	Max	PT-8	4059	30.3	17.3	71.8
			PT-9	3873	23.9	16.8	68.5
			PT-10	3814	15.9	16.5	60.3
	I2	Min	PT-12	1586	15.5	13.1	34.3
			PT-13	1599	8.5	8.8	15.3
			PT-14	1567	17.7	7.8	29.5
	I3	Min	PT-5	1593	16.8	7.0	37.4
			PT-6	1717	30.0	7.7	51.5
			PT-7	1744	27.6	5.2	38.6

Note: Individual and replicate sets of tests are alternately shaded and unshaded.

4.2 LV-S3 Stack Results

Summary tables for LV-S3 velocity, flow angle, gas tracer, and particle tracer test results are presented in the following subsections. Some test combinations were repeated (performed more than once at different times) to quantify the testing and response measurement uncertainty. Tests on the LV-S3 scale model stack include two test ports for the two different sampling systems; Test Port 1 is approximately seven duct diameters upstream of Test Port 2.

4.2.1 Velocity Uniformity

The initial test to determine the fan frequency setting for the LV-S3 model to achieve the desired flow conditions is included in Appendix D, Subsection D.1. Table 4.5 lists the results of the 25 velocity uniformity runs performed with the LV-S3 scale model. Table 2.2 lists the range of minimum scale model flow rates as 372 to 885 afpm (292 to 695 acfm). The desired testing conditions were between the minimum scale model flow rate and the actual stack velocity. With these flow conditions, the scale

model meets both the Reynolds number and DV criteria required to represent the actual stack with one operating fan.

All results were within the qualification criterion of %COV values ≤ 20%. COV values were typically less than 8%, with values ranging from 5.1 to 9.3 %COV. The largest COV value occurred for the AB fan combination at Port 2 under a minimum flow condition. The completed data sheets from these tests are available in Appendix D, Subsection D.2.

Table 4.5. Summary of LV-S3 Velocity Uniformity Tests

Operating Fan(s)	Flow Condition	Test Port	Run No.	Flow (acfm)	Velocity (afpm)	%COV
AB	Max	1	VT-1	2308	2977	5.9
	Norm	1	VT-26	2143	2764	6.5
	Min	1	VT-20	1129	1456	7.5
			VT-21	1127	1454	7.2
			VT-22	1120	1445	6.9
		2	VT-23	1136	1465	8.4
			VT-24	1150	1484	9.3
			VT-25	1124	1451	8.0
BC	Max	2	VT-2	2577	3324	6.1
			VT-3	2555	3296	5.8
			VT-4	2559	3301	6.0
		1	VT-5	2606	3361	5.6
			VT-6	2598	3351	5.7
			VT-7	2589	3340	5.3
	Norm	1	VT-8	2398	3093	6.0
	Min	1	VT-9	1238	1598	7.0
AC	Max	1	VT-18	2574	3321	5.1
	Min	1	VT-19	1238	1597	7.1
A	Norm	1	VT-14	1306	1683	8.3
			VT-15	1300	1677	8.6
			VT-16	1281	1653	6.9
		2	VT-17	1288	1662	7.3
B	Min	1	VT-10	665	858	7.3
			VT-11	674	869	7.3
			VT-12	747	964	7.9
C	Min	1	VT-13	941	1214	7.6

Note: Individual and replicate sets of tests are alternately shaded and unshaded.

4.2.2 LV-S3 Flow Angle

Table 4.6 lists the results of the flow angle tests for the LV-S3 scale model. The qualification criterion of ≤ 20° was met in all cases. The largest results of 10.7° and 10.3° occurred during tests of minimum flow conditions for Fan B and Fan C, respectively. Flow angle results were typically less than 7°. The completed data sheets from these tests are available in Appendix D, Subsection D.3.

Table 4.6. Summary of LV-S3 Flow Angle Tests

Operating Fan	Flow Condition	Test Port	Run No.	Approx. Air Velocity (afpm)	Mean Absolute Flow Angle (°)
B&C	Max	1	FA-24	3334	2.8
			FA-25	3296	2.8
			FA-26	3577	3.3
		2	FA-27	3668	3.2
			FA-28	3668	3.9
			FA-29	3569	2.9
	Normal	1	FA-23	3311	3.0
	Min	1	FA-22	1587	2.2
A&B	Max	1	FA-1	3196	7.4
	Normal	1	FA-2	3104	6.8
	Min	1	FA-3	1517	6.3
			FA-4	1533	9.8
			FA-5	1533	5.0
		2	FA-11	1516	2.1
			FA-12	N.A.	2.6
			FA-13	1544	2.3
A&C	Max	1	FA-21	3549	4.0
	Min	1	FA-20	1636	5.8
		2	FA-14	1744	3.2
A	Normal	1	FA-7	1800	7.8
		2	FA-8	1710	6.1
			FA-9	1699	4.9
			FA-10	1577	3.1
B	Min	1	FA-6	797	10.7
C	Min	1	FA-17	1032	5.4
			FA-18	1032	6.3
			FA-19	1060	8.8
		2	FA-15	1091	8.6
			FA-16	1184	10.3

Note: Individual and replicate sets of tests are alternately shaded and unshaded.

4.2.3 LV-S3 Gaseous Tracer Uniformity

Fifty-one gaseous tracer tests were conducted with the LV-S3 scale model. Table 4.7 lists the test results for the tests that are considered to have valid results. Gas tracer tests 27 & 28 are not included in Table 4.7 due to potential errors in the injection probe position. Test results were typically less than 1 %COV, with similarly small %maximum deviation values, which indicates a high level of tracer mixing at both Test Ports. This result was expected, given the number of bends and duct runs between the injection and sampling points. The completed data sheets from the LV-S3 gas tracer tests are available in Appendix D, Subsection D.4.

Table 4.7. Summary of LV-S3 Gas Tracer Uniformity at Test Ports 1 and 2

Operating Fan(s)	Test Port	Flow Condition	Injection Point	Run No.	Avg Velocity (afpm)	%COV	Abs. % Max. Dev. from Mean
B&C	2	Max	Center	GT-1	3590	0.9	1.1
			Center	GT-22	3298	0.7	0.8
			Center	GT-23	3307	0.8	1.1
			Top	GT-2	3463	0.3	0.7
			Bottom	GT-3	3323	0.2	0.5
			Far	GT-4	3323	0.4	0.7
			Near	GT-5	3441	0.2	0.4
	1	Max	Near	GT-6	3464	0.7	1.1
			Near	GT-20	3332	0.4	0.8
			Near	GT-21	3351	1.4	1.7
			Center	GT-7	3410	0.2	0.7
			Far	GT-8	3404	0.3	0.6
			Top	GT-9	3655	0.2	0.6
			Bottom	GT-10	3839	0.2	0.4
	1	Normal	Center	GT-18	3267	0.6	0.9
			Center	GT-19	3171	0.3	0.7
	1	Min	Center	GT-15	1564	0.3	0.7
			Center	GT-16	1555	0.4	0.7
			Center	GT-17	1646	0.3	0.8
A&B	1	Max	Top	GT-49	3046	1.2	1.7
			Top	GT-50	3022	0.4	1.0
		Normal	Top	GT-46	2872	1.0	1.3
			Top	GT-47	2922	0.3	0.7
	2	Min	Center	GT-37	1532	0.6	1.1
			Near Wall	GT-38	1541	0.6	0.9
			Far Wall	GT-39	1513	0.3	0.6
			Top	GT-40	1513	0.7	1.0
			Top	GT-48	1532	0.4	0.8
			Bottom	GT-41	1519	0.3	0.9
			Bottom	GT-51	1509	1.0	1.3
			Top	GT-42	1507	0.4	0.8
			Top	GT-43	1495	0.3	1.0
	1	Min	Top	GT-44	1374	1.6	2.0
			Top	GT-45	1372	0.3	0.6
A&C	1	Max	Center	GT-35	3483	1.1	1.4
			Center	GT-36	3485	0.3	0.7
	1	Min	Center	GT-26	1614	0.3	0.7
			Far	GT-29	1657	0.3	0.5
			Bottom	GT-30	1627	0.3	0.6
			Top	GT-31	1665	0.3	0.7
			Near	GT-32	1593	0.5	0.9
A	1	Normal	Center	GT-33	1616	0.3	0.7
			Center	GT-34	1610	0.3	0.7
	2	Normal	Center	GT-24	1579	0.8	1.2
			Center	GT-25	1541	1.3	1.7
B	1	Min	Center	GT-11	956	0.5	1.3
			Center	GT-12	946	0.4	0.9
C	1	Min	Center	GT-13	1086	0.4	0.7
			Center	GT-14	1041	1.8	3.9

Note: Individual or replicate sets of tests are alternately shaded and unshaded.

4.2.4 LV-S3 Particle Tracer Uniformity

Particle tracer uniformity tests were performed with the LV-S3 scale model stack at two sampling ports using several injection ports. Table 4.8 shows particle tracer uniformity test results with and without normalization applied for the LV-S3 scale model tests using injection port I5. Normalization refers to the removal of the concentration bias observed between the measurements from the bottom and side ports at a test location, as described in Section 4.1.4. As an example of the effect of normalization, measured particle concentration data from PT-32 is presented in Figure 4.1. The column of maximum deviation from the mean is included in these summary tables for information only, and is not a criterion for qualifying the sampling location. The completed data sheets from all tests are available in Appendix D, Subsection D.5.

As shown in Table 4.8, the first few particle uniformity tests failed to meet the criterion of $\leq$ 20 %COV. PT-1 through PT-4 had normalized COV values of about 22%. Particulate uniformity results greater than 20 %COV were not expected on this rather long stack, particularly since the gaseous tracer uniformity results had such low values. As described previously, for any particular stack flow condition, there is a range of acceptable scale model velocity conditions that can be used to represent that condition. As a result, test run PT-6, which had a lower velocity (than PT-1 through PT-3) and which still represents a maximum stack condition, resulted in a significantly lower (and within qualification criterion) uniformity result of 12.3 %COV. Consequently, additional testing with the BC fan combination was performed to measure the particulate tracer uniformity as a function of stack velocity. Particulate mixing had a high positive correlation to the average velocity in the stack. Table 4.9 presents particle tracer uniformity data collected versus variable air velocity, with data collected at both Port 1 and Port 2. Figure 4.2 graphically presents the data from Table 4.9, and the linear fit for the data from each port. Although the linear correlation is an unexpected result, and the high level of correlation was unanticipated.

Since some unforeseen results were encountered within the initial and velocity varying tests, additional tests (PT-36 through PT-40) were performed to examine effects of moving the injection port further upstream from I5. Injection port numbers with higher numerical values are further upstream (closer to the fans). Results from these tests are presented in Table 4.10. As expected, these data show that, as the injection port is moved further upstream from the test port, mixing is more uniform. There is a rather significant increase in tracer uniformity (or reduction in %COV) between I7 and I8. While there is a bend between I5 and I6, and again between I6 and I7, there is a significant length of stack duct as well as a bend between I7 and I8, which appears to increase tracer mixing significantly.

The first test among the injection location tests was PT-40, a repeat of the “failed” tests PT-1 through PT-3. However, PT-40 had a normalized %COV of 16.0%, which is both below the 20% criterion and lower than the average value of 21.8 %COV from PT-1 through PT-3. Furthermore, a separate test, PT-41 was a repeat of the “failed” test run PT-4. PT-41 had a moderately low result of 13.5 %COV, compared with the 21.1 %COV result from PT-4. Additional tests were conducted to verify these results. These were the first scale model tests to use an aerosol generator with an all-metal design. To explore the possibility that this new aerosol generator design was contributing to large variability in the tracer uniformity test results, two tests were performed using the previous PVC aerosol generator design. PT-42 and PT-43 used the PVC aerosol generator; normalized COV values were acceptable and comparable to the PT-40 result. However, the PT-42 and PT-43 test results had unusually high normalization factors (1.53 and 3.54, respectively), so subsequent testing with the PVC aerosol generators was discontinued.

Instead, the all-metal aerosol generator was used for the remaining tests, and PT-44 and PT-46, which were performed under the same stack conditions as PT-42 and PT-43, provided reasonably comparable results without the high normalization factor. Results of all the I5 repeat tests (PT-41 though PT-46) are summarized in Table 4.11.

Although these later tests (in Table 4.11) passed the tracer uniformity criterion, there was no simple way to reconcile the difference between the original (PT-1 through PT-4) test results. Consequently, additional tests at an alternate injection location were performed to provide independent verification of the stack qualification metric for these two sampling port locations. Although all injection locations installed on the scale model stack are acceptable for evaluating the stack, locations that are accessible at the facility itself are preferred in case stack testing on the actual stack is later required. As a result of a site visit, injection port I7 was selected as an alternative injection location for scale model testing. Table 4.12 presents the results of tests performed with the I7 injection port under dual fan combination conditions, at two different fan settings. All tests resulted in uniformity values that were well within the 20 %COV uniformity criterion, with most values less than 10 %COV. As a result, this stack and test condition combination is overall qualified under the particle tracer uniformity requirement.

Table 4.8. Summary of LV-S3 Particle Tracer Uniformity Tests with Particle Injection at I5

Operating Fan(s)	Test Port	Flow Condition	Run No.	Avg Velocity (afpm)	Non-normalized %COV	Normalized %COV	Absolute % Max. Dev. from Mean
B&C	1	Max	*PT-1*	*3467*	*22.3*	*22.2*	*56.8*
			PT-2	*3475*	*22.6*	*21.8*	*52.5*
			PT-3	*3643*	*23.8*	*21.4*	*53.0*
			PT-6	2289	12.7	12.3	27.7
	2	Max	PT-7	2131	12.5	12.0	28.3
			PT-8	2230	12.7	12.0	29.8
			PT-9	2235	12.6	12.6	25.8
	1	Normal	*PT-4*	*3133*	*21.1*	*21.1*	*48.9*
	1	Min	PT-5	1620	9.1	7.9	20.4
A&B	1	Max	PT-24	2515	15.3	12.9	36.9
	2	Max	PT-28	3121	17.9	17.9	36.2
			PT-35	3079	12.5	12.7	28.7
	1	Normal	PT-25	2103	10.7	10.2	23.9
			PT-26	1953	10.3	10.0	21.5
			PT-27	1944	9.7	9.5	23.1
	1	Min	PT-21	1278	4.2	4.2	9.9
			PT-22	1254	5.7	5.4	12.7
			PT-23	1290	5.0	4.8	14.2
	2	Min	PT-18	1277	6.6	4.1	15.7
			PT-19	1247	8.4	5.8	17.2
			PT-20	1278	6.8	4.7	14.7
A&C	1	Max	PT-12	2126	13.4	11.8	35.3
		Min	PT-14	1313	6.8	6.8	16.4
A	1	Normal	PT-13	1873	8.8	9.0	19.8
	2	Normal	PT-15	1836	11.5	9.1	26.3
			PT-16	1884	9.6	6.7	22.0
			PT-17	1910	10.2	8.6	24.1
B	1	Min	PT-10	921	9.6	4.2	15.1
C	1	Min	PT-11	1202	7.1	5.6	16.1

Note: Individual or replicate sets of tests are alternately shaded and unshaded.
Italicized results indicate tests that exceed the qualification criterion.

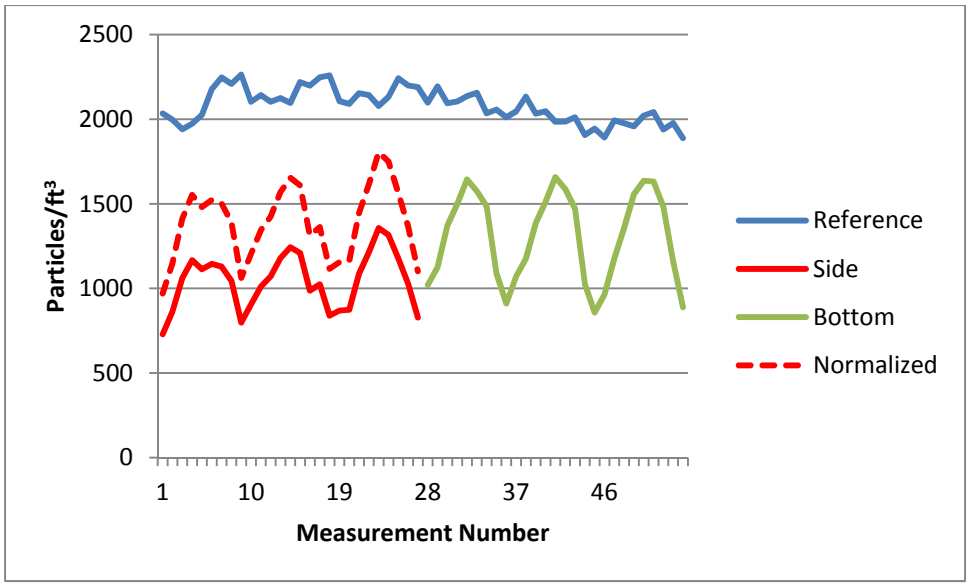


Figure 4.1. Measurement and Reference Particle Test Data from PT-32 on the LV-S3 Scale Model Stack. The side and bottom lines represent measurement traverses from the side and bottom of Test Port 1, while the reference line represents the concentration at a fixed point of the Reference Port. Normalized data are show with dotted line. The data collected from the side port have been adjusted up (normalized) by a factor of 1.33.

Table 4.9. Summary of Velocity Variation Tests at Test Ports 1 and 2. Particle injection occurred at Injection Port 5.

Test Port	Fan Setting (Hz)	Run No.	Avg Velocity (afpm)	Non-normalized %COV	Normalized %COV	Absolute % Max. Dev. from Mean
1	60	PT-1	3467	22.3	22.2	56.8
		PT-2	3475	22.6	21.8	52.5
		PT-3	3643	23.8	21.4	53.0
	55	PT-4	3133	21.1	21.1	48.9
	50	PT-33	2858	17.1	16.3	43.9
	45	PT-34	2530	13.9	13.7	37.5
	41	PT-32	2107	18.0	12.6	39.8
	40	PT-6	2289	12.7	12.3	27.7
	30	PT-5	1636	9.1	7.9	18.5
2	60	PT-29	3581	20.2	19.1	51.9
	55	PT-31	2958	19.5	18.0	48.7
	41	PT-30	2263	11.5	11.5	29.3
	40	PT-7	2131	12.5	12.0	28.3
		PT-8	2230	12.7	12.0	29.8
		PT-9	2235	12.6	12.6	25.8

Note: Individual or replicate sets of tests are alternately shaded and unshaded

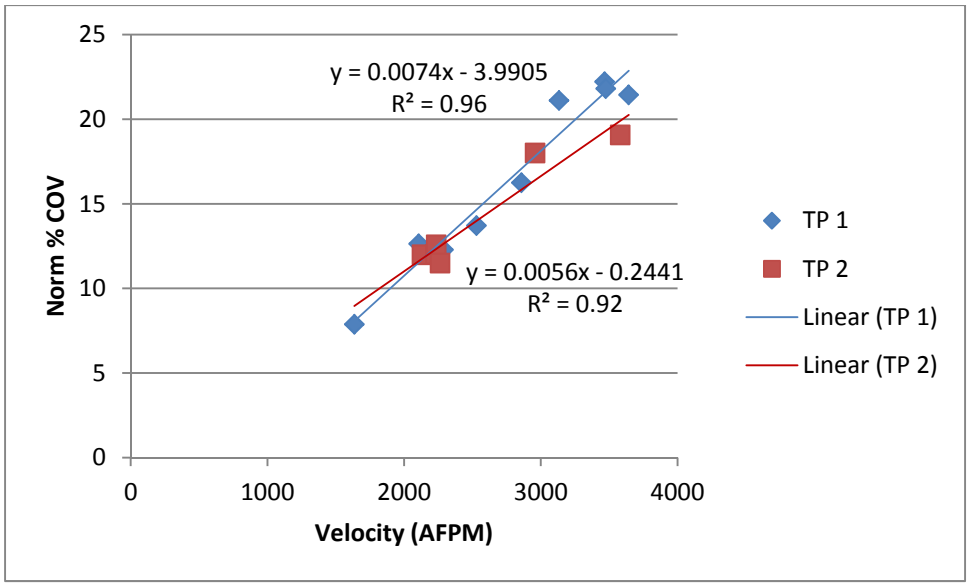


Figure 4.2. Linear Regression Results of Average Velocity Versus %COV for Test Port 1 and 2 Data Presented in Table 4.9

Table 4.10. Summary of Tests Moving Injection Port Upstream

Test Port	Fan Setting (Hz)	Injection Port	Run No.	Avg Velocity (afpm)	Non-normalized %COV	Normalized %COV	Absolute % Max. Dev. from Mean
1	60	I5	PT-40	3351	17.0	15.9	42.7
		I6	PT-36	3505	13.6	13.7	30.9
		I7	PT-37	3733	12.2	11.6	25.2
		I8	PT-38	3391	7.6	6.7	16.5
		I9	PT-39	3523	5.8	5.8	15.7
			PT-47	3310	5.7	5.3	12.4

Note: Individual or replicate sets of tests are alternately shaded and unshaded.

Table 4.11. Summary of Additional Testing to Verify B&C Max and Norm Test Results

Test Port	Injection Port	Fan Setting (Hz)	Run No.	Avg Velocity (afpm)	Non-normalized %COV	Normalized %COV	Absolute % Max. Dev. from Mean
1	I5	60	*PT-42*	*3423*	*25.9*	18.5	*56.8*
			PT-43	*3505*	*55.5*	16.7	*97.6*
			PT-44	3406	18.7	17.1	47.4
			PT-46	3789	17.6	17.4	43.6
		55	PT-41	2969	13.4	13.5	31.5
			PT-45	3146	14.1	14.4	28.8

Note: Individual or replicate sets of tests are alternately shaded and unshaded.
Italicized results indicate tests with unusually high normalization factors.

Table 4.12. Summary of Tests with Dual Fan Combinations with Particle Injection at I7

Fan Combination	Fan Setting (Hz)	Test Port	Run No.	Avg Velocity (afpm)	Non-normalized %COV	Normalized %COV	Absolute % Max. Dev. from Mean
BC	60	1	PT-48	3685	11.6	10.6	31.1
		2	PT-50	3282	9.2	9.1	21.4
	25	1	PT-49	1259	5.9	4.5	13.2
		2	PT-51	1235	9.0	4.2	15.3
AC	60	1	PT-55	3519	11.0	11.0	27.2
		2	PT-52	3375	11.4	11.0	24.8
	25	1	PT-54	1295	4.1	3.9	8.9
		2	PT-53	1251	14.5	5.3	22.6
AB	60	1	PT-56	2999	9.8	9.7	23.1
		2	PT-59	3019	14.5	9.9	31.6
	25	1	PT-57	1166	4.9	3.8	11.6
		2	PT-58	1194	6.7	4.0	12.5

Note: Individual or replicate sets of tests are alternately shaded and unshaded.

5.0 Conclusions

The results of the stack qualification tests performed with the LV-S2 and LV-S3 scale model stack are summarized in Table 5.1. The criteria for sampling probe locations given in ANSI/HPS N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities*, were met in all cases. These criteria address the capability of the sampling probe to extract a sample that represents the effluent stream. The range of results presented in Table 5.1 for the LV-S2 stack covers the designed location for the air sampling probe, Test Port 1. For the LV-S3 stack, tests were conducted at two locations; Test Port 1 represents the Record Sample location and seven duct diameters downstream is the continuous air monitor or CAM sampling location, Test Port 2. The results for both Test Ports are presented in Table 5.1.

Table 5.1. Summary of Results for the LV-S2 and LV-S3 Scale Model Stacks

	Acceptance Criteria	Units	LV-S2	LV-S3	
			Test Port 1	Test Port 1	Test Port 2
Velocity Uniformity	≤20	%COV	4.0 – 5.5	5.1 – 8.6	5.8 – 9.3
Flow Angle	≤20	Degrees	3.1 – 5.3	2.2 – 10.7	2.1 – 10.3
Gas Tracer Uniformity	≤20	%COV	0.2 – 8.3	0.2 – 1.8	0.2 – 1.3
	≤30	Maximum % Deviation from Mean	0.6 – 19.7	0.4 – 3.9	0.4 – 1.7
Particle Tracer Uniformity	≤20	Normalized %COV	5.2 – 19.2	3.8 – 11.0	4.0 – 11.0

Based on these scale model tests, the locations proposed for the air sampling probes in each of the LV-S2 and LV-S3 stacks meet the requirements of the ANSI/HPS N13.1-1999 standard. Additional velocity uniformity and flow angle tests on the actual stacks will be necessary during cold startup to confirm the validity of the scale model results in representing the actual stacks. In particular, the velocity uniformity test results for the actual stacks must be within 5 %COV of the range of results listed above for the scale model so that scale model results can be said to be representative of the stack. For example, if the actual LV-S2 stack sampling probe is located in a position corresponding to Test Port 1, the measured velocity uniformity %COV should be between 0.0 and 10.5 %COV (non-negative value for 4.0 - 5 = 0.0, and 5.5 + 5 = 10.5). The velocity uniformity test results summarized in Table 5.1 cover a range of flow conditions that are expected to bracket the conditions of the actual stack. For cold startup tests, the DV value and Reynolds number should meet the criteria listed in Section 1.1 (i.e., DV within a factor of six and Reynolds number >10,000). The velocity uniformity acceptance range would be constructed using the scale model results that correspond to the probe location and fan operating conditions present during the test on the actual stack.

If in-plant qualification testing becomes necessary, results comparable to this report are more likely when the tracer injection locations are comparable to those used for these tests. For the LV-S2 system either injection port (I2 or I3) would be acceptable; however, for the LV-S3 system, I-7 is preferred.

6.0 References

10 CFR 830, Subpart A. 2008. "Quality Assurance Requirements." *Code of Federal Regulations*, U.S. Department of Energy.

40 CFR 60, Appendix A, Method 1. "Method 1—Sample and Velocity Traverses for Stationary Sources." *Code of Federal Regulations*, U.S. Environmental Protection Agency.

40 CFR 61, Subpart H. "National Emission Standard for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities." *Code of Federal Regulations*, U.S. Environmental Protection Agency.

ANSI/HPS N13.1-1999. *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and ducts of Nuclear Facilities*. American National Standards Institute and the Health Physics Society, McLean, VA (reaffirmed in 2011 as ANSI/HPS N13.1-2011).

American Society of Mechanical Engineers (ASME). 2001. *Quality Assurance Requirements for Nuclear Facility Applications*. NQA-1-2000, New York, NY.

DOE Order 414.1D. "Quality Assurance." U.S. Department of Energy, Washington, D.C.

Appendix A

LV-S2 and LV-S3 Scale Model Testing Supporting Documents List

Appendix A: Document List

Project Plan	PP-WTPSP-105 Rev 0.0	Air Sampling Probe Location Tests for Waste Treatment Plant LV-C2, LV-S2, and LV-S2 (Group 1-2A) Air Exhaust Systems
Test Plan	TP-WTPSP-104 Rev 0.0	Air Sampling Probe Location Tests for Waste Treatment Plant LAW LV-C2, LV-S2 and LV-S3 (Group 1-2A) Air Exhaust Systems
Procedures	EMS-JAG-01	*Test to Determine Uniformity of a Tracer Gas at a Sampler Probe*
	EMS-JAG-02	*Test to Determine Uniformity of a Tracer Aerosol at a Sampler Probe*
	EMS-JAG-03	*Test to Calibrate Ventilation Flow Controller*
	EMS-JAG-04	*Test to Determine Uniformity of Gas Velocity at the Elevation of a Sampler Probe*
	EMS-JAG-05	*Test to Determine Flow Angle at the Elevation of a Sampler Probe*
Test Instructions	TI-WTPSP-112	Measurements LV-S2 Scale Model
	TI-WTPSP-113	Calibration of Ventilation Flow Controller for LV-S2 Scale Model Stack
	TI-WTPSP-114	Velocity Uniformity Measurements of LV-S2 Scale Model
	TI-WTPSP-115	Determine Flow Angle in LV-S2 Scale Model Stack
	TI-WTPSP-116	Tests of Particle Tracer Mixing in LV-S2 Scale Model Stack
	TI-WTPSP-117	Tests of Gas Tracer Mixing in LV-S2 Scale Model Stack
	TI-WTPSP-118	Measurements of LV-S3 Scale Model
	TI-WTPSP-119	Calibration of Ventilation Flow Controller for LV-S3 Scale Model Stack
	TI-WTPSP-120	Velocity Uniformity Measurements of LV-S3 Scale Model
	TI-WTPSP-121	Determine Flow Angle in LV-S3 Scale Model Stack
	TI-WTPSP-122	Tests of Gas Tracer Mixing in LV-S3 Scale Model Stack
	TI-WTPSP-123	Tests of Particle Tracer Mixing in LV-S3 Scale Model Stack
Calculation Packages	CCP-WTPSP-1320	Calibration of Ventilation Flow Controller for LV-S2 Scale Model Stack
	CCP-WTPSP-1321	Determine Air Velocity Uniformity of LV-S2 Scale Model Stack
	CCP-WTPSP-1322	Flow Angle Calculations in LV-S2 Scale Model Stack
	CCP-WTPSP-1323	Gas Tracer Mixing in Modified LV-S2 Scale Model Stack
	CCP-WTPSP-1324	Determine Particle Tracer Uniformity of LV-S2 Scale Model Stack
	CCP-WTPSP-1325	Calibration of Ventilation Flow Controller for LV-S3 Scale Model Stack
	CCP-WTPSP-1326	Determine Air Velocity Uniformity of LV-S3 Scale Model Stack
	CCP-WTPSP-1327	Flow Angle Calculations in LV-S3 Scale Model Stack
	CCP-WTPSP-1328	Gas Tracer Mixing in Modified LV-S3 Scale Model Stack
	CCP-WTPSP-1329	Determine Particle Tracer Uniformity of LV-S3 Scale Model Stack
	CCP-WTPSP-1333	Gaseous Tracer Comparison Analyses

Appendix B

N_2O and SF_6 Comparison Tests

Appendix B: N_2O and SF_6 Comparison Tests

The objective of replacing SF_6 with N_2O for the tracer gas in the gaseous tracer uniformity testing was primarily to reduce the global warming effects of these tests. An added benefit to the use of N_2O is that, after initial investments in equipment upgrades, the cost of the gas itself is lower than SF_6, so modest cost savings are realized. Although, in principle, all tracer gases should behave in an identical manner for measuring mixing within a stack, a series of tests with a basis in statistics was performed to demonstrate the equivalence of N_2O testing to SF_6 testing in the context of these qualification tests. This Appendix contains three sets of information, which describe the evaluation performed.

Subsection B.1 contains the sampling plan that was drafted to develop a set of tests that would determine whether N_2O and SF_6 are equivalent gases in the context of these stack qualification tests. Several sets of paired tests, where the N_2O and SF_6 were used in back-to-back tests, were outlined to determine, with statistical significance, whether the outcome of the stack qualification test would be unchanged by the use of this alternative gas. Subsection B.2 contains a summary and analysis of the tests that were performed. This demonstrates that the N_2O gas tests were equivalent to the SF_6 gas tests, and was the basis for proceeding with the exclusive use of N_2O for the tests described in the body of this report. Subsection B.3 contains a summary of the conclusions that were made in the N2O and SF6 comparison. Finally, Subsection B.4 contains the data sheets from the tests that are summarized in Subsection B.2. Statistical and experimental terms that are used in the following sections have been defined in Table B.1.

Table B.1. Statistical and Experimental Terms Used in these Appendix Sections

Analysis of Variance (AOV)	A statistical test determining whether the means of groups are equal.
%COV	The standard deviation divided by the mean for a given set of sample data. Also known as the relative standard deviation (RSD).
Max % Deviation	The largest absolute deviation of a single data point from the mean.
Response Variable	The data value or values that are measured that help test the hypotheses. In this case %COV and Max % Deviation are being measured for each gas, N_2O and SF_6. Because the hypothesis looks at the difference between the gases, the response variable is actually the difference between the gases with respect to %COV and also Max % Deviation.
Statistical Power	The probability that the test will conclude there is a significant difference between the gases, given that there truly is a difference between the gases. Increasing the sample size will increase the power. Ideally, enough samples should be taken to have at least 80% statistical power.
Null Hypothesis	What the experimenter is trying to disprove. In this case, the null hypothesis is that there is no difference between the gases.
Delta	The minimum amount of differences between the gas measurements that would indicate that the gases are in fact significantly different. For example, how much bigger or smaller should the %COV or Max % Deviation values of N_2O be from SF_6 to be convinced that N_2O and SF_6 are in fact different?
df	Degrees of freedom.
Standard Deviation	The average distance each data value is from the mean.
Significance Level	Otherwise known as 1 – confidence level. This is the probability of a type I error, which is concluding to reject the null hypothesis when the null was actually true. The significance level was set to 0.05, meaning that the confidence level was 0.95 (95% confidence).
Sum of Squares (SS)	An intermediate step needed in the AOV to help calculate the test statistic. It is an unscaled measure of variability.
Mean Square (MS)	An intermediate step needed in the AOV to help calculate the test statistic equal to the SS/df. It is measure of the estimated variance.
F	Test statistic based on an F distribution and is a ratio of mean square (MS) values.
p-value	The probability of obtaining a test statistic at least as extreme as the one that was actually observed from the sample data, assuming that the null hypothesis is true.

B.1 N_2O and SF_6 Comparison Sampling Plan

The goal of the sampling plan was to determine if N_2O and SF_6 perform similarly in the role of being a tracer during mixing tests. To achieve this goal, the test conditions needed to be determined, as well as the number of samples.

Preliminary data were collected to help determine the proper test conditions and the necessary number of samples. These data were acquired from the LB-S1 tests performed using SF_6, as well as two additional N_2O tests. Two different responses were recorded during each mixing test: 1) %COV (also referred to as %RSD), and 2) %Max Deviation (%MaxDev) (see definitions above). Preliminary data were collected by varying the levels of three different variables: 1) fan configuration, 2) injection position, and 3) fan control frequency (airflow control). Two of three fans (labeled A, B, and C) were used during each test, so the fan configuration levels were AB, AC, and BC. Five injection positions were tested: bottom, center, far wall, near wall, and top. Three airflow levels (fan control frequencies) were tested: max, normal, and min. The scale model used for these tests is described in report WTP-RPT-227, *Assessment of Waste Treatment Plant Lab C3V (LB-S1) Stack Sampling Probe Location for Compliance with ANSI/HPS N13.1-1999*.

Preliminary data were analyzed using analysis of variance (AOV) and the following AOV model:

$$Y = \mu + f_i + p_j + c_k$$

where Y is the response variable (%COV or %MaxDev), μ is the overall mean, f_i is the fan configuration, p_j is the injection position, and c_k is the fan control frequency. Significant differences were found between the fan configurations and between the injection positions. There were no significant differences in %COV and %MaxDev as a function of airflow (flow control). The boxplots below (Figure B.1) show which levels resulted in higher or lower %COV and %MaxDev values.

These analyses are useful in determining which test conditions should be run, so that the sampling plan will provide varying airflow conditions to best compare N_2O to SF_6. Because there were no significant differences between the airflow conditions (fan control settings), this variable does not need to be varied during the tests. All tests should then be performed at one flowrate level (e.g., "normal"). The fan configuration analysis shows that using the A-C fan combination is quite different from the A-B and B-C combinations. Injection position analyses showed that the bottom injection is generally higher with a little larger variability, and the center is generally smaller, with the other three levels very similar. To represent the widest range in flow conditions, the best levels to select for injection position would be bottom and center.

Statistical power (see definition in previous section) analyses were performed to help determine how many samples are needed. The necessary inputs to calculate statistical power are: 1) number of samples, 2) delta, 3) standard deviation, and 4) significance level (definitions for each input are found in previous section above). Significance level was set to 5%, meaning that the confidence level was set to 95% (very common level). The preliminary data of the differences between the gases showed that a conservative estimate for the standard deviation is 0.7 (when using %COV or %MaxDev). This means that on average the difference between N_2O and SF_6 values (under common testing conditions) varies from the mean by 0.7 (using either %COV or %MaxDev). The number of samples was varied between 2 and 10. Each sample was actually a pair of samples (one for each gas). The delta was also varied from 1 to 2.5 by 0.25 intervals.

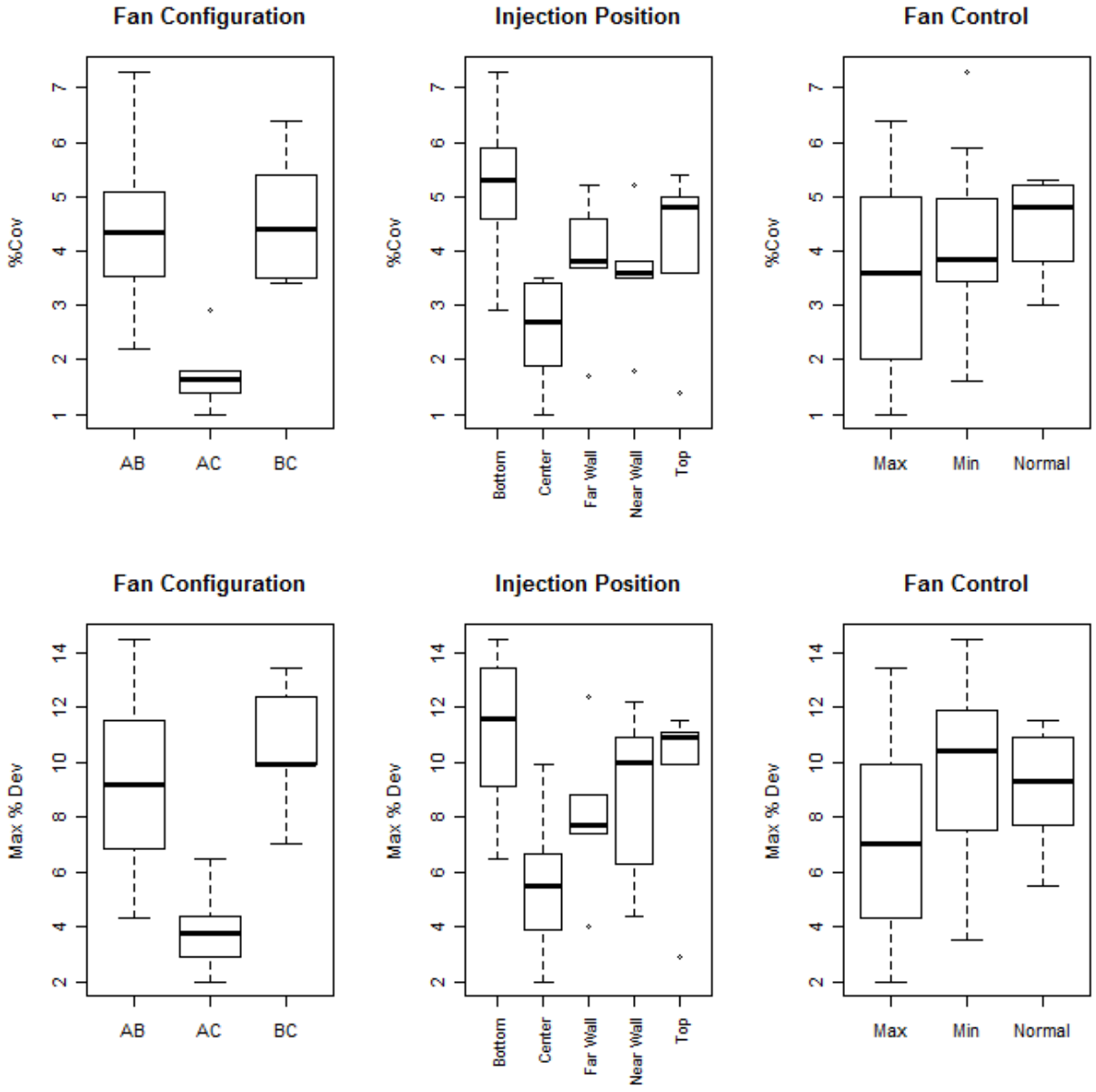


Figure B.1. Box Plots of the Preliminary Data from the LB-S1 Gaseous Tracer Tests

Figure B.2 shows how the statistical power increases as the sample size increases for each of the measures of delta assuming a standard deviation of the difference values to be 0.7. For example, if the user wants to conclude that any difference larger than 1 %COV as statistically different (this is what delta measures) and do this with an 80% statistical power probability, then the user would need to take six samples per pair. (Note: because sample numbers cannot be partial, number of samples should always be rounded up.)

With 99% power a difference of two would be detectable with six sampling pairs. A delta of two is a reasonable assumption; based on previous experience, if the sample data from the two gases differed by less than 2 %COV, the gases would not be considered to be significantly different. Six sampling pairs

would amount to three days of testing, where one test pair is run in the morning and another test pair is run in the afternoon. Six pairs also fit well with the possible test conditions. There are two different fan configurations that should be included and two injection positions plus an additional injection position not run during the preliminary tests (called "Other"). This additional position of "Other" is one that would mix poorly and give a better opportunity to see differences between the gases (if differences exist) in the extreme case. A complete experiment would then consist of two fan configurations and three injection points, which would amount to six total test pairs.

These power calculations were made assuming a standard deviation of 0.7, which was based on a small number of paired differences between the gases. An analysis of previous data calculated the expected random standard deviation which occurs when using one gas. This standard deviation was 1.3. This value could be considered a worst-case value for the standard deviation of the difference between the gases, because when taking the standard deviation of differences between two groups, the uncertainty (standard deviation) decreases. Using a standard deviation of 1.3, a worst-case scenario was calculated and the results are shown in Figure B.3. From this it would be concluded that with six sample pairs and a delta of 2 %COV, the test would be expected to have at least 85% statistical power. This is a further indication that six sample pairs should be sufficient.

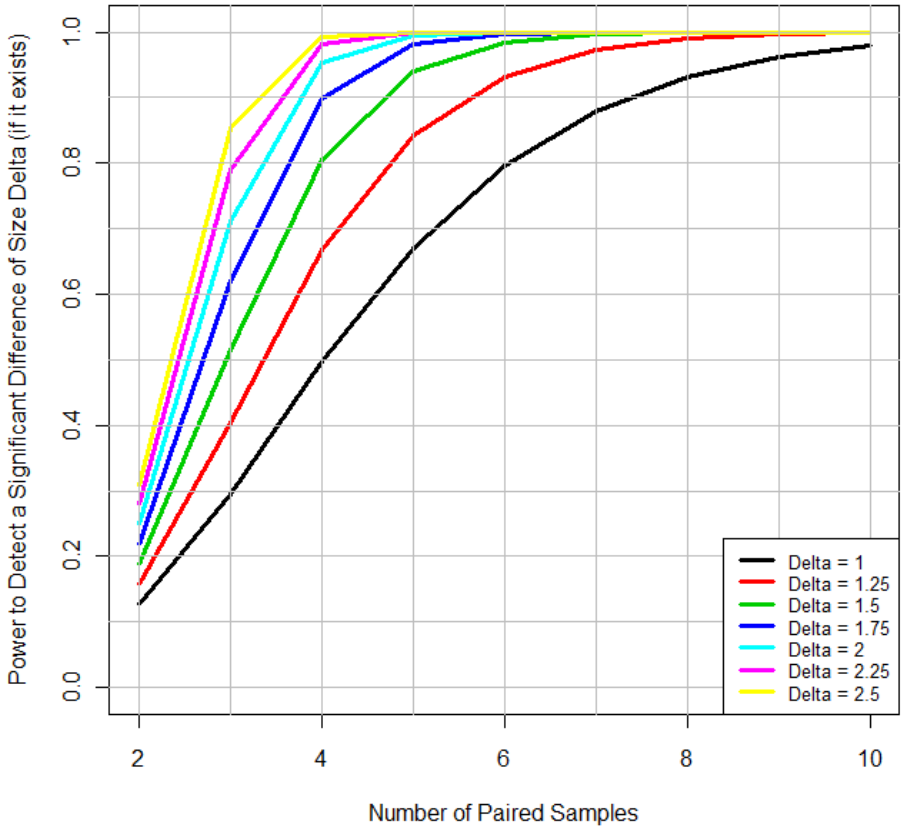


Figure B.2. Power and Sample Size Curves for Each Delta Assuming St. Dev. = 0.7

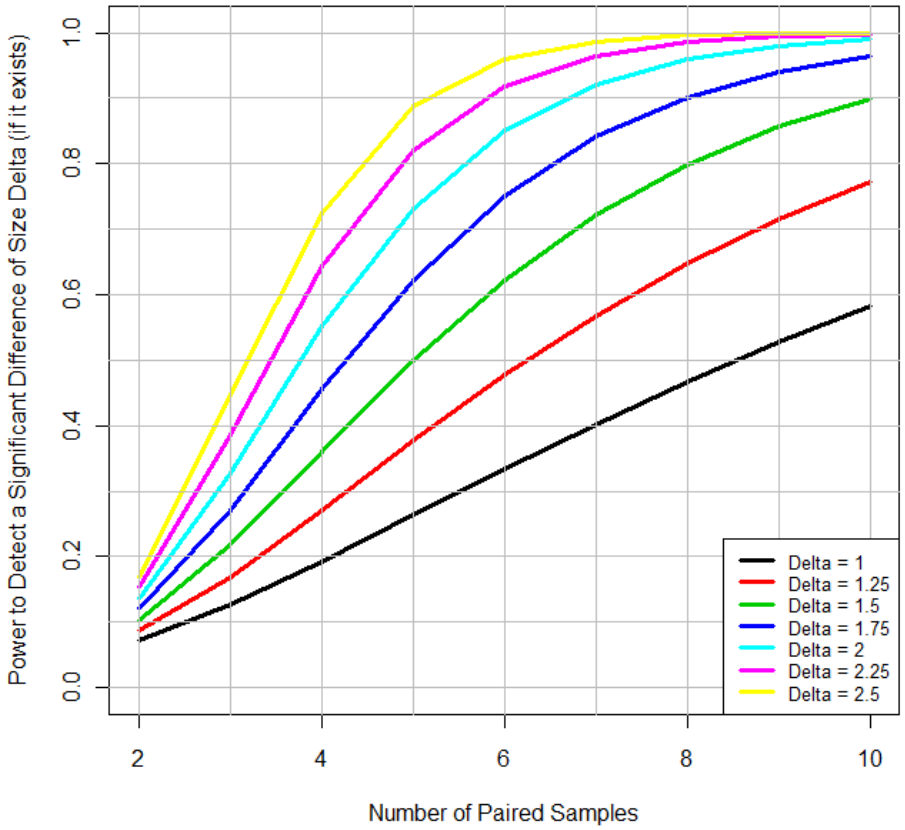


Figure B.3. Power and Sample Size Curves for Each Delta Assuming St. Dev. = 1.3

It is important to remember that the purpose of this test was to determine if N_2O is similar to SF_6. Running tests at varying flow conditions should be done to help the researcher measure how consistent that comparison is during varying flow conditions. However, the purpose of the varying flow conditions is not to determine if these conditions vary the response (%COV and %MaxDev). Varying flow conditions do vary the response. The varying conditions instead act as a blocking or pairing variable commonly used in randomized block AOV or paired t-test analyses. The variable that best varied the flow conditions was injection position. Because of this, the varying flow conditions will be created by changing the injection position, while holding the fan configuration and fan control setting constant.

Another factor that may cause differences in the responses between the two gases is the concentration. Usually, N_2O tests are performed at a higher concentration than SF_6 because the background is much higher. It is common that higher means, resulting from higher concentrations, will result in lower %COV values because the mean is part of the denominator of the %COV calculation. For this reason, just running them at their usual, or optimal, concentrations may result in a bias in the difference of their %COV values. To better quantify this, it was decided to also include tests in which both gases are run at the same concentrations. Table B.2 lists the rules to be followed in determining the concentration levels for each gas during testing, where b_s is the instrument-measured background level for SF_6 and b_n is the background for N_2O. (The N_2O background is significantly larger than that of SF_6.) Example calculations of the concentration levels are shown in the last two columns, assuming nominal background values of $b_s = 0.02$ and $b_n = 0.5$.

Table B.2. Rules to Determine Gas Concentration Levels for Testing

Concentration Variable Levels	SF_6	N_2O	If $b_s = 0.02$ & $b_n = 0.5$	
			SF_6	N_2O
Same	$b_n * 100$	$b_n * 100$	50	50
Optimal	$b_s * 50$	$b_n * 50$	1	25

Table B.3 below shows the sampling plan. Fan configuration and flowrate will remain constant throughout the tests (control variables). The two levels of concentration and three injection positions will be varied such that all six combinations are run. Each gas was run at each of the six combinations, so that a difference in the gas %COV and %MaxDev values may be analyzed.

Table B.3. Proposed Sampling Plan for Gas Comparison

	Control Variables		Testing Variables			
Test Number	Fan Configuration	Airflow	Concentration	Injection Position	First Gas	Second Gas
1 – 2	AB	Normal	Same	Center	N_2O	SF_6
3 – 4	AB	Normal	Optimal	Other	SF_6	N_2O
5 – 6	AB	Normal	Optimal	Center	SF_6	N_2O
7 – 8	AB	Normal	Same	Bottom	N_2O	SF_6
9 – 10	AB	Normal	Optimal	Bottom	N_2O	SF_6
11 – 12	AB	Normal	Same	Other	SF_6	N_2O

After the 12 tests (six pairs) were run, an initial analysis was performed to determine which tests would benefit from being repeated. Two to four of the test conditions were to provide replication.

Only one randomization constraint was added to the sampling plan. This was that the order of which gas was tested first for the first test of each day was randomized, but the second test of that day was to start with the same gas that was last used in the previous paired test. For example, test # 2 used SF_6, so therefore the second set of tests, test # 3, would also start with SF_6. This was done to minimize the number of times the gas was changed, because changing gases requires additional time and effort.

B.2 N_2O and SF_6 Comparison Results and Discussion

The testing strategy described in Subsection B.1 was performed using a modified version of the LB-S1 scale model stack, shown in Figure B.4. This modification included replacing one duct section with two sections that included two ports. This substitution was performed to utilize one of the ports for an injection location that was expected to result in poor mixing at the sampling location. This port is represented as the "Other" injection point in Table B.4 below. The modification to the LB-S1 stack resulted in less than a 1-inch reduction in the distance to the measurement port. The two sections that replaced the single section were nearly the same length.

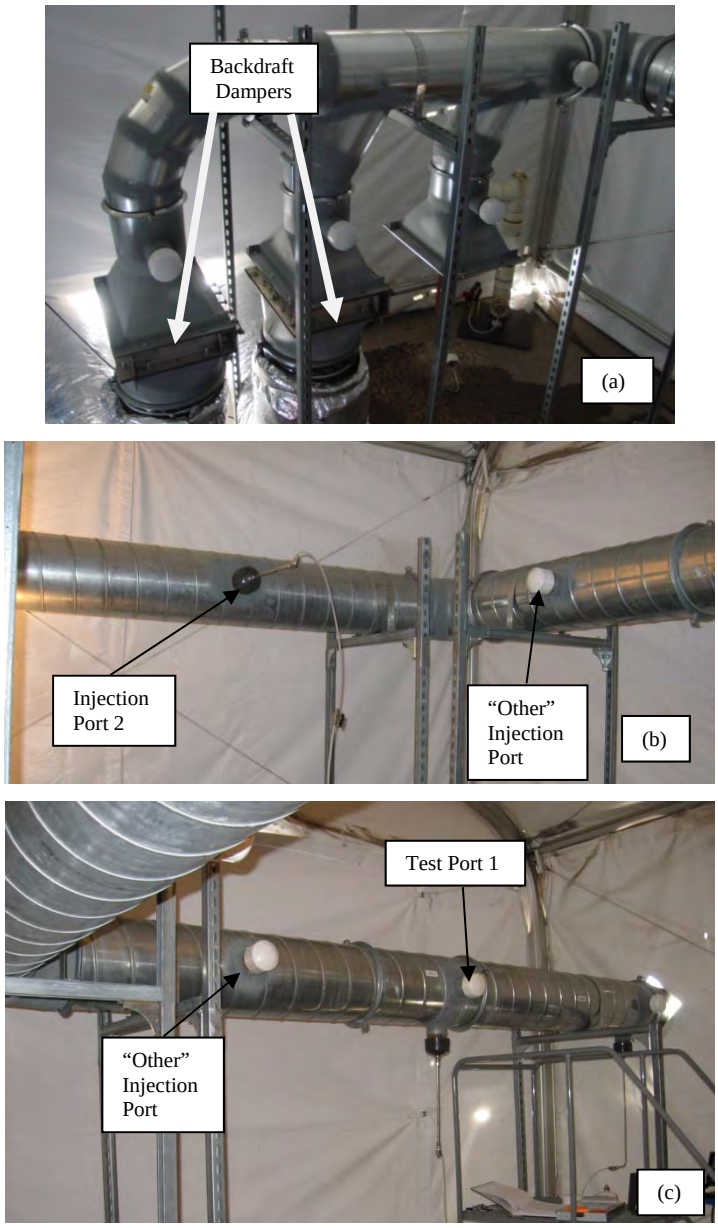


Figure B.4. Pictures of Modified LB-S1 Scale Model: a) Upstream section with backdraft dampers; b) Center section with Injection Port 2; c) Downstream section with "Other" Injection Port and Sampling Port 2.

Table B.4 summarizes the results of the tests performed (see Figure 3.1 for sampling points). All tests were performed with fans A & B, and at a velocity that was nominally the expected normal stack velocity, and measurements were made at Test Port 1. The variables that were adjusted in these tests were the injection location, the gas concentration, and whether N_2O or SF_6 was used first for each pair of tests. Gas equivalency (GE) tests 1 through 12 were the six pairs of base tests, and three of these tests were repeated. The shading in Table B.4 highlights the pairs of tests that were repeated. Note that the %COV values for any given pair of tests are comparable, and there is no systematic bias in the N_2O results compared with the SF_6 results. A statistical evaluation of these results is presented below.

Table B.4. Summary of Gas Equivalency Test Results. Each test was performed as part of a pair of tests, one with SF_6 and one with N_2O. The shaded rows highlight tests that were repeated.

Run No.	Fans	Injection	Test Port	Velocity (sfpm)	Gas	%COV	%MaxDev	Mean Conc (ppm)	Conc Level
GE-1	A & B	2 - Center	1	3331	N_2O	4.5	-8.8	41	Same
GE-2	A & B	2 - Center	1	3317	SF_6	4.3	-7.5	41	Same
GE-3	A & B	Other	1	3336	SF_6	119.8	258.8	0.776	Optimal
GE-4	A & B	Other	1	3353	N_2O	110.0	274.1	51	Optimal
GE-5	A & B	2 - Center	1	3308	SF_6	2.4	5.0	0.776	Optimal
GE-6	A & B	2 - Center	1	3330	N_2O	1.7	4.8	53	Optimal
GE-7	A & B	2-Bottom	1	3437	SF_6	5.3	-16.2	42	Same
GE-8	A & B	2-Bottom	1	3299	N_2O	4.8	-12.9	43	Same
GE-9	A & B	2-Bottom	1	3322	SF_6	5.0	-9.6	0.793	Optimal
GE-10	A & B	2-Bottom	1	3395	N_2O	4.8	-11.4	41	Optimal
GE-11	A & B	Other	1	3331	N_2O	69.0	159.7	38.63	Same
GE-12	A & B	Other	1	3291	SF_6	69.5	157	33.7	Same
GE-13	A & B	Other	1	3380	SF_6	71.4	181.8	0.747	Optimal
GE-14	A & B	Other	1	3350	N_2O	67.5	149.2	11.7	Optimal
GE-15	A & B	2-Bottom	1	3408	SF_6	4.5	-8.3	43.5	Same
GE-16	A & B	2-Bottom	1	3288	N_2O	4.3	-9.1	43.6	Same
GE-17	A & B	2-Center	1	3318	N_2O	1.3	4.0	43.4	Same
GE-18	A & B	2-Center	1	3351	SF_6	1.1	4.5	45.1	Same

AOV was run to determine if there were differences between the two gases in %COV and maximum deviation (%MaxDev). The AOV also looked for differences in the three injection points and the two different levels of concentration (optimal and same), as well as any interactions between the three factors. This resulted in the following AOV model being used:

$$Y = \mu + p_i + g_k + pg_{ik} + l_j + pl_{ij} + lg_{jk}$$

where Y is the response variable (%COV or %MaxDev), μ is the overall mean, p_i is the injection point, l_j is the level of concentration, g_k is the gas, and pl_{ij}, pg_{ik}, and lg_{jk} are the two-way interactions.

Table B.5 shows the AOV results when analyzing %COV, while Table B.6 shows the AOV results when analyzing %MaxDev. Factors with p-values less than 0.05 indicate significant differences between the different levels with 95% confidence. As expected, with both %COV and %MaxDev, there were significant differences between the three injection points (%COV p-value = 0.0010, %MaxDev p-value = 0.0005). This was expected because the "Other" injection point was specifically selected because it was quite different from the other two injection points.

The AOV results show that there were no significant differences between the gases of N_2O and SF_6 (%COV p-value = 0.5522, %MaxDev p-value=0.3439). There were also no significant interactions between the gases and injection point or concentration. This means that the two gases acted similarly across all of the tested injection points and the two concentration levels. The lack of interaction between gas and injection point can be seen in

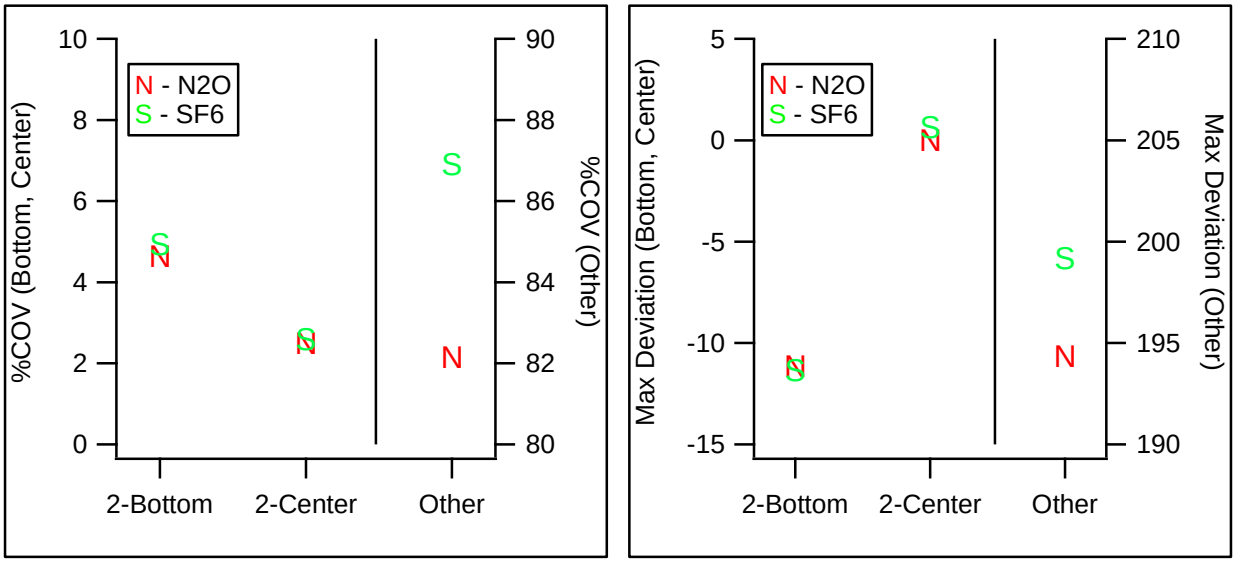


Figure B.5.

B.3 N_2O and SF_6 Comparison Conclusions

Preliminary data were used to determine what factors influence %COV and %MaxDev, as well as to help determine the number of runs that would be needed in an experiment comparing multiple gases. It was found that injection point and fan configuration influenced %COV and %MaxDev, but fan control frequency (airflow control) had no effect. Using statistical power calculations it was determined that running six samples per pair (paired because two gases were going to be tests) would supply 99% statistical power of finding a significant difference between the gases if the gases were in fact different by more than 2 %COV and 2 %MaxDev.

An experimental was designed with six paired samples to study the differences in the gases. It was decided to look at three different injection points and to look at two concentration levels, because the gases ran at such significantly different concentration levels. After the six paired samples were performed, three repeat pairs were performed for those runs that showed the greatest variation. Analysis of Variance (AOV) was performed on the experimental data and significant differences were found between the three injection points for both %COV and %MaxDev (p-values < 0.01). There were no significant differences found between the two gases for either %COV (p-value = 0.5522) or %MaxDev (p-value = 0.3439). With no significant differences found between the two gases when performing an experiment specifically designed with high statistical power to find differences if differences truly existed, it can be stated with high confidence that the gases perform similarly in these test conditions.

Table B.5. Analysis of %COV on Full Data

Source	df	SS	MS	F	p-value
Injection	2	9698.75	4849.38	18.534	0.0010*
Gas	1	3.173	3.173	0.502	0.5522
Injection x Gas	2	12.649	6.324	0.024	0.9762
Conc	1	1.017	1.017	0.004	0.9540
Injection x Conc	2	479.522	239.761	0.916	0.4382
Gas x Conc	1	5.601	5.601	0.021	0.8873
Error	8	2093.21	261.651		

* Indicates the factor has significant differences between the levels (p-value < 0.05)

Table B.6. Analysis of %MaxDev on Full Data

Source	df	SS	MS	F	p-value
Injection	2	60828.48	60828.48	22.155	0.0005*
Gas	1	7.112	7.112	1.511	0.3439
Injection x Gas	2	9.412	4.706	0.003	0.9966
Conc	1	1.342	1.342	0.001	0.9772
Injection x Conc	2	2579.167	1289.584	0.939	0.4301
Gas x Conc	1	20.854	20.854	0.015	0.9049
Error	8	10982.201	1372.775		

* Indicates the factor has significant differences between the levels (p-value < 0.05)

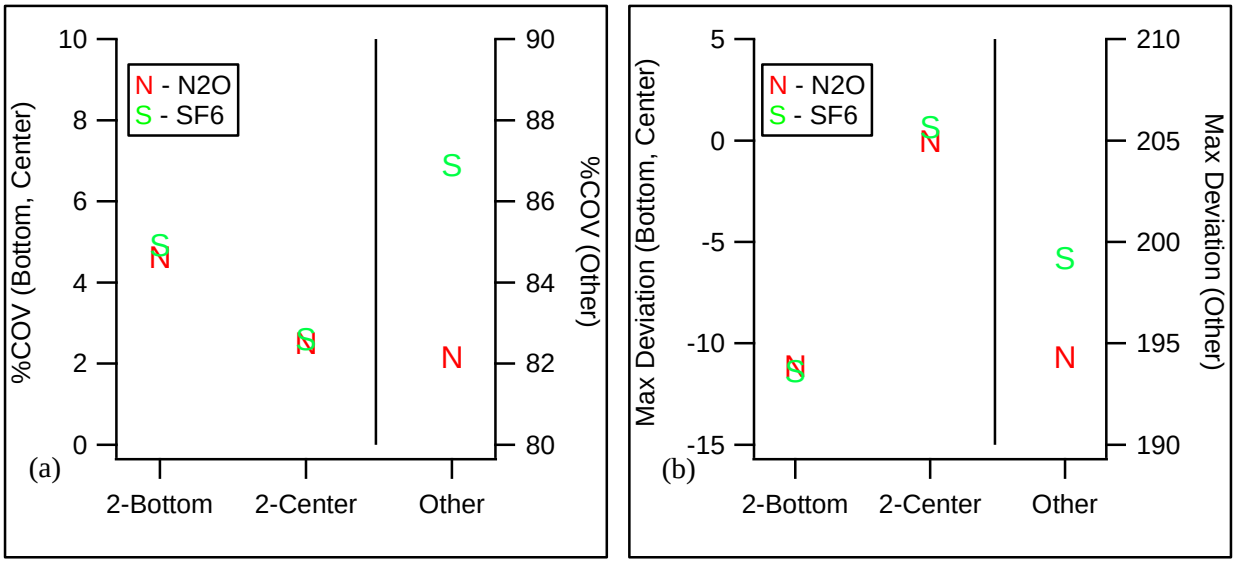


Figure B.5. The Mean %COV (a) and Maximum Deviation (b) for Each Gas at Each Injection Point

B.4 N_2O and SF_6 Comparison Datasheets

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site: Modified LB-S1 Model
Date/Time: 1/29/13 8:20-10:00
Testers: JEF, CA

Instrument: B&K Model 1302
Serial No.: 1788615
Property No.: WD54624

Setup:
7.8 ft B&K sample inlet tube length
1022 mbar station pressure
72 deg F ambient temp analyzer corrects to 20 deg C
23 percent RH ambient humidity

Pre-Test background, ppb SF6 [A]	ppb N2O [B]
Not compensating for water vapor, monitoring task 4	
21.9,21.3,22.6,21.4,21.7	654,628, 633, 620, 633
Compensating for water vapor, monitoring task 3	
3.34,3.76,3.76,3.49,3.38	481, 475, 504, 447, 445, 447

SF6 Cylinder CAL11936: 100 ppb
start P = 700 psi
end P = 700 psi

N2O Cylinder SV17699: 1.99 ppm
start P = 1800 psi
end P = 1800 psi

B&K Calibration Readings
Compensating for water vapor

SF6 (ppb)	N2O (ppm)
97	2.03
99	2.04
101	2.03
101	2.04
102	2.02

Not compensating for water vapor

101	2.49
101	2.47
99	2.45
102	2.49
101	2.48
100.40	**2.25** = avg
1.00	**1.13** = avg/standard

SF6 Cylinder FF34346: 4.97 ppm
start P = 800 psi
end P = 800 psi

N2O Cylinder SV17805: 59.6 ppm
start P = 1750 psi
end P = 1750 psi

B&K Calibration Readings
Compensating for water vapor

SF6 (ppm)	N2O (ppm)
4.89	61.8
4.92	59.6
4.90	62.0
4.89	62.0
4.89	62.1

Not compensating for water vapor

4.88	61.8
4.89	62.2
4.88	62.1
4.88	62.1
4.90	62.4
4.89	**61.81** = avg
0.98	**1.04** = avg/standard

Standards Used:	Expiration date:
Air Liquide 0.1 ppm SF6 in air, CAL11936	3/19/2013
Air Liquide 4.97 ppm SF6 in air, FF34346	3/19/2014
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/13/2013

NOTES:

Entries made by:	Technical Data Review performed by:
Julia Flaherty	
Signature/date 1/29/2013	Signature/date Ernest Antonio 2/15/2013

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	Modified LB-S1 Model	Instrument	B&K Model 1302
Date/Time	2/2/2013 15:10 - 16:20	Serial No.	1788615
Testers	JEF	Property No.	WD54624

Setup:
- 7.8 ft — B&K sample inlet tube length
- 1030 mbar station pressure
- 71 deg F ambient temp — analyzer corrects to 20 deg C
- 24 percent RH ambient humidity

Pre-Test background, ppb SF6 [A]	ppb N2O [B]
Not compensating for water vapor, monitoring task 4	
44, 47, 51, 46, 47	1004, 978, 1000, 984, 906
Compensating for water vapor, monitoring task 3	
0.29, 0.90, 0.87, -1.0, -1.3	430, 442, 429, 433, 435

	100	ppb		4.97	ppm
SF6 Cylinder	CAL11936		SF6 Cylinder	FF34346	
start P =	700	psi	start P =	800	psi
end P =	700	psi	end P =	800	psi
	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1800	psi	start P =	1700	psi
end P =	1800	psi	end P =	1700	psi

B&K Calibration Readings

Compensating for water vapor

SF6 (ppb)	N2O (ppm)
99	2.00
102	2.05
101	2.04
98	2.04
104	2.01
Not compensating for water vapor	
111	N/A
114	N/A
110	N/A
108	N/A
102	N/A
104.94	**2.03** = avg
1.05	**1.02** = avg/standard

B&K Calibration Readings

Compensating for water vapor

SF6 (ppm)	N2O (ppm)
4.86	60.7
4.88	60.9
4.90	60.7
4.91	60.9
4.92	61.0
Not compensating for water vapor	
4.88	N/A
4.89	N/A
4.88	N/A
4.88	N/A
4.89	N/A
4.89	**60.84** = avg
0.98	**1.02** = avg/standard

Standards Used:	Expiration date:
Air Liquide 0.1 ppm SF6 in air, CAL11936	3/19/2013
Air Liquide 4.97 ppm SF6 in air, FF34346	3/19/2014
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/13/2013

NOTES: Don't calibrate / check N2O without H2O compensation - values don't make sense and aren't used.

Entries made by: Julia Flaherty	Technical Data Review performed by:
Signature/date On File w/ Original 2/2/2013	Signature/date Ernest Antonio 2/15/2013

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	Modified LB-S1 Model	Instrument	B&K Model 1302
Date/Time	2/12/2013 09:05 - 10:05	Serial No.	1788615
Testers	JEF	Property No.	WD54624

Setup:	7.8 ft	B&K sample inlet tube length
	1028 mbar	station pressure
	64 deg F	ambient temp — analyzer corrects to 20 deg C
	25 percent RH	ambient humidity

Pre-Test background, ppb SF6 [A]	**ppb N2O [B]**
Not compensating for water vapor, monitoring task 4	
20,22, 18, 20, 19	750, 798, 713, 694, 715
Compensating for water vapor, monitoring task 3	
9, 7, 12, 4, 1	599, 626, 562, 637, 564

	100	ppb		4.97	ppm
SF6 Cylinder	CAL11936		SF6 Cylinder	FF34346	
start P =	700	psi	start P =	800	psi
end P =	700	psi	end P =	800	psi
	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1800	psi	start P =	1650	psi
end P =	1800	psi	end P =	1650	psi

B&K Calibration Readings
Compensating for water vapor

SF6 (ppb)	N2O (ppm)
99.1	2.03
100	2.05
98.6	2.04
101	2.05
97.7	2.06
Not compensating for water vapor	
101	N/A
101	N/A
99.9	N/A
101	N/A
98.5	N/A
99.78	**2.05** = avg
1.00	**1.03** = avg/standard

B&K Calibration Readings
Compensating for water vapor

SF6 (ppm)	N2O (ppm)
4.83	61.8
4.91	62.2
4.91	62.2
4.88	62.1
4.88	62.1
Not compensating for water vapor	
4.87	N/A
4.86	N/A
4.89	N/A
4.89	N/A
4.90	N/A
4.88	**62.08** = avg
0.98	**1.04** = avg/standard

Standards Used:	Expiration date:
Air Liquide 0.1 ppm SF6 in air, CAL11936	3/19/2013
Air Liquide 4.97 ppm SF6 in air, FF34346	3/19/2014
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/13/2013

NOTES: Modify Task 3 & 4 on B&K to measure SF6 for background check.
Do not run N2O cal gas w/o water compensation. Numbers don't make sense.

JF 2/12/13

Entries made by:	Julia Flaherty	Technical Data Review performed by:	
Signature/date	On File w/ Original 2/12/2013	Signature/date	Ernest Antonio 2/15/2013

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	Modified LB-S1 Model	Instrument	B&K Model 1302
Date/Time	2/18/2013 09:00 - 10:40	Serial No.	1788615
Testers	XYY	Property No.	WD54624

Setup:
- 7.8 ft — B&K sample inlet tube length
- 1017 mbar station pressure
- 67.1 deg F ambient temp — analyzer corrects to 20 deg C
- 24 percent RH ambient humidity

Pre-Test background, ppb SF6 [A]	**ppb N2O [B]**
Not compensating for water vapor, monitoring task 4	
2,2,2,2,-0.6	421, 440, 428, 428, 421
Compensating for water vapor, monitoring task 3	
4,4,2,2,4	511, 475, 468, 454, 465

	100	ppb		4.97	ppm
SF6 Cylinder	CAL11936		SF6 Cylinder	FF34346	
start P =	700	psi	start P =	780	psi
end P =	700	psi	end P =	780	psi
	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1750	psi	start P =	1620	psi
end P =	1720	psi	end P =	1610	psi

B&K Calibration Readings

Compensating for water vapor

SF6 (ppb)	N2O (ppm)	SF6 (ppm)	N2O (ppm)
101	2.06	4.94	61.2
101	2.06	4.94	61.3
101	2.06	4.92	61.8
100	2.06	4.93	61.5
97	2.05	4.94	61.4
Not compensating for water vapor		**Not compensating for water vapor**	
102	N/A	4.93	61.8
98	N/A	4.93	61.8
101	N/A	4.92	61.9
103	N/A	4.91	61.6
103	N/A	4.92	61.6
100.70	**2.06** = avg	**4.93**	**61.59** = avg
1.01	**1.03** = avg/standard	**0.99**	**1.03** = avg/standard

Standards Used:	Expiration date:
Air Liquide 0.1 ppm SF6 in air, CAL11936	3/19/2013
Air Liquide 4.97 ppm SF6 in air, FF34346	3/19/2014
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/13/2013

NOTES: Results of 2 ppm without water compensation are much higher than 2 ppm, i.e., ~ 2.5 ppm. Not sure why. XYY 2/18/13. Checkwed with Julia, she has seen similar results, so we will not use these.

XYY 2/18/13

Entries made by: Xiao-Ying Yu	Technical Data Review performed by:
Signature/date On File w/ Original 2/18/2013	Signature/date Ernest Antonio 2/15/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-1
Date	1/30/2013	Fan Configuration	A & B
Testers	XY, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	54.25 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	9:30/11:45
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	Port 2-Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	42.6	40.0	43.1	**41.9**	43.4	43.7	42.5	**43.2**
2	1.25	42.6	40.5	41.2	**41.4**	43.7	43.4	42.5	**43.2**
3	2.31	40.2	43.8	41.4	**41.8**	43.0	42.0	43.5	**42.8**
4	3.84	41.7	40.5	40.8	**41.0**	43.0	41.9	42.6	**42.5**
Center	5.95	41.4	41.7	40.3	**41.1**	41.0	42.0	41.0	**41.3**
5	8.05	39.8	40.0	40.3	**40.0**	39.9	38.7	40.2	**39.6**
6	9.58	39.3	38.8	40.6	**39.6**	38.0	38.8	38.0	**38.3**
7	10.64	38.1	38.6	39.7	**38.8**	38.5	36.6	35.9	**37.0**
8	11.39	38.7	38.5	38.3	**38.5**	38.3	38.1	38.7	**38.4**
Averages ------>		**40.5**	**40.3**	**40.6**	**40.5**	**41.0**	**40.6**	**40.5**	**40.7**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	40.58		Mean	40.54	40.68	40.61
Min Point	37.00	-8.8%	Std. Dev.	1.09	2.42	1.81
Max Point	43.20	6.5%	COV as %	2.7	6.0	4.5

Avg. C 40.500 ppm

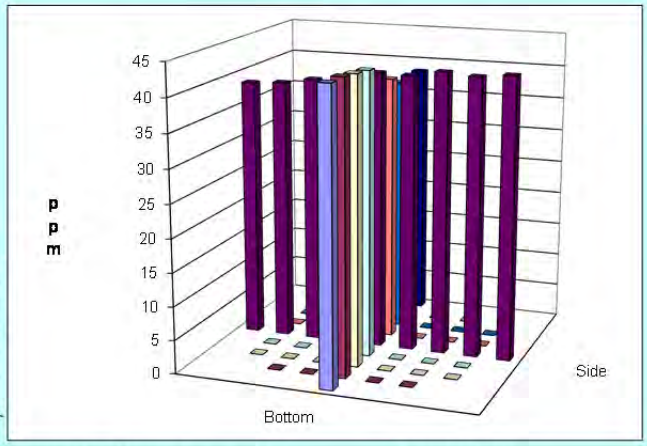
	Start	Finish	
Tracer tank pressure	580	580	psig
Injection flowmeter	2.5	2.5	slpm
Stack Temp	52.8	55.7	°F
Mean stack velocity	3313	3348	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1024	1024	mbar
Ambient humidity	34%	36%	RH
Ambient Temp	62.6	59.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.4,.4	.4,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n

Instruments Used:

B&K 1302 Gas Analyzer	SN	1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001		12/10/2013
Fisher Scientific	SN 90936818		12/13/2013

Gas analyzer checked: 1/29/2013

Notes:



Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	1/30/2013	Signature/date	2/15/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-2
Date	1/30/2013	Fan Configuration	A & B
Testers	XY, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	57.55 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	12:00/14:30
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	Port 2-Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	44.8	42.8	41.7	**43.1**	41.2	40.6	43.0	**41.6**
2	1.25	41.7	43.8	41.8	**42.4**	44.2	42.1	43.2	**43.2**
3	2.31	42.6	42.2	41.8	**42.2**	42.6	42.1	42.6	**42.4**
4	3.84	42.6	42.1	42.1	**42.3**	42.5	43.1	42.8	**42.8**
Center	5.95	40.8	41.2	42.1	**41.4**	41.4	40.0	40.8	**40.7**
5	8.05	39.9	40.9	40.7	**40.5**	39.7	40.7	39.9	**40.1**
6	9.58	39.7	39.7	39.7	**39.7**	38.7	38.4	38.3	**38.5**
7	10.64	38.0	38.5	39.0	**38.5**	38.3	37.9	37.1	**37.8**
8	11.39	38.4	37.8	39.1	**38.4**	40.8	39.0	37.9	**39.2**
Averages ---->		**40.9**	**41.0**	**40.9**	**40.9**	**41.0**	**40.4**	**40.6**	**40.7**

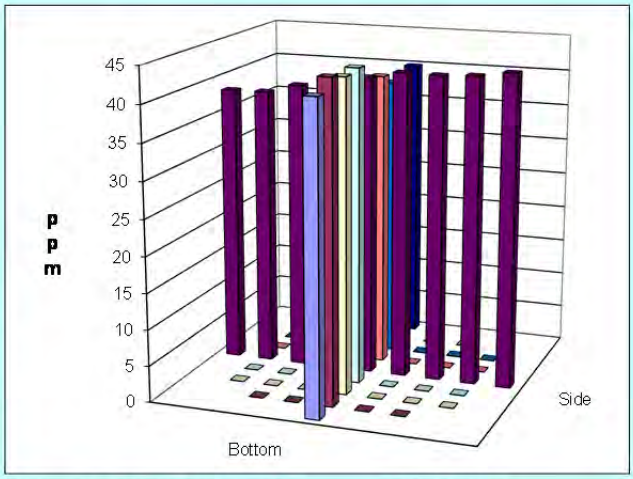
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	40.82		Mean	41.00	40.78	40.89
Min Point	37.77	-7.5%	Std. Dev.	1.50	2.14	1.78
Max Point	43.17	5.7%	COV as %	3.6	5.2	4.3

Avg. Conc. 40.794 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	100	100	psig
Injection flowmeter	2.9	2.9	slpm
Stack Temp	57.1	58	°F
Mean stack velocity	3397	3236	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1024	1024	mbar
Ambient humidity	37%	37%	RH
Ambient Temp	60.8	61.7	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.7,.5,-.7,-1.1	1.4,1.25,0.5,-0.7,-1.1	ppb
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 1/29/2013

Notes:

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	1/30/2013	Signature/date	2/15/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-3
Date	1/31/2013	Fan Configuration	A & B
Testers	XY, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	55.55 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	9:30/11:15
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppb SF6	Injection Point	other-center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppb				ppb			
1	0.50	2290	2750	2480	**2506.7**	77.4	50.6	104	**77.3**
2	1.25	2280	2800	2670	**2583.3**	109	118	109	**112.0**
3	2.31	2160	3120	2850	**2710.0**	178	118	230	**175.3**
4	3.84	1400	1480	1630	**1503.3**	405	113	406	**308.0**
Center	5.95	638	501	744	**627.7**	567	501	570	**546.0**
5	8.05	133	176	195	**168.0**	565	395	533	**497.7**
6	9.58	28.2	77.3	34.2	**46.6**	621	356	658	**545.0**
7	10.64	5.43	7.23	2.55	**5.1**	500	567	625	**564.0**
8	11.39	-0.2	0.2	1.67	**0.6**	539	709	610	**619.3**
Averages ---->		**992.7**	**1212.4**	**1178.6**	**1127.9**	**395.7**	**325.3**	**427.2**	**382.7**

All	ppb	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	755.33		Mean	1092.00	392.57	742.28
Min Point	0.56	-99.9%	Std. Dev.	1180.04	191.60	889.57
Max Point	2710.00	258.8%	COV as %	108.1	48.8	**119.8**

Avg. Conc. 776.387 ppb

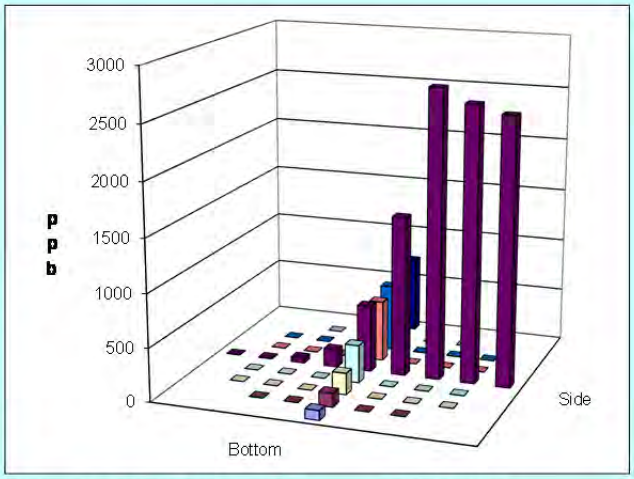
Instruments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	100	100	psig
Injection flowmeter	50	50	slpm
Stack Temp	53.4	57.7	°F
Mean stack velocity	3337	3335	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1027	1027	mbar
Ambient humidity	32%	36%	RH
Ambient Temp	67.1	60.8	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.3,-0.8,0.3, -0.1,-0.1	2,4,5,2,4	ppb
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 1/29/2013

Notes: injection center



Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	1/31/2013	Signature/date	2/15/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-4
Date	1/31/2013	Fan Configuration	A & B
Testers	XY, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	56.6 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	11:16/13:45
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	other-center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	155	124	145	**141.3**	3.94	4.1	5.35	**4.5**
2	1.25	137	147	121	**135.0**	6.13	6.9	5.56	**6.2**
3	2.31	132	81	131	**114.7**	12.1	8.65	13.5	**11.4**
4	3.84	82	35	82	**66.2**	19.4	25.8	29.7	**25.0**
Center	5.95	21	6	36	**21.2**	31.6	38.7	33.4	**34.6**
5	8.05	9.19	3.75	10.6	**7.8**	36.2	25.4	24.8	**28.8**
6	9.58	1.60	2.50	2.99	**2.4**	31.3	22.7	44.4	**32.8**
7	10.64	0.6	0.5	0.7	**0.6**	34.4	38.4	36.4	**36.4**
8	11.39	0.4	0.3	0.5	**0.4**	25.9	25.9	23.4	**25.1**
Averages ---->		**59.9**	**44.4**	**58.9**	**54.4**	**22.3**	**21.8**	**24.1**	**22.7**

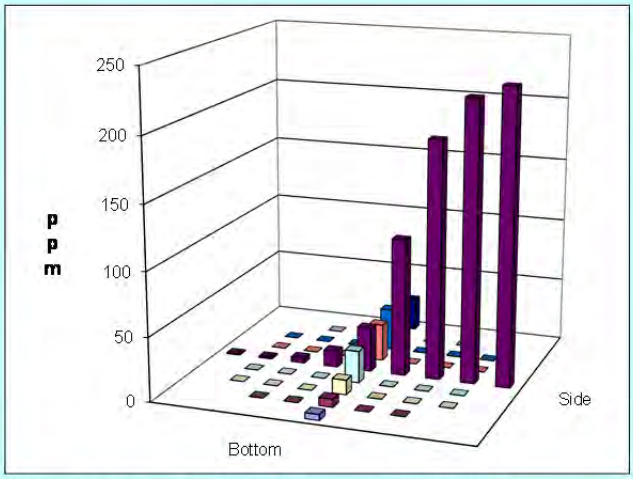
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	38.57		Mean	49.70	25.02	37.36
Min Point	0.40	-99.0%	Std. Dev.	56.25	11.80	41.09
Max Point	141.33	266.4%	COV as %	113.2	47.1	**110.0**

Avg. Conc. 39.908 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	600	600	psig
Injection flowmeter	2.5	2.5	slpm
Stack Temp	55.1	58.1	°F
Mean stack velocity	3494	3211	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1027	1026	mbar
Ambient humidity	37%	38%	RH
Ambient Temp	57.2	59.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.3,0.3,0.3,0.3,0.3	0.4,0.4,0.4,0.4,0.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 1/29/2013

Notes:

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	1/31/2013	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-5
Date	2/1/2013	Fan Configuration	A & B
Testers	EA, XY	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	46.8 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	9"30/11:00
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppb SF6	Injection Point	Port 2 Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppb				ppb			
1	0.50	767	796	826	**796.3**	765	764	775	**768.0**
2	1.25	763	772	764	**766.3**	744	765	746	**751.7**
3	2.31	761	772	789	**774.0**	742	768	756	**755.3**
4	3.84	753	763	753	**756.3**	739	774	750	**754.3**
Center	5.95	757	743	763	**754.3**	762	775	750	**762.3**
5	8.05	746	748	774	**756.0**	755	784	762	**767.0**
6	9.58	817	800	780	**799.0**	757	775	784	**772.0**
7	10.64	798	772	810	**793.3**	800	816	813	**809.7**
8	11.39	768	776	818	**787.3**	816	824	798	**812.7**
Averages ---->		**770.0**	**771.3**	**786.3**	**775.9**	**764.4**	**782.8**	**770.4**	**772.6**

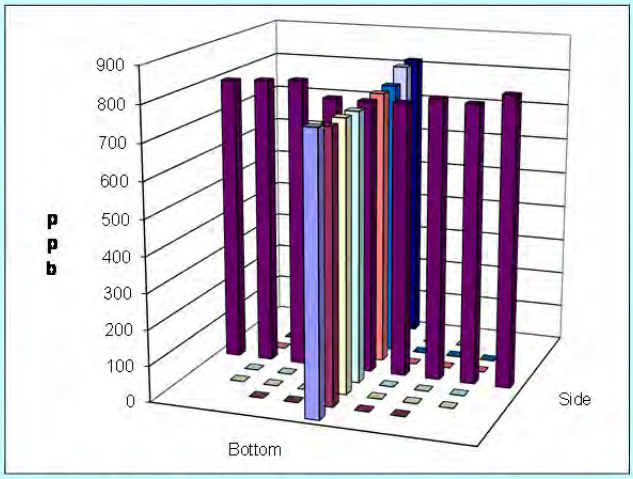
All	ppb	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	774.22		Mean	771.33	767.48	769.40
Min Point	751.67	-2.9%	Std. Dev.	18.40	19.99	18.56
Max Point	812.67	5.0%	COV as %	2.4	2.6	2.4

Avg. Conc. 776.208 ppb

Instuments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	50	85	psig
Injection flowmeter	50	50	slpm
Stack Temp	42	51.6	°F
Mean stack velocity	3292	3324	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1028	1029	mbar
Ambient humidity	37%	32%	RH
Ambient Temp	67.1	66.3	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	-0.2,1.7,-3, 1,-.4	2,4,6,1,6	ppb
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 1/29/2013

Notes: Calm, good day for testing. XYY 2/1/13

XYY 2/1/13

Entries made by:	XYY	Technical Data Review performed by:	Ernest Antonio
Signature/date	On file with original/2/1/13	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-6
Date	2/1/2013	Fan Configuration	A & B
Testers	EA, XY	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	54.2 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	11:30/13:00
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	Port 2 Center

Order -->		1st	2nd			2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	53.5	53.7	51.4	**52.9**	53.1	51.0	52.8	**52.3**
2	1.25	53.8	52.0	51.4	**52.4**	52.7	51.2	53.9	**52.6**
3	2.31	52.2	50.5	52.6	**51.8**	51.1	51.9	51.2	**51.4**
4	3.84	51.9	50.5	51.7	**51.4**	52.2	50.9	51.5	**51.5**
Center	5.95	52.6	50.8	52.0	**51.8**	51.5	51.4	51.2	**51.4**
5	8.05	53.4	52.4	52.0	**52.6**	52.4	52.0	51.1	**51.8**
6	9.58	53.7	52.4	51.4	**52.5**	54.4	54.0	52.2	**53.5**
7	10.64	52.7	54.5	55.0	**54.1**	53.7	54.6	52.6	**53.6**
8	11.39	54.9	53.8	54.7	**54.5**	54.7	56.8	53.9	**55.1**
Averages ---->		**53.2**	**52.3**	**52.5**	**52.6**	**52.9**	**52.6**	**52.3**	**52.6**

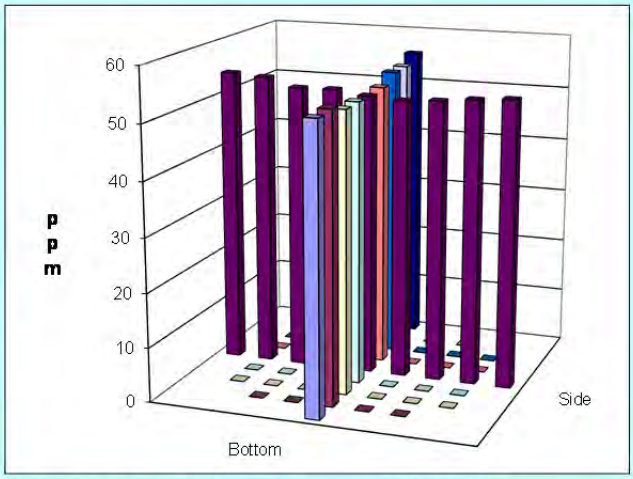
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	52.62		Mean	52.36	52.27	52.31
Min Point	51.37	-2.4%	Std. Dev.	0.88	0.99	0.90
Max Point	55.13	4.8%	COV as %	1.7	1.9	1.7

Avg. Conc. 52.750 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	600	600	psig
Injection flowmeter	3.3	3.3	slpm
Stack Temp	51.6	56.8	°F
Mean stack velocity	3252	3408	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1029	1029	mbar
Ambient humidity	32%	29%	RH
Ambient Temp	67.1	70.7	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.5,.5,.5,.5,	.5,.5,.5,.5,.5,	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 1/29/2013

Notes: N2O background is ~ 500 ppb today. Increased injection flow from 2.5 to 3.3 slpm to reach ~ 52 ppm @ center.

XYY 2/1/13

Entries made by:	XYY	Technical Data Review performed by:	Ernest Antonio
Signature/date	On file with original/2/1/13	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-7
Date	2/4/2013	Fan Configuration	A & B
Testers	XY, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	45.15 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	9:30/11:30
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	Port 2 bottom

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	42.9	42.4	43.0	**42.8**	43.2	45.0	45.2	**44.5**
2	1.25	39.7	41.9	42.6	**41.4**	44.6	45.2	44.9	**44.9**
3	2.31	43.3	44.4	44.4	**44.0**	45.3	45.0	44.9	**45.1**
4	3.84	45.1	44.3	43.9	**44.4**	44.0	45.4	45.4	**44.9**
Center	5.95	45.6	44.8	45.1	**45.2**	43.7	43.4	43.4	**43.5**
5	8.05	45.2	45.0	44.2	**44.8**	41.7	40.8	41.8	**41.4**
6	9.58	43.9	42.5	41.7	**42.7**	39.5	40.4	39.3	**39.7**
7	10.64	40.9	41.7	39.6	**40.7**	38.5	37.4	38.7	**38.2**
8	11.39	41.8	39.7	39.7	**40.4**	36.1	35.2	35.4	**35.6**
Averages ---->		**43.2**	**43.0**	**42.7**	**42.9**	**41.8**	**42.0**	**42.1**	**42.0**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	42.46		Mean	43.32	42.54	42.93
Min Point	35.57	-16.2%	Std. Dev.	1.74	2.79	2.27
Max Point	45.17	6.4%	COV as %	4.0	6.5	5.3

Avg. Conc. 42.223 ppm

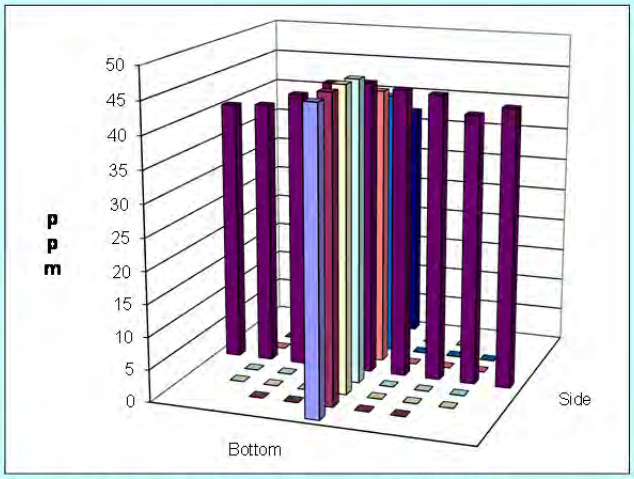
Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	50	50	psig
Injection flowmeter	3.1	3.1	slpm
Stack Temp	46.3	44	°F
Mean stack velocity	3467	3407	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1022	1022	mbar
Ambient humidity	39%	34%	RH
Ambient Temp	62.6	62.6	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.05,.05,.015, .01,.02	8,8,10,5,7	ppb
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 2/2/2013

Notes:



Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/4/2013	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-8
Date	2/4/2013	Fan Configuration	A & B
Testers	XY, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	46.4 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	11:35/14:00
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	Port 2 Bottom

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	42.1	42.2	41.5	**41.9**	44.8	45.0	46.2	**45.3**
2	1.25	44.4	41.5	44.0	**43.3**	44.2	44.7	45.3	**44.7**
3	2.31	44.4	42.5	41.8	**42.9**	45.9	45.8	45.5	**45.7**
4	3.84	43.7	45.2	44.5	**44.5**	45.3	46.2	46.2	**45.9**
Center	5.95	45.1	43.9	44.4	**44.5**	44.5	46.1	45.5	**45.4**
5	8.05	43.3	43.9	43.6	**43.6**	41.9	43.0	41.7	**42.2**
6	9.58	41.2	44.1	43.7	**43.0**	41.5	40.8	39.7	**40.7**
7	10.64	43.5	43.0	43.5	**43.3**	38.8	38.1	37.5	**38.1**
8	11.39	44.3	39.2	38.0	**40.5**	34.9	38.5	38.8	**37.4**
Averages ---->		**43.6**	**42.8**	**42.8**	**43.1**	**42.4**	**43.1**	**42.9**	**42.8**

All	ppm	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	42.94		Mean	43.58	43.25	43.41
Min Point	37.40	-12.9%	Std. Dev.	0.65	3.00	2.09
Max Point	45.90	6.9%	COV as %	1.5	6.9	4.8

Avg. Conc. 42.696 ppm

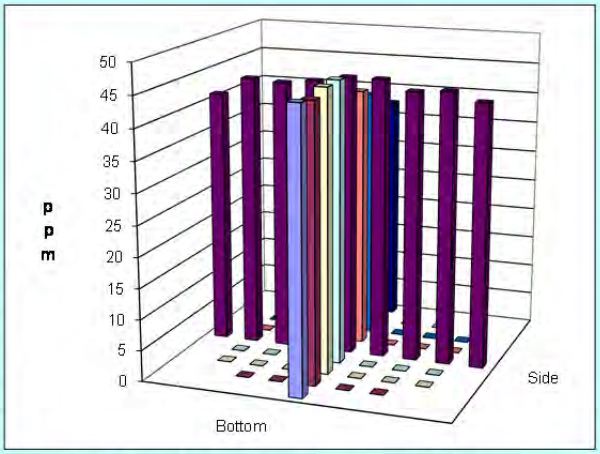
Instruments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	600	550	psig
Injection flowmeter	2.7	2.7	slpm
Stack Temp	44	48.8	°F
Mean stack velocity	3382	3215	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1022	1021	mbar
Ambient humidity	34%	32%	RH
Ambient Temp	63.5	66.2	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.3,.4	.4,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 2/4/2013

Notes:



Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/4/2013	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-9
Date	2/5/2013	Fan Configuration	A & B
Testers	EA, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	46 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	9:30/11:11
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppb SF6	Injection Point	Port 2 Bottom

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppb				ppb			
1	0.50	825	759	698	**760.7**	822	895	859	**858.7**
2	1.25	799	793	738	**776.7**	808	858	876	**847.3**
3	2.31	842	729	879	**816.7**	771	802	837	**803.3**
4	3.84	937	824	836	**865.7**	718	908	868	**831.3**
Center	5.95	762	784	807	**784.3**	775	810	780	**788.3**
5	8.05	793	813	806	**804.0**	723	755	825	**767.7**
6	9.58	852	764	833	**816.3**	686	725	759	**723.3**
7	10.64	781	808	742	**777.0**	673	758	779	**736.7**
8	11.39	767	905	772	**814.7**	737	745	672	**718.0**
Averages ---->		**817.6**	**797.7**	**790.1**	**801.8**	**745.9**	**806.2**	**806.1**	**786.1**

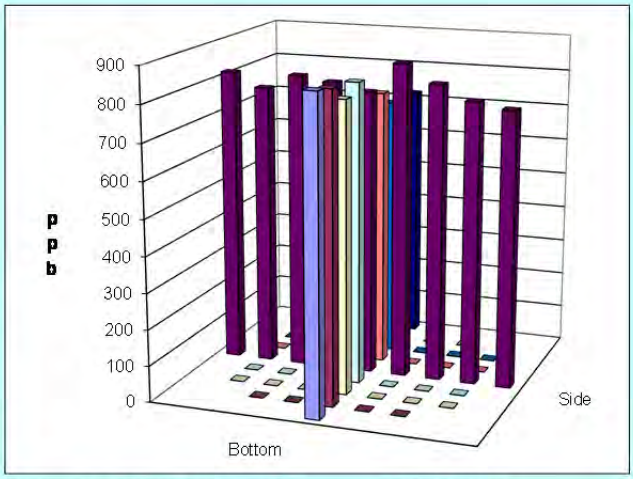
All	ppb	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	793.93		Mean	805.81	785.43	795.62
Min Point	718.00	-9.6%	Std. Dev.	31.50	46.22	39.44
Max Point	865.67	9.0%	COV as %	3.9	5.9	5.0

Avg. Conc. 794.875 ppb

Instuments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	100	100	psig
Injection flowmeter	50	50	slpm
Stack Temp	43	49	°F
Mean stack velocity	3227	3417	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1013	mbar
Ambient humidity	33%	34%	RH
Ambient Temp	61.7	63.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	5,4,2,-.5,2	5,4,3,5,1	ppb
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 2/2/2013

Notes:

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/2/2013	Signature/date	2/15/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-10		
Date	2/5/2013	Fan Configuration	A & B		
Testers	EA, CA	Fan Setting	33	Hz	
Stack Dia.	11.89 in.	Stack Temp	51.45 deg F		
Stack X-Area	111.0 in.^{2}	Start/End Time	1145/1400		
Test Port	1	Center 2/3 from	1.09	to:	10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2	to:	7
Measurement units	ppm N2O	Injection Point	Port 2 Bottom		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	41.3	40.8	39.8	**40.6**	42.5	43.4	43.7	**43.2**
2	1.25	42.1	42.1	43.3	**42.5**	42.6	43.4	44.3	**43.4**
3	2.31	42.9	42.3	42.8	**42.7**	43.2	43.7	42.6	**43.2**
4	3.84	42.4	42.7	42.6	**42.6**	42.5	42.8	43.0	**42.8**
Center	5.95	42.1	41.9	42.7	**42.2**	42.2	42.1	43.0	**42.4**
5	8.05	42.0	42.0	41.6	**41.9**	39.5	42.2	40.3	**40.7**
6	9.58	41.6	40.8	41.7	**41.4**	37.9	39.3	37.2	**38.1**
7	10.64	40.3	39.5	37.5	**39.1**	37.4	37.1	36.3	**36.9**
8	11.39	38.3	38.4	37.8	**38.2**	37.1	36.9	35.0	**36.3**
Averages ---->		**41.4**	**41.2**	**41.1**	**41.2**	**40.5**	**41.2**	**40.6**	**40.8**

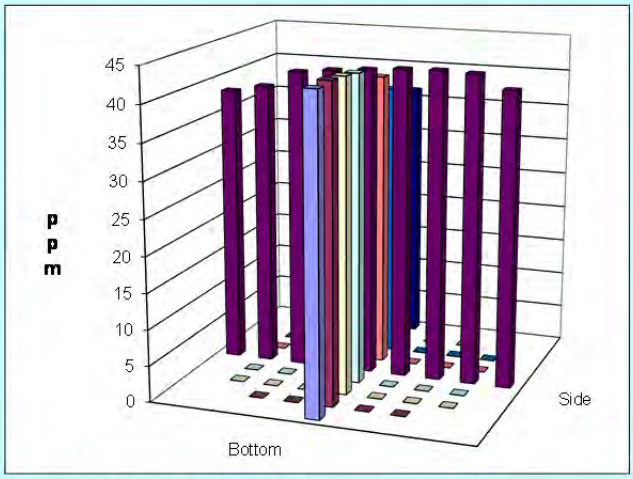
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	41.01		Mean	41.76	41.08	41.42
Min Point	36.33	-11.4%	Std. Dev.	1.26	2.60	1.99
Max Point	43.43	5.9%	COV as %	3.0	6.3	4.8

Avg. Conc. 40.844 ppm

Instruments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	500	500	psig
Injection flowmeter	2.5	2.5	slpm
Stack Temp	49	53.9	°F
Mean stack velocity	3417	3373	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1013	mbar
Ambient humidity	33%	34%	RH
Ambient Temp	64.4	66.2	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.3,.4	.4,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 2/2/2013

Notes:

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/5/2013	Signature/date	2/15/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-11
Date	2/6/2013	Fan Configuration	A & B
Testers	EA, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	55.2 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	930/1130
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	Other-Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	22.5	25.4	23.4	**23.8**	1.52	1.57	1.96	**1.7**
2	1.25	39.8	45.7	34.5	**40.0**	3.87	2.62	5.97	**4.2**
3	2.31	58.1	62.2	51.5	**57.3**	13.5	5.95	7.73	**9.1**
4	3.84	59.0	51.7	60.2	**57.0**	25.6	22.6	19.3	**22.5**
Center	5.95	63.2	60.9	56.6	**60.2**	52.5	56.6	53.0	**54.0**
5	8.05	32.6	44.8	41.6	**39.7**	100.0	108.0	95.8	**101.3**
6	9.58	20.5	19.0	25.0	**21.5**	116.0	106.0	95.0	**105.7**
7	10.64	6.67	9.59	12.1	**9.5**	73.7	77.8	69.8	**73.8**
8	11.39	5.69	6.14	4.54	**5.5**	45.7	49.1	43.1	**46.0**
Averages ---->		**34.2**	**36.2**	**34.4**	**34.9**	**48.0**	**47.8**	**43.5**	**46.5**

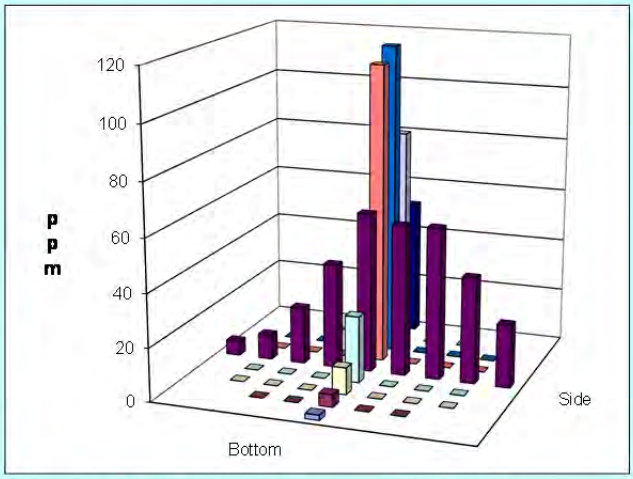
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	40.69		Mean	40.73	52.92	46.82
Min Point	1.68	-95.9%	Std. Dev.	19.44	42.39	32.31
Max Point	105.67	159.7%	COV as %	47.7	80.1	**69.0**

Avg. Conc. 38.634 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	600	600	psig
Injection flowmeter	2.5	2.5	slpm
Stack Temp	53.4	57	°F
Mean stack velocity	3391	3271	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1019	1019	mbar
Ambient humidity	29%	27%	RH
Ambient Temp	63.5	67.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.4,.4	.4,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 2/2/2013

Notes: Injection from bottom center
wind 15-20 according to HMS

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/6/2013	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-12
Date	2/6/2013	Fan Configuration	A & B
Testers	EA, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	57.05 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	1145/1330
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	Other-Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	6.46	2.09	2.58	**3.7**	1.90	1.70	1.97	**1.9**
2	1.25	5.96	5.98	6.14	**6.0**	2.91	3.18	3.05	**3.0**
3	2.31	15.1	13.3	14.4	**14.3**	3.35	9.76	8.05	**7.1**
4	3.84	38.6	42.9	40.5	**40.7**	15.9	23.5	18.8	**19.4**
Center	5.95	51.2	49.8	51.3	**50.8**	45.2	42.7	44.6	**44.2**
5	8.05	53.4	59.6	57.1	**56.7**	86.6	78.4	79.8	**81.6**
6	9.58	49.7	47.1	45.2	**47.3**	91.3	86.2	94.5	**90.7**
7	10.64	33.3	39.1	35.2	**35.9**	70.3	65.8	64.3	**66.8**
8	11.39	28.2	27.8	22.7	**26.2**	33.3	37.6	45.8	**38.9**
Averages ---->		**31.3**	**32.0**	**30.6**	**31.3**	**39.0**	**38.8**	**40.1**	**39.3**

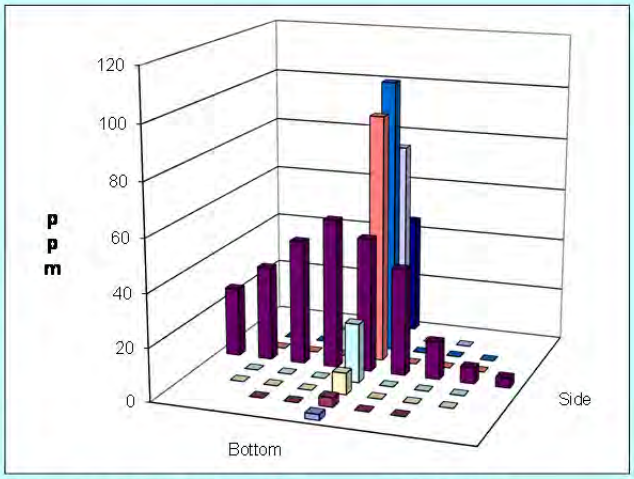
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	35.28		Mean	35.95	44.68	40.31
Min Point	1.86	-94.7%	Std. Dev.	19.01	35.95	28.00
Max Point	90.67	157.0%	COV as %	52.9	80.5	69.5

Avg. Conc. 33.758 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	300	300	psig
Injection flowmeter	2.5	2.5	slpm
Stack Temp	57.0	57.1	°F
Mean stack velocity	3271	3311	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1019	1019	mbar
Ambient humidity	28%	28%	RH
Ambient Temp	64.4	66.2	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	3.,-.3,-.3,-.5,-.2	.03,.02,.02,.02,.01	ppb
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 2/2/2013

Notes: Injection from bottom center
Wind 15-20
Injection flow meter gas left as N2O

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/6/2013	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-13		
Date	2/12/2013	Fan Configuration	A & B		
Testers	XY, CA	Fan Setting	33	Hz	
Stack Dia.	11.89 in.	Stack Temp	50.4 deg F		
Stack X-Area	111.0 in.^{2}	Start/End Time	1000/1130		
Test Port	1	Center 2/3 from	1.09	to:	10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2	to:	7
Measurement units	ppb SF6	Injection Point	Other-Center		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppb				ppb			
1	0.50	59.9	95.0	160	**105.0**	23.5	38.4	46.4	**36.1**
2	1.25	20.6	192	283	**165.2**	36.1	40.8	74.1	**50.3**
3	2.31	830	368	463	**553.7**	266	244	157.0	**222.3**
4	3.84	687	727	864	**759.3**	466	502	444	**470.7**
Center	5.95	1090	980	1200	**1090.0**	1020	1260	1110	**1130.0**
5	8.05	1130	1190	1100	**1140.0**	1730	1940	2000	**1890.0**
6	9.58	881	943	972	**932.0**	2110	2220	2330	**2220.0**
7	10.64	679	698	681	**686.0**	1260	1350	1520	**1376.7**
8	11.39	485	469	376	**443.3**	1560	799	795	**1051.3**
Averages ---->		**651.4**	**629.1**	**677.7**	**652.7**	**941.3**	**932.7**	**941.8**	**938.6**

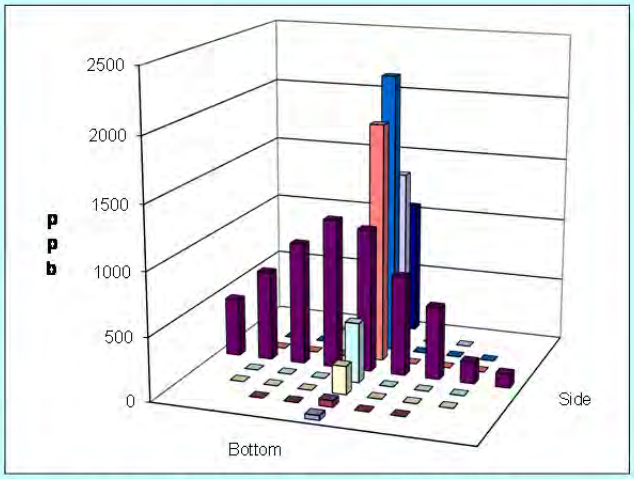
All	ppb	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	795.66		Mean	760.89	1051.43	906.16
Min Point	36.10	-95.5%	Std. Dev.	337.82	837.42	631.71
Max Point	2220.00	179.0%	COV as %	44.4	79.6	69.7

Avg. Conc. 756.371 ppb

Instuments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	50	50	psig
Injection flowmeter	50	50	slpm
Stack Temp	46.1	54.7	°F
Mean stack velocity	3370	3390	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1028	1028	mbar
Ambient humidity	28%	29%	RH
Ambient Temp	63.5	64.4	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	3,5,2,5,0.1	5,5,5,6,5	ppb
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 2/12/2013

Notes:

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/12/2013	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-14
Date	2/12/2013	Fan Configuration	A & B
Testers	XY, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	55.75 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	1135 / 1600
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	Other-Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	2.89	1.70	2.30	**2.3**	0.93	0.59	0.68	**0.7**
2	1.25	5.01	4.47	3.32	**4.3**	0.88	1.07	1.73	**1.2**
3	2.31	5.77	8.48	7.20	**7.2**	2.15	2.63	2.48	**2.4**
4	3.84	9.56	12.2	12.6	**11.5**	7.01	5.99	6.82	**6.6**
Center	5.95	16.8	19.4	17.2	**17.8**	19.7	19.7	20.8	**20.1**
5	8.05	17.3	19.7	16.9	**18.0**	29.6	32.0	31.5	**31.0**
6	9.58	17.7	13.3	14.4	**15.1**	31.7	29.7	29.7	**30.4**
7	10.64	11.9	10.9	12.4	**11.7**	23.7	23.5	21.2	**22.8**
8	11.39	7.68	6.36	8.13	**7.4**	13.2	13.1	14.8	**13.7**
Averages ---->		**10.5**	**10.7**	**10.5**	**10.6**	**14.3**	**14.3**	**14.4**	**14.3**

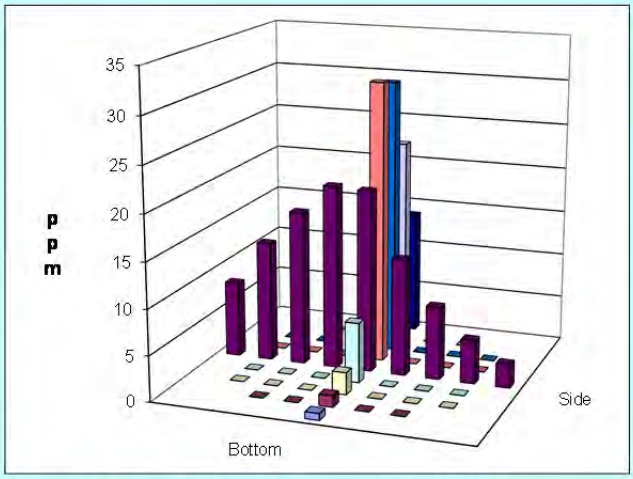
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	12.45		Mean	12.21	16.36	14.29
Min Point	0.73	-94.1%	Std. Dev.	5.20	12.81	9.64
Max Point	31.03	149.2%	COV as %	42.6	78.3	67.5

Avg. Conc. 11.642 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	550	550	psig
Injection flowmeter	0.8	0.8	slpm
Stack Temp	54.7	56.8	°F
Mean stack velocity	3390	3309	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1027	1027	mbar
Ambient humidity	29%	31%	RH
Ambient Temp	63.5	64.4	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.3,.3,.3,.3,	.3,.3,.4,.4,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 2/12/2013

Notes:

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/12/2013	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-15
Date	2/13/2013	Fan Configuration	A & B
Testers	EA, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	53.6 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	930/1135
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	Port 2-Bttom

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	44.4	44.4	46.9	**45.2**	45.5	43.8	43.4	**44.2**
2	1.25	47.4	44.3	45.6	**45.8**	43.2	46.5	46.0	**45.2**
3	2.31	46.5	44.5	45.6	**45.5**	46.1	44.8	45.9	**45.6**
4	3.84	44.9	45.3	45.1	**45.1**	45.0	46.3	45.2	**45.5**
Center	5.95	45.1	44.8	45.4	**45.1**	45.0	44.7	44.4	**44.7**
5	8.05	44.3	44.2	44.6	**44.4**	42.7	43.0	43.2	**43.0**
6	9.58	42.9	42.7	42.9	**42.8**	40.9	41.5	41.8	**41.4**
7	10.64	41.4	40.5	39.9	**40.6**	39.2	40.4	40.5	**40.0**
8	11.39	39.7	40.7	40.9	**40.4**	41.1	43.4	39.2	**41.2**
Averages ———>		**44.1**	**43.5**	**44.1**	**43.9**	**43.2**	**43.8**	**43.3**	**43.4**

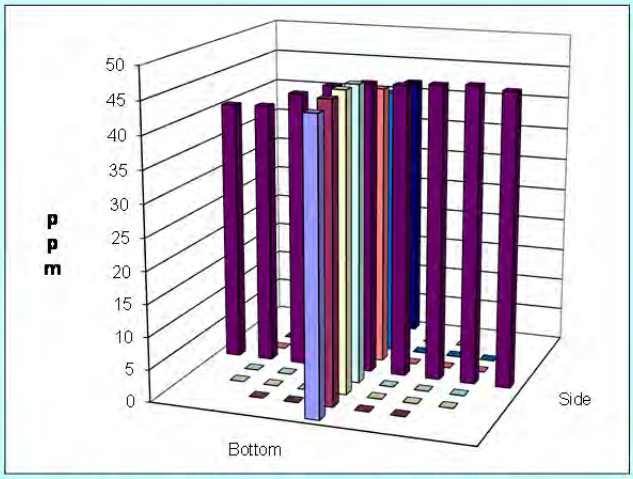
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	43.66		Mean	44.19	43.63	43.91
Min Point	40.03	-8.3%	Std. Dev.	1.86	2.22	1.98
Max Point	45.77	4.8%	COV as %	4.2	5.1	4.5

Avg. Conc. 43.504 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1788615	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	100	100	psig
Injection flowmeter	3.1	3.1	slpm
Stack Temp	53.2	54.0	°F
Mean stack velocity	3482	3334	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1025	1026	mbar
Ambient humidity	26%	28%	RH
Ambient Temp	67.1	67.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	-1.5,-3.1,-3.9,1.1,-0.2	9,7,7,6,8	ppb
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 2/12/2013

Notes:

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/13/2013	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-16
Date	2/12/2013	Fan Configuration	A & B
Testers	EA, CA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	55.45 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	1150/1330
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	Port2-Bottom

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	45.3	43.3	44.9	**44.5**	45.5	45.3	46.3	**45.7**
2	1.25	45.9	43.4	43.1	**44.1**	44.1	47.1	46.8	**46.0**
3	2.31	45.6	45.1	45.1	**45.3**	45.1	46.1	46.0	**45.7**
4	3.84	45.6	44.0	45.6	**45.1**	47.6	45.6	46.8	**46.7**
Center	5.95	45.5	45.6	44.6	**45.2**	47.5	44.1	44.2	**45.3**
5	8.05	45.3	44.2	43.0	**44.2**	42.8	42.1	41.6	**42.2**
6	9.58	43.5	43.3	43.3	**43.4**	42.4	41.3	40.2	**41.3**
7	10.64	45.5	42.5	42.6	**43.5**	41.8	39.5	39.1	**40.1**
8	11.39	40.6	38.6	41.9	**40.4**	40.0	40.2	39.3	**39.8**
Averages ---->		**44.8**	**43.3**	**43.8**	**44.0**	**44.1**	**43.5**	**43.4**	**43.6**

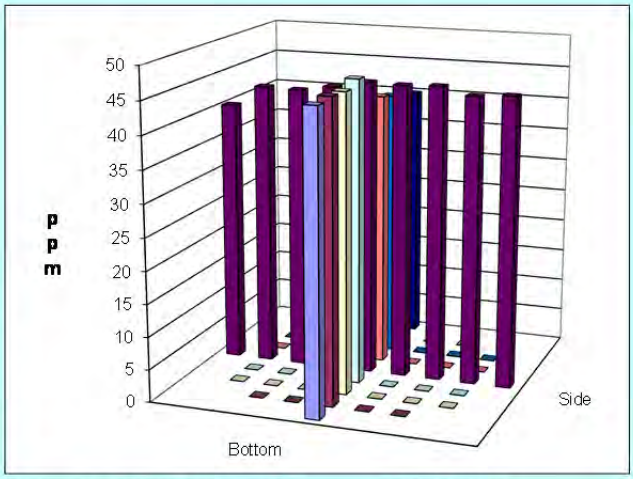
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	43.80		Mean	44.40	43.90	44.15
Min Point	39.83	-9.1%	Std. Dev.	0.80	2.62	1.88
Max Point	46.67	6.5%	COV as %	1.8	6.0	4.3

Avg. Conc. 43.621 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	550	550	psig
Injection flowmeter	2.7	2.7	slpm
Stack Temp	54.0	56.9	°F
Mean stack velocity	3334	3241	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1026	1026	mbar
Ambient humidity	27%	26%	RH
Ambient Temp	67.1	69.8	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.3,.4,.4,.3	.4,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 2/12/2013

Notes:

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/13/2013	Signature/date	2/15/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-17
Date	2/14/2013	Fan Configuration	A & B
Testers	XY, EA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	49.1 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	930/1145
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	Port2-Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	42.4	43.7	43.5	**43.2**	43.9	42.9	42.8	**43.2**
2	1.25	43.3	43.5	44.8	**43.9**	41.7	43.2	42.5	**42.5**
3	2.31	41.6	43.2	42.7	**42.5**	43.9	42.4	43.6	**43.3**
4	3.84	43.4	42.6	42.3	**42.8**	43.4	43.5	42.2	**43.0**
Center	5.95	42.4	42.9	43.1	**42.8**	43.5	43.3	41.9	**42.9**
5	8.05	42.4	43.9	42.8	**43.0**	43.1	43.1	44.1	**43.4**
6	9.58	43.9	42.7	42.7	**43.1**	44.5	43.9	43.8	**44.1**
7	10.64	43.3	44.0	42.7	**43.3**	43.3	45.7	44.4	**44.5**
8	11.39	45.1	45.5	44.4	**45.0**	46.1	45.3	44.1	**45.2**
Averages ------>		**43.1**	**43.6**	**43.2**	**43.3**	**43.7**	**43.7**	**43.3**	**43.6**

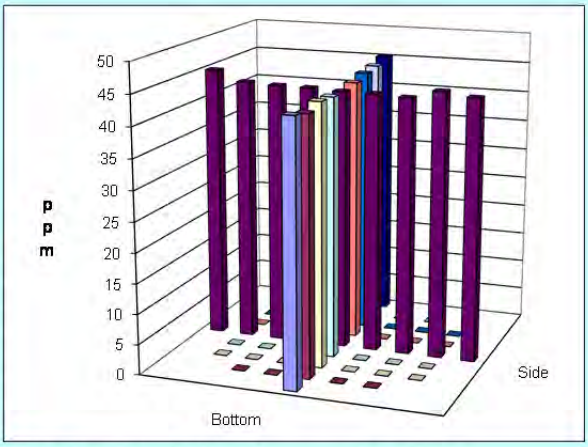
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	43.42		Mean	43.06	43.38	43.22
Min Point	42.47	-2.2%	Std. Dev.	0.45	0.69	0.58
Max Point	45.17	4.0%	COV as %	1.0	1.6	1.3

Avg. Conc. 43.496 ppm

	Start	Finish	
Tracer tank pressure	450	450	psig
Injection flowmeter	2.7	2.7	slpm
Stack Temp	44.5	53.7	°F
Mean stack velocity	3260	3375	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1033	1033	mbar
Ambient humidity	29%	28%	RH
Ambient Temp	60.8	67.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.43,.434,.43, .43,.407	.412, .409 ,.388, .372, .387	ppm
No. Bk-Gd samples	5	5	n

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/13/2013



Gas analyzer checked: 2/12/2013

Notes:

Entries made by:	XY	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/14/2013	Signature/date	2/28/2013

TRACER GAS TRAVERSE DATA FORM

Site	Modified LB-S1 Model	Run No.	GE-18
Date	2/14/2013	Fan Configuration	A & B
Testers	XY, EA	Fan Setting	33 Hz
Stack Dia.	11.89 in.	Stack Temp	55.8 deg F
Stack X-Area	111.0 in.^{2}	Start/End Time	1145/1300
Test Port	1	Center 2/3 from	1.09 to: 10.80
Distance to disturbance	123.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	Port2-Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	45.2	45.9	44.1	**45.1**	43.8	43.7	46.0	**44.5**
2	1.25	44.5	44.0	45.4	**44.6**	44.5	45.3	43.9	**44.6**
3	2.31	44.9	44.6	45.1	**44.9**	45.5	44.6	44.5	**44.9**
4	3.84	44.1	44.5	43.8	**44.1**	44.7	44.8	44.6	**44.7**
Center	5.95	45.0	44.7	45.4	**45.0**	44.3	44.3	44.7	**44.4**
5	8.05	44.7	44.1	45.1	**44.6**	44.5	45.3	44.5	**44.8**
6	9.58	44.8	46.7	44.7	**45.4**	46.1	44.8	45.2	**45.4**
7	10.64	45.3	44.8	46.8	**45.6**	45.8	45.9	46.2	**46.0**
8	11.39	45.9	44.6	45.6	**45.4**	47.6	46.6	47.0	**47.1**
Averages ---->		**44.9**	**44.9**	**45.1**	**45.0**	**45.2**	**45.0**	**45.2**	**45.1**

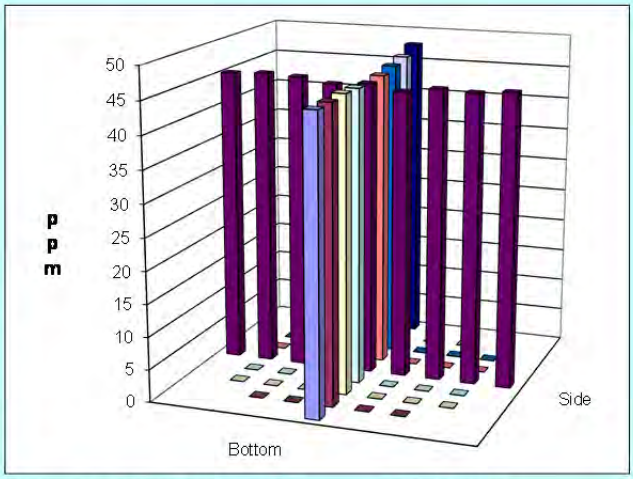
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	45.06		Mean	44.90	44.95	44.93
Min Point	44.13	-2.0%	Std. Dev.	0.51	0.54	0.50
Max Point	47.07	4.5%	COV as %	1.1	1.2	1.1

Avg. Conc. 45.096 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/13/2013

	Start	Finish	
Tracer tank pressure	100	100	psig
Injection flowmeter	3.2	3.2	slpm
Stack Temp	53.7	57.9	°F
Mean stack velocity	3318	3383	fpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1033	1033	mbar
Ambient humidity	28%	26%	RH
Ambient Temp	68.0	68.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	1,.3,.3,1,.4	10,9,9,10, 11	ppb
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 2/12/2013

Notes:

Entries made by:	Yu Xiao-Ying	Technical Data Review performed by:	Ernest Antonio
Signature/date	2/14/2013	Signature/date	2/28/2013

Appendix C

LV-S2 Data Sheets

C.1 LV-S2 Calibration of Ventilation Flow Controller

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	Run No.	FC-1
Date	3/27/13	Fan Configuration	FAN B
Testers	XY, CA	Fan Setting	35 Hz
Stack Dia.	11.969 in.	Stack Temp	72.5 deg F
Stack X-Area	112.5 in.2	Start/End Time	13:36/13:55
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Velocity units	aft/min	Data Files:	NA

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1594	1669	1631	**1631.3**	1527	1264	1424	**1405.0**
2	1.26	2137	2149	2112	**2132.7**	2042	2046	2107	**2065.0**
3	2.32	2310	2357	2327	**2331.3**	2264	2196	2251	**2237.0**
4	3.87	2300	2408	2438	**2382.0**	2378	2448	2462	**2429.3**
Center	5.98	2259	2415	2440	**2371.3**	2367	2411	2368	**2382.0**
5	8.10	2492	2413	2470	**2458.3**	2257	2256	2236	**2249.7**
6	9.65	2479	2406	2422	**2435.7**	2131	2136	2147	**2138.0**
7	10.71	2377	2324	2325	**2342.0**	2031	2048	2019	**2032.7**
8	11.47	2210	2150	2175	**2178.3**	1893	1905	1868	**1888.7**
Averages ———>		**2239.8**	**2254.6**	**2260.0**	**2251.4**	**2098.9**	**2078.9**	**2098.0**	**2091.9**

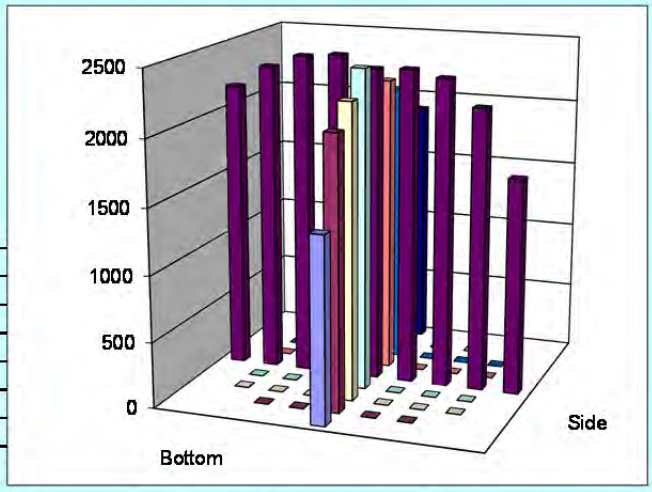
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2171.7		Mean	2350.5	2219.1	2284.8
Min Point	1405.0	-35.3%	Std. Dev.	106.6	151.1	143.0
Max Point	2458.3	13.2%	COV as %	4.5	6.8	6.3

Flow w/o C-Pt 1677 acfm
Vel Avg w/o C-Pt 2146 afpm

Instuments Used:

		Cal Due
TSI VelociCalc	T95351203001	12/10/13
Fisher Scientific Barometer	90936818	12/11/2013

	Start	Finish	
Stack temp	73	72	F
Equipment temp	N/A	N/A	F
Ambient temp	76.1	67.1	F
Stack static	N/A	N/A	mbars
Ambient pressure	29.94	29.94	in Hg
Total Stack pressure	N/A	N/A	mbars
Ambient humidity	30%	33%	RH



Notes:

CA 3/27/13

Entries made by:	Carmen Arimescu
Signature/date	3/27/2013
Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/11/2013
Signature on file with original TI-WTPSP-113	

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	Run No.	FC-2
Date	3/27/13	Fan Configuration	FAN A
Testers	XY, CA	Fan Setting	35 Hz
Stack Dia.	11.969 in.	Stack Temp	72.0 deg F
Stack X-Area	112.5 in.2	Start/End Time	1357/1418
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Velocity units	aft/min	Data Files:	NA

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1780	1672	1528	1660.0	1631	1256	1242	1376.3
2	1.26	2312	2260	2243	2271.7	2157	2177	2162	2165.3
3	2.32	2453	2425	2467	2448.3	2356	2380	2378	2371.3
4	3.87	2529	2475	2517	2507.0	2489	2486	2484	2486.3
Center	5.98	2520	2444	2526	2496.7	2456	2414	2424	2431.3
5	8.10	2528	2474	2523	2508.3	2421	2339	2370	2376.7
6	9.65	2507	2510	2528	2515.0	2290	2368	2290	2316.0
7	10.71	2430	2450	2434	2438.0	2177	2227	2177	2193.7
8	11.47	2219	2271	2257	2249.0	2024	2004	2072	2033.3
Averages ———>		2364.2	2331.2	2335.9	2343.8	2222.3	2183.4	2177.7	2194.5

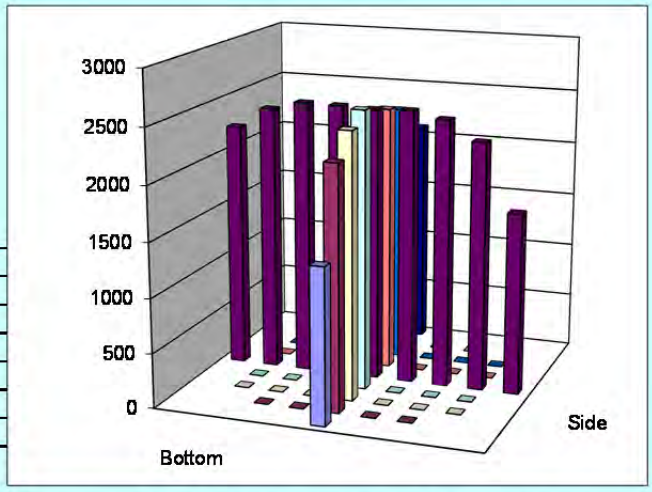
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	2269.1		Mean	2455.0	2334.4	2394.7
Min Point	1376.3	-39.3%	Std. Dev.	86.4	118.6	117.7
Max Point	2515.0	10.8%	COV as %	3.5	5.1	4.9

Flow w/o C-Pt 1754 acfm
Vel Avg w/o C-Pt 2245 afpm

Instuments Used:

		Cal Due
TSI VelociCalc	T95351203001	12/10/13
Fisher Scientific Barometer	90936818	12/11/2013

	Start	Finish	
Stack temp	72	72	F
Equipment temp	N/A	N/A	F
Ambient temp	66.2	67.1	F
Stack static	N/A	N/A	mbars
Ambient pressure	29.94	29.94	in Hg
Total Stack pressure	N/A	N/A	mbars
Ambient humidity	33%	34%	RH



Notes:

CA 3/27/13

Entries made by:	Carmen Arimescu
Signature/date	3/27/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/27/2013
Signature on file with original TI-WTPSP-113	

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	Run No.	FC-3
Date	4/9/13	Fan Configuration	Fan A
Testers	EA	Fan Setting	25 Hz
Stack Dia.	11.969 in.	Stack Temp	67.0 deg F
Stack X-Area	112.5 in.2	Start/End Time	1100/1135
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Velocity units	aft/min	Data Files:	NA

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1019	1357	1286	**1220.7**	1204	1620	1612	**1478.7**
2	1.26	1979	1904	1937	**1940.0**	1909	1978	1972	**1953.0**
3	2.32	2069	2076	2109	**2084.7**	2144	2165	2045	**2118.0**
4	3.87	2095	2117	2116	**2109.3**	2264	2220	2174	**2219.3**
Center	5.98	2118	2095	2067	**2093.3**	2198	2183	2098	**2159.7**
5	8.10	2109	2135	2102	**2115.3**	2215	2111	2040	**2122.0**
6	9.65	2108	2113	2113	**2111.3**	2123	2038	2001	**2054.0**
7	10.71	2077	2079	2038	**2064.7**	1964	1968	1910	**1947.3**
8	11.47	1915	1869	1912	**1898.7**	1855	1843	1785	**1827.7**
Averages ———>		**1943.2**	**1971.7**	**1964.4**	**1959.8**	**1986.2**	**2014.0**	**1959.7**	**1986.6**

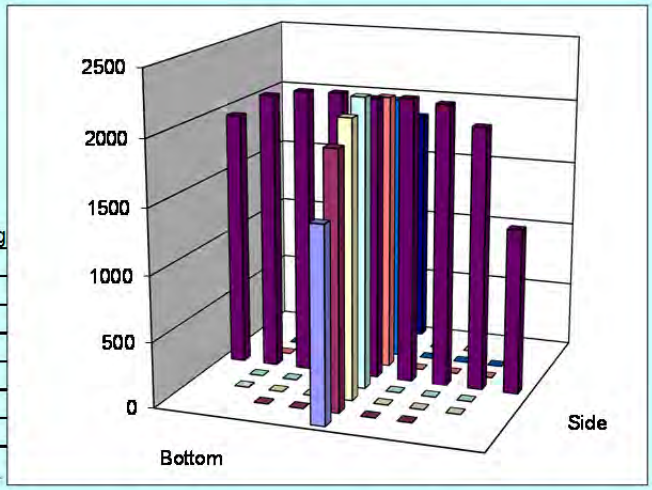
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	1973.2		Mean	2074.1	2081.9	2078.0
Min Point	1220.7	-38.1%	Std. Dev.	61.8	102.8	81.5
Max Point	2219.3	12.5%	COV as %	3.0	4.9	3.9

Flow w/o C-Pt 1527 acfm
Vel Avg w/o C-Pt 1954 afpm

Instuments Used:

		Cal Due
TSI VelociCalc	T95351203001	12/10/13
Fisher Scientific Barometer	90936818	12/11/2013

	Start	Finish	
Stack temp	68	66	F
Equipment temp	NA	NA	F
Ambient temp	55	60	F
Stack static	NA	NA	mbars
Ambient pressure	30.15	30.18	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	44%	38.00	RH



Notes: The Wye intersection was installed this morning combining both fans into one output. The output was Connected to Fan A back draft damper.

EA 4/9/2013

Entries made by:	Carmen Arimescu
Signature/date	4/9/2013
Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/27/2013
Signature on file with original TI-WTPSP-113	

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	Run No.	FC-4
Date	4/17/13	Fan Configuration	Fan B
Testers	EA, CA	Fan Setting	35 Hz
Stack Dia.	11.969 in.	Stack Temp	61.5 deg F
Stack X-Area	112.5 in.2	Start/End Time	1108/1130
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Velocity units	aft/min	Data Files:	NA

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1931	2298	2187	**2138.7**	1653	2290	2101	**2014.7**
2	1.26	2761	2744	2711	**2738.7**	2690	2672	2656	**2672.7**
3	2.32	2890	2922	2890	**2900.7**	2905	2890	2870	**2888.3**
4	3.87	2953	2985	2978	**2972.0**	3144	3199	3005	**3116.0**
Center	5.98	2953	2967	2955	**2958.3**	3113	3196	2939	**3082.7**
5	8.10	2969	2970	2975	**2971.3**	2975	3166	2930	**3023.7**
6	9.65	2982	2967	2969	**2972.7**	2952	3089	2837	**2959.3**
7	10.71	2923	2920	2928	**2923.7**	2758	2798	2717	**2757.7**
8	11.47	2762	2748	2756	**2755.3**	2524	2623	2555	**2567.3**
Averages ———>		**2791.6**	**2835.7**	**2816.6**	**2814.6**	**2746.0**	**2880.3**	**2734.4**	**2786.9**

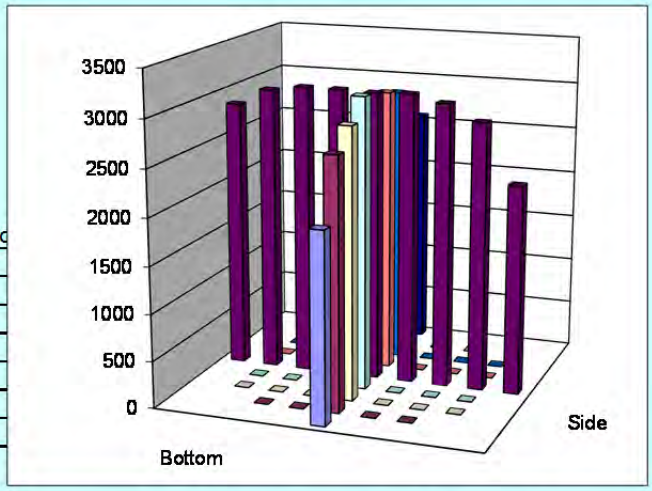
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	2800.8		Mean	2919.6	2928.6	2924.1
Min Point	2014.7	-28.1%	Std. Dev.	84.5	165.9	126.6
Max Point	3116.0	11.3%	COV as %	2.9	5.7	4.3

Flow w/o C-Pt 2167 acfm
Vel Avg w/o C-Pt 2773 afpm

Instuments Used:

		Cal Due
TSI VelociCalc	T95351203001	12/10/13
Fisher Scientific Barometer	90936818	12/11/2013

	Start	Finish	
Stack temp	61	62	F
Equipment temp	NA	NA	F
Ambient temp	52.7	54.1	F
Stack static	NA	NA	mbars
Ambient pressure	30.30	30.30	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	29%	29.00	RH



Notes: The Fans output were routed to the Wye Junctic
and the output of the Wye Juction was connected to Fan B
back draft damper.

CA 4/17/13

Entries made by:	Carmen Arimescu
Signature/date	4/17/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 5/27/2013
Signature on file with original TI-WTPSP-113

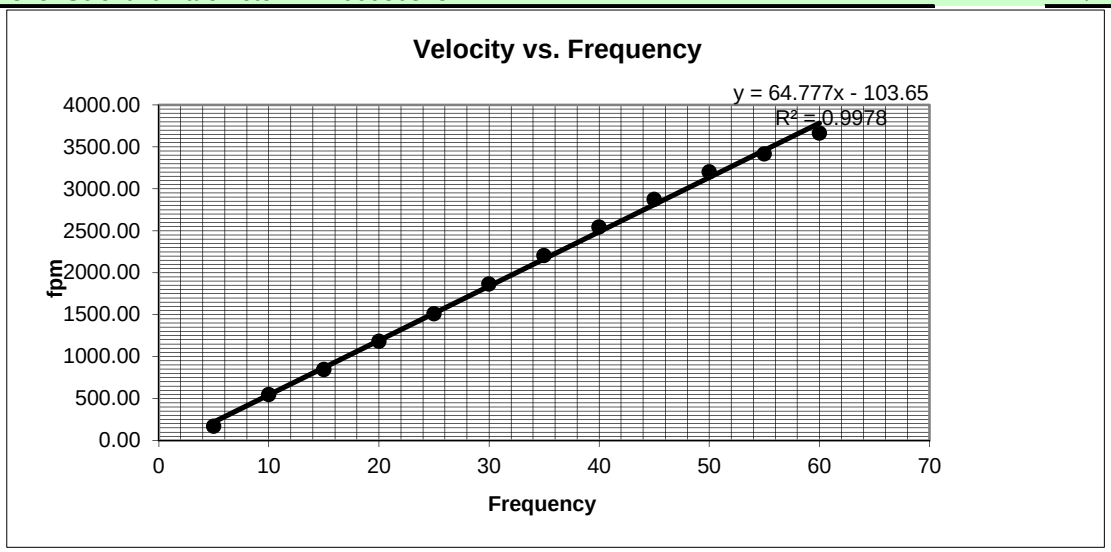
VELOCITY vs. FREQUENCY DATA FORM

Site	**LV-S2 Model**		Run No.	**VF-1**	
Date	3/27/2013		Stack Temp	84	
Tester	XY, CA		Stack RH%		
Stack Dia.	11.969	in.	Baro Press	29.97	
Stack X-Area	112.5	in2	Fan Configuration	Fan A	
Test Port	1		Start/End Time	1435/1518	
Dist. from disturbance	221.12	inches	Reference point from velocity test VC :		Side 8
Velocity Readings, units =		afpm			

	Target acfm	Target afpm	Estmtd Hz	
	3034	4636	73.1	max
	2004	3062	48.8	normal
	1176	1798	29.3	min

	afpm						
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	82	218	210	170.00	76.32	152.63	132.83
10	554	520	569	547.67	25.11	50.21	427.92
15	865	838	835	846.00	16.52	33.05	661.02
20	1216	1173	1152	1180.33	32.62	65.25	922.25
25	1562	1496	1466	1508.00	49.11	98.22	1178.27
30	1908	1850	1835	1864.33	38.55	77.11	1456.69
35	2240	2195	2179	2204.67	31.63	63.26	1722.61
40	2606	2518	2513	2545.67	52.31	104.62	1989.05
45	2915	2860	2848	2874.33	35.73	71.45	2245.85
50	3306	3142	3152	3200.00	91.93	183.87	2500.31
55	3386	3429	3434	3416.33	26.39	52.78	2669.34
60	3522	3758	3706	3662.00	124.00	248.00	2861.29

Instuments Used:		**Cal Exp. Date:**
TSI VelociCalc	T95351203001	12/10/2013
Fisher Scientific Barometer	90936818	12/11/2013



Entries made by:	Carmen Arimescu	Technical Data Review performed by:	ELG
Signature/date	3/27/2013	Signature/date	5/27/2013
		Signature on file with original TI-WTPSP-113	

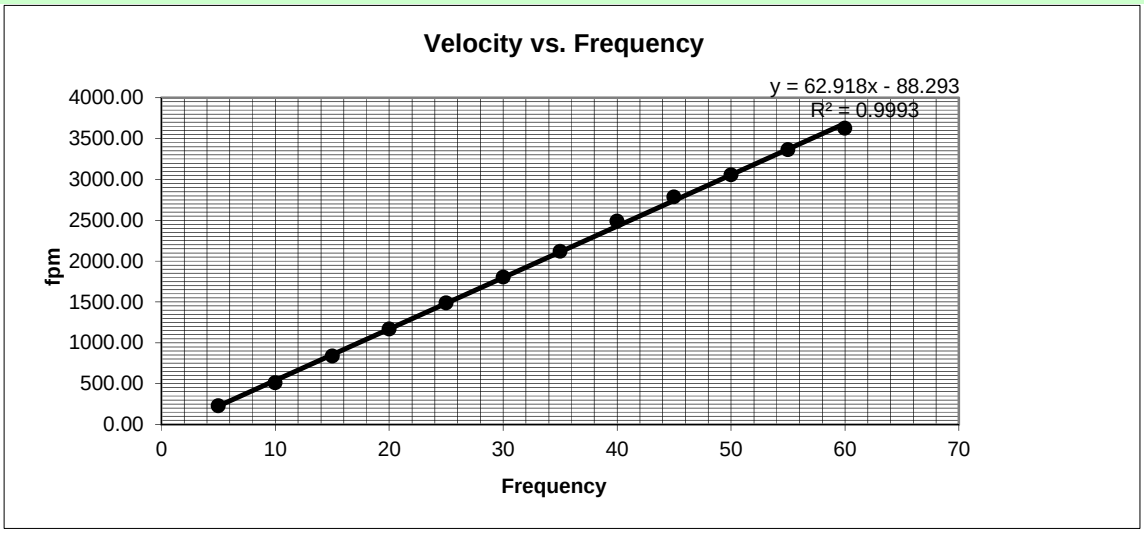
VELOCITY vs. FREQUENCY DATA FORM

Site	**LV-S2 model**		Run No.	**VF-2**
Date	3/27/2013		Stack Temp	77
Tester	EA,CA		Stack RH%	NA
Stack Dia.	11.969	in.	Baro Press	29.94
Stack X-Area	112.5	in2	Fan Configuration	Fan B
Test Port	1		Start/End Time	323/350
Dist. from disturbance	221.12	inches	Reference point from velocity test VC :	Bottom 6
Velocity Readings, units =		afpm		

	Target acfm	Target afpm	Estmtd Hz	
	3034	4636	75	max
	2004	3062	48.6	normal
	1176	1798	29.9	min

	afpm						
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	220	274	192	228.67	41.68	83.36	178.67
10	508	520	505	511.00	7.94	15.87	399.27
15	816	872	827	838.33	29.67	59.34	655.03
20	1145	1201	1160	1168.67	28.99	57.98	913.13
25	1497	1500	1469	1488.67	17.10	34.20	1163.16
30	1816	1794	1798	1802.67	11.72	23.44	1408.51
35	2140	2103	2121	2121.33	18.50	37.00	1657.49
40	2571	2409	2481	2487.00	81.17	162.33	1943.21
45	2768	2771	2819	2786.00	28.62	57.24	2176.83
50	3059	3043	3070	3057.33	13.58	27.15	2388.83
55	3358	3368	3361	3362.33	5.13	10.26	2627.14
60	3632	3674	3574	3626.67	50.21	100.43	2833.68

Instuments Used:		**Cal Exp. Date:**
TSI VelociCalc	T95351203001	12/10/2013
Fisher Scientific Barometer	90936818	12/11/2013



Entries made by:	Carmen Arimescu	Technical Data Review performed by:	ELG
Signature/date	3/27/2013	Signature/date	5/12/2013
		Signature on file with original TI-WTPSP-113	

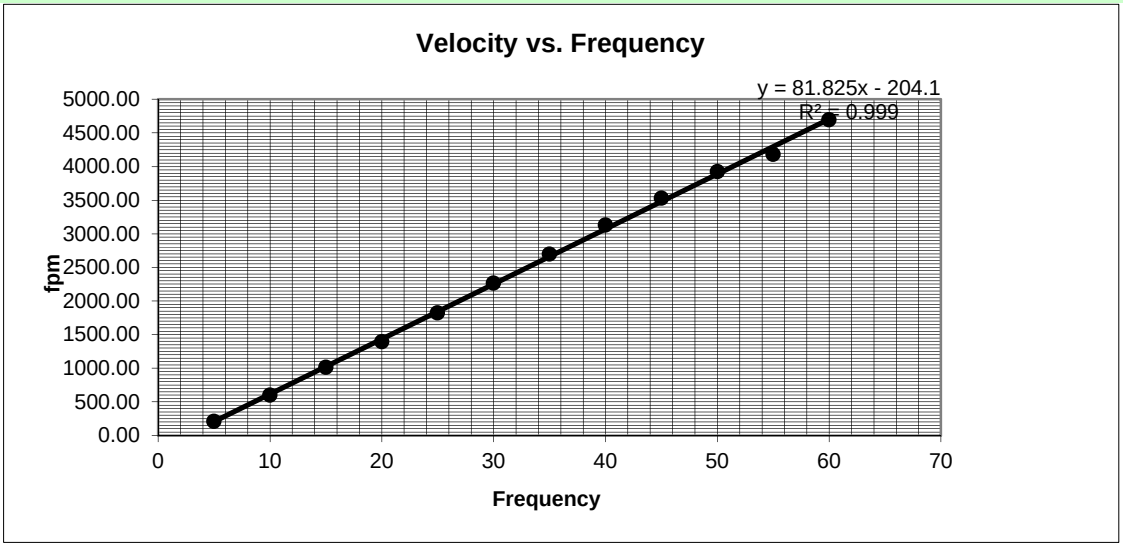
VELOCITY vs. FREQUENCY DATA FORM

Site	**LV-S2 model**	Run No.	**VF-3**
Date	4/9/2013	Stack Temp	67
Tester	EA, CA	Stack RH%	NA
Stack Dia.	11.969 in.	Baro Press	30.21
Stack X-Area	112.5 in2	Fan Configuration	Fan A
Test Port	1	Start/End Time	131/220
Dist. from disturbance	221.12 inches	Reference point from velocity test VC :	Bottom 2
Velocity Readings, units =	afpm		

Target acfm	Target afpm	Estmtd Hz	
3034	4636	59.1	max
2004	3062	39.9	normal
1176	1798	24.4	min

	afpm						
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	192	206	230	209.33	19.22	38.44	163.56
10	592	573	630	598.33	29.02	58.05	467.51
15	1000	1023	1020	1014.33	12.50	25.01	792.54
20	1374	1410	1403	1395.67	19.09	38.18	1090.50
25	1828	1826	1813	1822.33	8.14	16.29	1423.87
30	2290	2254	2245	2263.00	23.81	47.62	1768.18
35	2689	2735	2662	2695.33	36.91	73.82	2105.99
40	3140	3131	3121	3130.67	9.50	19.01	2446.13
45	3572	3532	3491	3531.67	40.50	81.00	2759.45
50	3985	3889	3900	3924.67	52.54	105.08	3066.52
55	4021	4233	4290	4181.33	141.75	283.49	3267.07
60	4820	4641	4627	4696.00	107.62	215.23	3669.20

Instuments Used:		**Cal Exp. Date:**
TSI VelociCalc	T95351203001	12/10/2013
Fisher Scientific Barometer	90936818	12/11/2013



Entries made by:	Carmen Arimescu	Technical Data Review performed by:	ELG
Signature/date	4/9/2013	Signature/date	5/12/2013
		Signature on file with original TI-WTPSP-113	

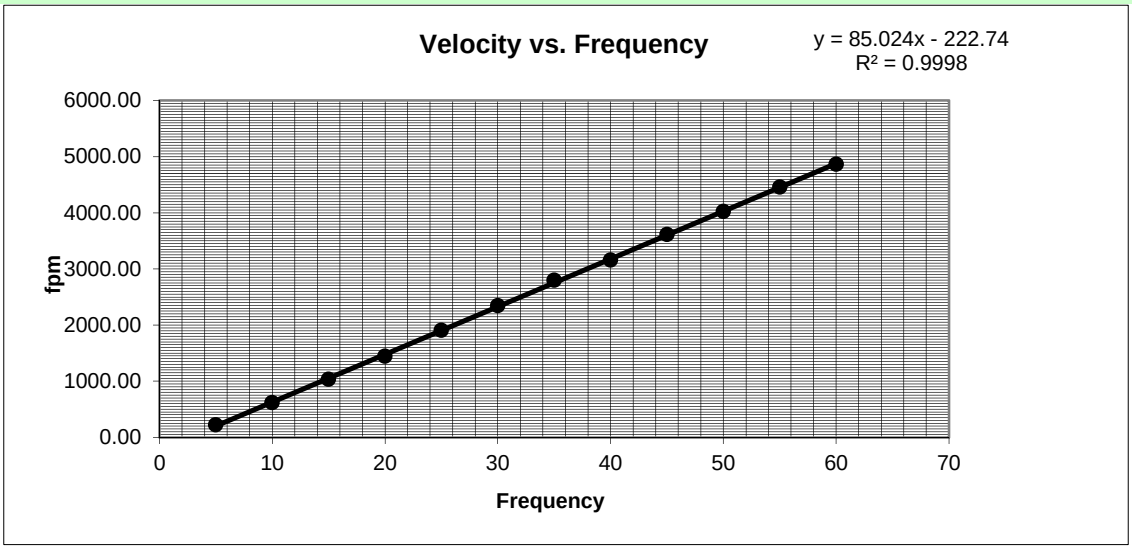
VELOCITY vs. FREQUENCY DATA FORM

Site	**LV-S2 model**	Run No.	**VF-4**
Date	4/17/2013	Stack Temp	74
Tester	EA, Ca	Stack RH%	na
Stack Dia.	11.969 in.	Baro Press	30.33
Stack X-Area	112.5 in2	Fan Configuration	Fan B
Test Port	1	Start/End Time	1316/1345
Dist. from disturbance	221.12 inches	Reference point from velocity test VC :	Bottom 7
Velocity Readings, units =	afpm		

Target acfm	Target afpm	Estmtd Hz	
3034	4636	57.1	max
2004	3062	38.6	normal
1176	1798	23.7	min

	afpm						
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	212	239	222	224.33	13.65	27.30	175.28
10	611	624	614	616.33	6.81	13.61	481.57
15	1060	1033	1015	1036.00	22.65	45.30	809.47
20	1481	1421	1429	1443.67	32.58	65.16	1128.00
25	1974	1876	1863	1904.33	60.68	121.36	1487.94
30	2327	2440	2276	2347.67	83.93	167.86	1834.34
35	2836	2834	2718	2796.00	67.56	135.11	2184.64
40	3190	3195	3086	3157.00	61.54	123.08	2466.71
45	3652	3638	3555	3615.00	52.43	104.86	2824.56
50	4105	4074	3895	4024.67	113.36	226.72	3144.66
55	4468	4599	4313	4460.00	143.17	286.34	3484.80
60	4875	4955	4754	4861.33	101.19	202.39	3798.38

Instuments Used:		**Cal Exp. Date:**
TSI VelociCalc	T95351203001	12/10/2013
Fisher Scientific Barometer	90936818	12/11/2013



Entries made by:	Carmen Arimescu	Technical Data Review performed by:	ELG
Signature/date	4/17/2013	Signature/date	5/27/2013
		Signature on file with original TI-WTPSP-113	

C.2 LV-S2 Velocity Uniformity Data Sheets

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	Run No.	VT-1		
Date	3/29/13	Fan Configuration	Fan B		
Testers	EA, CA	Fan Setting	27	Hz	
Stack Dia.	11.969 in.	Stack Temp	75	deg F	
Stack X-Area	112.5 in.2	Start/End Time	1320/1344		
Test Port	1	Center 2/3 from	1.10	to:	10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2	to:	7
Velocity units	s ft/min	Data Files:	NA		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1080	1146	1133	**1119.7**	639	1052	1129	**940.0**
2	1.26	1521	1521	1479	**1507.0**	1506	1502	1485	**1497.7**
3	2.32	1600	1647	1652	**1633.0**	1640	1636	1659	**1645.0**
4	3.87	1675	1672	1696	**1681.0**	1727	1706	1771	**1734.7**
Center	5.98	1697	1704	1695	**1698.7**	1701	1687	1703	**1697.0**
5	8.10	1721	1713	1733	**1722.3**	1637	1644	1650	**1643.7**
6	9.65	1713	1715	1706	**1711.3**	1575	1601	1583	**1586.3**
7	10.71	1652	1660	1644	**1652.0**	1508	1495	1503	**1502.0**
8	11.47	1491	1497	1509	**1499.0**	1395	1412	1395	**1400.7**
Averages ---->		**1572.2**	**1586.1**	**1583.0**	**1580.4**	**1480.9**	**1526.1**	**1542.0**	**1516.3**

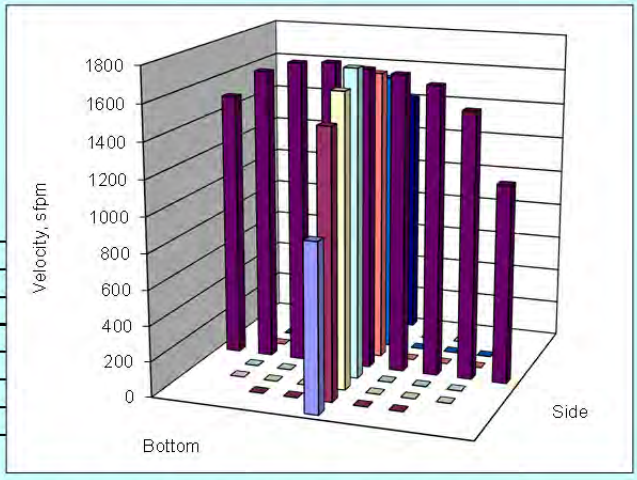
All	**s ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**1548.4**		**Mean**	**1657.9**	**1615.2**	**1636.5**
Min Point	**940.0**	**-39.3%**	**Std. Dev.**	**73.7**	**91.4**	**82.8**
Max Point	**1734.7**	**12.0%**	**COV as %**	**4.4**	**5.7**	**5.1**

Flow w/o C-Pt **1195** acfm
Vel Avg w/o C-Pt **1530** afpm

Instuments Used: Cal Due

Fishcer Scientific Barometer SN 90936818	12/11/13
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	72	77	F
Equipment temp	NA	NA	F
Ambient temp	80.6	75.2	F
Stack static	NA	NA	mbars
Ambient pressure	30.09	30.12	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	22%	24%	RH



Notes: 1678 Measured at Bottom 6

CA 3/29/13

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	3/29/2013	Signature/date	6/11/2013
		Signature on file with original	TI-WTPSP-114

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	**Run No.**	VT-2		
Date	3/29/13	**Fan Configuration**	Fan B		
Testers	EA, CA	**Fan Setting**	27 Hz		
Stack Dia.	11.969 in.	**Stack Temp**	79 deg F		
Stack X-Area	112.5 in.2	**Start/End Time**	1346/207		
Test Port	1	**Center 2/3 from**	1.10	to:	10.87
Distance to disturbance	221.12 inches	**Points in Center 2/3**	2	to:	7
Velocity units	s ft/min	**Data Files:**	NA		

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial –->		**1**	**2**	**3**	**Mean**	**1**	**2**	**3**	**Mean**
Point	**Depth, in.**	**Velocity**				**Velocity**			
1	0.50	1132	1208	1144	**1161.3**	614	1166	851	**877.0**
2	1.26	1518	1541	1535	**1531.3**	1464	1502	1505	**1490.3**
3	2.32	1629	1657	1627	**1637.7**	1631	1645	1607	**1627.7**
4	3.87	1710	1715	1674	**1699.7**	1718	1716	1710	**1714.7**
Center	5.98	1694	1702	1722	**1706.0**	1689	1713	1705	**1702.3**
5	8.10	1713	1714	1732	**1719.7**	1700	1641	1655	**1665.3**
6	9.65	1733	1722	1716	**1723.7**	1576	1572	1570	**1572.7**
7	10.71	1641	1616	1670	**1642.3**	1467	1490	1493	**1483.3**
8	11.47	1523	1517	1507	**1515.7**	1383	1312	1384	**1359.7**
Averages ———->		**1588.1**	**1599.1**	**1591.9**	**1593.0**	**1471.3**	**1528.6**	**1497.8**	**1499.2**

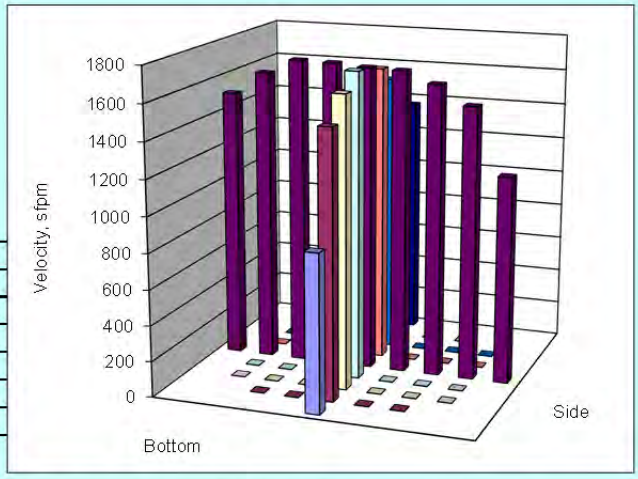
All	**s ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**1546.1**		**Mean**	**1665.8**	**1608.0**	**1636.9**
Min Point	**877.0**	**-43.3%**	**Std. Dev.**	**68.8**	**95.4**	**85.3**
Max Point	**1723.7**	**11.5%**	**COV as %**	**4.1**	**5.9**	**5.2**

Flow w/o C-Pt **1193** acfm
Vel Avg w/o C-Pt **1526** afpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/13
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	80	78	F
Equipment temp	NA	NA	F
Ambient temp	75.2	73.4	F
Stack static	NA	NA	mbars
Ambient pressure	30.12	30.12	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	24%	26%	RH



Notes:

CA 3/29/13

Entries made by:	Carmen Arimescu
Signature/date	3/29/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 5/12/2013
Signature on file with original TI-WTPSP-114

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	**Run No.**	VT-3		
Date	3/29/13	**Fan Configuration**	Fan B		
Testers	EA, CA	**Fan Setting**	27 Hz		
Stack Dia.	11.969 in.	**Stack Temp**	78 deg F		
Stack X-Area	112.5 in.2	**Start/End Time**	210/229		
Test Port	1	**Center 2/3 from**	1.10	to:	10.87
Distance to disturbance	221.12 inches	**Points in Center 2/3**	2	to:	7
Velocity units	s ft/min	**Data Files:**	NA		

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial –->		**1**	**2**	**3**	**Mean**	**1**	**2**	**3**	**Mean**
Point	**Depth, in.**	**Velocity**				**Velocity**			
1	0.50	1055	1023	1055	**1044.3**	836	862	719	**805.7**
2	1.26	1572	1526	1500	**1532.7**	1492	1533	1522	**1515.7**
3	2.32	1626	1617	1636	**1626.3**	1648	1609	1648	**1635.0**
4	3.87	1716	1706	1691	**1704.3**	1707	1733	1738	**1726.0**
Center	5.98	1709	1679	1734	**1707.3**	1695	1714	1692	**1700.3**
5	8.10	1732	1731	1716	**1726.3**	1651	1641	1666	**1652.7**
6	9.65	1695	1707	1765	**1722.3**	1587	1575	1598	**1586.7**
7	10.71	1663	1652	1667	**1660.7**	1494	1495	1482	**1490.3**
8	11.47	1558	1584	1546	**1562.7**	1374	1368	1363	**1368.3**
Averages ———->		**1591.8**	**1580.6**	**1590.0**	**1587.4**	**1498.2**	**1503.3**	**1492.0**	**1497.9**

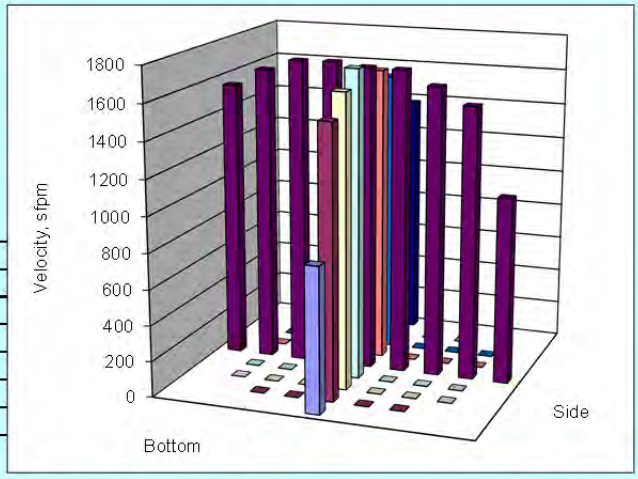
All	**s ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**1542.6**		**Mean**	**1668.6**	**1615.2**	**1641.9**
Min Point	**805.7**	**-47.8%**	**Std. Dev.**	**69.9**	**89.1**	**81.8**
Max Point	**1726.3**	**11.9%**	**COV as %**	**4.2**	**5.5**	**5.0**

Flow w/o C-Pt **1190** acfm
Vel Avg w/o C-Pt **1523** afpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/13
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	78	78	F
Equipment temp	NA	NA	F
Ambient temp	73.4	73.4	F
Stack static	NA	NA	mbars
Ambient pressure	30.12	30.12	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	26%	25%	RH



Notes:

CA 3/29/13

Entries made by:	Carmen Arimescu
Signature/date	3/29/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 5/12/2013
Signature on file with original TI-WTPSP-114

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	**Run No.**	VT-4		
Date	3/29/13	**Fan Configuration**	Fan A		
Testers	EA, CA	**Fan Setting**	27 Hz		
Stack Dia.	11.969 in.	**Stack Temp**	77 deg F		
Stack X-Area	112.5 in.2	**Start/End Time**	230/1502		
Test Port	1	**Center 2/3 from**	1.10	to:	10.87
Distance to disturbance	221.12 inches	**Points in Center 2/3**	2	to:	7
Velocity units	s ft/min	**Data Files:**	NA		

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial –->		**1**	**2**	**3**	**Mean**	**1**	**2**	**3**	**Mean**
Point	**Depth, in.**	**Velocity**				**Velocity**			
1	0.50	1256	1204	1177	**1212.3**	611	965	988	**854.7**
2	1.26	1658	1662	1611	**1643.7**	1633	1648	1652	**1644.3**
3	2.32	1828	1786	1761	**1791.7**	1780	1781	1788	**1783.0**
4	3.87	1850	1839	1837	**1842.0**	1850	1860	1864	**1858.0**
Center	5.98	1827	1855	1825	**1835.7**	1814	1849	1854	**1839.0**
5	8.10	1881	1874	1842	**1865.7**	1788	1771	1773	**1777.3**
6	9.65	1857	1861	1858	**1858.7**	1722	1733	1705	**1720.0**
7	10.71	1802	1813	1822	**1812.3**	1654	1653	1648	**1651.7**
8	11.47	1651	1665	1663	**1659.7**	1512	1562	1502	**1525.3**
Averages ———->		**1734.4**	**1728.8**	**1710.7**	**1724.6**	**1596.0**	**1646.9**	**1641.6**	**1628.1**

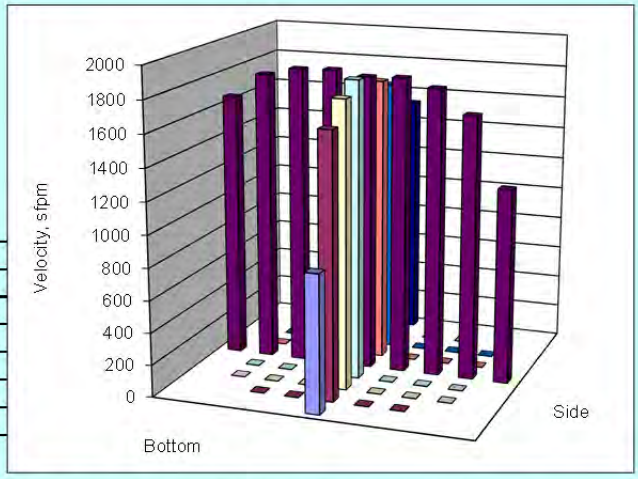
All	**s ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**1676.4**		**Mean**	**1807.1**	**1753.3**	**1780.2**
Min Point	**854.7**	**-49.0%**	**Std. Dev.**	**76.5**	**84.7**	**82.4**
Max Point	**1865.7**	**11.3%**	**COV as %**	**4.2**	**4.8**	**4.6**

Flow w/o C-Pt **1294** acfm
Vel Avg w/o C-Pt **1656** afpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/13
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	78	76	F
Equipment temp	NA	NA	F
Ambient temp	75.2	73.4	F
Stack static	NA	NA	mbars
Ambient pressure	30.12	30.12	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	24%	26%	RH



Notes:

CA 3/29/13

Entries made by:	Carmen Arimescu
Signature/date	3/29/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/12/2013
Signature on file with original TI-WTPSP-114	

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	**Run No.**	VT-5		
Date	3/29/13	**Fan Configuration**	Fan A		
Testers	EA, CA	**Fan Setting**	27 Hz		
Stack Dia.	11.969 in.	**Stack Temp**	78 deg F		
Stack X-Area	112.5 in.2	**Start/End Time**	1505/1538		
Test Port	1	**Center 2/3 from**	1.10	to:	10.87
Distance to disturbance	221.12 inches	**Points in Center 2/3**	2	to:	7
Velocity units	s ft/min	**Data Files:**	NA		

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial –->		**1**	**2**	**3**	**Mean**	**1**	**2**	**3**	**Mean**
Point	**Depth, in.**	**Velocity**				**Velocity**			
1	0.50	1221	1243	1168	**1210.7**	846	961	950	**919.0**
2	1.26	1669	1683	1639	**1663.7**	1679	1648	1640	**1655.7**
3	2.32	1776	1757	1778	**1770.3**	1803	1779	1771	**1784.3**
4	3.87	1841	1857	1838	**1845.3**	1864	1887	1856	**1869.0**
Center	5.98	1846	1855	1900	**1867.0**	1840	1820	1830	**1830.0**
5	8.10	1869	1865	1870	**1868.0**	1806	1765	1763	**1778.0**
6	9.65	1854	1831	1884	**1856.3**	1708	1699	1707	**1704.7**
7	10.71	1809	1758	1783	**1783.3**	1669	1609	1629	**1635.7**
8	11.47	1653	1663	1643	**1653.0**	1555	1477	1487	**1506.3**
Averages ———->		**1726.4**	**1723.6**	**1722.6**	**1724.2**	**1641.1**	**1627.2**	**1625.9**	**1631.4**

All	**s ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**1677.8**		**Mean**	**1807.7**	**1751.0**	**1779.4**
Min Point	**919.0**	**-45.2%**	**Std. Dev.**	**74.9**	**88.1**	**83.9**
Max Point	**1869.0**	**11.4%**	**COV as %**	**4.1**	**5.0**	**4.7**

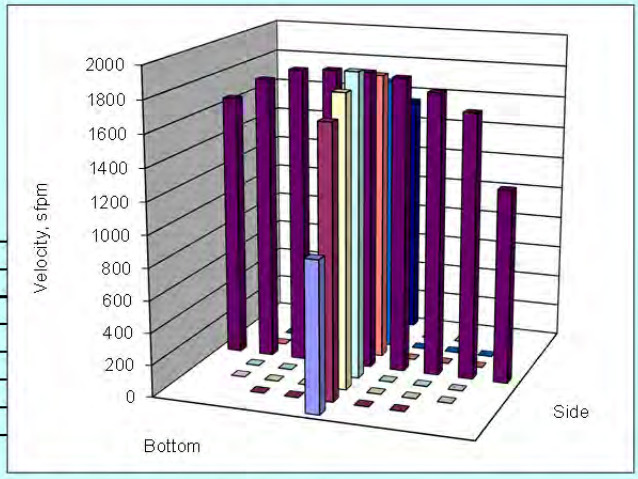
Flow w/o C-Pt **1294** acfm
Vel Avg w/o C-Pt **1656** afpm

Instuments Used: Cal Due

Fishcer Scientific Barometer SN 90936818 12/11/13

TSI VelociCalc SN T95351203001 12/10/2013

	Start	Finish	
Stack temp	78.6	77	F
Equipment temp	NA	NA	F
Ambient temp	75.2	75.2	F
Stack static	NA	NA	mbars
Ambient pressure	30.12	30.12	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	25%	25%	RH



Notes:

CA 3/29/13

Entries made by:	Carmen Arimescu
Signature/date	3/29/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 5/27/2013
Signature on file with original TI-WTPSP-114

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	**Run No.**	VT-6		
Date	3/29/13	**Fan Configuration**	Fan A		
Testers	EA, CA	**Fan Setting**	27 Hz		
Stack Dia.	11.969 in.	**Stack Temp**	75 deg F		
Stack X-Area	112.5 in.2	**Start/End Time**	1538/1600		
Test Port	1	**Center 2/3 from**	1.10	to:	10.87
Distance to disturbance	221.12 inches	**Points in Center 2/3**	2	to:	7
Velocity units	s ft/min	**Data Files:**	NA		

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial –->		**1**	**2**	**3**	**Mean**	**1**	**2**	**3**	**Mean**
Point	**Depth, in.**	**Velocity**				**Velocity**			
1	0.50	1240	1225	1275	**1246.7**	1063	1166	1050	**1093.0**
2	1.26	1669	1661	1655	**1661.7**	1629	1656	1613	**1632.7**
3	2.32	1795	1749	1786	**1776.7**	1758	1762	1758	**1759.3**
4	3.87	1838	1807	1825	**1823.3**	1850	1858	1862	**1856.7**
Center	5.98	1843	1827	1831	**1833.7**	1845	1837	1824	**1835.3**
5	8.10	1855	1845	1890	**1863.3**	1771	1797	1762	**1776.7**
6	9.65	1879	1854	1886	**1873.0**	1724	1721	1724	**1723.0**
7	10.71	1851	1786	1796	**1811.0**	1652	1653	1682	**1662.3**
8	11.47	1655	1644	1656	**1651.7**	1549	1501	1541	**1530.3**
Averages ———->		**1736.1**	**1710.9**	**1733.3**	**1726.8**	**1649.0**	**1661.2**	**1646.2**	**1652.1**

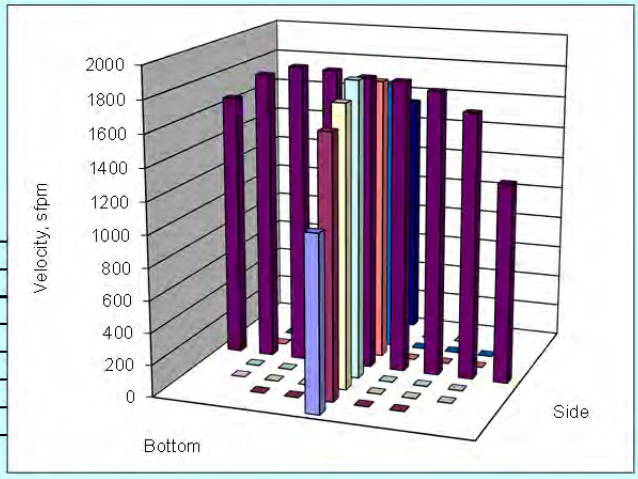
All	**s ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**1689.5**		**Mean**	**1806.1**	**1749.4**	**1777.8**
Min Point	**1093.0**	**-35.3%**	**Std. Dev.**	**71.4**	**83.3**	**80.1**
Max Point	**1873.0**	**10.9%**	**COV as %**	**4.0**	**4.8**	**4.5**

Flow w/o C-Pt **1306** acfm
Vel Avg w/o C-Pt **1671** afpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/13
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	77	73.6	F
Equipment temp	NA	NA	F
Ambient temp	75.2	74.3	F
Stack static	NA	NA	mbars
Ambient pressure	30.12	30.15	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	24%	26%	RH



Notes:

CA 3/29/13

Entries made by:	Carmen Arimescu
Signature/date	3/29/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 5/12/2013
Signature on file with original TI-WTPSP-114

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	**Run No.**	VT-7		
Date	4/10/13	**Fan Configuration**	Fan A		
Testers	EA, CA	**Fan Setting**	59 Hz		
Stack Dia.	11.969 in.	**Stack Temp**	59 deg F		
Stack X-Area	112.5 in.2	**Start/End Time**	900/940		
Test Port	1	**Center 2/3 from**	1.10	to:	10.87
Distance to disturbance	221.12 inches	**Points in Center 2/3**	2	to:	7
Velocity units	s ft/min	**Data Files:**	NA		

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial –->		**1**	**2**	**3**	**Mean**	**1**	**2**	**3**	**Mean**
Point	**Depth, in.**	**Velocity**				**Velocity**			
1	0.50	3631	3787	3796	**3738.0**	3681	3570	3419	**3556.7**
2	1.26	4452	4428	4380	**4420.0**	4469	4500	4439	**4469.3**
3	2.32	4790	4797	4771	**4786.0**	4868	4842	4857	**4855.7**
4	3.87	4935	4973	4928	**4945.3**	5123	5133	5090	**5115.3**
Center	5.98	4901	4935	4866	**4900.7**	5132	5102	5074	**5102.7**
5	8.10	4906	4972	4882	**4920.0**	5020	4928	4997	**4981.7**
6	9.65	5019	4909	4926	**4951.3**	4882	4888	4887	**4885.7**
7	10.71	4866	4829	4927	**4874.0**	4792	4752	4764	**4769.3**
8	11.47	4640	4651	4619	**4636.7**	4428	4419	4411	**4419.3**
Averages ———->		**4682.2**	**4697.9**	**4677.2**	**4685.8**	**4710.6**	**4681.6**	**4659.8**	**4684.0**

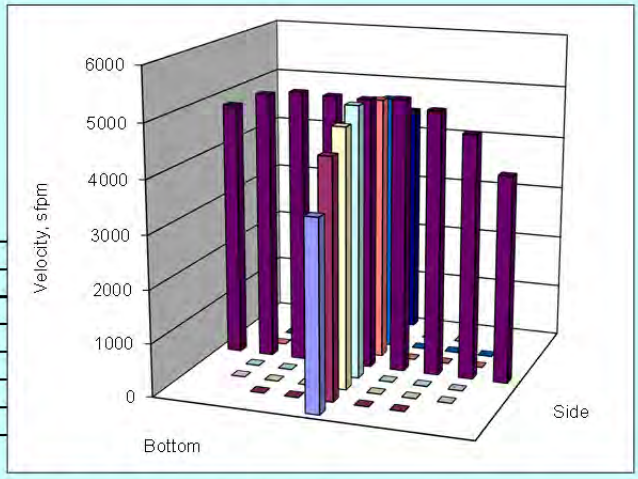
All	**s ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**4684.9**		**Mean**	**4828.2**	**4882.8**	**4855.5**
Min Point	**3556.7**	**-24.1%**	**Std. Dev.**	**188.4**	**222.4**	**200.1**
Max Point	**5115.3**	**9.2%**	**COV as %**	**3.9**	**4.6**	**4.1**

Flow w/o C-Pt **3630** acfm
Vel Avg w/o C-Pt **4645** afpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/13
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	58	59.6	F
Equipment temp	NA	NA	F
Ambient temp	57.2	58.1	F
Stack static	NA	NA	mbars
Ambient pressure	30.24	30.24	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	36%	38%	RH



Notes: Air flow coming from Fan A and B.
WYE junction.

CA 4/10/13

Entries made by:	Carmen Arimescu
Signature/date	4/10/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 5/12/2013
Signature on file with original TI-WTPSP-114

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	**Run No.**	VT-8		
Date	4/10/13	**Fan Configuration**	Fan A		
Testers	EA, CA	**Fan Setting**	55 Hz		
Stack Dia.	11.969 in.	**Stack Temp**	60 deg F		
Stack X-Area	112.5 in.2	**Start/End Time**	944/1006		
Test Port	1	**Center 2/3 from**	1.10	to:	10.87
Distance to disturbance	221.12 inches	**Points in Center 2/3**	2	to:	7
Velocity units	s ft/min	**Data Files:**	NA		

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial –->		**1**	**2**	**3**	**Mean**	**1**	**2**	**3**	**Mean**
Point	**Depth, in.**	**Velocity**				**Velocity**			
1	0.50	3444	3357	3709	**3503.3**	3329	3475	3319	**3374.3**
2	1.26	4166	4169	4260	**4198.3**	4099	4114	4153	**4122.0**
3	2.32	4501	4499	4567	**4522.3**	4479	4463	4464	**4468.7**
4	3.87	4708	4705	4770	**4727.7**	4728	4728	4689	**4715.0**
Center	5.98	4716	4747	4756	**4739.7**	4653	4567	4569	**4596.3**
5	8.10	4744	4758	4738	**4746.7**	4498	4618	4541	**4552.3**
6	9.65	4710	4746	4739	**4731.7**	4398	4449	4447	**4431.3**
7	10.71	4640	4635	4644	**4639.7**	4288	4266	4297	**4283.7**
8	11.47	4384	4429	4387	**4400.0**	4033	4111	4141	**4095.0**
Averages ———->		**4445.9**	**4449.4**	**4507.8**	**4467.7**	**4278.3**	**4310.1**	**4291.1**	**4293.2**

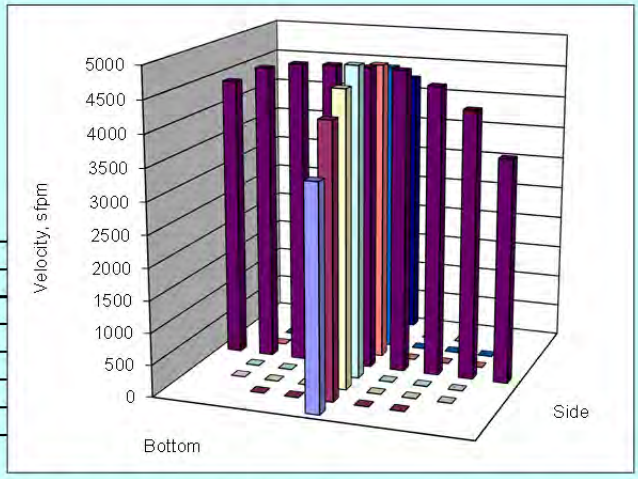
All	**s ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**4380.4**		**Mean**	**4615.1**	**4452.8**	**4534.0**
Min Point	**3374.3**	**-23.0%**	**Std. Dev.**	**200.8**	**199.2**	**209.8**
Max Point	**4746.7**	**8.4%**	**COV as %**	**4.4**	**4.5**	**4.6**

Flow w/o C-Pt **3395** acfm
Vel Avg w/o C-Pt **4345** afpm

Instuments Used: Cal Due

Fishcer Scientific Barometer SN 90936818 12/11/13
TSI VelociCalc SN T95351203001 12/10/2013

	Start	Finish	
Stack temp	59	61	F
Equipment temp	NA	NA	F
Ambient temp	59	61.7	F
Stack static	NA	NA	mbars
Ambient pressure	30.24	30.24	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	38%	36%	RH



Notes: With WYE junction.

CA 4/10/13

Entries made by: Carmen Arimescu
Signature/date 4/10/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 5/12/2013
Signature on file with original TI-WTPSP-114

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	**Run No.**	VT-9		
Date	4/16/13	**Fan Configuration**	Fan A		
Testers	EA, CA	**Fan Setting**	58 Hz		
Stack Dia.	11.969 in.	**Stack Temp**	53 deg F		
Stack X-Area	112.5 in.2	**Start/End Time**	923/950		
Test Port	1	**Center 2/3 from**	1.10	to:	10.87
Distance to disturbance	221.12 inches	**Points in Center 2/3**	2	to:	7
Velocity units	s ft/min	**Data Files:**	NA		

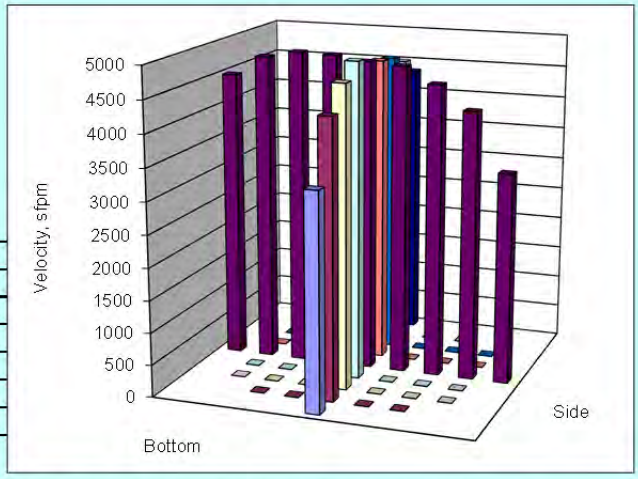
Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial –->		**1**	**2**	**3**	**Mean**	**1**	**2**	**3**	**Mean**
Point	**Depth, in.**	**Velocity**				**Velocity**			
1	0.50	3287	3165	3368	**3273.3**	2945	3535	3127	**3202.3**
2	1.26	4192	4125	4218	**4178.3**	4136	4101	4093	**4110.0**
3	2.32	4507	4537	4593	**4545.7**	4467	4511	4452	**4476.7**
4	3.87	4805	4732	4828	**4788.3**	4712	4705	4683	**4700.0**
Center	5.98	4896	4792	4798	**4828.7**	4663	4572	4599	**4611.3**
5	8.10	4968	4815	4912	**4898.3**	4641	4496	4493	**4543.3**
6	9.65	4917	4891	4933	**4913.7**	4526	4479	4496	**4500.3**
7	10.71	4821	4807	4815	**4814.3**	4384	4336	4403	**4374.3**
8	11.47	4512	4546	4456	**4504.7**	4092	4134	4208	**4144.7**
Averages ———->		**4545.0**	**4490.0**	**4546.8**	**4527.3**	**4285.1**	**4318.8**	**4283.8**	**4295.9**

All	**s ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**4411.6**		**Mean**	**4709.6**	**4473.7**	**4591.7**
Min Point	**3202.3**	**-27.4%**	**Std. Dev.**	**263.9**	**190.6**	**252.7**
Max Point	**4913.7**	**11.4%**	**COV as %**	**5.6**	**4.3**	**5.5**

Flow w/o C-Pt **3417** acfm
Vel Avg w/o C-Pt **4373** afpm

	Start	Finish	
Stack temp	52	54	F
Equipment temp	NA	NA	F
Ambient temp	54	57.2	F
Stack static	NA	NA	mbars
Ambient pressure	30.00	30.00	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	29%	26%	RH

Instuments Used:	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/13
TSI VelociCalc SN T95351203001	12/10/2013



Notes:

CA 4/16/13

Entries made by:	Carmen Arimescu
Signature/date	4/16/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 5/12/2013
Signature on file with original TI-WTPSP-114

VELOCITY TRAVERSE DATA FORM

Site	LV-S2 Model	**Run No.**	VT-10		
Date	4/17/13	**Fan Configuration**	Fan B		
Testers	EA, CA	**Fan Setting**	57 Hz		
Stack Dia.	11.969 in.	**Stack Temp**	69 deg F		
Stack X-Area	112.5 in.2	**Start/End Time**	1436/1510		
Test Port	1	**Center 2/3 from**	1.10	to:	10.87
Distance to disturbance	221.12 inches	**Points in Center 2/3**	2	to:	7
Velocity units	s ft/min	**Data Files:**	NA		

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial –->		**1**	**2**	**3**	**Mean**	**1**	**2**	**3**	**Mean**
Point	**Depth, in.**	**Velocity**				**Velocity**			
1	0.50	3612	3427	3857	**3632.0**	3111	3304	3213	**3209.3**
2	1.26	4466	4428	4402	**4432.0**	4368	4515	4359	**4414.0**
3	2.32	4751	4701	4755	**4735.7**	4681	4687	4712	**4693.3**
4	3.87	4923	4859	4924	**4902.0**	4916	4893	4909	**4906.0**
Center	5.98	4959	4943	4915	**4939.0**	4825	4848	4823	**4832.0**
5	8.10	4998	4931	4932	**4953.7**	4749	4735	4780	**4754.7**
6	9.65	5017	4938	4975	**4976.7**	4614	4685	4681	**4660.0**
7	10.71	4922	4796	4878	**4865.3**	4475	4592	4560	**4542.3**
8	11.47	4646	4591	4545	**4594.0**	4247	4203	4264	**4238.0**
Averages ———->		**4699.3**	**4623.8**	**4687.0**	**4670.0**	**4442.9**	**4495.8**	**4477.9**	**4472.2**

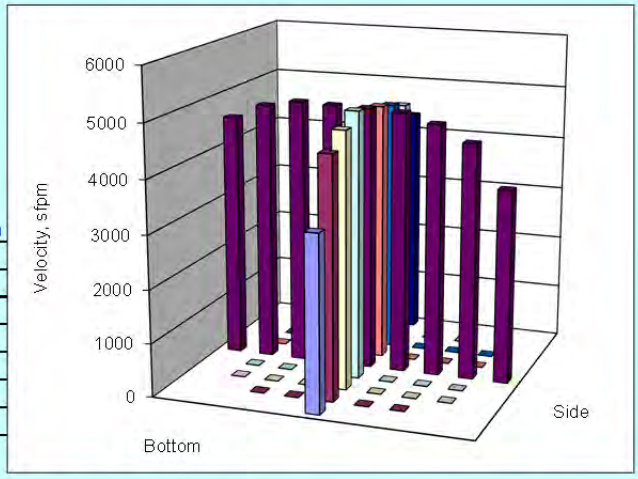
All	**s ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**4571.1**		**Mean**	**4829.2**	**4686.0**	**4757.6**
Min Point	**3209.3**	**-29.8%**	**Std. Dev.**	**192.5**	**168.2**	**188.9**
Max Point	**4976.7**	**8.9%**	**COV as %**	**4.0**	**3.6**	**4.0**

Flow w/o C-Pt **3541** acfm
Vel Avg w/o C-Pt **4532** afpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/13
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	68	69	F
Equipment temp	NA	NA	F
Ambient temp	78.8	78.8	F
Stack static	NA	NA	mbars
Ambient pressure	30.33	30.33	in Hg
Total Stack pressure	NA	NA	mbars
Ambient humidity	21%	21%	RH



Notes: The Fans output were routed to the Wye Junction and the output of the Wye Juction was connected to Fan B back draft damper.

CA 4/17/13

Entries made by:	Carmen Arimescu
Signature/date	4/17/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 5/27/2013
Signature on file with original TI-WTPSP-114

C.3 LV-S2 Flow Angle Data Sheets

FLOW ANGLE DATA FORM

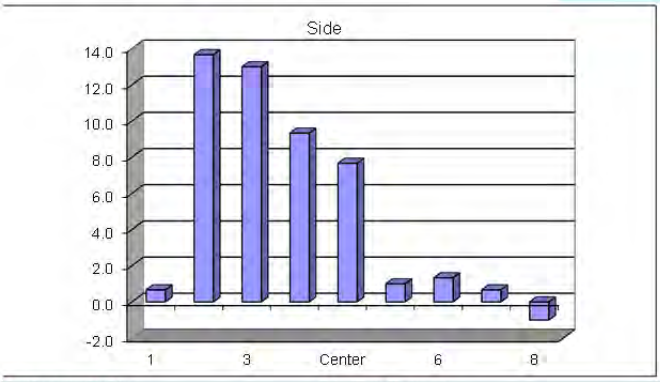
Site	LV-S2 Scale Model	Run No.	FA-1
Date	4/4/2013	Fan Setting	27 Hz
Tester	EA, CA	Fan configuration	Fan A
Stack Dia.	11.969 in	Approx. air vel.	1680 afpm at point >>
Stack X-Area	112.5 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	221.12 in	Stack Temp	55
Start/End Time	9:00/11:25		

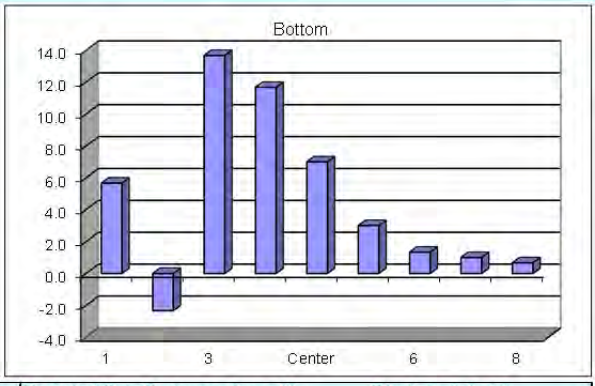
Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial --->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	1	0	1	**0.7**	7	4	6	**5.7**
2	1.26	14	14	13	**13.7**	-10	2	1	**-2.3**
3	2.32	11	13	15	**13.0**	16	11	14	**13.7**
4	3.87	-1	12	17	**9.3**	15	10	10	**11.7**
Center	5.98	5	8	10	**7.7**	11	4	6	**7.0**
5	8.10	0	2	1	**1.0**	5	1	3	**3.0**
6	9.65	1	2	1	**1.3**	3	-1	2	**1.3**
7	10.71	0	0	2	**0.7**	2	0	1	**1.0**
8	11.47	-1	0	-2	**-1.0**	3	-1	0	**0.7**
Mean of absolute values:					**5.4**				**5.1**
" " w/o points by wall:					**6.7**				**5.7**
								Grand mean ABS	**5.3**
								" " w/o wall pts	**6.2**

Instuments Used:		**Cal. Due**	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	Cat. 3	(MAN3)

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
CA 4/4/13





Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	4/4/2013	Signature/date	5/27/2013
		Signature on file with original TI-WTPSP-115	

FLOW ANGLE DATA FORM

Site	LV-S2 Scale Model	Run No.	FA-2
Date	4/4/2013	Fan Setting	27 Hz
Tester	EA, CA	Fan configuration	Fan B
Stack Dia.	11.969 in	Approx. air vel.	1718 afpm at point >>
Stack X-Area	112.5 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	221.12 in	Stack Temp	60
Start/End Time	1127/1200		

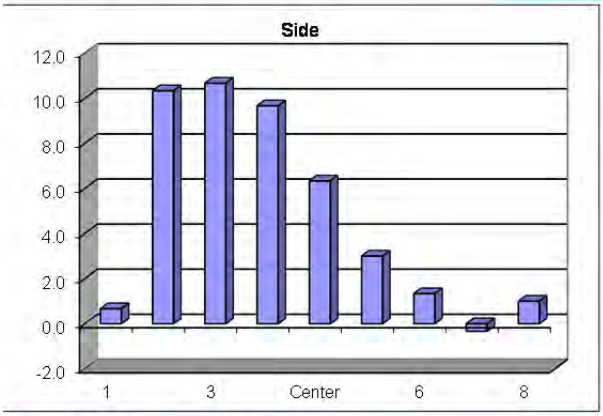
Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	1	1	0	**0.7**	4	2	4	**3.3**
2	1.26	12	8	11	**10.3**	10	9	14	**11.0**
3	2.32	11	10	11	**10.7**	10	10	10	**10.0**
4	3.87	11	9	9	**9.7**	4	5	8	**5.7**
Center	5.98	7	6	6	**6.3**	4	5	5	**4.7**
5	8.10	3	3	3	**3.0**	1	1	2	**1.3**
6	9.65	3	0	1	**1.3**	2	1	2	**1.7**
7	10.71	1	-1	-1	**-0.3**	1	1	1	**1.0**
8	11.47	1	0	2	**1.0**	0	1	1	**0.7**
Mean of absolute values:					**4.8**				**4.4**
" " w/o points by wall:					**6.0**				**5.0**
								Grand mean ABS	**4.6**
								" " w/o wall pts	**5.5**

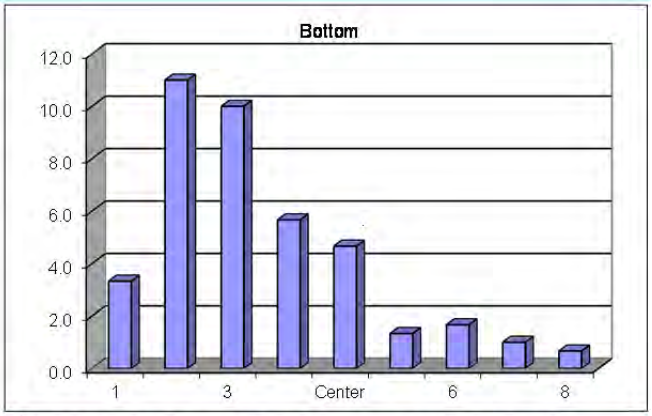
Instruments Used:		Cal. Due	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	Cat. 3	(MAN3)

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

CA 4/4/13





Entries made by:	Carmen Arimescu
Signature/date	4/4/2013
Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/27/2013
Signature on file with original TI-WTPSP-115	

FLOW ANGLE DATA FORM

Site	LV-S2 Scale Model	Run No.	FA-3
Date	4/4/2013	Fan Setting	27 Hz
Tester	EA, CA	Fan configuration	Fan B
Stack Dia.	11.969 in	Approx. air vel.	1630 afpm at point >>
Stack X-Area	112.5 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	221.12 in	Stack Temp	59
Start/End Time	1200/1216		

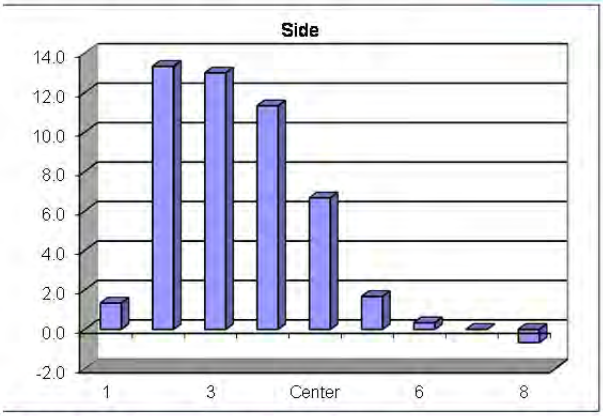
Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-1	1	4	**1.3**	-1	0	0	**-0.3**
2	1.26	13	14	13	**13.3**	2	0	10	**4.0**
3	2.32	13	14	12	**13.0**	5	6	10	**7.0**
4	3.87	10	12	12	**11.3**	5	7	8	**6.7**
Center	5.98	6	10	4	**6.7**	1	4	3	**2.7**
5	8.10	2	3	0	**1.7**	-2	1	-1	**-0.7**
6	9.65	1	0	0	**0.3**	-1	0	-4	**-1.7**
7	10.71	0	1	-1	**0.0**	-1	-2	-4	**-2.3**
8	11.47	-1	-1	0	**-0.7**	0	-1	-2	**-1.0**
Mean of absolute values:					**5.4**				**2.9**
" " w/o points by wall:					**6.6**				**3.6**
								Grand mean ABS	**4.1**
								" " w/o wall pts	**5.1**

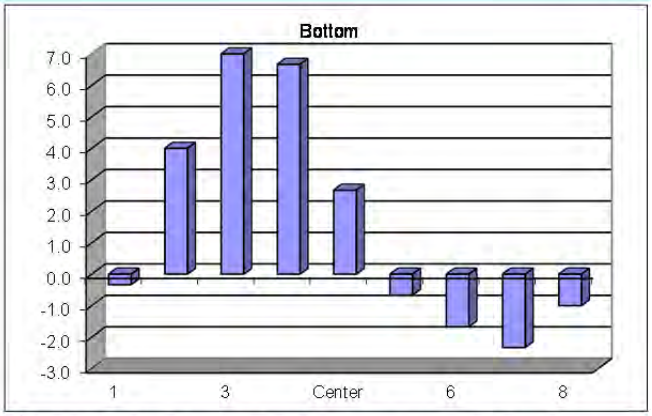
Instruments Used:		**Cal. Due**	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	Cat. 3	(MAN3)

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

CA 4/4/13





Entries made by:	Carmen Arimescu
Signature/date	4/4/2013
Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/27/2013
Signature on file with original TI-WTPSP-115	

FLOW ANGLE DATA FORM

Site	LV-S2 Scale Model	Run No.	FA-4
Date	4/4/2013	Fan Setting	27 Hz
Tester	EA, CA	Fan configuration	Fan B
Stack Dia.	11.969 in	Approx. air vel.	1594 afpm at point >>
Stack X-Area	112.5 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	221.12 in	Stack Temp	59.3
Start/End Time	1222/1300		

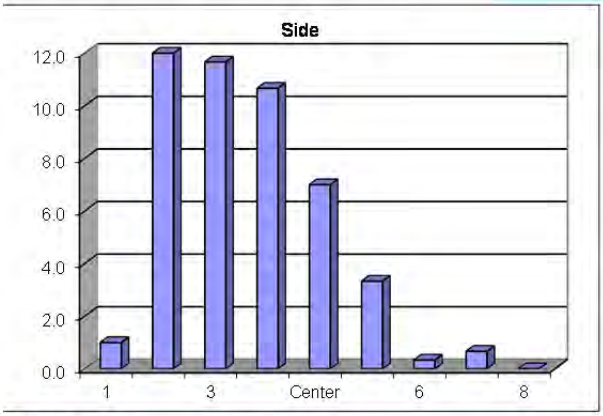
Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	0	1	2	**1.0**	8	1	1	**3.3**
2	1.26	12	12	12	**12.0**	1	1	-5	**-1.0**
3	2.32	11	12	12	**11.7**	7	7	7	**7.0**
4	3.87	12	10	10	**10.7**	8	8	6	**7.3**
Center	5.98	7	8	6	**7.0**	6	8	4	**6.0**
5	8.10	5	4	1	**3.3**	4	6	2	**4.0**
6	9.65	0	1	0	**0.3**	2	5	1	**2.7**
7	10.71	0	1	1	**0.7**	1	0	1	**0.7**
8	11.47	0	0	0	**0.0**	0	0	1	**0.3**
Mean of absolute values:					**5.2**				**3.6**
" " w/o points by wall:					**6.5**				**4.1**
								Grand mean ABS	**4.4**
								" " w/o wall pts	**5.3**

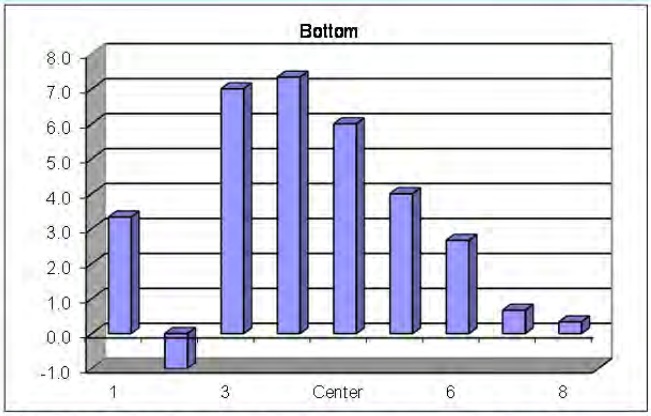
Instruments Used:		**Cal. Due**	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	Cat. 3	(MAN3)

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

CA 4/4/13





Entries made by:	Carmen Arimescu
Signature/date	4/4/2013
Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/27/2013
Signature on file with original TI-WTPSP-115	

FLOW ANGLE DATA FORM

Site	LV-S2 Scale Model	Run No.	FA-5
Date	4/16/2013	Fan Setting	59.1 Hz
Tester	EA,CA	Fan configuration	Fan A
Stack Dia.	11.969 in	Approx. air vel.	4196 afpm at point >>
Stack X-Area	112.5 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	221.12 in	Stack Temp	53
Start/End Time	955/1055		

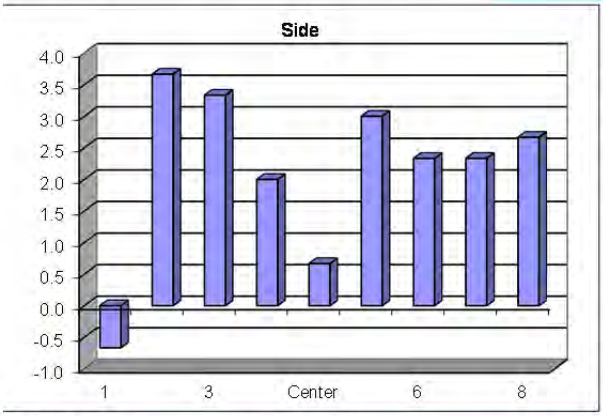
Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	0	0	-2	**-0.7**	0	-6	-10	**-5.3**
2	1.26	-2	3	10	**3.7**	0	6	-2	**1.3**
3	2.32	-2	1	11	**3.3**	-7	5	-5	**-2.3**
4	3.87	0	0	6	**2.0**	-6	3	-5	**-2.7**
Center	5.98	0	3	-1	**0.7**	-7	-10	-5	**-7.3**
5	8.10	3	4	2	**3.0**	-4	-5	-4	**-4.3**
6	9.65	1	5	1	**2.3**	-3	-4	-4	**-3.7**
7	10.71	0	4	3	**2.3**	-4	-4	-4	**-4.0**
8	11.47	0	5	3	**2.7**	-5	-2	-3	**-3.3**
Mean of absolute values:					**2.3**				**3.8**
" " w/o points by wall:					**2.5**				**3.7**
								Grand mean ABS	**3.1**
								" " w/o wall pts	**3.1**

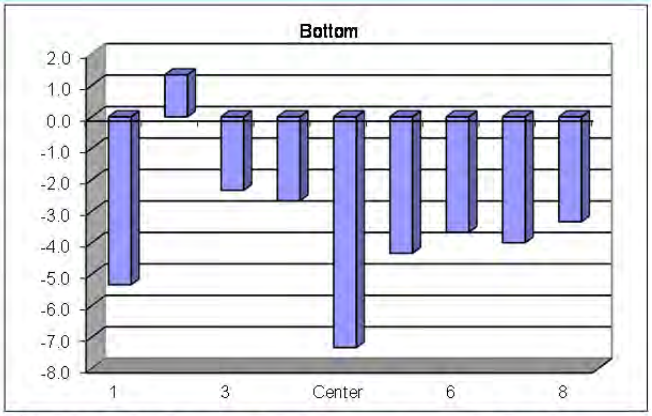
Instruments Used:		Cal. Due	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	Cat. 3	(MAN3)

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

CA 4/16/13





Entries made by:	Carmen Arimescu
Signature/date	4/16/2013
Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/27/2013
Signature on file with original TI-WTPSP-115	

FLOW ANGLE DATA FORM

Site	LV-S2 Scale Model	Run No.	FA-6
Date	4/17/2013	Fan Setting	58.2 Hz
Tester	EA, CA	Fan configuration	Fan A
Stack Dia.	11.969 in	Approx. air vel.	4512 afpm at point >>
Stack X-Area	112.5 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	221.12 in	Stack Temp	50
Start/End Time	910/952		

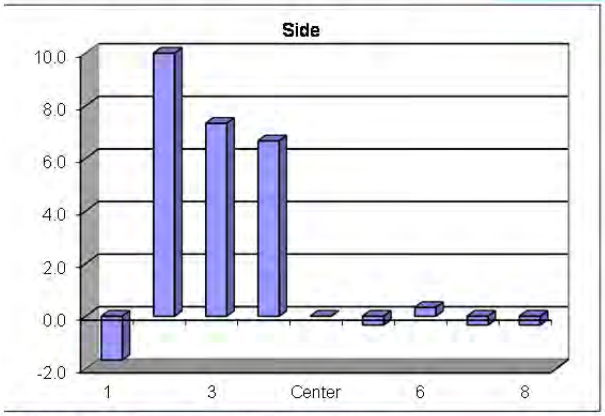
Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-3	-1	-1	**-1.7**	-6	-5	-6	**-5.7**
2	1.26	10	10	10	**10.0**	-17	-15	-14	**-15.3**
3	2.32	8	7	7	**7.3**	-1	-15	1	**-5.0**
4	3.87	7	6	7	**6.7**	-1	4	0	**1.0**
Center	5.98	0	0	0	**0.0**	0	0	-1	**-0.3**
5	8.10	0	-1	0	**-0.3**	1	0	1	**0.7**
6	9.65	0	0	1	**0.3**	1	3	1	**1.7**
7	10.71	0	-1	0	**-0.3**	1	2	2	**1.7**
8	11.47	0	-1	0	**-0.3**	0	2	1	**1.0**
Mean of absolute values:					**3.0**				**3.6**
" " w/o points by wall:					**3.6**				**3.7**
								Grand mean ABS	**3.3**
								" " w/o wall pts	**3.6**

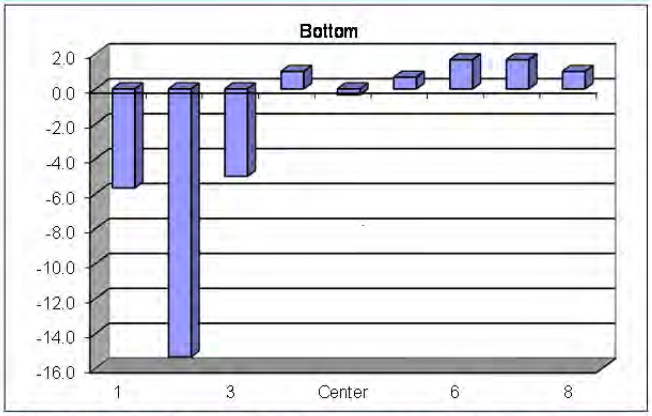
Instruments Used:		Cal. Due	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	Cat. 3	(MAN3)

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

CA 4/17/13





Entries made by:	Carmen Arimescu
Signature/date	4/17/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/27/2013
Signature on file with original TI-WTPSP-115	

FLOW ANGLE DATA FORM

Site	LV-S2 Scale Model	Run No.	FA-7
Date	4/17/2013	Fan Setting	58.2 Hz
Tester	EA, CA	Fan configuration	Fan A
Stack Dia.	11.969 in	Approx. air vel.	4504 afpm at point >>
Stack X-Area	112.5 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	221.12 in	Stack Temp	53
Start/End Time	957/1025		

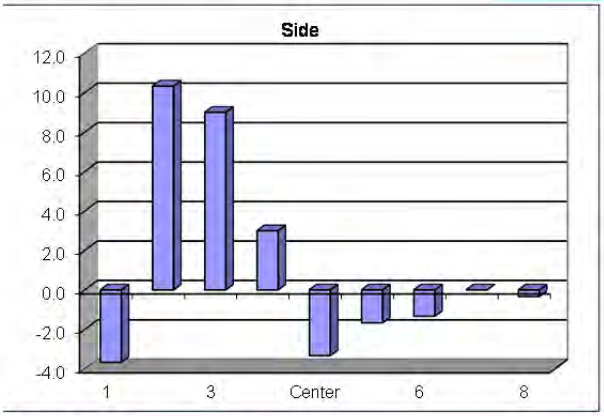
Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-3	-4	-4	**-3.7**	-10	-11	-3	**-8.0**
2	1.26	9	11	11	**10.3**	-20	6	-21	**-11.7**
3	2.32	8	10	9	**9.0**	7	4	7	**6.0**
4	3.87	4	5	0	**3.0**	6	3	5	**4.7**
Center	5.98	-1	-4	-5	**-3.3**	-3	-4	-3	**-3.3**
5	8.10	-2	-1	-2	**-1.7**	-2	-3	-3	**-2.7**
6	9.65	-1	-1	-2	**-1.3**	-3	-3	-3	**-3.0**
7	10.71	-1	1	0	**0.0**	-3	-4	-3	**-3.3**
8	11.47	-1	0	0	**-0.3**	-3	-1	-2	**-2.0**
Mean of absolute values:					**3.6**				**5.0**
" " w/o points by wall:					**4.1**				**5.0**
								Grand mean ABS	**4.3**
								" " w/o wall pts	**4.5**

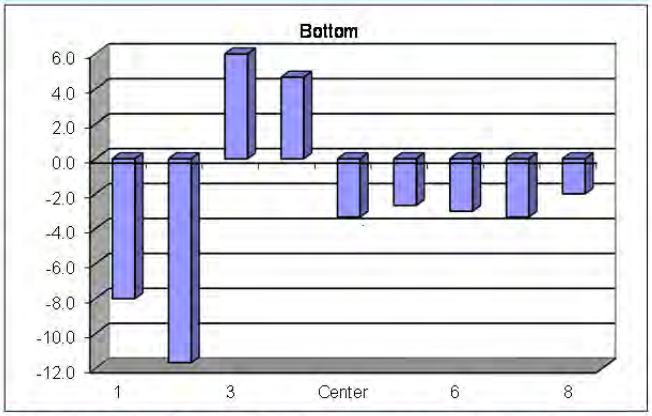
Instruments Used:		Cal. Due	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	Cat. 3	(MAN3)

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

CA 4/17/13





Entries made by:	Carmen Arimescu
Signature/date	4/17/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/27/2013
Signature on file with original TI-WTPSP-115	

FLOW ANGLE DATA FORM

Site	LV-S2 Scale Model	Run No.	FA-8
Date	4/17/2013	Fan Setting	57 Hz
Tester	EA, CA	Fan configuration	Fan B
Stack Dia.	11.969 in	Approx. air vel.	4510 afpm at point >>
Stack X-Area	112.5 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	221.12 in	Stack Temp	69
Start/End Time	300/330		

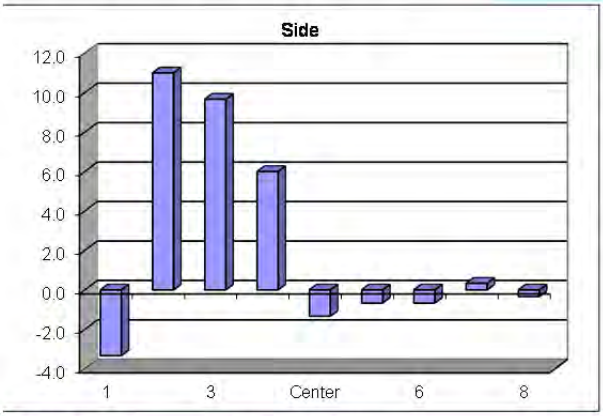
Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-2	-4	-4	**-3.3**	-10	-10	-14	**-11.3**
2	1.26	11	11	11	**11.0**	-15	-21	-21	**-19.0**
3	2.32	10	9	10	**9.7**	11	7	8	**8.7**
4	3.87	7	6	5	**6.0**	5	5	6	**5.3**
Center	5.98	-1	-1	-2	**-1.3**	-4	-5	-4	**-4.3**
5	8.10	-1	0	-1	**-0.7**	-3	-3	-2	**-2.7**
6	9.65	-1	0	-1	**-0.7**	-2	-3	-1	**-2.0**
7	10.71	0	1	0	**0.3**	-1	-1	-1	**-1.0**
8	11.47	0	0	-1	**-0.3**	-1	-1	-1	**-1.0**
Mean of absolute values:					**3.7**				**6.1**
" " w/o points by wall:					**4.2**				**6.1**
								Grand mean ABS	**4.9**
								" " w/o wall pts	**5.2**

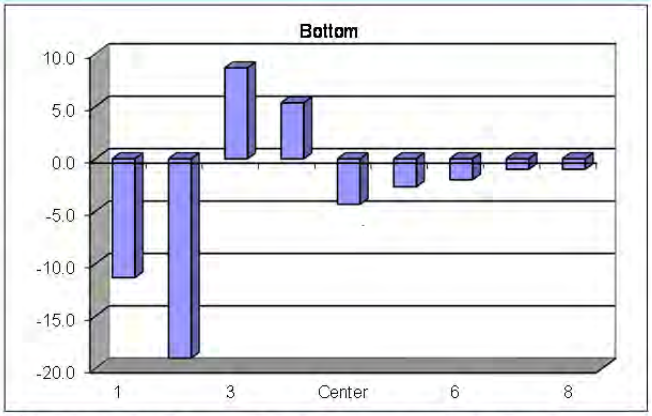
Instruments Used:		**Cal. Due**	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	Cat. 3	(MAN3)

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

CA 4/17/13





Entries made by:	Carmen Arimescu
Signature/date	4/17/2013
Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/13/2013
Signature on file with original TI-WTPSP-115	

FLOW ANGLE DATA FORM

Site	LV-S2 Scale Model	Run No.	FA-9
Date	4/18/2013	Fan Setting	57 Hz
Tester	EA, CA	Fan configuration	Fan B
Stack Dia.	11.969 in	Approx. air vel.	4520 afpm at point >>
Stack X-Area	112.5 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	221.12 in	Stack Temp	62.7
Start/End Time	900/926		

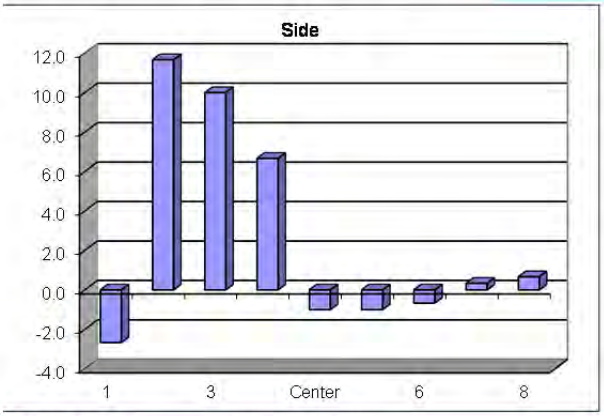
Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-2	-3	-3	**-2.7**	-9	-7	-11	**-9.0**
2	1.26	12	12	11	**11.7**	9	10	9	**9.3**
3	2.32	10	10	10	**10.0**	6	6	7	**6.3**
4	3.87	8	6	6	**6.7**	3	2	2	**2.3**
Center	5.98	-1	-1	-1	**-1.0**	-5	-6	-6	**-5.7**
5	8.10	-1	-1	-1	**-1.0**	-4	-4	-3	**-3.7**
6	9.65	0	-1	-1	**-0.7**	-4	-3	-3	**-3.3**
7	10.71	1	1	-1	**0.3**	-3	-3	-3	**-3.0**
8	11.47	1	0	1	**0.7**	-3	-3	-4	**-3.3**
Mean of absolute values:					**3.9**				**5.1**
" " w/o points by wall:					**4.5**				**4.8**
								Grand mean ABS	**4.5**
								" " w/o wall pts	**4.6**

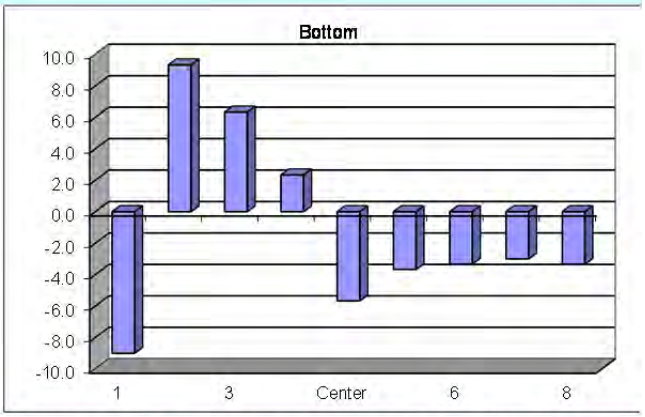
Instruments Used:		Cal. Due	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	Cat. 3	(MAN3)

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

CA 4/18/13





Entries made by:	Carmen Arimescu
Signature/date	4/18/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/27/2013
Signature on file with original TI-WTPSP-115	

FLOW ANGLE DATA FORM

Site	LV-S2 Scale Model	Run No.	FA-10
Date	4/18/2013	Fan Setting	57 Hz
Tester	EA, Ca	Fan configuration	Fan B
Stack Dia.	11.969 in	Approx. air vel.	4624 afpm at point >>
Stack X-Area	112.5 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	221.12 in	Stack Temp	62.7
Start/End Time	927/1000		

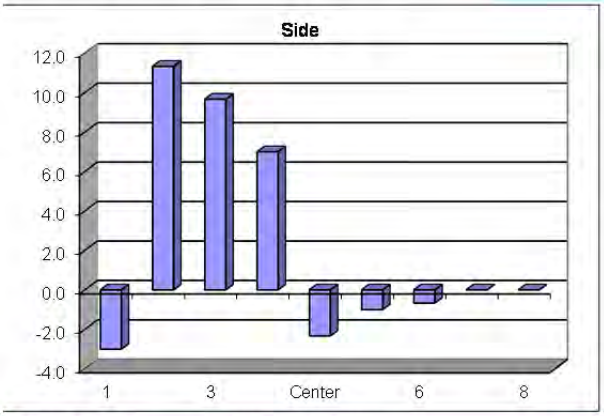
Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-5	-2	-2	**-3.0**	-5	-9	-5	**-6.3**
2	1.26	11	12	11	**11.3**	12	11	13	**12.0**
3	2.32	9	10	10	**9.7**	-2	-2	-3	**-2.3**
4	3.87	7	7	7	**7.0**	-2	7	6	**3.7**
Center	5.98	-2	-2	-3	**-2.3**	-3	-2	-3	**-2.7**
5	8.10	-1	-1	-1	**-1.0**	-1	-1	-2	**-1.3**
6	9.65	0	-1	-1	**-0.7**	0	-1	-1	**-0.7**
7	10.71	1	-1	0	**0.0**	0	-1	-1	**-0.7**
8	11.47	0	0	0	**0.0**	0	-1	-1	**-0.7**
Mean of absolute values:					**3.9**				**3.4**
" " w/o points by wall:					**4.6**				**3.3**
								Grand mean ABS	**3.6**
								" " w/o wall pts	**4.0**

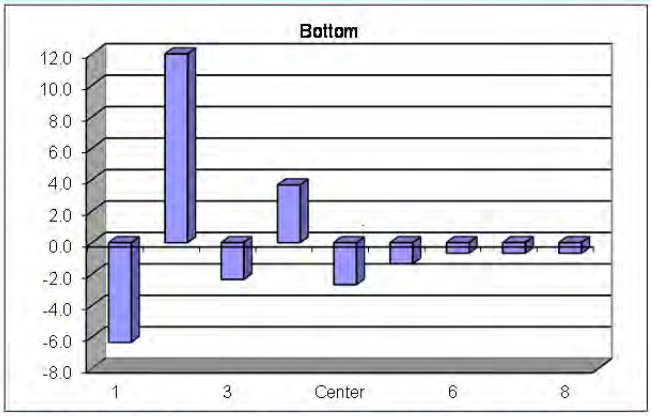
Instruments Used:		**Cal. Due**	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	Cat. 3	(MAN3)

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

CA 4/17/13





Entries made by:	Carmen Arimescu
Signature/date	4/17/2013
Technical Data Review performed by:	Elizabeth Golovich
Signature/date	5/27/2013
Signature on file with original TI-WTPSP-115	

C.4 LV-S2 Gas Tracer Calibration and Uniformity Data Sheets

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	LV-S2	Instrument	B&K Model 1302
Date/Time	6/10/2013 730/955	Serial No.	1804888
Testers	EA, CA	Property No.	WD54623

Setup:
- 6.3 ft — B&K sample inlet tube length
- 1015 mbar station pressure
- 67.1 deg F ambient temp — analyzer corrects to 20 deg C
- 32 percent RH ambient humidity

Pre-Test background **ppb N2O** compensating for water vapor

460, 434, 437, 411, 421

,

	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1600	psi	start P =	1400	psi
end P =	1600	psi	end P =	1400	psi

B&K Calibration Readings

N2O (ppm)	N2O (ppm)
2.02	58.6
1.99	59.0
1.98	59.5
2.01	59.3
2.00	59.5
1.99	59.4
1.98	59.4
1.97	59.4
1.98	59.3
1.97	59.4
1.99 = avg	**59.28** = avg
1.00 = avg/standard	**0.99** = avg/standard

Standards Used:	Expiration date:
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/11/2013

NOTES:

CA 6/10/13

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	6/10/2013	Signature/date	7/23/2013
		Signature on file with the original TI-WTPSP-117	

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	LV-S2	Instrument	B&K Model 1302
Date/Time	6/17/2013 910/955	Serial No.	1804888
Testers	XYY, CA	Property No.	WD54623

Setup:
- 6.3 ft — B&K sample inlet tube length
- 1016 mbar station pressure
- 68.9 deg F ambient temp — analyzer corrects to 20 deg C
- 40 percent RH ambient humidity

Pre-Test background **ppb N2O** compensating for water vapor

432, 409, 397, 393, 393

,

	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1500	psi	start P =	1320	psi
end P =	1480	psi	end P =	1320	psi

B&K Calibration Readings

N2O (ppm)	N2O (ppm)
2.09	61.0
2.09	61.3
2.10	61.2
2.09	61.2
2.06	61.3
2.08	61.2
2.07	61.1
2.03	61.1
2.06	61.0
2.03	60.9
2.07 = avg	**61.13** = avg
1.04 = avg/standard	**1.03** = avg/standard

Standards Used:	Expiration date:
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/11/2013

NOTES:

XYY 6/17/13

Entries made by: Xiao-Ying Yu	Technical Data Review performed by: Elizabeth Golovich
Signature/date 6/17/2013	Signature/date 7/23/2013
	Signature on file with the original TI-WTPSP-117

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	LV-S2	Instrument	B&K Model 1302
Date/Time	6/24/2013 729/815	Serial No.	1804888
Testers	CA	Property No.	WD54623

Setup:
- 6.3 ft — B&K sample inlet tube length
- 1004 mbar station pressure
- 67.1 deg F ambient temp — analyzer corrects to 20 deg C
- 46 percent RH ambient humidity

Pre-Test background **ppb N2O** compensating for water vapor

434, 413, 394, 377, 379

,

	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1500	psi	start P =	1300	psi
end P =	1500	psi	end P =	1300	psi

B&K Calibration Readings

N2O (ppm)	N2O (ppm)
2.03	61.6
2.07	61.7
2.09	61.5
2.05	61.4
2.05	61.7
2.03	61.2
2.04	61.1
2.01	61.1
2.04	61.1
2.04	60.9
2.05 = avg	**61.33** = avg
1.03 = avg/standard	**1.03** = avg/standard

Standards Used:	Expiration date:
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/11/2013

NOTES:

CA 6/24/2013

Entries made by: Carmen Arimescu	Technical Data Review performed by: Elizabeth Golovich
Signature/date 6/24/2013	Signature/date 7/23/2013
	Signature on file with the original TI-WTPSP-117

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	LV-S2	Instrument	B&K Model 1302
Date/Time	6/26/2013 350/430	Serial No.	1804888
Testers	CA	Property No.	WD54623

Setup:
- 6.3 ft — B&K sample inlet tube length
- 1015 mbar station pressure
- 71.6 deg F ambient temp — analyzer corrects to 20 deg C
- 42 percent RH ambient humidity

Pre-Test background **ppb N2O** compensating for water vapor

467, 430, 436, 414, 367

,

	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1500	psi	start P =	1300	psi
end P =	1500	psi	end P =	1300	psi

B&K Calibration Readings

N2O (ppm)	N2O (ppm)
2.12	60.9
2.07	61.1
2.06	60.8
2.06	60.7
2.06	60.8
2.04	60.5
2.05	60.5
2.03	60.4
2.04	60.6
2.04	60.7
2.06 = avg	**60.70** = avg
1.03 = avg/standard	**1.02** = avg/standard

Standards Used:	Expiration date:
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/11/2013

NOTES:

CA 6/26/2013

Entries made by: Carmen Arimescu	Technical Data Review performed by: Elizabeth Golovich
Signature/date 6/26/2013	Signature/date 7/23/2013
	Signature on file with the original TI-WTPSP-117

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-1
Date	6/10/2013	Fan Configuration	Fan B
Testers	EA, CA	Fan Setting	57 Hz
Stack Dia.	11.969 in.	Stack Temp	81.0 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1005/1230
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	25.4	25.8	24.7	25.3	24.9	24.9	25.0	24.9
2	1.26	25.5	25.4	24.9	25.3	25.0	25.0	24.8	24.9
3	2.32	26.3	24.8	25.0	25.4	25.1	25.0	24.9	25.0
4	3.87	25.7	25.0	25.2	25.3	25.1	25.1	25.1	25.1
Center	5.98	25.8	25.3	25.3	25.5	25.1	25.3	25.2	25.2
5	8.10	25.9	25.2	25.3	25.5	25.6	25.3	25.3	25.4
6	9.65	25.7	25.2	25.4	25.4	25.3	25.2	25.2	25.2
7	10.71	25.5	25.0	25.3	25.3	25.0	25.0	25.3	25.1
8	11.47	25.6	25.1	25.1	25.3	25.0	25.5	25.3	25.3
Averages ---------->		25.7	25.2	25.1	25.3	25.1	25.1	25.1	25.1

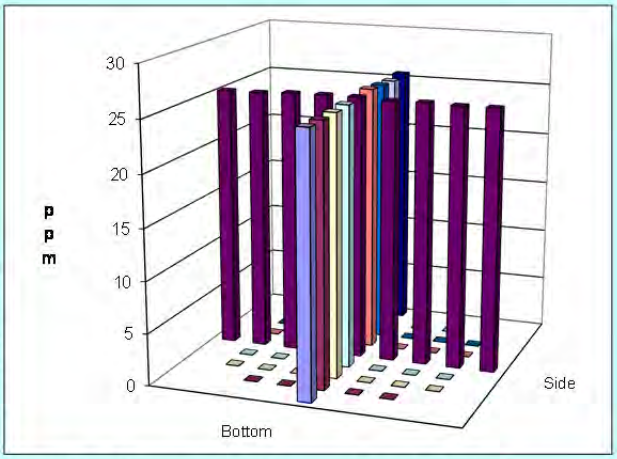
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	25.24		Mean	25.37	25.14	25.25
Min Point	24.93	-1.2%	Std. Dev.	0.09	0.16	0.17
Max Point	25.47	0.9%	COV as %	0.4	0.6	0.7

Avg. Conc. 25.23 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	800	800	psig
Injection flowmeter	3.4	3.4	slpm
Stack Temp	79	83	°F
Mean stack velocity	4611	4731	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1012	mbar
Ambient humidity	26%	22%	RH
Ambient Temp	77.0	79.7	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.4,.5,.3,.3	.6,.4,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Mean Vel=Bottom 7

CA 6/10/13

Entries made by:	Carmen Arimescu
Signature/date	6/10/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-2
Date	6/10/2013	Fan Configuration	Fan B min
Testers	JAG, EA	Fan Setting	23.7 Hz
Stack Dia.	11.969 in.	Stack Temp	91.9 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1330/1505
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	26.7	27.0	26.5	**26.7**	26.7	27.2	26.7	**26.9**
2	1.26	26.5	26.9	27.0	**26.8**	27.3	27.4	26.4	**27.0**
3	2.32	27.1	26.7	27.0	**26.9**	27.1	27.4	26.3	**26.9**
4	3.87	27.2	26.8	26.5	**26.8**	27.4	27.0	27.3	**27.2**
Center	5.98	27.4	27.0	26.6	**27.0**	27.5	27.0	27.4	**27.3**
5	8.10	27.1	26.8	26.8	**26.9**	27.8	26.9	27.3	**27.3**
6	9.65	27.0	26.9	26.5	**26.8**	27.8	26.8	27.2	**27.3**
7	10.71	26.7	26.7	26.6	**26.7**	27.1	27.0	27.8	**27.3**
8	11.47	27.0	26.5	26.6	**26.7**	27.4	26.7	26.8	**27.0**
Averages ---->		**27.0**	**26.8**	**26.7**	**26.8**	**27.3**	**27.0**	**27.0**	**27.1**

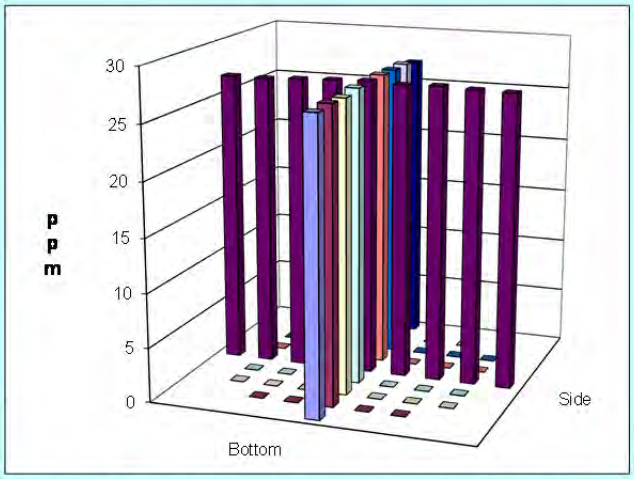
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	26.98		Mean	26.85	27.20	27.02
Min Point	26.67	-1.2%	Std. Dev.	0.11	0.15	0.22
Max Point	27.33	1.3%	COV as %	0.4	0.6	0.8

Avg. Conc. 26.96 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	850	700	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	92.5	91.2	°F
Mean stack velocity	1750	1769	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1011	1010	mbar
Ambient humidity	23%	22%	RH
Ambient Temp	77.9	82.4	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.3,.3,.4,.4	.4,.3,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Mean Velocity = Bottom 7

JA G 6/13/2013

Entries made by:	John Glissmeyer
Signature/date	6/10/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-3
Date	6/10/2013	Fan Configuration	Fan B min
Testers	JAG, EA	Fan Setting	23.7 Hz
Stack Dia.	11.969 in.	Stack Temp	90.6 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1508/1630
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Near Top

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	26.1	26.4	26.2	**26.2**	26.1	26.2	25.9	**26.1**
2	1.26	26.1	26.2	26.5	**26.3**	26.1	26.2	26.2	**26.2**
3	2.32	26.2	26.3	26.0	**26.2**	26.4	26.2	26.2	**26.3**
4	3.87	26.0	25.9	26.3	**26.1**	26.1	26.2	26.1	**26.1**
Center	5.98	26.4	26.5	26.4	**26.4**	26.2	25.9	26.2	**26.1**
5	8.10	26.2	26.3	26.3	**26.3**	26.2	26.5	26.5	**26.4**
6	9.65	26.4	26.5	26.2	**26.4**	26.7	25.9	26.4	**26.3**
7	10.71	26.7	26.5	26.5	**26.6**	26.6	25.9	25.9	**26.1**
8	11.47	26.8	26.7	26.5	**26.7**	26.3	26.2	26.2	**26.2**
Averages ---->		**26.3**	**26.4**	**26.3**	**26.3**	**26.3**	**26.1**	**26.2**	**26.2**

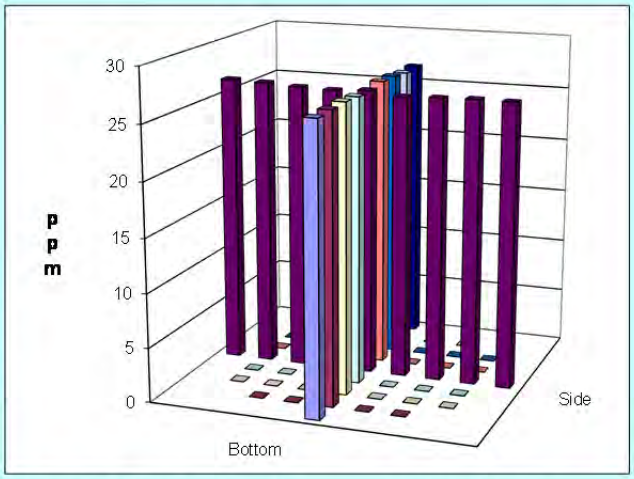
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	26.27		Mean	26.30	26.22	26.26
Min Point	26.07	-0.8%	Std. Dev.	0.17	0.12	0.14
Max Point	26.67	1.5%	COV as %	0.6	0.4	0.6

Avg. Conc. 26.27 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	900	900	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	91.2	89.9	°F
Mean stack velocity	1769	1798	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1010	1010	mbar
Ambient humidity	22%	20%	RH
Ambient Temp	83.3	84.2	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.3,.3,.3,.3	.4,.4,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Mean Velocity = Bottom 7

JA G 6/10/2013

Entries made by:	John Glissmeyer
Signature/date	6/10/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-4
Date	6/11/2013	Fan Configuration	Fan B
Testers	EA,CA	Fan Setting	23.7 Hz
Stack Dia.	11.969 in.	Stack Temp	69.0 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	735/930
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Far Top

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	28.3	28.1	27.1	**27.8**	27.5	26.9	26.7	**27.0**
2	1.26	28.0	27.6	27.5	**27.7**	27.5	27.3	26.2	**27.0**
3	2.32	27.5	27.5	27.7	**27.6**	26.8	26.7	26.4	**26.6**
4	3.87	27.8	27.6	27.5	**27.6**	26.9	27.1	26.3	**26.8**
Center	5.98	27.9	27.6	27.5	**27.7**	26.8	26.8	26.7	**26.8**
5	8.10	28.0	27.3	26.9	**27.4**	26.8	27.2	26.8	**26.9**
6	9.65	27.5	27.3	27.3	**27.4**	27.0	27.1	27.0	**27.0**
7	10.71	27.6	27.5	27.3	**27.5**	26.4	26.9	26.7	**26.7**
8	11.47	27.4	27.5	27.1	**27.3**	27.0	26.5	26.7	**26.7**
Averages ---->		**27.8**	**27.6**	**27.3**	**27.6**	**27.0**	**26.9**	**26.6**	**26.8**

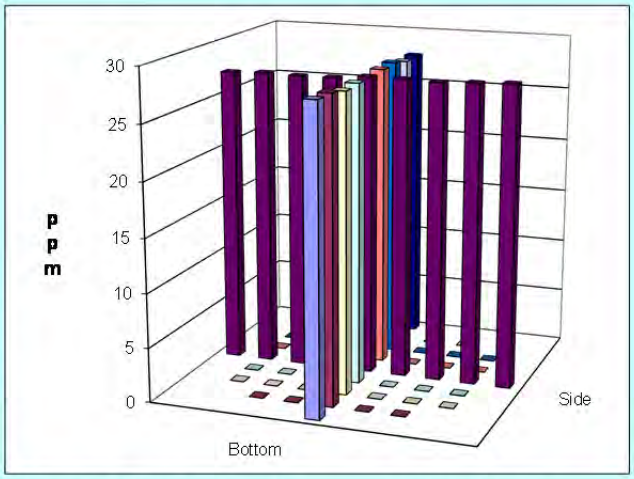
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	27.20		Mean	27.54	26.83	27.19
Min Point	26.63	-2.1%	Std. Dev.	0.13	0.16	0.40
Max Point	27.83	2.3%	COV as %	0.5	0.6	1.5

Avg. Conc. 27.19 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	650	650	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	69	69	°F
Mean stack velocity	1758	1791	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1012	1012	mbar
Ambient humidity	34%	32%	RH
Ambient Temp	64.4	67.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.4,.4	.5,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Mean Vel=Bottom7
It was breezy.

CA 6/11/13

Entries made by: Carmen Arimescu
Signature/date 6/11/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-117

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-5		
Date	6/12/2013	Fan Configuration	Fan B		
Testers	EA,CA	Fan Setting	23 Hz		
Stack Dia.	11.969 in.	Stack Temp	68.5 deg F		
Stack X-Area	112.5 in.^{2}	Start/End Time	800/930		
Test Port	1	Center 2/3 from	1.10	to:	10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2	to:	7
Measurement units	ppm N2O	Injection Point	I3 Near Bottom		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	27.6	26.9	28.0	**27.5**	28.4	28.1	27.6	**28.0**
2	1.26	27.3	27.0	27.7	**27.3**	28.1	27.9	28.2	**28.1**
3	2.32	27.8	27.4	28.4	**27.9**	28.2	27.6	27.6	**27.8**
4	3.87	27.5	27.3	27.5	**27.4**	29.0	27.8	27.5	**28.1**
Center	5.98	27.3	27.4	27.4	**27.4**	28.5	27.9	28.3	**28.2**
5	8.10	27.2	27.1	27.1	**27.1**	29.7	28.1	27.8	**28.5**
6	9.65	27.7	27.2	27.2	**27.4**	28.0	27.7	27.4	**27.7**
7	10.71	27.8	27.6	27.4	**27.6**	27.9	28.1	27.5	**27.8**
8	11.47	27.6	27.5	28.2	**27.8**	28.4	27.7	27.4	**27.8**
Averages ---->		**27.5**	**27.3**	**27.7**	**27.5**	**28.5**	**27.9**	**27.7**	**28.0**

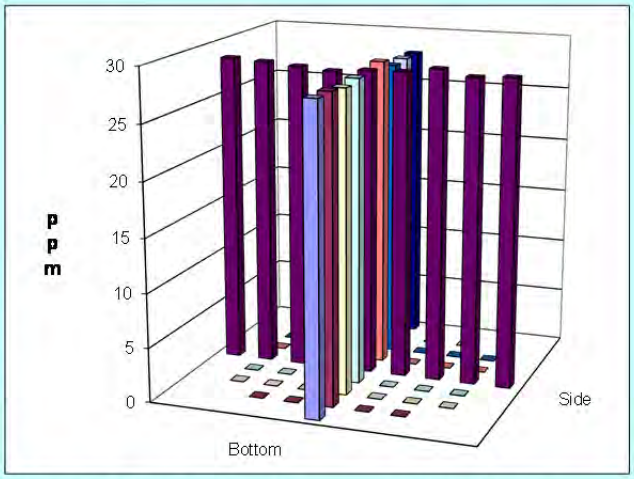
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	27.75		Mean	27.44	28.04	27.74
Min Point	27.13	-2.2%	Std. Dev.	0.23	0.29	0.40
Max Point	28.53	2.8%	COV as %	0.8	1.0	1.4

Avg. Conc. 27.74 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	650	650	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	65	72	°F
Mean stack velocity	1729	1732	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1013	mbar
Ambient humidity	33%	33%	RH
Ambient Temp	63.5	63.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.4,.4	.5,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Mean Vel=Bottom7

CA 6/12/13

Entries made by:	Carmen Arimescu
Signature/date	6/12/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-6
Date	6/12/2013	Fan Configuration	Fan B
Testers	EA, CA	Fan Setting	23 Hz
Stack Dia.	11.969 in.	Stack Temp	73.5 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	933/1048
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Far Bottom

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	27.3	27.6	27.1	**27.3**	27.5	27.3	27.8	**27.5**
2	1.26	27.4	27.9	27.6	**27.6**	27.1	27.2	28.0	**27.4**
3	2.32	27.1	27.5	28.8	**27.8**	27.1	27.7	28.6	**27.8**
4	3.87	27.5	27.4	27.7	**27.5**	27.6	28.0	28.0	**27.9**
Center	5.98	27.3	27.8	27.3	**27.5**	27.6	28.5	28.1	**28.1**
5	8.10	27.4	27.4	27.5	**27.4**	27.8	28.1	28.0	**28.0**
6	9.65	27.8	27.2	28.0	**27.7**	27.5	27.9	27.9	**27.8**
7	10.71	26.9	26.9	27.0	**26.9**	27.8	28.0	27.9	**27.9**
8	11.47	27.5	26.9	27.0	**27.1**	27.5	28.2	28.1	**27.9**
Averages ---->		**27.4**	**27.4**	**27.6**	**27.4**	**27.5**	**27.9**	**28.0**	**27.8**

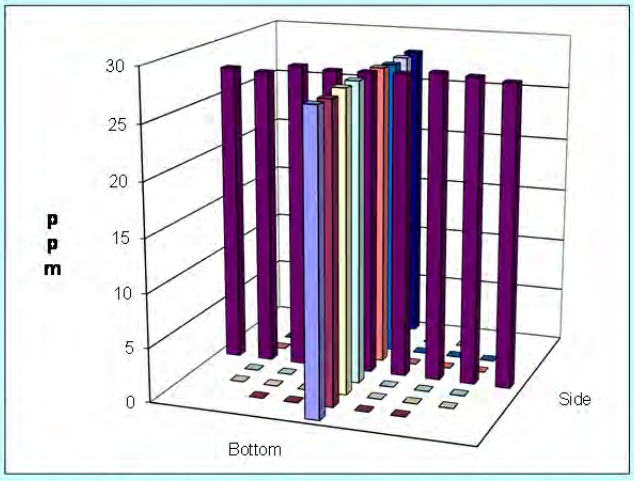
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	27.62		Mean	27.50	27.83	27.66
Min Point	26.93	-2.5%	Std. Dev.	0.28	0.20	0.29
Max Point	28.07	1.6%	COV as %	1.0	0.7	1.0

Avg. Conc. 27.60 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	700	700	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	69	78	°F
Mean stack velocity	1791	1726	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1013	mbar
Ambient humidity	33%	30%	RH
Ambient Temp	64.4	67.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.3,.4,.4,.4	.4,.4,.3,.4,.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Mean Vel=Bottom7

CA 6/12/13

Entries made by:	Carmen Arimescu
Signature/date	6/12/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-7
Date	6/12/2013	Fan Configuration	Fan B max
Testers	EA, CA	Fan Setting	56.5
Stack Dia.	11.969 in.	Stack Temp	78.0 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1050/1216
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	28.0	28.6	28.4	**28.3**	29.2	29.5	29.5	**29.4**
2	1.26	28.4	28.4	28.2	**28.3**	28.9	29.1	29.2	**29.1**
3	2.32	28.3	27.6	28.2	**28.0**	29.2	29.2	28.9	**29.1**
4	3.87	28.6	28.2	28.0	**28.3**	28.7	28.9	28.7	**28.8**
Center	5.98	28.5	28.5	28.2	**28.4**	28.3	28.1	28.3	**28.2**
5	8.10	28.5	28.6	28.7	**28.6**	28.2	27.8	27.9	**28.0**
6	9.65	29.3	28.6	29.8	**29.2**	28.0	28.5	27.7	**28.1**
7	10.71	29.3	29.3	29.7	**29.4**	27.3	27.8	27.8	**27.6**
8	11.47	29.2	29.8	29.5	**29.5**	27.8	26.8	27.2	**27.3**
Averages ---->		**28.7**	**28.6**	**28.7**	**28.7**	**28.4**	**28.4**	**28.4**	**28.4**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	28.54		Mean	28.61	28.40	28.51
Min Point	27.27	-4.4%	Std. Dev.	0.52	0.57	0.54
Max Point	29.50	3.4%	COV as %	1.8	2.0	1.9

Avg. Conc. 28.56 ppm

Instruments Used:

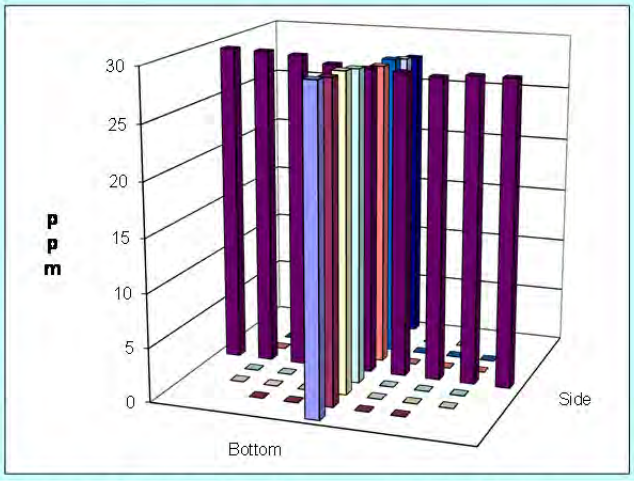
B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	500	600	psig
Injection flowmeter	3.7	3.8	slpm
Stack Temp	78	78	°F
Mean stack velocity	4702	4714	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1013	mbar
Ambient humidity	30%	27%	RH
Ambient Temp	69.8	71.6	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.3,.4,.4	.5,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 6/10/2013

Notes: Mean Vel=Bottom7

CA 6/12/13



Entries made by: Carmen Arimescu
Signature/date 6/12/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-117

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-8
Date	6/12/2013	Fan Configuration	Fan B
Testers	EA,CA	Fan Setting	56.5 Hz
Stack Dia.	11.969 in.	Stack Temp	82.8 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1315/1440
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Bottom

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	31.1	31.2	30.7	**31.0**	27.6	28.0	27.9	**27.8**
2	1.26	30.9	30.7	30.5	**30.7**	28.1	27.7	27.8	**27.9**
3	2.32	30.2	30.2	30.0	**30.1**	28.2	27.6	27.3	**27.7**
4	3.87	30.1	29.6	28.7	**29.5**	28.0	27.7	27.5	**27.7**
Center	5.98	29.6	29.0	28.5	**29.0**	28.5	28.2	28.2	**28.3**
5	8.10	28.4	28.1	27.8	**28.1**	29.2	29.5	29.7	**29.5**
6	9.65	27.5	27.5	26.9	**27.3**	30.3	30.5	29.9	**30.2**
7	10.71	27.5	27.7	25.9	**27.0**	31.6	31.8	31.3	**31.6**
8	11.47	27.5	27.2	26.0	**26.9**	31.6	31.7	31.7	**31.7**
Averages ——>		**29.2**	**29.0**	**28.3**	**28.9**	**29.2**	**29.2**	**29.0**	**29.2**

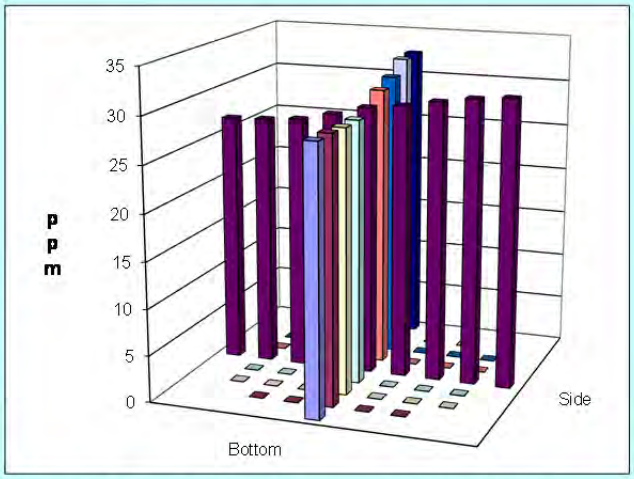
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	29.00		Mean	28.82	28.98	28.90
Min Point	26.90	-7.2%	Std. Dev.	1.40	1.49	1.39
Max Point	31.67	9.2%	COV as %	4.9	5.2	4.8

Avg. Conc. 29.04 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	700	750	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	80.5	85	°F
Mean stack velocity	4757	4610	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1012	mbar
Ambient humidity	19%	22%	RH
Ambient Temp	84.2	76.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.4,.4,.4,.4	.5,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Mean Vel= Bottom 7

Thermometer was in the sun when we begin the test and in the shade when we finish the test.

CA 6/12/13

Entries made by:	Carmen Arimescu
Signature/date	6/12/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-9
Date	6/13/2013	Fan Configuration	Fan B
Testers	EA, CA	Fan Setting	56.5 Hz
Stack Dia.	11.969 in.	Stack Temp	68.8 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	752/920
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Top

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	25.8	25.2	25.4	**25.5**	30.6	30.0	29.6	**30.1**
2	1.26	25.6	25.3	25.7	**25.5**	29.9	30.1	29.2	**29.7**
3	2.32	26.2	26.4	26.1	**26.2**	29.7	29.7	29.4	**29.6**
4	3.87	27.1	27.0	26.9	**27.0**	29.4	29.8	29.1	**29.4**
Center	5.98	28.5	28.4	28.3	**28.4**	29.1	28.9	28.8	**28.9**
5	8.10	30.3	29.7	29.5	**29.8**	28.5	28.7	28.0	**28.4**
6	9.65	31.6	31.5	31.6	**31.6**	28.5	28.1	28.7	**28.4**
7	10.71	32.9	32.1	32.7	**32.6**	28.9	27.1	27.4	**27.8**
8	11.47	33.6	33.1	33.0	**33.2**	27.3	26.2	27.6	**27.0**
Averages ——>		**29.1**	**28.7**	**28.8**	**28.9**	**29.1**	**28.7**	**28.6**	**28.8**

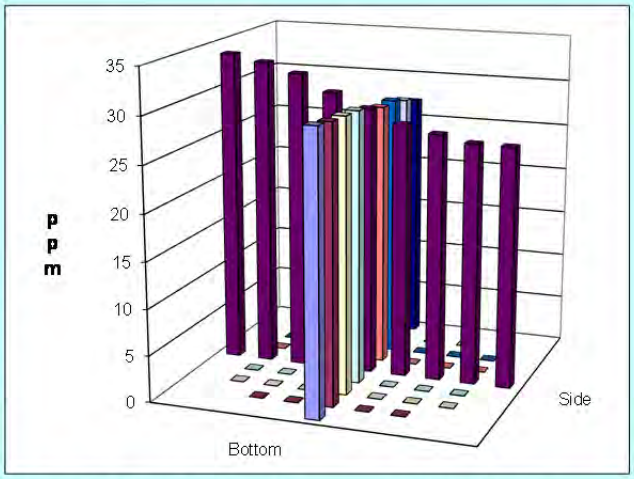
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	28.85		Mean	28.73	28.90	28.82
Min Point	25.47	-11.7%	Std. Dev.	2.69	0.72	1.90
Max Point	33.23	15.2%	COV as %	9.4	2.5	6.6

Avg. Conc. 28.87 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	650	650	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	67.5	70	°F
Mean stack velocity	4715	4828	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1019	1019	mbar
Ambient humidity	33%	32%	RH
Ambient Temp	62.6	66.2	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.4,.4	.5,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Mean Vel= Bottom 7

CA 6/13/13

Entries made by:	Carmen Arimescu
Signature/date	6/13/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-10
Date	6/13/2013	Fan Configuration	Fan B
Testers	EA,CA	Fan Setting	56.5 Hz
Stack Dia.	11.969 in.	Stack Temp	76.4 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	930/1045
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Far wall

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	24.0	24.2	23.9	**24.0**	28.6	28.1	28.2	**28.3**
2	1.26	25.0	25.1	25.1	**25.1**	28.5	28.1	28.0	**28.2**
3	2.32	25.3	25.2	25.1	**25.2**	28.3	27.9	28.5	**28.2**
4	3.87	26.7	27.2	26.3	**26.7**	28.1	28.3	28.0	**28.1**
Center	5.98	28.1	27.9	27.9	**28.0**	28.3	28.2	28.5	**28.3**
5	8.10	29.8	29.8	29.5	**29.7**	29.4	28.7	29.1	**29.1**
6	9.65	31.2	30.9	30.9	**31.0**	29.3	29.8	29.9	**29.7**
7	10.71	31.6	32.9	32.3	**32.3**	28.4	30.2	28.1	**28.9**
8	11.47	32.3	32.1	32.2	**32.2**	29.1	29.4	29.7	**29.4**
Averages ---->		**28.2**	**28.4**	**28.1**	**28.2**	**28.7**	**28.7**	**28.7**	**28.7**

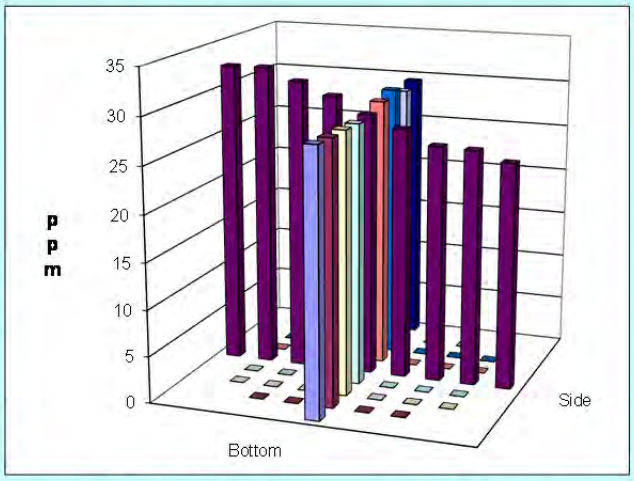
All	ppm	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	28.47		Mean	28.28	28.65	28.46
Min Point	24.03	-15.6%	Std. Dev.	2.82	0.58	1.96
Max Point	32.27	13.3%	COV as %	10.0	2.0	6.9

Avg. Conc. 28.51 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	650	650	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	70	76.4	°F
Mean stack velocity	4828	4795	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1019	1019	mbar
Ambient humidity	31%	29%	RH
Ambient Temp	67.1	68	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.4,.3,.3,.4	.5,.4,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Mean Vel= Bottom 7

The injection is 1" from the far wall.

Ca 6/13/13

Entries made by:	Carmen Arimescu
Signature/date	6/13/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	4/2/2014
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-11
Date	6/13/2013	Fan Configuration	Fan B
Testers	EA	Fan Setting	56.5 Hz
Stack Dia.	11.969 in.	Stack Temp	76.9 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1058/1230
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Near Wall

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	30.4	30.9	30.1	**30.5**	26.9	27.9	27.0	**27.3**
2	1.26	29.7	30.2	30.1	**30.0**	27.0	28.0	27.4	**27.5**
3	2.32	31.2	30.7	30.0	**30.6**	27.7	27.8	28.5	**28.0**
4	3.87	30.3	30.0	29.4	**29.9**	28.4	28.5	29.0	**28.6**
Center	5.98	29.4	28.8	29.0	**29.1**	28.9	28.7	29.2	**28.9**
5	8.10	27.7	27.7	27.9	**27.8**	29.1	29.2	29.2	**29.2**
6	9.65	26.5	26.6	26.9	**26.7**	29.0	29.4	29.6	**29.3**
7	10.71	25.4	25.5	25.8	**25.6**	28.7	28.4	28.8	**28.6**
8	11.47	25.1	24.7	25.8	**25.2**	29.3	30.5	29.1	**29.6**
Averages ——>		**28.4**	**28.3**	**28.3**	**28.4**	**28.3**	**28.7**	**28.6**	**28.6**

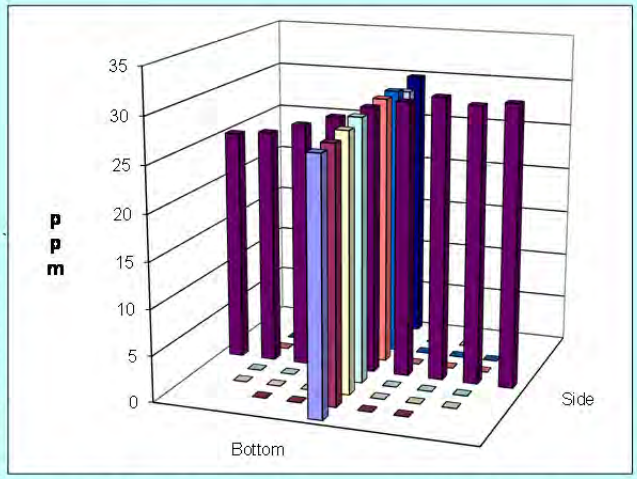
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	28.46		Mean	28.51	28.60	28.55
Min Point	25.20	-11.5%	Std. Dev.	1.90	0.66	1.37
Max Point	30.63	7.6%	COV as %	6.7	2.3	4.8

Avg. Conc. 28.40 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	650	650	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	77.5	76.2	°F
Mean stack velocity	4621	4754	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1019	1019	mbar
Ambient humidity	29%	24%	RH
Ambient Temp	69.8	75.2	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.3,.4,.4,.3	.5,.4,.4,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Mean Vel= Bottom 7

The injection is 1" from the near wall.

EA 6/13/13

Entries made by:	Ernest Antonio
Signature/date	6/13/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-12
Date	6/13/2013	Fan Configuration	Fan B
Testers	JAG / EA	Fan Setting	23 Hz
Stack Dia.	11.969 in.	Stack Temp	80.9 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1333 / 1502
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Near Bottom

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	27.8	27.9	27.6	**27.8**	27.3	27.6	27.3	**27.4**
2	1.26	28.0	28.0	27.5	**27.8**	27.3	27.3	27.6	**27.4**
3	2.32	27.7	28.0	27.4	**27.7**	27.5	27.3	27.6	**27.5**
4	3.87	27.7	27.4	27.4	**27.5**	27.3	27.2	27.3	**27.3**
Center	5.98	27.5	27.5	27.5	**27.5**	27.1	27.3	27.0	**27.1**
5	8.10	28.2	27.8	27.5	**27.8**	27.8	27.4	27.0	**27.4**
6	9.65	27.6	27.6	27.3	**27.5**	27.5	27.1	27.3	**27.3**
7	10.71	27.8	27.8	27.6	**27.7**	27.4	27.5	27.0	**27.3**
8	11.47	28.0	27.8	27.4	**27.7**	27.7	27.4	27.3	**27.5**
Averages ———>		**27.8**	**27.8**	**27.5**	**27.7**	**27.4**	**27.3**	**27.3**	**27.3**

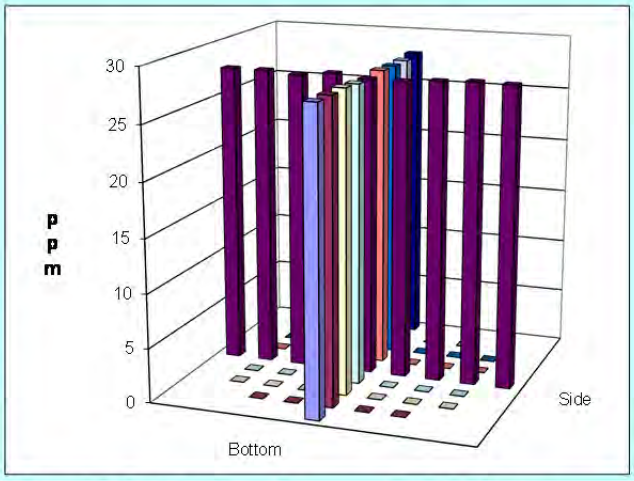
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	27.51		Mean	27.66	27.32	27.49
Min Point	27.13	-1.4%	Std. Dev.	0.15	0.11	0.22
Max Point	27.83	1.2%	COV as %	0.6	0.4	0.8

Avg. Conc. 27.54 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	700	700	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	77.5	84.2	°F
Mean stack velocity	1732	1647	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1019	1018	mbar
Ambient humidity	25%	24%	RH
Ambient Temp	75.2	76.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4, .4, .3, .3, .3	.4, .4, .3, .3, .3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Repeat of GT-5.

Velocity measured at bottom #7.

Entries made by: JAG
Signature/date 6/13/2013
Signature on original.

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-117

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-13
Date	6/14/2013	Fan Configuration	Fan B
Testers	EA	Fan Setting	23 Hz
Stack Dia.	11.969 in.	Stack Temp	70.7 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	0800/0938
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Near Wall Bottom

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	28.5	28.0	27.8	**28.1**	27.3	27.2	27.3	**27.3**
2	1.26	28.5	28.3	27.3	**28.0**	27.3	27.1	27.4	**27.3**
3	2.32	28.3	27.9	27.5	**27.9**	27.2	27.4	27.1	**27.2**
4	3.87	28.1	27.7	27.5	**27.8**	27.0	27.0	26.9	**27.0**
Center	5.98	28.2	28.1	27.7	**28.0**	27.2	27.7	27.0	**27.3**
5	8.10	28.0	28.0	27.7	**27.9**	27.7	27.3	26.8	**27.3**
6	9.65	28.2	27.8	27.6	**27.9**	27.1	27.3	26.8	**27.1**
7	10.71	28.0	27.9	28.0	**28.0**	27.2	27.4	26.9	**27.2**
8	11.47	28.2	27.4	27.5	**27.7**	27.4	27.1	26.8	**27.1**
Averages ---->		**28.2**	**27.9**	**27.6**	**27.9**	**27.3**	**27.3**	**27.0**	**27.2**

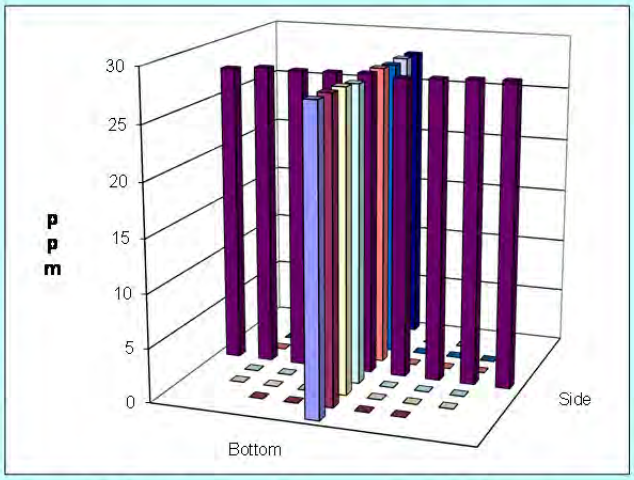
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	27.55		Mean	27.92	27.18	27.55
Min Point	26.97	-2.1%	Std. Dev.	0.09	0.12	0.40
Max Point	28.10	2.0%	COV as %	0.3	0.5	1.4

Avg. Conc. 27.54 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	625	625	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	67.3	74.1	°F
Mean stack velocity	1741	1723	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1021	1021	mbar
Ambient humidity	37%	31%	RH
Ambient Temp	63.5	68.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.4,.4,.4,.4	.4,.4,.4,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Velocity checked at bottom7.
Repeat of GT-5 injection at I3 bottom near wall

EA 6/14/13

Entries made by:	Ernest Antonio
Signature/date	6/14/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-14
Date	6/14/2013	Fan Configuration	Fan B
Testers	EA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	75.0 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	0945/1111
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Far Wall

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	25.3	24.0	24.6	**24.6**	26.9	27.8	28.6	**27.8**
2	1.26	25.6	25.2	24.6	**25.1**	27.7	28.4	28.2	**28.1**
3	2.32	25.8	25.6	25.2	**25.5**	28.5	28.4	28.5	**28.5**
4	3.87	26.4	27.2	27.2	**26.9**	28.4	28.4	27.6	**28.1**
Center	5.98	28.3	28.4	28.2	**28.3**	28.2	28.0	27.8	**28.0**
5	8.10	29.5	29.5	29.7	**29.6**	28.4	28.2	27.9	**28.2**
6	9.65	31.6	31.1	31.2	**31.3**	29.1	29.1	28.1	**28.8**
7	10.71	32.3	32.1	32.4	**32.3**	29.6	30.1	28.7	**29.5**
8	11.47	33.0	32.8	33.0	**32.9**	28.4	29.4	28.4	**28.7**
Averages ——>		**28.6**	**28.4**	**28.5**	**28.5**	**28.4**	**28.6**	**28.2**	**28.4**

All	**ppm**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	28.46		Mean	28.43	28.44	28.44
Min Point	24.63	-13.4%	Std. Dev.	2.76	0.52	1.91
Max Point	32.93	15.7%	COV as %	9.7	1.8	6.7

Avg. Conc. 28.49 ppm

Instuments Used:

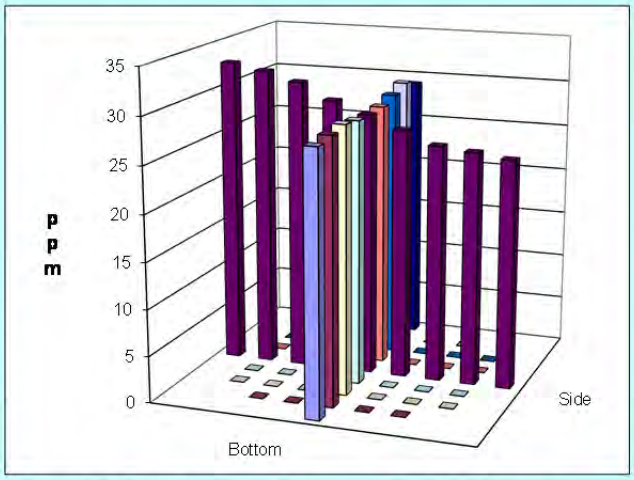
B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	675	650	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	73.4	76.5	°F
Mean stack velocity	4613	4543	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1021	1022	mbar
Ambient humidity	31%	28%	RH
Ambient Temp	68.9	72.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.3,.3	.5,.3,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 6/10/2013

Notes: Velocity checked at bottom 7
Repeat of GT-10.

EA 6/14/13



Entries made by: Ernest Antonio
Signature/date 6/14/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-117

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-15
Date	6/14/2013	Fan Configuration	Fan B
Testers	EA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	77.5 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1115/1300
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Far wall

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	24.4	25.4	25.7	**25.2**	31.4	32.6	32.3	**32.1**
2	1.26	25.3	26.6	26.0	**26.0**	30.9	32.2	32.5	**31.9**
3	2.32	26.0	26.6	28.6	**27.1**	31.4	32.0	33.4	**32.3**
4	3.87	26.8	27.2	29.3	**27.8**	31.6	32.5	33.5	**32.5**
Center	5.98	28.8	29.7	30.4	**29.6**	30.7	32.0	33.2	**32.0**
5	8.10	30.6	31.6	32.6	**31.6**	31.0	32.2	34.0	**32.4**
6	9.65	31.4	32.5	34.3	**32.7**	32.7	33.5	34.9	**33.7**
7	10.71	32.7	34.2	35.4	**34.1**	32.9	33.9	34.1	**33.6**
8	11.47	34.1	35.5	37.3	**35.6**	33.7	34.2	34.5	**34.1**
Averages ---->		**28.9**	**29.9**	**31.1**	**30.0**	**31.8**	**32.8**	**33.6**	**32.7**

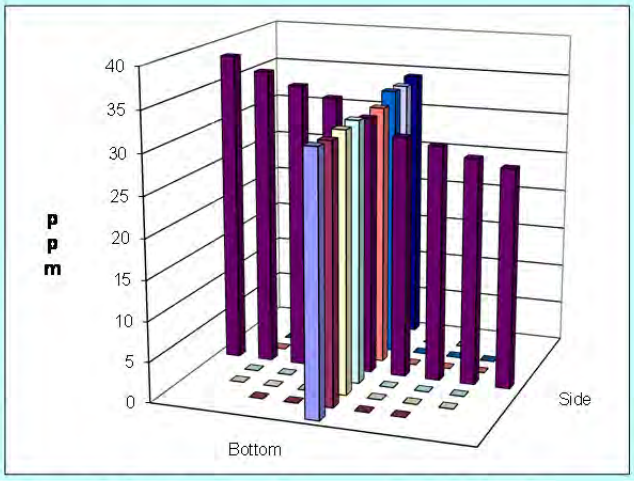
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	31.35		Mean	29.84	32.62	31.23
Min Point	25.17	-19.7%	Std. Dev.	3.07	0.75	2.59
Max Point	35.63	13.7%	COV as %	10.3	2.3	8.3

Avg. Conc. 31.42 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	650	650	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	76.5	78.5	°F
Mean stack velocity	4543	3645	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1022	1022	mbar
Ambient humidity	28%	26%	RH
Ambient Temp	72.5	83.3	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.3,.3,.3,.3	.4,.4,.4,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/10/2013

Notes: Velocity checked at bottom 7.
2nd repeat of GT10. Breezy conditions.
Upon taking finish stack velocity measurement noticed significant drop on velo.
Flexible duct had become separated from Fan outlet.

EA 6/14/13

Entries made by:	Ernest Antonio
Signature/date	6/14/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-16
Date	6/17/2013	Fan Configuration	Fan A
Testers	XY, CA	Fan Setting	55.4 Hz
Stack Dia.	11.969 in.	Stack Temp	81.4 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1000/1148
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	28.6	29.0	29.5	**29.0**	26.7	27.2	26.6	**26.8**
2	1.26	30.3	30.5	29.6	**30.1**	25.7	26.4	27.3	**26.5**
3	2.32	30.1	30.3	29.6	**30.0**	26.9	27.8	27.9	**27.5**
4	3.87	29.7	30.5	29.2	**29.8**	28.4	28.1	29.8	**28.8**
Center	5.98	30.0	30.1	29.7	**29.9**	28.4	29.1	31.6	**29.7**
5	8.10	29.9	30.4	29.7	**30.0**	30.4	30.1	34.6	**31.7**
6	9.65	30.3	30.6	29.8	**30.2**	32.8	33.3	34.6	**33.6**
7	10.71	31.1	31.1	29.6	**30.6**	32.6	32.5	38.5	**34.5**
8	11.47	29.2	29.6	31.2	**30.0**	34.5	34.5	31.6	**33.5**
Averages ---->		**29.9**	**30.2**	**29.8**	**30.0**	**29.6**	**29.9**	**31.4**	**30.3**

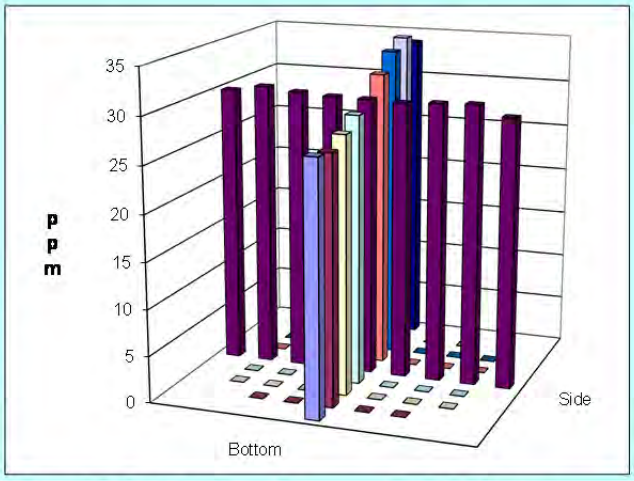
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	30.13		Mean	30.10	30.32	30.21
Min Point	26.47	-12.2%	Std. Dev.	0.26	3.04	2.08
Max Point	34.53	14.6%	COV as %	0.9	10.0	6.9

Avg. Conc. 30.17 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	800	800	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	81.3	81.5	°F
Mean stack velocity	4549	4556	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1016	1015	mbar
Ambient humidity	27%	20%	RH
Ambient Temp	81.5	89.6	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.3,.3,.3,.3	.4,.3,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/17/2013

Notes: Mean Velocity - Bottom 2

CA 6/17/13

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	6/17/2013	Signature/date	7/23/2013
		Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-17
Date	6/18/2013	Fan Configuration	Fan A
Testers	XYY, CA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	70.8 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	900/1100
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Near Wall

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	29.6	29.7	29.7	**29.7**	31.2	30.4	28.3	**30.0**
2	1.26	30.3	28.7	29.6	**29.5**	30.9	30.5	30.2	**30.5**
3	2.32	29.3	29.4	29.9	**29.5**	31.1	31.2	30.6	**31.0**
4	3.87	29.5	29.9	29.8	**29.7**	30.6	30.4	30.3	**30.4**
Center	5.98	30.0	29.6	29.8	**29.8**	30.0	30.0	30.6	**30.2**
5	8.10	29.8	29.2	29.8	**29.6**	30.0	29.9	29.9	**29.9**
6	9.65	29.7	29.8	29.2	**29.6**	29.4	29.4	29.4	**29.4**
7	10.71	29.7	29.5	29.7	**29.6**	29.0	29.6	29.3	**29.3**
8	11.47	28.4	29.3	29.3	**29.0**	28.8	28.8	28.2	**28.6**
Averages ---->		**29.6**	**29.5**	**29.6**	**29.6**	**30.1**	**30.0**	**29.6**	**29.9**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	29.74		Mean	29.63	30.11	29.87
Min Point	28.60	-3.8%	Std. Dev.	0.10	0.61	0.49
Max Point	30.97	4.1%	COV as %	0.3	2.0	1.6

Avg. Conc. 29.71 ppm

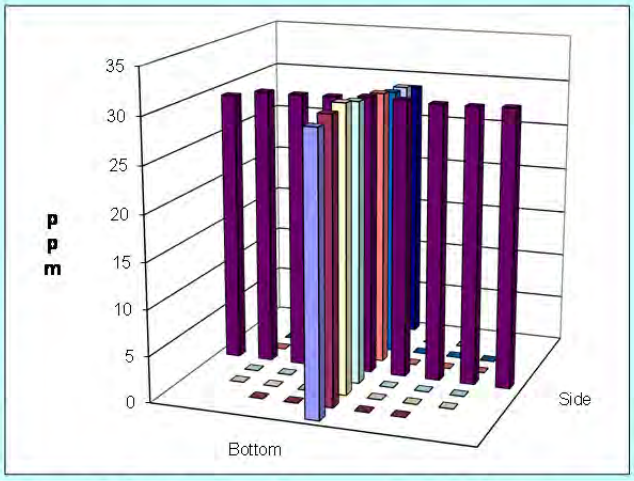
Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	700	680	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	71.4	70.2	°F
Mean stack velocity	4493	4540	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1010	1010	mbar
Ambient humidity	30%	35%	RH
Ambient Temp	75.2	69.8	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.3,.3,.3,.3	.5,.5,.4,.4,.3	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 6/17/2013

Notes: Mean Vel - Bottom 2



Entries made by: Carmen Arimescu
Signature/date 6/18/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-117

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-18
Date	6/18/2013	Fan Configuration	Fan A
Testers	XYY, CA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	71.2 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1105/1220
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Far Wall

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	28.7	27.7	28.3	**28.2**	27.5	27.8	29.8	**28.4**
2	1.26	28.8	28.4	28.5	**28.6**	28.5	28.6	28.2	**28.4**
3	2.32	28.9	28.8	28.3	**28.7**	28.2	28.6	28.6	**28.5**
4	3.87	28.4	28.1	28.5	**28.3**	28.7	28.9	27.8	**28.5**
Center	5.98	28.6	29.0	29.1	**28.9**	28.1	28.8	28.2	**28.4**
5	8.10	29.6	29.3	29.2	**29.4**	29.0	29.7	29.0	**29.2**
6	9.65	29.8	30.7	30.4	**30.3**	29.6	30.6	30.2	**30.1**
7	10.71	30.8	31.2	30.3	**30.8**	29.8	31.6	30.3	**30.6**
8	11.47	32.6	31.1	31.7	**31.8**	30.7	32.0	31.6	**31.4**
Averages ---->		**29.6**	**29.4**	**29.4**	**29.4**	**28.9**	**29.6**	**29.3**	**29.3**

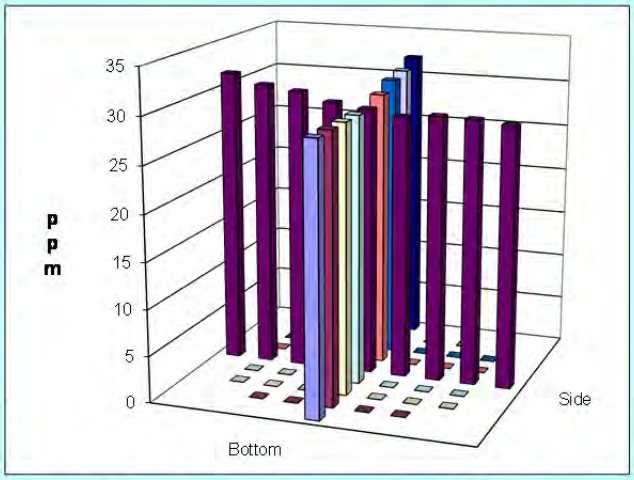
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	29.36		Mean	29.27	29.10	29.18
Min Point	28.23	-3.8%	Std. Dev.	0.93	0.91	0.89
Max Point	31.80	8.3%	COV as %	3.2	3.1	3.1

Avg. Conc. 29.45 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	680	660	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	70.2	72.2	°F
Mean stack velocity	4540	4494	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1010	1010	mbar
Ambient humidity	35%	33%	RH
Ambient Temp	69.8	70.7	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.5,.4,.4,.3	.5,.5,.4,.4,.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/17/2013

Notes: Mean Vel - Bottom 2

Entries made by:	Carmen Arimescu
Signature/date	6/18/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-19
Date	6/18/2013	Fan Configuration	Fan A
Testers	XYY,CA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	71.6 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1225/148
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Bottom

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	29.4	29.6	28.7	**29.2**	29.3	31.3	29.8	**30.1**
2	1.26	29.9	29.8	29.1	**29.6**	30.3	30.0	30.9	**30.4**
3	2.32	29.7	29.7	29.4	**29.6**	30.7	30.8	30.0	**30.5**
4	3.87	30.0	29.9	29.6	**29.8**	30.5	30.6	29.8	**30.3**
Center	5.98	30.2	30.3	29.8	**30.1**	29.8	29.8	30.5	**30.0**
5	8.10	29.7	29.1	29.4	**29.4**	29.3	29.4	29.4	**29.4**
6	9.65	29.0	28.5	28.9	**28.8**	28.4	27.2	28.3	**28.0**
7	10.71	28.3	27.9	28.5	**28.2**	28.0	26.5	26.8	**27.1**
8	11.47	27.6	26.0	26.7	**26.8**	28.3	27.3	29.9	**28.5**
Averages ---->		**29.3**	**29.0**	**28.9**	**29.1**	**29.4**	**29.2**	**29.5**	**29.4**

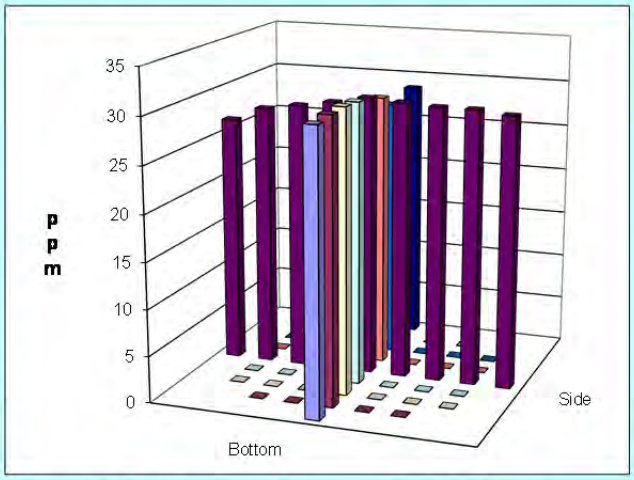
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	29.21		Mean	29.37	29.38	29.37
Min Point	26.77	-8.4%	Std. Dev.	0.64	1.34	1.01
Max Point	30.50	4.4%	COV as %	2.2	4.6	3.4

Avg. Conc. 29.11 ppm

Instruments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	680	680	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	72.2	71	°F
Mean stack velocity	4494	4566	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1010	1010	mbar
Ambient humidity	33%	32%	RH
Ambient Temp	70.7	70.7	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.5,.4,.,.4,.4	.5,.4,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/17/2013

Notes: Mean Vel - Bottom 2

Entries made by: Carmen Arimescu
Signature/date 6/18/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-117

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-20
Date	6/18/2013	Fan Configuration	Fan A
Testers	BGF, CA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	74.0 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	150/317
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Top

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	29.0	31.1	28.6	**29.6**	28.5	28.0	28.3	**28.3**
2	1.26	30.5	31.4	31.4	**31.1**	29.2	27.8	26.9	**28.0**
3	2.32	29.4	31.0	30.9	**30.4**	28.1	28.4	28.6	**28.4**
4	3.87	30.0	30.1	30.8	**30.3**	30.9	29.9	29.7	**30.2**
Center	5.98	29.7	30.3	31.1	**30.4**	30.8	29.6	30.0	**30.1**
5	8.10	29.0	28.6	29.9	**29.2**	30.5	29.3	30.3	**30.0**
6	9.65	27.6	27.7	28.8	**28.0**	30.4	30.1	31.0	**30.5**
7	10.71	27.3	26.6	26.9	**26.9**	32.3	30.9	31.5	**31.6**
8	11.47	28.4	27.0	27.2	**27.5**	30.7	30.2	32.1	**31.0**
Averages ---->		**29.0**	**29.3**	**29.5**	**29.3**	**30.2**	**29.4**	**29.8**	**29.8**

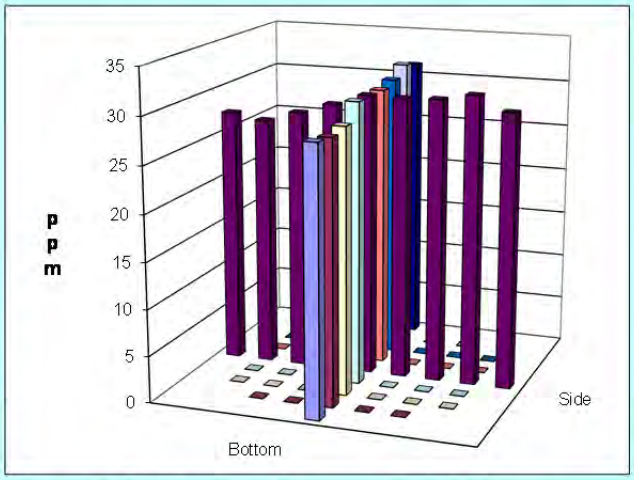
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	29.52		Mean	29.48	29.82	29.65
Min Point	26.93	-8.8%	Std. Dev.	1.51	1.25	1.34
Max Point	31.57	6.9%	COV as %	5.1	4.2	4.5

Avg. Conc. 29.43 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	680	680	psig
Injection flowmeter	3.8	3.8	slpm
Stack Temp	71.8	76.1	°F
Mean stack velocity	4566	4348	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1010	1011	mbar
Ambient humidity	33%	30%	RH
Ambient Temp	70.7	77.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.4,.3,.3,.3	.3,.4,.4,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/17/2013

Notes: Mean Vel - Bottom 2

Entries made by:	Carmen Arimescu
Signature/date	6/18/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-21
Date	6/20/2013	Fan Configuration	Fan A
Testers	JAG, CA	Fan Setting	23.4 Hz
Stack Dia.	11.969 in.	Stack Temp	67.2 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1020/1210
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Center

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	34.9	36.8	34.7	**35.5**	38.5	37.9	38.1	**38.2**
2	1.26	35.5	37.1	36.3	**36.3**	38.4	39.0	38.9	**38.8**
3	2.32	37.2	37.4	36.5	**37.0**	38.3	38.3	38.4	**38.3**
4	3.87	37.5	38.0	36.3	**37.3**	38.2	37.7	38.9	**38.3**
Center	5.98	37.8	38.5	37.1	**37.8**	38.1	38.1	37.7	**38.0**
5	8.10	38.6	38.4	38.6	**38.5**	38.3	38.3	38.1	**38.2**
6	9.65	39.9	40.3	39.9	**40.0**	39.1	37.6	38.5	**38.4**
7	10.71	40.7	39.7	39.2	**39.9**	38.2	39.9	35.7	**37.9**
8	11.47	39.9	40.9	40.2	**40.3**	39.9	39.4	39.5	**39.6**
Averages ———>		**38.0**	**38.6**	**37.6**	**38.1**	**38.6**	**38.5**	**38.2**	**38.4**

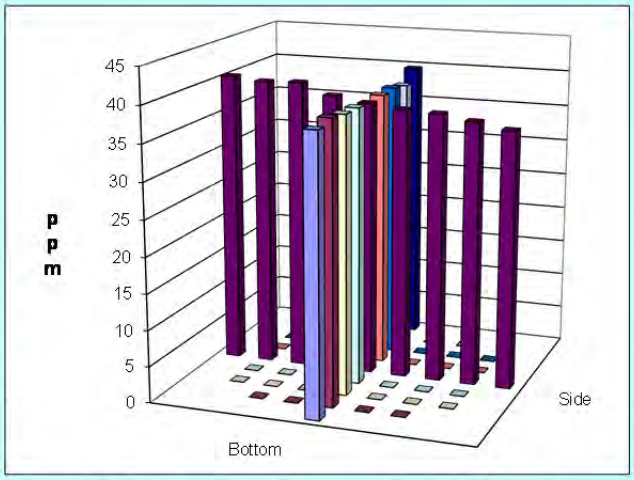
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	38.24		Mean	38.12	38.27	38.20
Min Point	35.47	-7.2%	Std. Dev.	1.43	0.28	0.99
Max Point	40.33	5.5%	COV as %	3.7	0.7	2.6

Avg. Conc. 38.28 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	600	600	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	66.9	67.5	°F
Mean stack velocity	1729	1787	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1014	1014	mbar
Ambient humidity	32%	33%	RH
Ambient Temp	70.7	69.8	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.3,.4	.4,.4,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/17/2013

Notes: Mean Vel=Bottom 2

CA 6/20/13

Entries made by:	Carmen Arimescu
Signature/date	6/20/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-22
Date	6/20/2013	Fan Configuration	Fan A
Testers	CA,MSP	Fan Setting	23.4 Hz
Stack Dia.	11.969 in.	Stack Temp	69.0 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1220/1400
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Far Wall

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	36.9	36.6	37.1	**36.9**	40.0	38.6	38.1	**38.9**
2	1.26	36.6	35.7	36.4	**36.2**	38.3	38.3	39.5	**38.7**
3	2.32	36.0	36.6	37.3	**36.6**	39.9	38.5	37.5	**38.6**
4	3.87	34.9	34.7	35.6	**35.1**	36.5	37.0	36.9	**36.8**
Center	5.98	35.9	36.2	36.5	**36.2**	35.6	36.2	36.3	**36.0**
5	8.10	37.0	38.7	37.6	**37.8**	35.7	37.2	37.2	**36.7**
6	9.65	37.6	39.3	40.0	**39.0**	36.8	37.9	38.6	**37.8**
7	10.71	40.5	40.5	40.3	**40.4**	37.9	34.8	35.9	**36.2**
8	11.47	38.6	43.2	42.4	**41.4**	36.3	37.5	38.3	**37.4**
Averages ---->		**37.1**	**37.9**	**38.1**	**37.7**	**37.4**	**37.3**	**37.6**	**37.5**

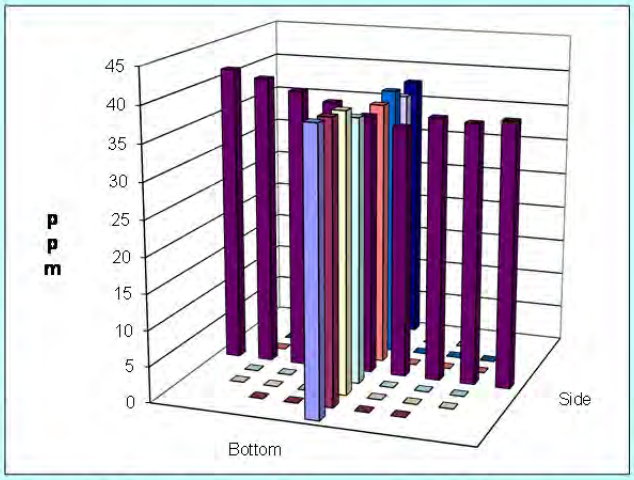
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	37.59		Mean	37.33	37.26	37.30
Min Point	35.07	-6.7%	Std. Dev.	1.85	1.11	1.47
Max Point	41.40	10.1%	COV as %	5.0	3.0	3.9

Avg. Conc. 37.78 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	550	550	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	66.9	71	°F
Mean stack velocity	1787	1782	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1014	1014	mbar
Ambient humidity	41%	34%	RH
Ambient Temp	66.2	70.7	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.3,.3,.3	.4,.3,.4,.4,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/17/2013

Notes: Mean Vel=Bottom 2

CA 6/20/13

Entries made by:	Carmen Arimescu
Signature/date	6/20/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-23
Date	6/20/2013	Fan Configuration	Fan A
Testers	MSP, CA	Fan Setting	23.4 Hz
Stack Dia.	11.969 in.	Stack Temp	70.4 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	211/325
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Near Wall

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	38.3	39.7	38.2	**38.7**	38.9	37.6	37.6	**38.0**
2	1.26	37.0	38.3	38.7	**38.0**	38.9	38.5	38.1	**38.5**
3	2.32	38.5	39.2	38.5	**38.7**	37.8	38.2	37.6	**37.9**
4	3.87	38.7	38.2	38.8	**38.6**	38.1	38.5	38.3	**38.3**
Center	5.98	37.6	37.8	37.7	**37.7**	37.4	38.2	38.2	**37.9**
5	8.10	37.5	37.4	38.0	**37.6**	37.7	37.7	37.2	**37.5**
6	9.65	36.7	37.3	36.6	**36.9**	37.8	36.5	36.4	**36.9**
7	10.71	35.8	35.2	35.1	**35.4**	36.7	35.1	35.6	**35.8**
8	11.47	35.5	34.8	36.4	**35.6**	36.5	36.9	35.5	**36.3**
Averages ——>		**37.3**	**37.5**	**37.6**	**37.5**	**37.8**	**37.5**	**37.2**	**37.5**

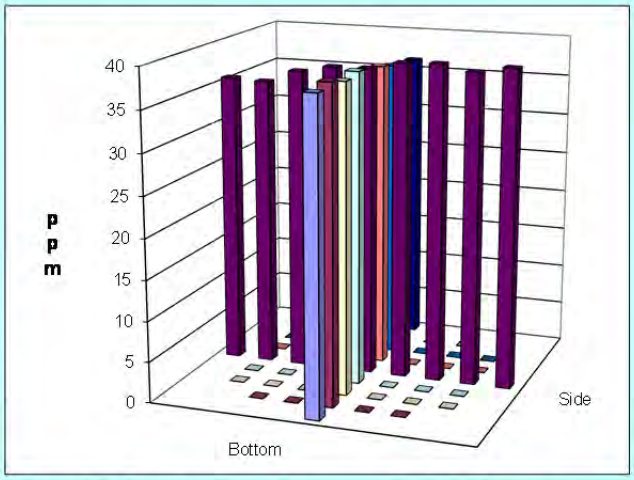
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	37.46		Mean	37.55	37.55	37.55
Min Point	35.37	-5.6%	Std. Dev.	1.15	0.93	1.00
Max Point	38.73	3.4%	COV as %	3.1	2.5	2.7

Avg. Conc. 37.42 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	550	550	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	70	70.7	°F
Mean stack velocity	1782	1775	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1014	1014	mbar
Ambient humidity	34%	42%	RH
Ambient Temp	71.6	69.8	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.3,.4,.4,.3	.4,.3,.4,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/17/2013

Notes: Mean Vel=Bottom 2

CA 6/20/13

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	6/20/2013	Signature/date	7/23/2013
		Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-24
Date	6/20/2013	Fan Configuration	Fan A
Testers	MSP, CA	Fan Setting	23.4 Hz
Stack Dia.	11.969 in.	Stack Temp	67.7 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	330/500
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 TOP

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	35.8	34.0	36.9	**35.6**	37.3	37.9	36.9	**37.4**
2	1.26	35.2	35.6	35.2	**35.3**	36.6	37.7	36.8	**37.0**
3	2.32	35.6	34.9	35.9	**35.5**	37.9	38.2	36.4	**37.5**
4	3.87	36.8	36.2	36.8	**36.6**	38.2	38.0	37.5	**37.9**
Center	5.98	38.1	36.2	37.5	**37.3**	38.9	38.2	37.6	**38.2**
5	8.10	38.8	38.4	39.9	**39.0**	37.9	39.6	37.8	**38.4**
6	9.65	39.6	38.8	39.1	**39.2**	38.2	38.5	39.1	**38.6**
7	10.71	40.3	39.1	39.1	**39.5**	39.1	39.9	38.3	**39.1**
8	11.47	38.1	38.3	40.1	**38.8**	38.7	38.4	39.6	**38.9**
Averages ---->		**37.6**	**36.8**	**37.8**	**37.4**	**38.1**	**38.5**	**37.8**	**38.1**

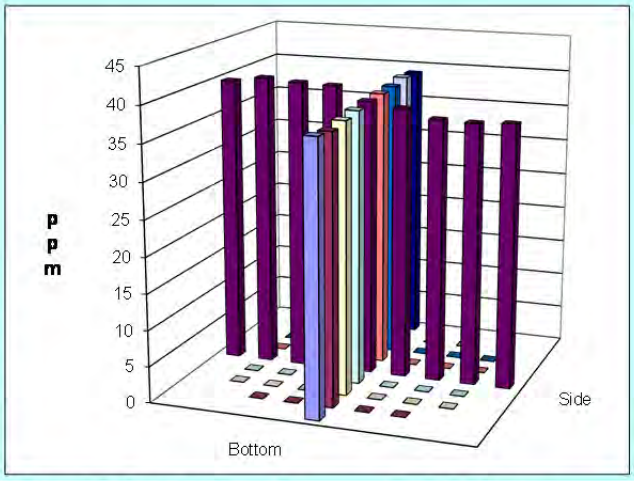
All	ppm	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	37.77		Mean	37.48	38.11	37.80
Min Point	35.33	-6.4%	Std. Dev.	1.77	0.70	1.33
Max Point	39.50	4.6%	COV as %	4.7	1.8	3.5

Avg. Conc. 37.77 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	500	500	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	70.7	64.7	°F
Mean stack velocity	1775	1744	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1014	1014	mbar
Ambient humidity	39%	45%	RH
Ambient Temp	70.7	66.2	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.3,.4,.3,.3	.4,.4,.4,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/17/2013

Notes: Mean Vel=Bottom 7

CA 6/20/13

Entries made by:	Carmen Arimescu
Signature/date	6/20/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-25
Date	6/21/2013	Fan Configuration	Fan A
Testers	JAG, CA	Fan Setting	23.4 Hz
Stack Dia.	11.969 in.	Stack Temp	64.3 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	932/1130
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Bottom

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	39.0	39.2	39.2	**39.1**	37.7	38.6	38.3	**38.2**
2	1.26	39.5	38.2	37.1	**38.3**	38.4	38.8	37.0	**38.1**
3	2.32	39.7	39.0	37.9	**38.9**	38.4	38.3	38.0	**38.2**
4	3.87	38.3	38.6	37.6	**38.2**	37.6	37.5	37.3	**37.5**
Center	5.98	38.8	38.5	38.1	**38.5**	38.1	37.4	37.3	**37.6**
5	8.10	38.9	38.1	37.2	**38.1**	38.4	37.0	37.0	**37.5**
6	9.65	38.3	39.3	38.3	**38.6**	38.7	38.1	38.1	**38.3**
7	10.71	39.6	38.5	39.0	**39.0**	37.7	38.3	36.8	**37.6**
8	11.47	40.0	40.4	39.6	**40.0**	38.1	37.2	38.0	**37.8**
Averages ——>		**39.1**	**38.9**	**38.2**	**38.7**	**38.1**	**37.9**	**37.5**	**37.9**

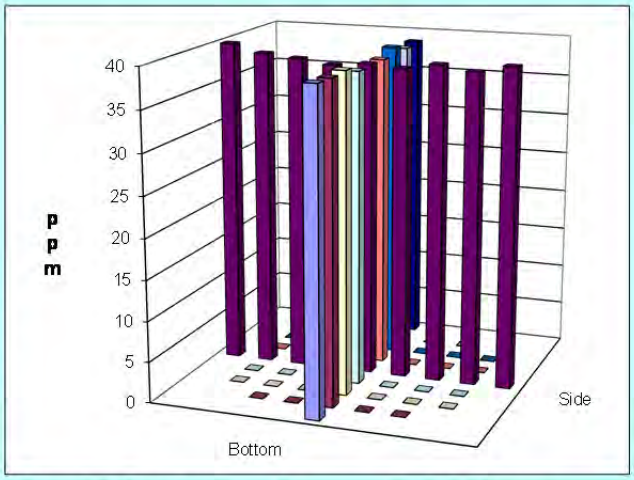
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	38.30		Mean	38.50	37.82	38.16
Min Point	37.47	-2.2%	Std. Dev.	0.36	0.37	0.50
Max Point	40.00	4.4%	COV as %	0.9	1.0	1.3

Avg. Conc. 38.33 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	500	500	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	63.8	64.8	°F
Mean stack velocity	1812	1805	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1019	1020	mbar
Ambient humidity	49%	49%	RH
Ambient Temp	65.3	63.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.4,.4	.4,.3,.4,.4,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/17/2013

Notes: Mean Vel=Bottom 2

CA 6/21/13

Entries made by:	Carmen Arimescu	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	6/21/2013	Signature/date	7/23/2013
		Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-26
Date	6/24/2013	Fan Configuration	Fan A
Testers	EA,CA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	67.4 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	820/1000
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	39.2	39.4	39.3	**39.3**	39.7	39.4	39.5	**39.5**
2	1.26	39.2	39.2	39.1	**39.2**	39.8	39.4	39.2	**39.5**
3	2.32	39.2	39.4	30.4	**36.3**	40.0	39.6	39.4	**39.7**
4	3.87	39.5	39.2	39.2	**39.3**	40.0	39.5	39.3	**39.6**
Center	5.98	39.5	39.3	39.3	**39.4**	40.1	39.5	39.5	**39.7**
5	8.10	39.4	39.4	39.4	**39.4**	40.1	39.4	39.4	**39.6**
6	9.65	39.5	39.4	39.5	**39.5**	39.9	39.8	39.7	**39.8**
7	10.71	39.4	39.2	39.3	**39.3**	40.0	39.6	39.3	**39.6**
8	11.47	39.6	39.3	39.2	**39.4**	39.7	39.6	39.2	**39.5**
Averages ---->		**39.4**	**39.3**	**38.3**	**39.0**	**39.9**	**39.5**	**39.4**	**39.6**

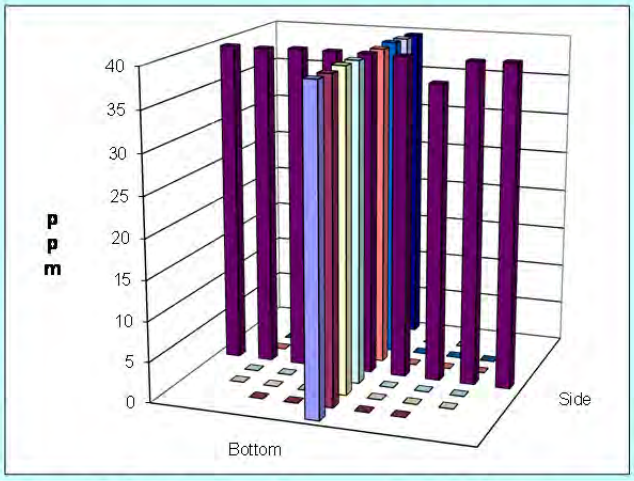
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	39.31		Mean	38.90	39.64	39.27
Min Point	36.33	-7.6%	Std. Dev.	1.14	0.10	0.87
Max Point	39.80	1.3%	COV as %	2.9	0.3	2.2

Avg. Conc. 39.28 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	500	450	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	65.8	69	°F
Mean stack velocity	4624	4646	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1004	1004	mbar
Ambient humidity	67%	66%	RH
Ambient Temp	68.0	69.8	°F
B&K vapor correction	Y	y	Y/N
Back-Gd gas	.3,.3,.3,.3,.3	.5,.4,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/24/2013

Notes: Mean Vel = Bottom2

CA 6/24/2013

Entries made by:	Carmen Arimescu
Signature/date	6/24/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-27
Date	6/24/2013	Fan Configuration	Fan A
Testers	EA, CA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	70.5 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1005/1115
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Near Top

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	38.9	39.2	39.3	**39.1**	38.9	38.9	38.9	**38.9**
2	1.26	39.1	39.1	39.2	**39.1**	39.0	39.3	39.2	**39.2**
3	2.32	39.1	39.2	39.4	**39.2**	39.0	39.0	39.3	**39.1**
4	3.87	39.3	39.1	39.4	**39.3**	39.2	39.2	39.3	**39.2**
Center	5.98	39.4	39.3	39.5	**39.4**	39.4	39.0	39.4	**39.3**
5	8.10	39.5	39.3	39.4	**39.4**	39.2	39.0	39.3	**39.2**
6	9.65	39.5	39.3	39.5	**39.4**	39.3	39.3	39.2	**39.3**
7	10.71	39.4	39.4	39.2	**39.3**	39.2	39.1	39.1	**39.1**
8	11.47	39.2	39.2	39.3	**39.2**	39.3	39.1	39.2	**39.2**
Averages ——>		**39.3**	**39.2**	**39.4**	**39.3**	**39.2**	**39.1**	**39.2**	**39.2**

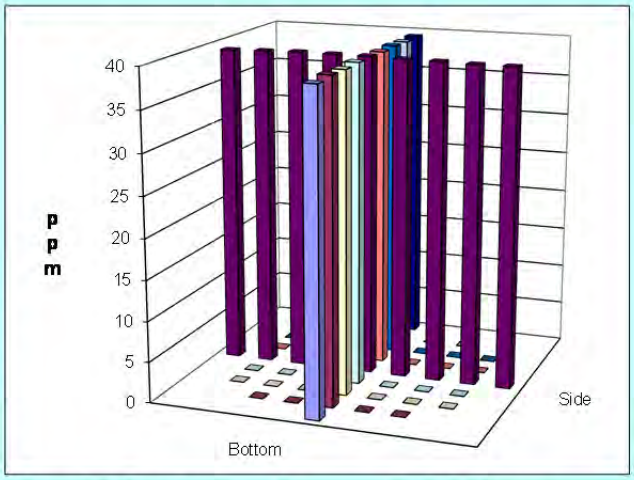
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	39.22		Mean	39.31	39.19	39.25
Min Point	38.90	-0.8%	Std. Dev.	0.11	0.07	0.11
Max Point	39.43	0.5%	COV as %	0.3	0.2	0.3

Avg. Conc. 39.21 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	400	300	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	69	72	°F
Mean stack velocity	4646	4451	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1004	1004	mbar
Ambient humidity	66%	51%	RH
Ambient Temp	69.8	72.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.4,.3,.3,.3	.5,.4,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/24/2013

Notes: Mean Vel = Bottom2

CA 6/24/2013

Entries made by:	Carmen Arimescu
Signature/date	6/24/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-28
Date	6/24/2013	Fan Configuration	Fan A
Testers	EA, CA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	73.4 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1120/1235
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Near Bottom

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	39.1	39.0	38.8	**39.0**	38.6	38.9	39.2	**38.9**
2	1.26	38.9	39.2	39.0	**39.0**	38.9	38.9	39.3	**39.0**
3	2.32	39.0	39.0	39.2	**39.1**	39.1	38.9	39.3	**39.1**
4	3.87	39.2	39.0	39.2	**39.1**	38.9	39.1	39.2	**39.1**
Center	5.98	39.3	39.0	39.3	**39.2**	39.0	39.0	39.3	**39.1**
5	8.10	39.3	38.9	39.4	**39.2**	39.1	39.0	39.2	**39.1**
6	9.65	39.4	39.2	39.4	**39.3**	39.1	39.2	39.0	**39.1**
7	10.71	39.0	39.2	39.3	**39.2**	38.9	39.1	39.1	**39.0**
8	11.47	39.1	39.1	39.3	**39.2**	39.0	39.2	38.9	**39.0**
Averages ———>		**39.1**	**39.1**	**39.2**	**39.1**	**39.0**	**39.0**	**39.2**	**39.1**

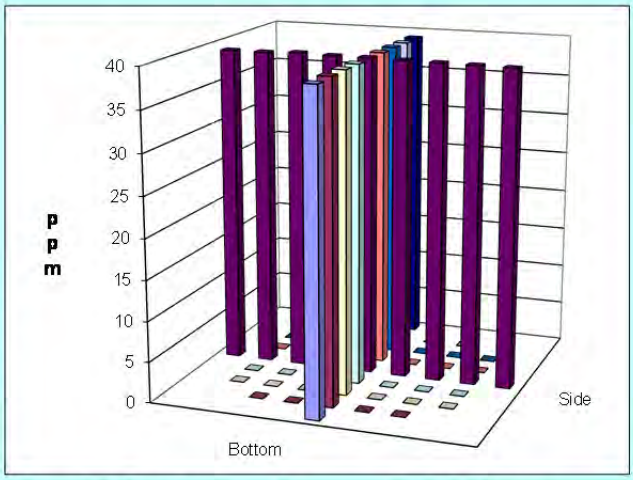
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	39.10		Mean	39.16	39.08	39.12
Min Point	38.90	-0.5%	Std. Dev.	0.10	0.03	0.08
Max Point	39.33	0.6%	COV as %	0.3	0.1	0.2

Avg. Conc. 39.09 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	300	0	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	72	74.8	°F
Mean stack velocity	4451	4461	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1004	1004	mbar
Ambient humidity	51%	43%	RH
Ambient Temp	71.6	76.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.4,.3,.3,.3	.5,.4,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/24/2013

Notes: Mean Vel = Bottom2

Flow control was constant at 3.6 at the end of the test.

CA 6/24/2013

Entries made by:	Carmen Arimescu
Signature/date	6/24/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-29
Date	6/24/2013	Fan Configuration	Fan A
Testers	EA, CA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	72.1 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	145/320
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Far Bottom

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	39.7	39.8	39.7	**39.7**	39.7	39.3	39.4	**39.5**
2	1.26	40.0	40.0	39.9	**40.0**	39.5	39.6	39.5	**39.5**
3	2.32	40.0	40.1	39.6	**39.9**	39.5	39.4	39.6	**39.5**
4	3.87	40.0	39.9	40.0	**40.0**	39.7	39.7	39.6	**39.7**
Center	5.98	40.1	40.1	40.0	**40.1**	39.6	39.6	39.5	**39.6**
5	8.10	40.4	40.0	39.8	**40.1**	39.6	39.7	39.6	**39.6**
6	9.65	40.2	40.1	39.9	**40.1**	39.7	39.9	39.8	**39.8**
7	10.71	40.2	40.2	39.8	**40.1**	39.8	39.5	39.7	**39.7**
8	11.47	40.1	40.1	39.9	**40.0**	39.8	39.8	39.5	**39.7**
Averages ---->		**40.1**	**40.0**	**39.8**	**40.0**	**39.7**	**39.6**	**39.6**	**39.6**

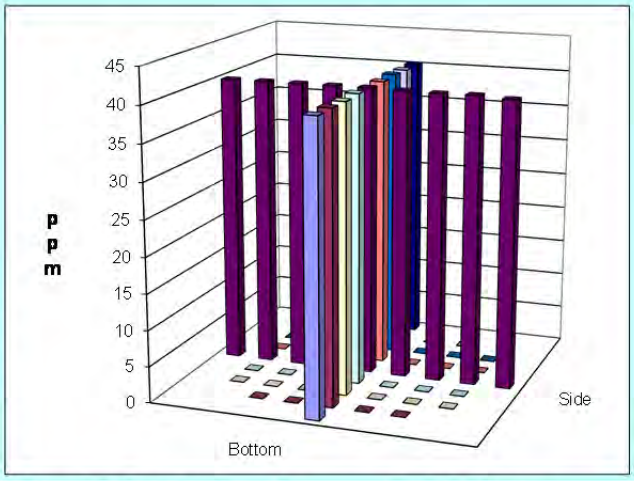
	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	39.80		Mean	40.01	39.62	39.82
Min Point	39.47	-0.8%	Std. Dev.	0.07	0.10	0.22
Max Point	40.07	0.7%	COV as %	0.2	0.3	0.6

Avg. Conc. 39.80 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	700	700	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	73.9	70.2	°F
Mean stack velocity	4411	4431	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1004	1004	mbar
Ambient humidity	33%	52%	RH
Ambient Temp	75.2	68.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.3,.3,.4,.3	.5,.4,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/24/2013

Notes: Mean Vel = Bottom2

CA 6/24/2013

Entries made by:	Carmen Arimescu
Signature/date	6/24/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-30
Date	6/26/2013	Fan Configuration	Fan A
Testers	EA, Ca	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	69.4 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	800/950
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Far Top

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	41.0	40.1	40.3	**40.5**	39.9	39.9	39.3	**39.7**
2	1.26	40.6	40.3	39.8	**40.2**	39.8	39.7	39.3	**39.6**
3	2.32	41.0	40.3	39.8	**40.4**	39.9	39.6	39.4	**39.6**
4	3.87	40.7	40.6	39.8	**40.4**	39.8	39.9	39.5	**39.7**
Center	5.98	40.8	40.8	39.8	**40.5**	39.9	39.8	39.6	**39.8**
5	8.10	40.7	41.1	40.0	**40.6**	40.1	40.4	39.6	**40.0**
6	9.65	40.7	40.5	40.6	**40.6**	39.9	39.9	39.5	**39.8**
7	10.71	40.7	40.5	40.7	**40.6**	40.6	40.2	39.9	**40.2**
8	11.47	40.6	40.6	40.4	**40.5**	41.2	40.2	39.9	**40.4**
Averages ---->		**40.8**	**40.5**	**40.1**	**40.5**	**40.1**	**40.0**	**39.6**	**39.9**

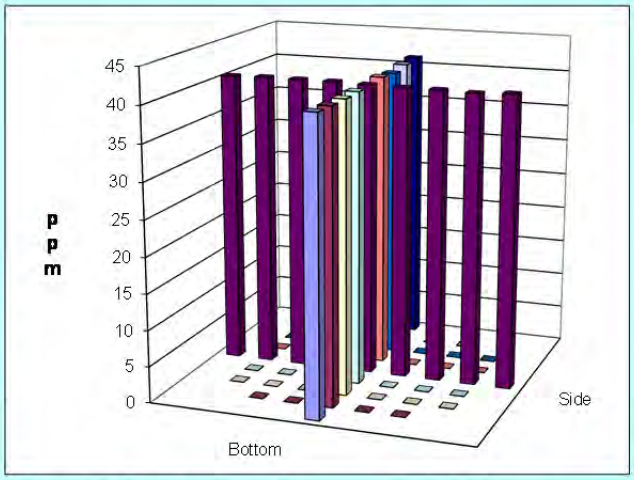
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	40.18		Mean	40.47	39.82	40.15
Min Point	39.60	-1.4%	Std. Dev.	0.15	0.23	0.38
Max Point	40.63	1.1%	COV as %	0.4	0.6	1.0

Avg. Conc. 40.18 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	650	650	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	67	71.7	°F
Mean stack velocity	4785	4713	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1014	1014	mbar
Ambient humidity	58%	45%	RH
Ambient Temp	68	74.3	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4,.4,.4,.2,.4	.3,.3,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/24/2013

Notes: Mean Vel = Bottom 2

CA 6/26/2013

Entries made by:	Carmen Arimescu
Signature/date	6/26/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-31
Date	6/26/2013	Fan Configuration	Fan A
Testers	EA,CA	Fan Setting	23.4 Hz
Stack Dia.	11.969 in.	Stack Temp	73.7 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1000/1120
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I2 Far Wall

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	36.3	34.9	36.2	**35.8**	39.1	36.7	37.7	**37.8**
2	1.26	36.1	34.0	37.1	**35.7**	37.9	36.7	37.3	**37.3**
3	2.32	36.7	35.3	38.2	**36.7**	37.8	36.3	37.3	**37.1**
4	3.87	36.6	35.0	36.7	**36.1**	36.4	36.0	36.6	**36.3**
Center	5.98	39.4	37.0	37.0	**37.8**	37.1	36.6	37.1	**36.9**
5	8.10	37.2	37.5	38.3	**37.7**	38.4	37.6	35.5	**37.2**
6	9.65	40.4	41.5	40.6	**40.8**	40.5	39.8	40.4	**40.2**
7	10.71	41.3	40.7	44.5	**42.2**	42.5	39.4	40.9	**40.9**
8	11.47	43.0	44.0	42.0	**43.0**	41.3	41.6	40.9	**41.3**
Averages ---->		**38.6**	**37.8**	**39.0**	**38.4**	**39.0**	**37.9**	**38.2**	**38.3**

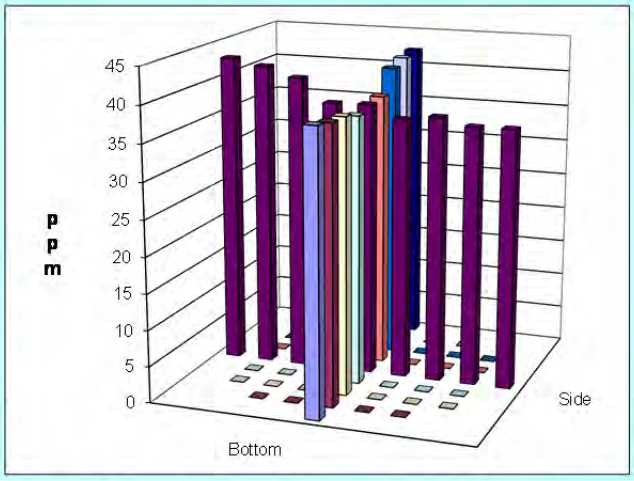
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	38.39		Mean	38.15	38.00	38.08
Min Point	35.73	-6.9%	Std. Dev.	2.44	1.80	2.06
Max Point	43.00	12.0%	COV as %	6.4	4.7	5.4

Avg. Conc. 38.51 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	680	680	psig
Injection flowmeter	1.4	1.4	slpm
Stack Temp	72.9	74.5	°F
Mean stack velocity	1770	1747	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1014	1015	mbar
Ambient humidity	39%	36%	RH
Ambient Temp	77	78.8	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.3,.3,.3,.3	.3,.3,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/24/2013

Notes: Mean Vel = Bottom 2

CA 6/26/2013

Entries made by:	Carmen Arimescu
Signature/date	6/26/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S2	Run No.	GT-32
Date	6/26/2013	Fan Configuration	Fan A
Testers	EA, CA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	74.8 deg F
Stack X-Area	112.5 in.^{2}	Start/End Time	1125/1300
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I3 Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	38.5	38.6	38.8	**38.6**	37.9	38.8	38.9	**38.5**
2	1.26	38.6	38.5	38.8	**38.6**	38.4	38.4	38.5	**38.4**
3	2.32	38.3	38.6	38.4	**38.4**	38.5	38.9	38.9	**38.8**
4	3.87	38.5	38.6	38.7	**38.6**	38.5	38.5	38.7	**38.6**
Center	5.98	38.6	38.6	38.9	**38.7**	38.6	38.7	38.6	**38.6**
5	8.10	38.7	38.8	38.7	**38.7**	38.7	38.6	38.7	**38.7**
6	9.65	38.8	38.9	38.7	**38.8**	38.8	38.5	38.7	**38.7**
7	10.71	38.7	39.0	38.8	**38.8**	38.9	38.5	38.8	**38.7**
8	11.47	38.6	38.4	38.8	**38.6**	38.8	38.4	38.8	**38.7**
Averages ---->		**38.6**	**38.7**	**38.7**	**38.7**	**38.6**	**38.6**	**38.7**	**38.6**

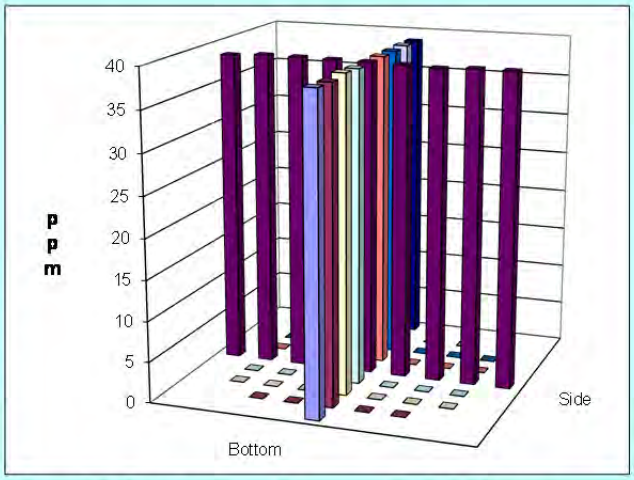
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	38.65		Mean	38.68	38.64	38.66
Min Point	38.43	-0.6%	Std. Dev.	0.14	0.11	0.12
Max Point	38.83	0.5%	COV as %	0.4	0.3	0.3

Avg. Conc. 38.64 ppm

Instuments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	700	700	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	75	74.5	°F
Mean stack velocity	4460	4464	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1015	1015	mbar
Ambient humidity	35%	38%	RH
Ambient Temp	78.8	76.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.3,.3,.3,.3	.4,.3,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 6/24/2013

Notes: Mean Vel = Bottom 2

CA 6/26/2013

Entries made by:	Carmen Arimescu
Signature/date	6/26/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-117	

C.5 LV-S2 Particle Tracer Uniformity Data Sheets

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-1
Date	6/27/2013	Fan configuration	Fan A
Tester	EA, CA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	85.65 deg F
Stack X-Area	112.5 in.2	Start/End Time	1045 / 1237
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order ---->	2nd		1st

		Side				Bottom			
Traverse-->									
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	601	537	514	550.7	628	635	433	565.3
2	1.26	732	693	671	698.7	890	976	765	877.0
3	2.32	827	793	868	829.3	1327	1263	1060	1216.7
4	3.87	842	833	932	869.0	1468	1461	1341	1423.3
Center	5.98	888	906	897	897.00	1536	1572	1437	1515.00
5	8.10	945	818	849	870.7	1634	1606	1429	1556.3
6	9.65	756	741	641	712.7	1508	1519	1339	1455.3
7	10.71	549	524	458	510.3	1122	1165	998	1095.0
8	11.47	226	271	292	263.0	692	667	606	655.0
Averages ------>		707.3	679.6	680.2	689.0	1200.6	1207.1	1045.3	1151.0

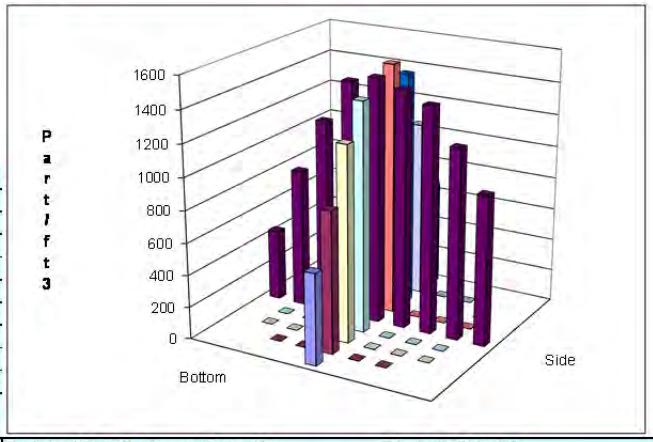
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	920.0		Mean	769.7	1305.5	1037.6	1302.73
Min Point	263.0	-71.4%	Std. Dev.	138.7	251.3	339.6	233.41
Max Point	1556.3	69.2%	COV as %	18.0	19.3	32.7	17.92

Avg Con 884 pt/ft3

	Start	Finish	
Generator Inlet Press	2.7	2.7	psig
Stack Temp	83.8	87.5	F
Mean velocity	4734	4351	afpm
Ambient pressure	1019	1019	inHg
Ambient humidity	31%	26%	RH
Ambient temp	83.3	94.1	F
Back-Gd aerosol	7, 4, 3, 4	2, 1, 4, 2	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output	145	145	psig

Instuments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: We had problem with aerosol generator.

CA 6/27/13

Oil Used Edwards

Ref. Probe Location: Reference port downstream port 1

Probe Type / Configuration: L-shaped probe

Entries made by: CA 6/27/13
Signature/date
Signature on file with original

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-116

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-2
Date	7/1/2013	Fan configuration	Fan A Max
Tester	CB, EA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	84.65 deg F
Stack X-Area	112.5 in.2	Start/End Time	0715 / 0845
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	1st		2nd

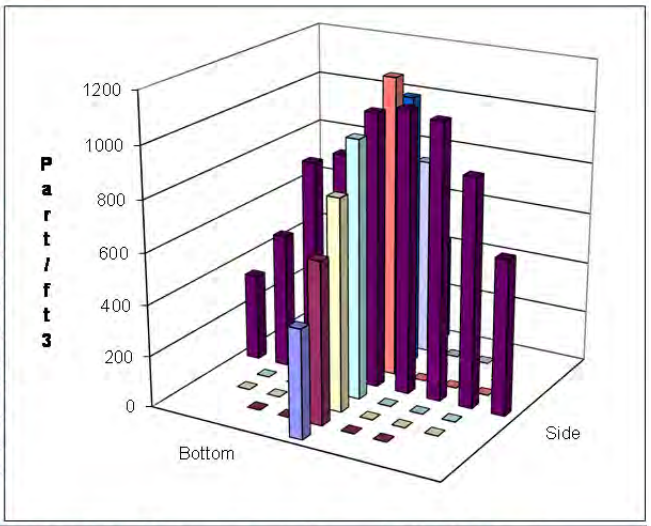
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	482	455	550	**495.7**	491	398	378	**422.3**
2	1.26	690	746	748	**728.0**	667	566	654	**629.0**
3	2.32	851	937	849	**879.0**	899	771	797	**822.3**
4	3.87	863	848	985	**898.7**	1086	982	938	**1002.0**
Center	5.98	774	832	1015	**873.7**	1109	1037	1053	**1066.3**
5	8.10	668	752	762	**727.3**	1191	1153	1155	**1166.3**
6	9.65	718	658	685	**687.0**	1117	1035	1026	**1059.3**
7	10.71	446	383	462	**430.3**	810	768	743	**773.7**
8	11.47	280	281	276	**279.0**	433	379	420	**410.7**
Averages ---->		**641.3**	**654.7**	**703.6**	**666.5**	**867.0**	**787.7**	**796.0**	**816.9**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	741.7		Mean	746.3	931.3	838.8	921.07
Min Point	279.0	-62.4%	Std. Dev.	163.9	192.8	196.9	189.01
Max Point	1166.3	57.3%	COV as %	22.0	20.7	23.5	20.52

Avg Conc 713 pt/ft3

	Start	Finish	
Generator Inlet Press	2.7	2.7	psig
Stack Temp	81.4	87.9	F
Mean velocity	4525	4046	afpm
Ambient pressure	29.88	29.88	inHg
Ambient humidity	33%	32%	RH
Ambient temp	82.4	86	F
Back-Gd aerosol	5, 6, 2, 3	6, 5, 12, 5	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output	24	30	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: 9 um count on MET One OPC ~1500 +/- 150 at start of side testing. Counts increased slightly with time until Bottom run #2, started to decrease again.

CB 7/1/2013

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by:	Carolyne Burns
Signature/date	7/1/2013
	Signature on file with original

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-116	

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-3
Date	7/1/2013	Fan configuration	Fan A Max
Tester	CB, EA	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	95.35 deg F
Stack X-Area	112.5 in.2	Start/End Time	924 / 1115
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	1st		2nd

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	678	682	590	**650.0**	564	462	453	**493.0**
2	1.26	875	842	572	**763.0**	722	680	814	**738.7**
3	2.32	849	851	979	**893.0**	987	929	1138	**1018.0**
4	3.87	1034	1030	1147	**1070.3**	1129	1125	1075	**1109.7**
Center	5.98	1034	1234	960	**1076.0**	1216	1141	1168	**1175.0**
5	8.10	918	962	932	**937.3**	1207	1137	1194	**1179.3**
6	9.65	775	711	699	**728.3**	1088	1038	1135	**1087.0**
7	10.71	459	558	548	**521.7**	771	846	829	**815.3**
8	11.47	230	255	224	**236.3**	426	536	499	**487.0**
Averages ---------->		**761.3**	**791.7**	**739.0**	**764.0**	**901.1**	**877.1**	**922.8**	**900.3**

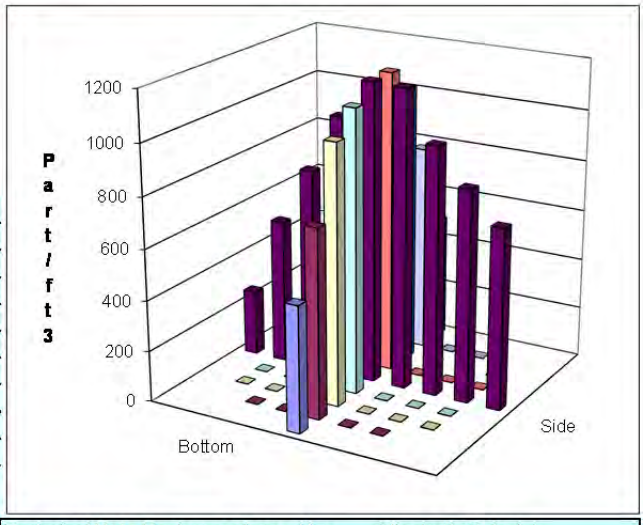
All	**pt/ft3**	**Dev. from mean**
Mean	832.2	
Min Point	236.3	-71.6%
Max Point	1179.3	41.7%

Center 2/3	**Side**	**Bottom**	**All**	**Normlzd**
Mean	855.7	1017.6	936.6	975.98
Std. Dev.	199.6	174.6	198.8	194.58
COV as %	23.3	17.2	21.2	19.94

Avg Conc 796 pt/ft3

	Start	Finish	
Generator Inlet Press	2.6	2.7	psig
Stack Temp	91	99.7	F
Mean velocity	4295	4212	afpm
Ambient pressure	29.88	29.91	inHg
Ambient humidity	33%	27%	RH
Ambient temp	85.1	94.1	F
Back-Gd aerosol	6, 22, 8, 8	4, 6, 7, 3	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	20	25	psig

Instruments Used:		**Cal. Due**
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: Ventillation duct disconnected at the wye at the beginning of the test. Retaped and started test ~9:50. Flow acceptable.

CB 7/1/2013

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by:	Carolyne Burns	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/1/2013	Signature/date	7/23/2013
	Signature on file with original	Signature on file with the original TI-WTPSP-116	

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-4
Date	7/2/2013	Fan configuration	Fan A Min
Tester	SS, EA	Fan Setting	21 Hz
Stack Dia.	11.969 in.	Stack Temp	83 deg F
Stack X-Area	112.5 in.2	Start/End Time	0616 / 0800
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	1st		2nd

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1184	1276	1260	1240.0	1517	1509	1970	1665.3
2	1.26	1263	1404	1319	1328.7	1941	1933	2241	2038.3
3	2.32	1389	1398	1376	1387.7	1975	2166	2422	2187.7
4	3.87	1419	1423	1404	1415.3	2071	2304	2343	2239.3
Center	5.98	1319	1522	1438	1426.3	2164	2177	2296	2212.3
5	8.10	1443	1677	1492	1537.3	2193	2258	2361	2270.7
6	9.65	1571	1579	1664	1604.7	2237	2336	2388	2320.3
7	10.71	1344	1645	1753	1580.7	2086	2416	2335	2279.0
8	11.47	1003	1316	1503	1274.0	2005	2205	2080	2096.7
Averages ---------->		1326.1	1471.1	1467.7	1421.6	2021.0	2144.9	2270.7	2145.5

All	pt/ft3	Dev. from mean
Mean	1783.6	
Min Point	1240.0	-30.5%
Max Point	2320.3	30.1%

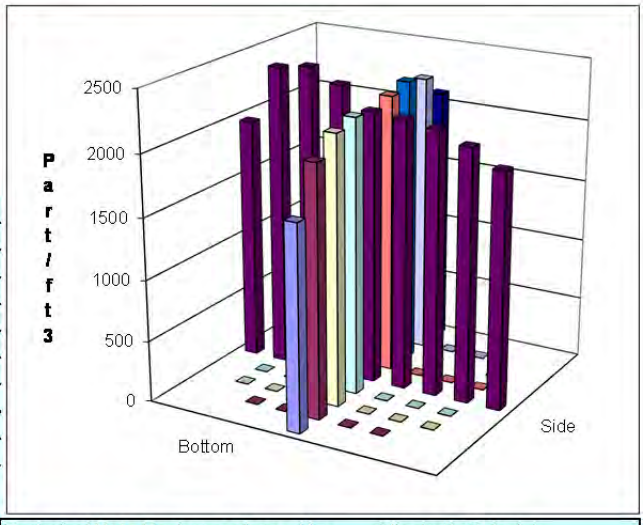
Center 2/3	Side	Bottom	All	Normlzd
Mean	1468.7	2221.1	1844.9	2249.55
Std. Dev.	105.3	91.8	401.8	130.69
COV as %	7.2	4.1	21.8	5.81

Avg Conc 1779 pt/ft3

	Start	Finish	
Generator Inlet Press	1.4	1.4	psig
Stack Temp	75.8	90.2	F
Mean velocity	1581	1513	afpm
Ambient pressure	29.85	29.88	inHg
Ambient humidity	63%	37%	RH
Ambient temp	74.3	89.6	F
Back-Gd aerosol	8, 10, 12, 4	5, 12, 6, 3	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	28	28	psig

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: Ref data started at 1705 and ended at 2225 (end of runs.)

SS 7/2/2013

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by: Suan Sande
Signature/date 7/2/2013
Signature on file with original

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-116

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-5
Date	7/2/2013	Fan configuration	Fan B Min
Tester	SS, EA	Fan Setting	22 Hz
Stack Dia.	11.969 in.	Stack Temp	101.85 deg F
Stack X-Area	112.5 in.2	Start/End Time	0850 / 1040
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	2nd		1st

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	994	893	938	**941.7**	1302	1233	1335	**1290.0**
2	1.26	1088	938	905	**977.0**	1399	1450	1406	**1418.3**
3	2.32	1037	966	1012	**1005.0**	1521	1477	1417	**1471.7**
4	3.87	1144	1016	907	**1022.3**	1375	1482	1520	**1459.0**
Center	5.98	1141	1123	1001	**1088.3**	1574	1522	1553	**1549.7**
5	8.10	1264	1092	1162	**1172.7**	1474	1552	1500	**1508.7**
6	9.65	1361	1227	1176	**1254.7**	1405	1476	1524	**1468.3**
7	10.71	1109	1014	1118	**1080.3**	1423	1448	1504	**1458.3**
8	11.47	755	828	731	**771.3**	1197	1252	1229	**1226.0**
Averages ---------->		**1099.2**	**1010.8**	**994.4**	**1034.8**	**1407.8**	**1432.4**	**1443.1**	**1427.8**

All	pt/ft3	Dev. from mean
Mean	1231.3	
Min Point	771.3	-37.4%
Max Point	1549.7	25.9%

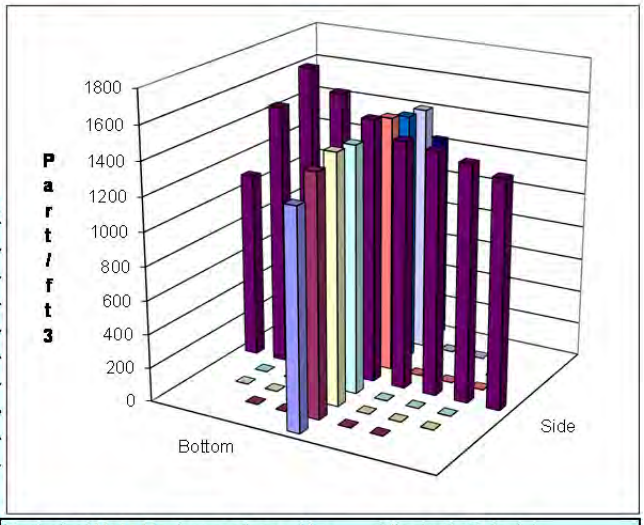
Center 2/3	Side	Bottom	All	Normlzd
Mean	1085.8	1476.3	1281.0	1511.15
Std. Dev.	98.7	41.8	215.3	106.01
COV as %	9.1	2.8	16.8	7.02

Avg Conc 1220 pt/ft3

	Start	Finish	
Generator Inlet Press	1.1	1.1	psig
Stack Temp	99.6	104.1	F
Mean velocity	1575	1610	afpm
Ambient pressure	29.91	29.91	inHg
Ambient humidity	33%	24%	RH
Ambient temp	92.3	99.5	F
Back-Gd aerosol	10, 17, 20, 10	3, 4, 6, 8	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	22	20	psig

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes:

SS 7/2/2013

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by:	Suan Sande	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/2/2013	Signature/date	7/23/2013
	Signature on file with original	Signature on file with the original TI-WTPSP-116	

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-6
Date	7/3/2013	Fan configuration	Fan B Min
Tester	CB, EA	Fan Setting	22 Hz
Stack Dia.	11.969 in.	Stack Temp	80.45 deg F
Stack X-Area	112.5 in.2	Start/End Time	0610 / 0750
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	First		Second

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1718	1392	1749	**1619.7**	2313	2399	2650	**2454.0**
2	1.26	1844	1480	1695	**1673.0**	2608	2797	2921	**2775.3**
3	2.32	1799	1722	1824	**1781.7**	2787	3057	3098	**2980.7**
4	3.87	1666	1688	1783	**1712.3**	3030	3279	3296	**3201.7**
Center	5.98	1813	1801	2126	**1913.3**	2969	3234	3414	**3205.7**
5	8.10	1688	1843	1932	**1821.0**	3108	3210	3252	**3190.0**
6	9.65	1514	1636	1844	**1664.7**	3072	3077	3262	**3137.0**
7	10.71	1214	1423	1658	**1431.7**	2881	2995	3043	**2973.0**
8	11.47	1130	1171	1042	**1114.3**	2576	2710	2895	**2727.0**
Averages ---------->		**1598.4**	**1572.9**	**1739.2**	**1636.9**	**2816.0**	**2973.1**	**3092.3**	**2960.5**

All	pt/ft3	Dev. from mean
Mean	2298.7	
Min Point	1114.3	-51.5%
Max Point	3205.7	39.5%

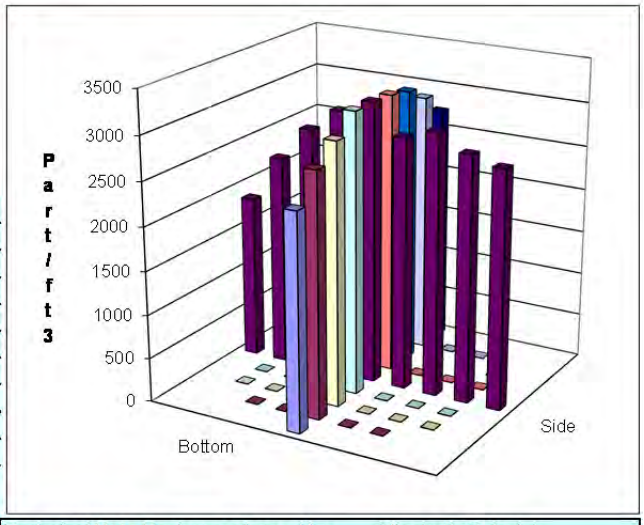
Center 2/3	Side	Bottom	All	Normlzd
Mean	1714.0	3066.2	2390.1	2968.90
Std. Dev.	152.5	162.7	717.8	229.23
COV as %	8.9	5.3	30.0	7.72

Avg Conc 2266 pt/ft3

	Start	Finish	
Generator Inlet Press	1.8	1.8	psig
Stack Temp	75.8	85.1	F
Mean velocity	1750	1684	afpm
Ambient pressure	29.94	29.94	inHg
Ambient humidity	47%	30%	RH
Ambient temp	72.5	82.4	F
Back-Gd aerosol	1, 2, 3, 7	5, 4, 5, 5	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	38	36	psig

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: Particle count appears to increase increase with T increase. Viscosity of the oil (?) coule be the cause as the ambient T increases.

CB 7/1/2013

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by: Carolyne Burns
Signature/date 7/3/2013
Signature on file with original

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-116

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-7
Date	7/3/2013	Fan configuration	Fan B Min
Tester	CB, EA	Fan Setting	22 Hz
Stack Dia.	11.969 in.	Stack Temp	90.1 deg F
Stack X-Area	112.5 in.2	Start/End Time	0815 / 0945
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	Second		First

		Side				Bottom			
Traverse--> / Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	871	794	880	848.3	1391	1187	1212	1263.3
2	1.26	966	918	882	922.0	1370	1500	1506	1458.7
3	2.32	957	864	755	858.7	1469	1596	1530	1531.7
4	3.87	882	912	785	859.7	1550	1598	1563	1570.3
Center	5.98	904	954	818	892.0	1646	1608	1568	1607.3
5	8.10	885	984	963	944.0	1501	1562	1542	1535.0
6	9.65	898	890	849	879.0	1462	1467	1480	1469.7
7	10.71	797	881	807	828.3	1482	1360	1370	1404.0
8	11.47	776	668	696	713.3	1281	1372	1300	1317.7
Averages ---------->		881.8	873.9	826.1	860.6	1461.3	1472.2	1452.3	1462.0

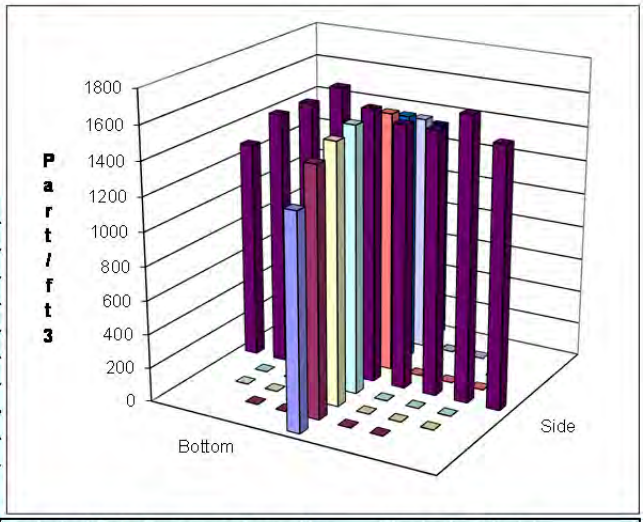
All	pt/ft3	Dev. from mean
Mean	1161.3	
Min Point	713.3	-38.6%
Max Point	1607.3	38.4%

Center 2/3	Side	Bottom	All	Normlzd
Mean	883.4	1511.0	1197.2	1551.38
Std. Dev.	39.7	70.4	330.2	80.05
COV as %	4.5	4.7	27.6	5.16

Avg Conc 1150 pt/ft3

	Start	Finish	
Generator Inlet Press	1.1	1.1	psig
Stack Temp	87.1	93.1	F
Mean velocity	1708	1780	afpm
Ambient pressure	29.94	29.97	inHg
Ambient humidity	28%	25%	RH
Ambient temp	86.9	90.5	F
Back-Gd aerosol	7, 2, 5, 3	3, 5, 12, 3	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output	40	20	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: Side center particle count low, may need to consider increasing for side measurements for future tests.

CB 7/1/2013

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by:	Carolyne Burns
Signature/date	7/3/2013
	Signature on file with original

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
	Signature on file with the original TI-WTPSP-116

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-8
Date	7/3/2013	Fan configuration	Fan B MAX
Tester	CB, EA	Fan Setting	48 Hz
Stack Dia.	11.969 in.	Stack Temp	95.15 deg F
Stack X-Area	112.5 in.2	Start/End Time	1015 / 1140
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	First		Second

		Side				Bottom			
Traverse--> / Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1093	1114	977	1061.3	1698	1577	1698	1657.7
2	1.26	1431	1608	1612	1550.3	2354	2253	2279	2295.3
3	2.32	1663	1645	1746	1684.7	2859	2691	2710	2753.3
4	3.87	1759	1607	1637	1667.7	3139	3048	2974	3053.7
Center	5.98	1849	1728	1844	1807.0	3070	3037	3035	3047.3
5	8.10	1815	1680	1625	1706.7	2703	2594	2570	2622.3
6	9.65	1442	1484	1574	1500.0	2322	2107	2102	2177.0
7	10.71	1025	1168	1149	1114.0	1605	1654	1562	1607.0
8	11.47	387	562	588	512.3	897	911	865	891.0
Averages ---------->		1384.9	1399.6	1416.9	1400.4	2294.1	2208.0	2199.4	2233.9

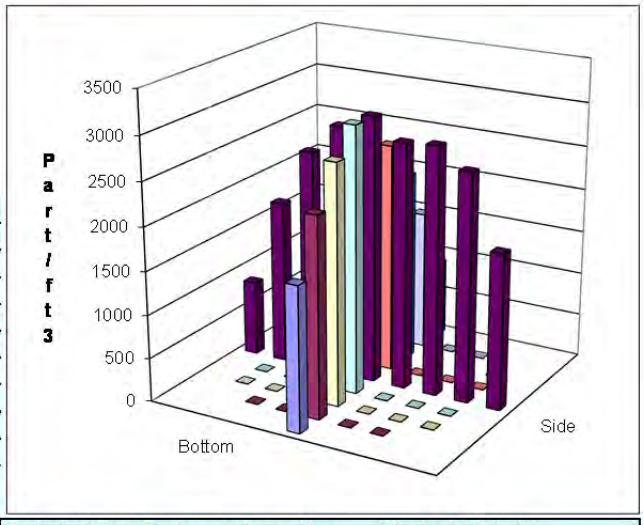
All	pt/ft3	Dev. from mean
Mean	1817.1	
Min Point	512.3	-71.8%
Max Point	3053.7	68.0%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1575.8	2508.0	2041.9	2582.69
Std. Dev.	227.5	521.0	619.0	446.33
COV as %	14.4	20.8	30.3	17.28

Avg Conc 1741 pt/ft3

	Start	Finish	
Generator Inlet Press	2.5	2.6	psig
Stack Temp	93.1	97.2	F
Mean velocity	4099	4018	afpm
Ambient pressure	29.97	30	inHg
Ambient humidity	25%	21%	RH
Ambient temp	89.6	95	F
Back-Gd aerosol	5, 6, 4, 5	1, 6, 4, 8	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	29	36	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes:

CB 7/1/2013

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by:	Carolyne Burns	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/3/2013	Signature/date	7/23/2013
	Signature on file with original	Signature on file with the original TI-WTPSP-116	

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-9
Date	7/5/2013	Fan configuration	Fan B Max
Tester	SS, EA	Fan Setting	45 Hz
Stack Dia.	11.969 in.	Stack Temp	68.35 deg F
Stack X-Area	112.5 in.2	Start/End Time	0603 / 0740
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	1st		2nd

Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	725	859	907	**830.3**	852	935	890	**892.3**
2	1.26	1019	1140	1095	**1084.7**	1275	1462	1382	**1373.0**
3	2.32	1201	1289	1339	**1276.3**	1538	1751	1652	**1647.0**
4	3.87	1351	1209	1380	**1313.3**	1815	1995	2081	**1963.7**
Center	5.98	1356	1350	1453	**1386.3**	1883	2124	2068	**2025.0**
5	8.10	1196	1560	1399	**1385.0**	1713	1939	1939	**1863.7**
6	9.65	1127	1243	1228	**1199.3**	1553	1618	1637	**1602.7**
7	10.71	790	819	738	**782.3**	1276	1316	1324	**1305.3**
8	11.47	414	350	449	**404.3**	744	734	787	**755.0**
Averages ---------->		**1019.9**	**1091.0**	**1109.8**	**1073.6**	**1405.4**	**1541.6**	**1528.9**	**1492.0**

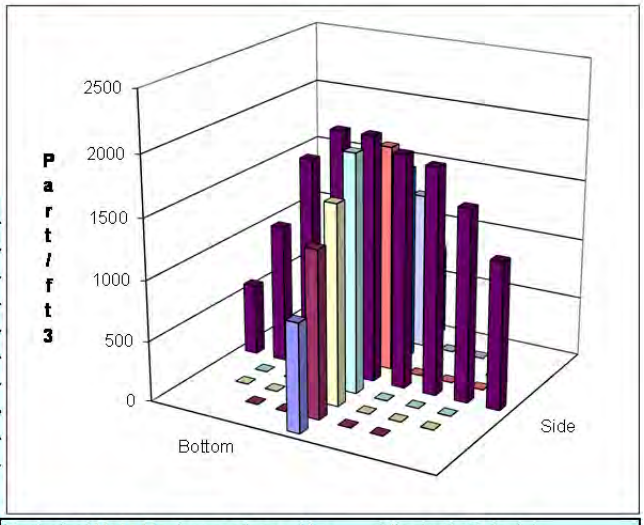
All	pt/ft3	Dev. from mean
Mean	1282.8	
Min Point	404.3	-68.5%
Max Point	2025.0	57.9%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1203.9	1682.9	1443.4	1720.72
Std. Dev.	214.2	281.3	345.6	288.52
COV as %	17.8	16.7	23.9	16.77

Avg Conc 1230 pt/ft3

	Start	Finish	
Generator Inlet Press	2.8	2.8	psig
Stack Temp	64.8	71.9	F
Mean velocity	3886	3860	afpm
Ambient pressure	29.85	29.85	inHg
Ambient humidity	55%	33%	RH
Ambient temp	59.9	74.3	F
Back-Gd aerosol	5, 6, 1, 3	3, 2, 3, 7	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output	28	34	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes:

SS 7/5/2013

Oil Used: Edwards
Ref. Probe Location: Ref port downstream of Port1
Probe Type / Configuration: L-Shape probe

Entries made by:	Susan Sande	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/5/2013	Signature/date	7/23/2013
	Signature on file with original	Signature on file with the original TI-WTPSP-116	

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-10
Date	7/5/2013	Fan configuration	Fan B Max
Tester	SS, EA	Fan Setting	45 Hz
Stack Dia.	11.969 in.	Stack Temp	75.6 deg F
Stack X-Area	112.5 in.2	Start/End Time	0746 / 0926
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	2nd		1st

Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1104	941	709	**918.0**	814	683	507	**668.0**
2	1.26	1362	1196	1195	**1251.0**	1324	1141	1076	**1180.3**
3	2.32	1483	1407	1343	**1411.0**	1499	1359	1316	**1391.3**
4	3.87	1536	1379	1592	**1502.3**	1708	1587	1539	**1611.3**
Center	5.98	1367	1562	1535	**1488.0**	1772	1538	1499	**1603.0**
5	8.10	1347	1660	1546	**1517.7**	1513	1405	1297	**1405.0**
6	9.65	1334	1279	1363	**1325.3**	1230	1145	1175	**1183.3**
7	10.71	1016	830	1065	**970.3**	1002	916	892	**936.7**
8	11.47	438	433	539	**470.0**	467	475	471	**471.0**
Averages ---------->		**1220.8**	**1187.4**	**1209.7**	**1206.0**	**1258.8**	**1138.8**	**1085.8**	**1161.1**

All	pt/ft3	Dev. from mean
Mean	1183.5	
Min Point	470.0	-60.3%
Max Point	1611.3	36.1%

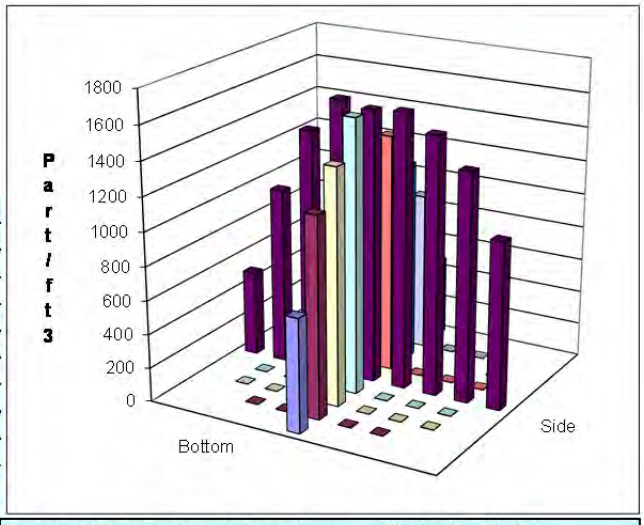
Center 2/3	Side	Bottom	All	Normlzd
Mean	1352.2	1330.1	1341.2	1393.44
Std. Dev.	195.2	245.5	213.4	229.23
COV as %	14.4	18.5	15.9	16.45

Avg Conc 1138 pt/ft3

	Start	Finish	
Generator Inlet Press	2.6	2.6	psig
Stack Temp	71.9	79.3	F
Mean velocity	3680	3948	afpm
Ambient pressure	29.85	29.85	inHg
Ambient humidity	31%	31%	RH
Ambient temp	77	74.3	F
Back-Gd aerosol	1, 5, 2, 10	1, 2, 4, 4	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	25	34	psig

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: Covered particle generator with white cloth to shield it from the sun.

SS 7/5/2013

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by: Susan Sande
Signature/date 7/5/2013
Signature on file with original

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-116

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-11
Date	7/5/2013	Fan configuration	Fan B Max
Tester	SS, EA	Fan Setting	45 Hz
Stack Dia.	11.969 in.	Stack Temp	91.5 deg F
Stack X-Area	112.5 in.2	Start/End Time	1:47/3:30
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I2
Order --->	2nd		1st

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1156	1062	1319	**1179.0**	1157	1000	1219	**1125.3**
2	1.26	1584	1718	1652	**1651.3**	1644	1573	1636	**1617.7**
3	2.32	1566	1784	1929	**1759.7**	1944	1818	2030	**1930.7**
4	3.87	1872	1698	1670	**1746.7**	2164	2148	2256	**2189.3**
Center	5.98	1954	1560	1607	**1707.0**	2042	2131	2108	**2093.7**
5	8.10	1935	1659	1883	**1825.7**	1791	1886	1918	**1865.0**
6	9.65	1859	1564	1529	**1650.7**	1603	1651	1636	**1630.0**
7	10.71	1452	1286	1228	**1322.0**	1369	1322	1263	**1318.0**
8	11.47	739	780	813	**777.3**	935	776	754	**821.7**
Averages ---------->		**1568.6**	**1456.8**	**1514.4**	**1513.3**	**1627.7**	**1589.4**	**1646.7**	**1621.3**

All	pt/ft3	Dev. from mean
Mean	1567.3	
Min Point	777.3	-50.4%
Max Point	2189.3	39.7%

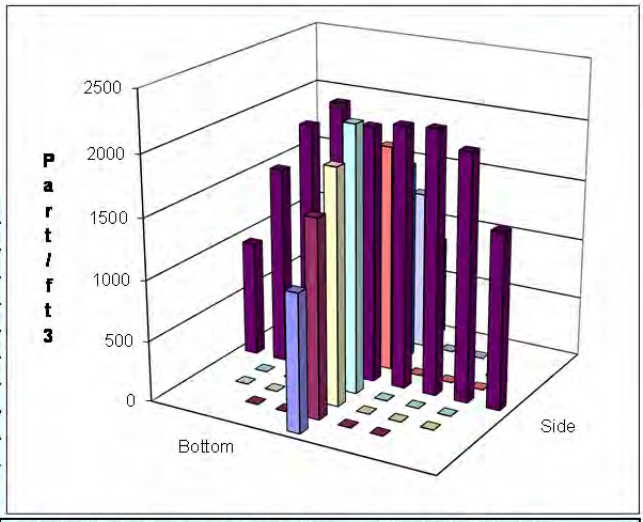
Center 2/3	Side	Bottom	All	Normlzd
Mean	1666.1	1806.3	1736.2	1924.94
Std. Dev.	163.9	303.7	245.5	276.35
COV as %	9.8	16.8	14.1	14.36

Avg Conc 1526 pt/ft3

	Start	Finish	
Generator Inlet Press	1.8	1.8	psig
Stack Temp	91.5	_	F
Mean velocity	3954	_	afpm
Ambient pressure	29.91	29.88	inHg
Ambient humidity	22%	21%	RH
Ambient temp	86	87.8	F
Back-Gd aerosol	4, 5, 5, 3	4, 6, 4, 3	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output	38	30	psig

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: Covered particle generator with white cloth to shield it from the sun. At end of test we lost the seal at the WYE. Did not get final velocity or stack temp.

SS 7/5/2013

Oil Used: Edwards
Ref. Probe Location: Ref port downstream of Port1
Probe Type / Configuration: L-Shape probe

Entries made by:	Susan Sande	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/5/2013	Signature/date	7/23/2013
	Signature on file with original	Signature on file with the original TI-WTPSP-116	

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-12
Date	7/9/2013	Fan configuration	Fan B Min
Tester	CB, EA	Fan Setting	20.3 Hz
Stack Dia.	11.969 in.	Stack Temp	70.5 deg F
Stack X-Area	112.5 in.2	Start/End Time	0550 / 0730
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I2
Order --->			2nd 1st

Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	791	996	970	**919.0**	1315	1373	1540	**1409.3**
2	1.26	956	990	1155	**1033.7**	1481	1472	1567	**1506.7**
3	2.32	1013	1030	1225	**1089.3**	1576	1588	1681	**1615.0**
4	3.87	1097	1101	1329	**1175.7**	1633	1767	1814	**1738.0**
Center	5.98	1130	1296	1428	**1284.7**	1658	1789	1770	**1739.0**
5	8.10	1405	1598	1600	**1534.3**	1541	1629	1693	**1621.0**
6	9.65	1404	1491	1643	**1512.7**	1414	1618	1610	**1547.3**
7	10.71	1322	1365	1606	**1431.0**	1340	1494	1410	**1414.7**
8	11.47	1280	1300	1540	**1373.3**	1270	1272	1192	**1244.7**
Averages ---------->		**1155.3**	**1240.8**	**1388.4**	**1261.5**	**1469.8**	**1555.8**	**1586.3**	**1537.3**

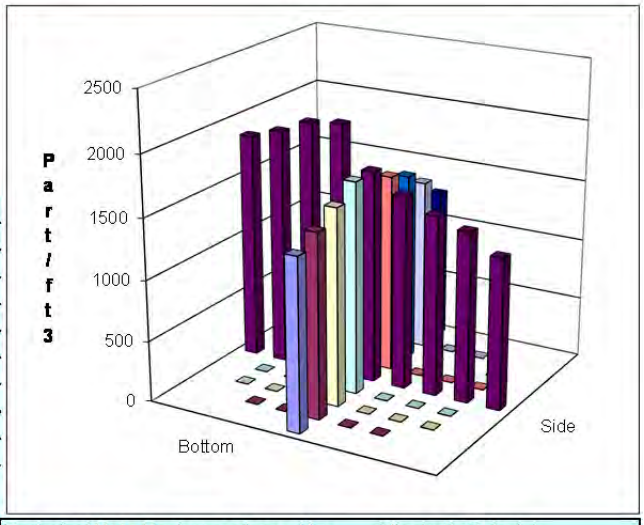
All	pt/ft3	Dev. from mean
Mean	1399.4	
Min Point	919.0	-34.3%
Max Point	1739.0	24.3%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1294.5	1597.4	1445.9	1674.83
Std. Dev.	203.3	118.9	224.3	218.98
COV as %	15.7	7.4	15.5	13.07

Avg Conc 1385 pt/ft3

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	65.5	75.5	F
Mean velocity	1585	1587	afpm
Ambient pressure	30	30	inHg
Ambient humidity	65%	29%	RH
Ambient temp	63.5	82.4	F
Back-Gd aerosol	3, 3, 13, 8	2, 6, 3, 10	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	38	32	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: Covered the aerosol generator with a tarp (cloth) at the beginning of the bottom #3 run.
CB 7/9/2013

Oil Used: Edwards
Ref. Probe Location: Ref port downstream of Port1
Probe Type / Configuration: L-Shape probe

Entries made by: CB
Signature/date 7/9/2013
Signature on file with original

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-116

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-13
Date	7/9/2013	Fan configuration	Fan B Min
Tester	CB, EA, SS	Fan Setting	20.3 Hz
Stack Dia.	11.969 in.	Stack Temp	79.8 deg F
Stack X-Area	112.5 in.2	Start/End Time	0735 / 0915
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I2
Order --->		1st	2nd

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1383	1402	1379	1388.0	1434	1590	1533	1519.0
2	1.26	1585	1196	1327	1369.3	1608	1677	1653	1646.0
3	2.32	1725	1359	1381	1488.3	1715	1700	1745	1720.0
4	3.87	1800	1285	1488	1524.3	1800	1869	1831	1833.3
Center	5.98	1782	1473	1535	1596.7	1845	1799	1815	1819.7
5	8.10	1784	1618	1884	1762.0	1807	1710	1747	1754.7
6	9.65	1923	1701	1947	1857.0	1759	1627	1641	1675.7
7	10.71	1706	1628	1710	1681.3	1608	1526	1628	1587.3
8	11.47	1322	1330	1641	1431.0	1494	1380	1445	1439.7
Averages ---------->		1667.8	1443.6	1588.0	1566.4	1674.4	1653.1	1670.9	1666.1

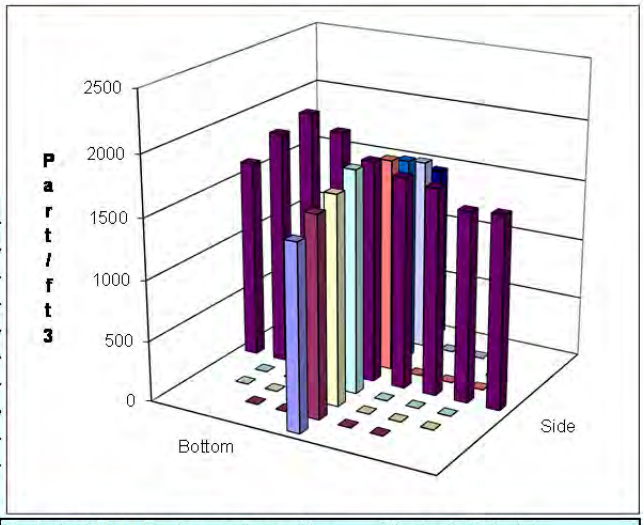
All	pt/ft3	Dev. from mean
Mean	1616.3	
Min Point	1369.3	-15.3%
Max Point	1857.0	14.9%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1611.3	1719.5	1665.4	1777.93
Std. Dev.	168.0	90.4	141.3	156.11
COV as %	10.4	5.3	8.5	8.78

Avg Conc 1605 pt/ft3

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	75.5	84.1	F
Mean velocity	1587	1610	afpm
Ambient pressure	30	30.03	inHg
Ambient humidity	29%	29%	RH
Ambient temp	82.4	86	F
Back-Gd aerosol	7,3,3,4	5,10,12,15	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	32	34	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes:

SS 7/9/2013

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by: SS
Signature/date 7/9/2013
Signature on file with original

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-116

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-14
Date	7/9/2013	Fan configuration	Fan B Min
Tester	EA, SS, TH	Fan Setting	20.3 Hz
Stack Dia.	11.969 in.	Stack Temp	88.7 deg F
Stack X-Area	112.5 in.2	Start/End Time	0915\1106
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I2
Order --->	2nd		1st

Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1170	1041	1176	1129.0	1642	1521	1516	1559.7
2	1.26	1255	1108	1184	1182.3	1790	1585	1660	1678.3
3	2.32	1259	1107	1124	1163.3	1909	1727	1880	1838.7
4	3.87	1403	1225	1211	1279.7	2031	1892	1987	1970.0
Center	5.98	1395	1203	1464	1354.0	1911	1888	1940	1913.0
5	8.10	1510	1330	1584	1474.7	1873	1823	1864	1853.3
6	9.65	1606	1281	1434	1440.3	1730	1737	1738	1735.0
7	10.71	1430	1396	1277	1367.7	1613	1675	1753	1680.3
8	11.47	1256	1457	1105	1272.7	1393	1550	1531	1491.3
Averages ---------->		1364.9	1238.7	1284.3	1296.0	1765.8	1710.9	1763.2	1746.6

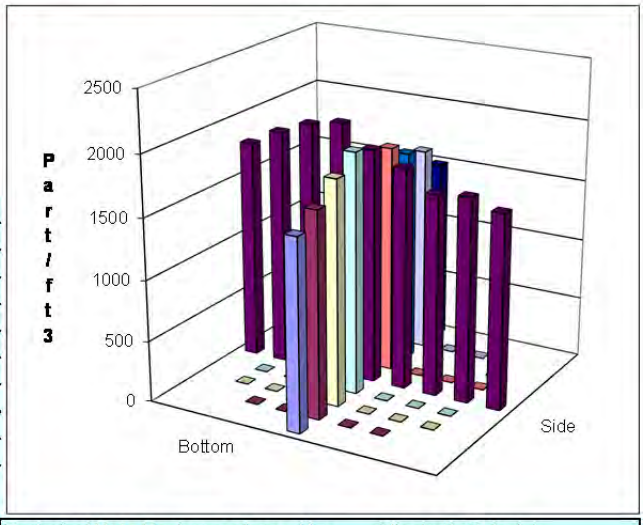
All	pt/ft3	Dev. from mean
Mean	1521.3	
Min Point	1129.0	-25.8%
Max Point	1970.0	29.5%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1323.1	1809.8	1566.5	1839.61
Std. Dev.	120.3	114.5	276.6	142.65
COV as %	9.1	6.3	17.7	7.75

Avg Conc 1507 pt/ft3

	Start	Finish	
Generator Inlet Press	1.3	1.2	psig
Stack Temp	84.1	93.3	F
Mean velocity	1610	1524	afpm
Ambient pressure	30.03	30.03	inHg
Ambient humidity	29%	27%	RH
Ambient temp	86	89.6	F
Back-Gd aerosol	15,15,10,12	9,6,7,14	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	34	28	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: First side traverse seemed high so we redid it as side 4

SS 7/9/2013

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by:	SS	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/9/2013	Signature/date	7/23/2013
	Signature on file with original	Signature on file with the original TI-WTPSP-116	

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-15
Date	7/10/2013	Fan configuration	Fan A Min
Tester	EA, SS	Fan Setting	20.3 Hz
Stack Dia.	11.969 in.	Stack Temp	75.7 deg F
Stack X-Area	112.5 in.2	Start/End Time	0606 / 0745
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I2
Order --->	2nd		1st

Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1139	1265	1341	1248.3	1104	1174	1244	1174.0
2	1.26	1290	1404	1519	1404.3	1247	1368	1337	1317.3
3	2.32	1334	1469	1554	1452.3	1422	1463	1442	1442.3
4	3.87	1448	1452	1617	1505.7	1460	1564	1563	1529.0
Center	5.98	1413	1527	1668	1536.0	1537	1496	1489	1507.3
5	8.10	1511	1663	1634	1602.7	1444	1420	1510	1458.0
6	9.65	1648	1702	1690	1680.0	1430	1408	1476	1438.0
7	10.71	1497	1560	1668	1575.0	1402	1246	1289	1312.3
8	11.47	1434	1411	1571	1472.0	1202	1217	1230	1216.3
Averages ---------->		1412.7	1494.8	1584.7	1497.4	1360.9	1372.9	1397.8	1377.2

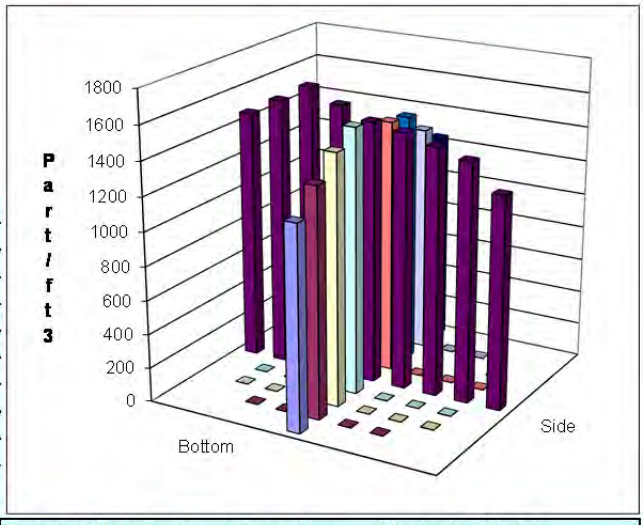
All	pt/ft3	Dev. from mean
Mean	1437.3	
Min Point	1174.0	-18.3%
Max Point	1680.0	16.9%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1536.6	1429.2	1482.9	1496.47
Std. Dev.	93.1	85.0	102.1	95.86
COV as %	6.1	5.9	6.9	6.41

Avg Conc 1427 pt/ft3

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	70	81.4	F
Mean velocity	1570	1616	afpm
Ambient pressure	29.91	29.88	inHg
Ambient humidity	50%	31%	RH
Ambient temp	67.1	81.5	F
Back-Gd aerosol	8, 8, 12, 13	8, 8, 8, 9	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	29	32	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes:

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by:	Susan Sande
Signature/date	7/10/2013
	Signature on file with original

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-116	

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-16
Date	7/10/2013	Fan configuration	Fan A Max
Tester	EA, SS, TH	Fan Setting	49 Hz
Stack Dia.	11.969 in.	Stack Temp	85.65 deg F
Stack X-Area	112.5 in.2	Start/End Time	0752 / 0935
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I2
Order --->	1st		2nd

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	850	799	769	**806.0**	872	889	878	**879.7**
2	1.26	1088	987	921	**998.7**	1170	1229	1307	**1235.3**
3	2.32	1158	1177	1216	**1183.7**	1463	1401	1533	**1465.7**
4	3.87	1353	1325	1169	**1282.3**	1711	1770	1720	**1733.7**
Center	5.98	1367	1249	1165	**1260.3**	1923	1796	1822	**1847.0**
5	8.10	1432	1248	1251	**1310.3**	1823	1731	1696	**1750.0**
6	9.65	1083	1193	1145	**1140.3**	1687	1501	1435	**1541.0**
7	10.71	533	774	744	**683.7**	1236	1054	1073	**1121.0**
8	11.47	340	199	396	**311.7**	586	471	433	**496.7**
Averages ---------->		**1022.7**	**994.6**	**975.1**	**997.4**	**1385.7**	**1315.8**	**1321.9**	**1341.1**

All	**pt/ft3**	**Dev. from mean**
Mean	**1169.3**	
Min Point	**311.7**	**-73.3%**
Max Point	**1847.0**	**58.0%**

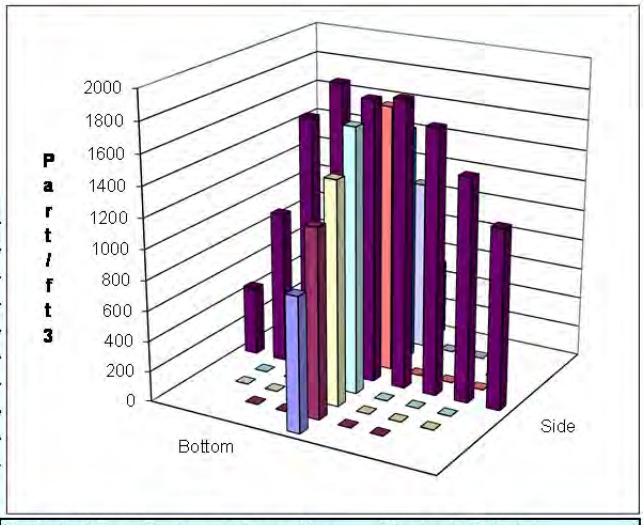
Center 2/3	**Side**	**Bottom**	**All**	**Normlzd**
Mean	**1122.8**	**1527.7**	**1325.2**	**1586.53**
Std. Dev.	**220.5**	**273.5**	**318.0**	**294.03**
COV as %	**19.6**	**17.9**	**24.0**	**18.53**

Avg Conc 1121 pt/ft3

	Start	Finish	
Generator Inlet Press	2.0	2.0	psig
Stack Temp	81.9	89.4	F
Mean velocity	3973	3795	afpm
Ambient pressure	29.88	29.88	inHg
Ambient humidity	31%	29%	RH
Ambient temp	81.5	86	F
Back-Gd aerosol	12, 14, 11, 6	7, 11, 7, 8	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	32	22	psig

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes:

SS 7/10/2013

Oil Used: Edwards
Ref. Probe Location: Ref port downstream of Port1
Probe Type / Configuration: L-Shape probe

Entries made by:	Susan Sande	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/10/2013	Signature/date	7/23/2013
	Signature on file with original	Signature on file with the original TI-WTPSP-116	

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-17
Date	7/10/2013	Fan configuration	Fan A Max
Tester	EA, SS, TH	Fan Setting	49 Hz
Stack Dia.	11.969 in.	Stack Temp	93.15 deg F
Stack X-Area	112.5 in.2	Start/End Time	0940 /
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I2
Order --->	1st		2nd

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	578	747	659	**661.3**	757	740	499	**665.3**
2	1.26	834	993	805	**877.3**	962	1028	836	**942.0**
3	2.32	867	1080	907	**951.3**	1249	1253	985	**1162.3**
4	3.87	1031	1162	919	**1037.3**	1440	1437	1125	**1334.0**
Center	5.98	901	1071	1050	**1007.3**	1508	1430	1281	**1406.3**
5	8.10	743	1033	1074	**950.0**	1459	1437	1161	**1352.3**
6	9.65	878	1116	965	**986.3**	1387	1275	1026	**1229.3**
7	10.71	693	649	551	**631.0**	1053	986	797	**945.3**
8	11.47	359	287	337	**327.7**	455	477	313	**415.0**
Averages ---------->		**764.9**	**904.2**	**807.4**	**825.5**	**1141.1**	**1118.1**	**891.4**	**1050.2**

All	pt/ft3	Dev. from mean
Mean	937.9	
Min Point	327.7	-65.1%
Max Point	1406.3	49.9%

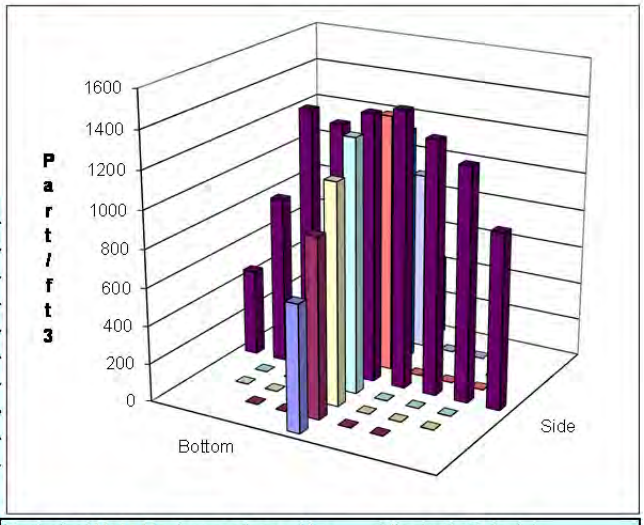
Center 2/3	Side	Bottom	All	Normlzd
Mean	920.1	1196.0	1058.0	1240.25
Std. Dev.	137.2	190.3	214.2	189.14
COV as %	14.9	15.9	20.2	15.25

Avg Conc 904 pt/ft3

	Start	Finish	
Generator Inlet Press	1.7	1.6	psig
Stack Temp	89.4	96.9	F
Mean velocity	3795	3908	afpm
Ambient pressure	29.88	29.91	inHg
Ambient humidity	29%	24%	RH
Ambient temp	86	91.4	F
Back-Gd aerosol	9, 6, 4, 4	4, 4, 4, 5	pt/ft3
No. Blk-Gd samples	4	4	
Compressor output	11	20	psig

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: Lowered inlet press to 1.8, settled at 1.7 psig.

SS7/10/13

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by: Susan Sande
Signature/date 7/10/2013
Signature on file with original

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-116

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-18
Date	7/10/2013	Fan configuration	Fan A Max
Tester	TH, SS	Fan Setting	56 Hz
Stack Dia.	11.969 in.	Stack Temp	104.5 deg F
Stack X-Area	112.5 in.2	Start/End Time	1314 / 1515
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I2
Order —–>	1st		2nd

		Side				Bottom			
Traverse-->									
Trial —–>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1099	1194	1223	1172.0	1636	1494	1562	1564.0
2	1.26	1358	1648	1494	1500.0	1779	1744	1870	1797.7
3	2.32	1560	1840	1706	1702.0	1915	2006	2114	2011.7
4	3.87	1483	1800	1937	1740.0	2229	2297	2288	2271.3
Center	5.98	1653	1825	1885	1787.7	2390	2267	2244	2300.3
5	8.10	2028	1585	1942	1851.7	2205	2172	2288	2221.7
6	9.65	1646	1771	1965	1794.0	2057	2067	2108	2077.3
7	10.71	1476	1564	1768	1602.7	1801	1753	1895	1816.3
8	11.47	1082	1086	1309	1159.0	1328	1374	1279	1327.0
Averages ———–>		1487.2	1590.3	1692.1	1589.9	1926.7	1908.2	1960.9	1931.9

All	pt/ft3	Dev. from mean
Mean	1760.9	
Min Point	1159.0	-34.2%
Max Point	2300.3	30.6%

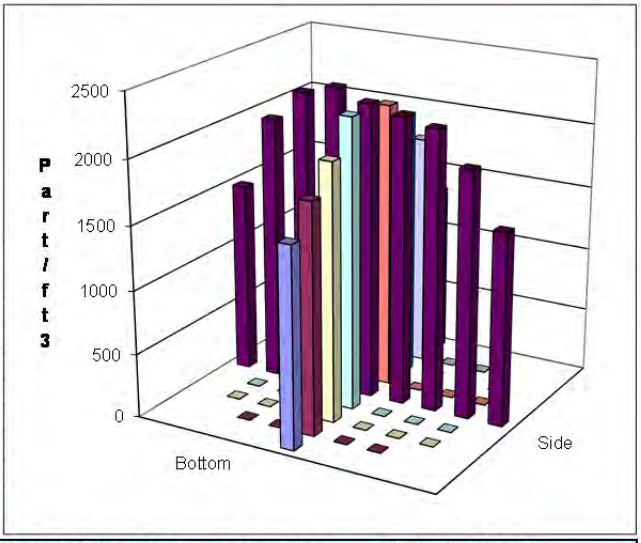
Center 2/3	Side	Bottom	All	Normlzd
Mean	1711.1	2070.9	1891.0	2136.38
Std. Dev.	122.3	207.6	248.3	189.57
COV as %	7.1	10.0	13.1	8.87

Avg Conc 1726 pt/ft3

	Start	Finish	
Generator Inlet Press	1.6	1.7	psig
Stack Temp	101.8	107.2	F
Mean velocity	3075	2857	afpm
Ambient pressure	29.91	29.91	inHg
Ambient humidity	20%	17%	RH
Ambient temp	93.2	100.4	F
Back-Gd aerosol	31, 49, 34, 24	32, 20, 19, 26	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output	24	18	psig

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes:

SS7/10/13

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by:	Susan Sande	Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/10/2013	Signature/date	7/23/2013
	Signature on file with original	Signature on file with the original TI-WTPSP-116	

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-19
Date	7/11/2013	Fan configuration	Fan A Max
Tester	EA, CB, SS	Fan Setting	55.5 Hz
Stack Dia.	11.969 in.	Stack Temp	71.65 deg F
Stack X-Area	112.5 in.2	Start/End Time	0550 / 0808
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I2
Order --->	2nd		1st

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	693	931	690	771.3	463	327	648	479.3
2	1.26	1098	1032	1038	1056.0	914	977	1122	1004.3
3	2.32	1377	1480	1362	1406.3	1179	1273	1337	1263.0
4	3.87	1620	1406	1424	1483.3	1356	1691	1616	1554.3
Center	5.98	1706	1865	1670	1747.0	1543	1822	1854	1739.7
5	8.10	1545	1753	1601	1633.0	1459	1603	1791	1617.7
6	9.65	1582	1433	1480	1498.3	1479	1396	1699	1524.7
7	10.71	1116	880	962	986.0	1054	1051	1241	1115.3
8	11.47	474	457	658	529.7	537	486	584	535.7
Averages ---------->		1245.7	1248.6	1209.4	1234.6	1109.3	1180.7	1321.3	1203.8

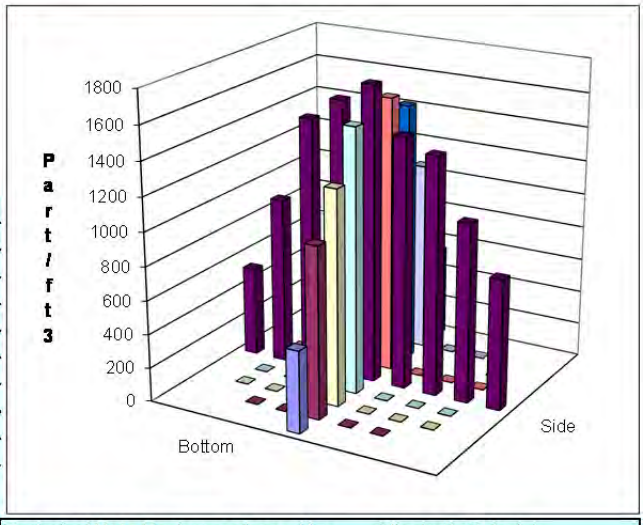
All	pt/ft3	Dev. from mean
Mean	1219.2	
Min Point	479.3	-60.7%
Max Point	1747.0	43.3%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1401.4	1402.7	1402.1	1405.03
Std. Dev.	283.2	276.4	268.8	269.41
COV as %	20.2	19.7	19.2	19.17

Avg Conc 1154 pt/ft3

	Start	Finish	
Generator Inlet Press	2.6	2.6	psig
Stack Temp	66.4	76.9	F
Mean velocity	4583	4633	afpm
Ambient pressure	29.83	29.85	inHg
Ambient humidity	35%	33%	RH
Ambient temp	64.4	76.1	F
Back-Gd aerosol	28,19,13,18	7, 4, 4, 4	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output	29	34	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: High backgrount counts

SS 7/11/13

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by: Susan Sande
Signature/date 7/11/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-116

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-20
Date	7/11/2013	Fan configuration	Fan A Max
Tester	EA, CB, SS, TH	Fan Setting	46.5 Hz
Stack Dia.	11.969 in.	Stack Temp	81.85 deg F
Stack X-Area	112.5 in.2	Start/End Time	0820 / 1010
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	1st		2nd

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	641	728	651	673.3	748	601	344	564.3
2	1.26	942	1051	1166	1053.0	1088	996	1014	1032.7
3	2.32	1055	1326	1380	1253.7	1405	1244	1356	1335.0
4	3.87	1135	1256	1369	1253.3	1657	1366	1413	1478.7
Center	5.98	1077	1570	1527	1391.3	1698	1479	1554	1577.0
5	8.10	1095	1357	1442	1298.0	1683	1545	1555	1594.3
6	9.65	908	1209	1263	1126.7	1585	1450	1546	1527.0
7	10.71	684	956	724	788.0	1195	1046	1092	1111.0
8	11.47	546	571	358	491.7	613	511	520	548.0
Averages ---------->		898.1	1113.8	1097.8	1036.6	1296.9	1137.6	1154.9	1196.4

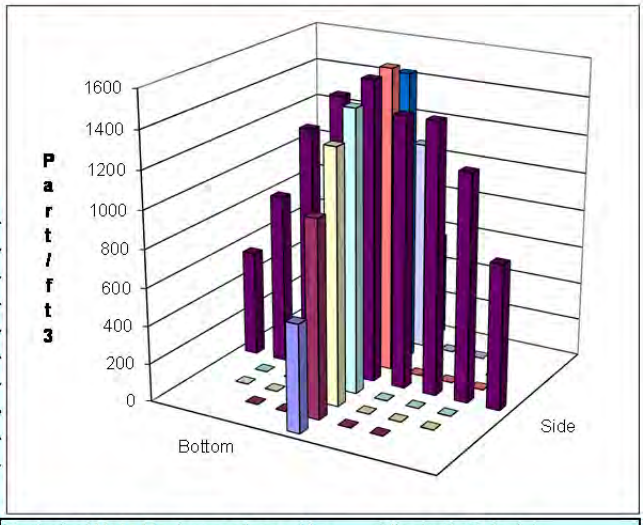
All	pt/ft3	Dev. from mean
Mean	1116.5	
Min Point	491.7	-56.0%
Max Point	1594.3	42.8%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1166.3	1379.4	1272.8	1350.65
Std. Dev.	200.3	227.7	233.8	220.47
COV as %	17.2	16.5	18.4	16.32

Avg Conc 1071 pt/ft3

	Start	Finish	
Generator Inlet Press	2.5	2.5	psig
Stack Temp	79.3	84.4	F
Mean velocity	4124	3841	afpm
Ambient pressure	29.85	29.88	inHg
Ambient humidity	22%	24%	RH
Ambient temp	87.8	81.5	F
Back-Gd aerosol	6, 7, 4, 6	3,4,4,4	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output	38	42	psig

Instruments Used:			Cal. Due
TSI VelciCalc		T95351203001	12/10/2013
Fisher Scientific		90936818	12/11/2013
Met One OPC		96258675	FIO
Met One OP	3983	1011529009	1/14/2014



Notes:

SS 7/11/13

Oil Used: Edwards
Ref. Probe Location: Ref port downstream of Port1
Probe Type / Configuration: L-Shape probe

Entries made by: Susan Sande
Signature/date 7/11/2013

Technical Data Review performed by: Elizabeth Golovich
Signature/date 7/23/2013
Signature on file with the original TI-WTPSP-116

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S2 Scale Model	Run No.	PT-21
Date	7/11/2013	Fan configuration	Fan A Max
Tester	EA, CB, SS, TH	Fan Setting	46.5 Hz
Stack Dia.	11.969 in.	Stack Temp	87.15 deg F
Stack X-Area	112.5 in.2	Start/End Time	1020 / 1200
Test Port	1	Center 2/3 from	1.10 to: 10.87
Distance to disturbance	221.12 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I3
Order --->	2nd		1st

		Side				Bottom			
Traverse-->									
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3							
1	0.50	798	752	939	**829.7**	448	630	629	**569.0**
2	367.00	1071	1068	1239	**1126.0**	1129	1133	1037	**1099.7**
3	2.32	1372	1360	1488	**1406.7**	1256	1364	1351	**1323.7**
4	3.87	1430	1583	1538	**1517.0**	1469	1586	1429	**1494.7**
Center	5.98	1616	1573	1716	**1635.0**	1615	1717	1627	**1653.0**
5	8.10	1632	1501	1539	**1557.3**	1680	1666	1777	**1707.7**
6	9.65	1417	1379	1367	**1387.7**	1443	1491	1573	**1502.3**
7	10.71	1190	1159	954	**1101.0**	1176	1239	1095	**1170.0**
8	11.47	798	772	544	**704.7**	604	612	589	**601.7**
Averages ---------->		**1258.2**	**1238.6**	**1258.2**	**1251.7**	**1202.2**	**1270.9**	**1234.1**	**1235.7**

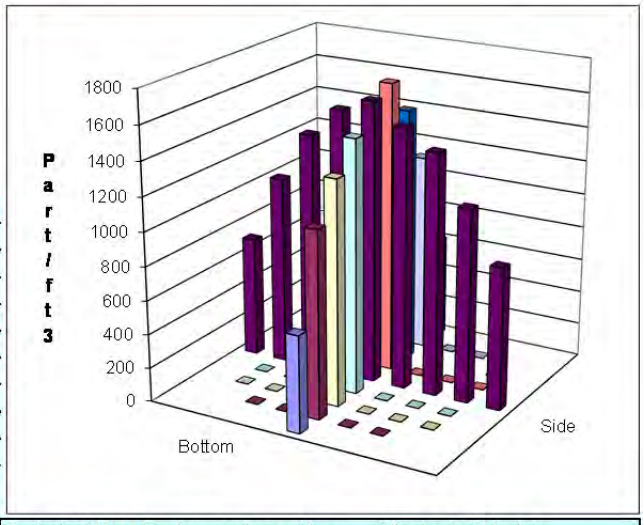
All	pt/ft3	Dev. from mean
Mean	1243.7	
Min Point	569.0	-54.2%
Max Point	1707.7	37.3%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1390.1	1421.6	1405.8	1413.49
Std. Dev.	207.2	232.3	212.1	212.68
COV as %	14.9	16.3	15.1	15.05

Avg Conc 1194 pt/ft3

	Start	Finish	
Generator Inlet Press	2.4	2.5	psig
Stack Temp	84.4	89.9	F
Mean velocity	3841	3653	afpm
Ambient pressure	29.88	29.91	inHg
Ambient humidity	24%	22%	RH
Ambient temp	81.5	84.2	F
Back-Gd aerosol	4,5,7,9	8, 6, 2, 2	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output	42	30	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes:

SS 7/11/13

Oil Used: Edwards

Ref. Probe Location: Ref port downstream of Port1

Probe Type / Configuration: L-Shape probe

Entries made by:	Susan Sande
Signature/date	7/11/2013

Technical Data Review performed by:	Elizabeth Golovich
Signature/date	7/23/2013
Signature on file with the original TI-WTPSP-116	

Appendix D

LV-S3 Data Sheets

D.1 LV-S3 Calibration of Ventilation Flow Controller

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	FC-1
Date	7/12/13	Fan Configuration	Fan C
Testers	EA, SS,CB	Fan Setting	31 Hz
Stack Dia.	11.922 in.	Stack Temp	96.9 deg F
Stack X-Area	111.6 in.2	Start/End Time	1422 / 1448
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Velocity units	aft/min	Data Files:	NA

Order →		2nd				1st			
Traverse→		Side				Bottom			
Trial →		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	738	824	855	**805.7**	746	839	829	**804.7**
2	1.25	933	936	937	**935.3**	862	920	936	**906.0**
3	2.31	1034	1006	999	**1013.0**	952	1004	1023	**993.0**
4	3.85	1070	1072	1039	**1060.3**	1061	1076	1060	**1065.7**
Center	5.96	1115	1112	1090	**1105.7**	1107	1126	1119	**1117.3**
5	8.07	1115	1075	1085	**1091.7**	1079	1185	1086	**1116.7**
6	9.61	1032	1039	1035	**1035.3**	1039	1002	1047	**1029.3**
7	10.67	951	991	982	**974.7**	892	911	920	**907.7**
8	11.42	852	869	866	**862.3**	794	781	815	**796.7**
Averages →		**982.2**	**991.6**	**987.6**	**987.1**	**948.0**	**982.7**	**981.7**	**970.8**

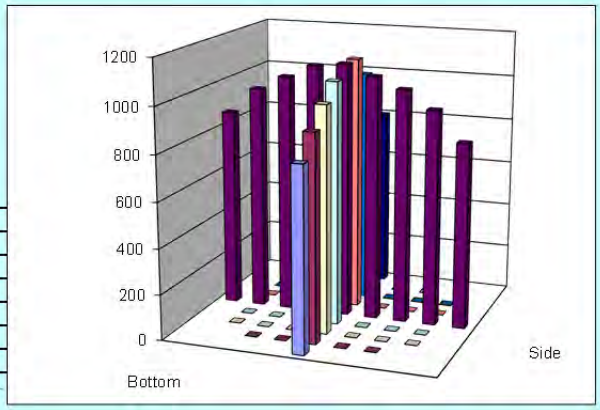
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	978.9		Mean	1030.9	1019.4	1025.1
Min Point	796.7	-18.6%	Std. Dev.	61.6	88.8	73.7
Max Point	1117.3	14.1%	COV as %	6.0	8.7	7.2

Flow w/o C-Pt 746 acfm
Vel Avg w/o C-Pt 962 afpm

	Start	Finish	
Stack temp	99.1	94.7	F
Equipment temp	na	na	F
Ambient temp	89.6	86	F
Stack static	na	na	mbars
Ambient pressure	29.91	29.91	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	19%	20%	RH

Instuments Used:

		Cal Due
TSI VelociCalc	T95351203001	12/10/13
Fisher Scientific Barometer	90936818	12/11/2013



Notes:

CB 7/12/2013

Entries made by:	CB 7/12/2013	Technical Data Review performed by:	Carmen Arimescu
Signature/date	Signature on file with original	Signature/date	12/9/2013
			Signature on file with original TI-WTSP-119

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	FC-2
Date	7/15/13	Fan Configuration	Fan B Only
Testers	EA, SS	Fan Setting	32 Hz
Stack Dia.	11.922 in.	Stack Temp	69.7 deg F
Stack X-Area	111.6 in.2	Start/End Time	0546 / 0610
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Velocity units	aft/min	Data Files:	NA

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	702	671	727	700.0	761	809	809	793.0
2	1.25	824	804	840	822.7	823	834	870	842.3
3	2.31	910	897	899	902.0	920	927	960	935.7
4	3.85	979	972	949	966.7	1002	970	1018	996.7
Center	5.96	1016	1003	993	1004.0	1042	1017	1063	1040.7
5	8.07	989	963	982	978.0	1041	1055	1044	1046.7
6	9.61	957	915	917	929.7	977	992	983	984.0
7	10.67	885	877	872	878.0	902	921	890	904.3
8	11.42	784	756	781	773.7	761	802	776	779.7
Averages ———>		894.0	873.1	884.4	883.9	914.3	925.2	934.8	924.8

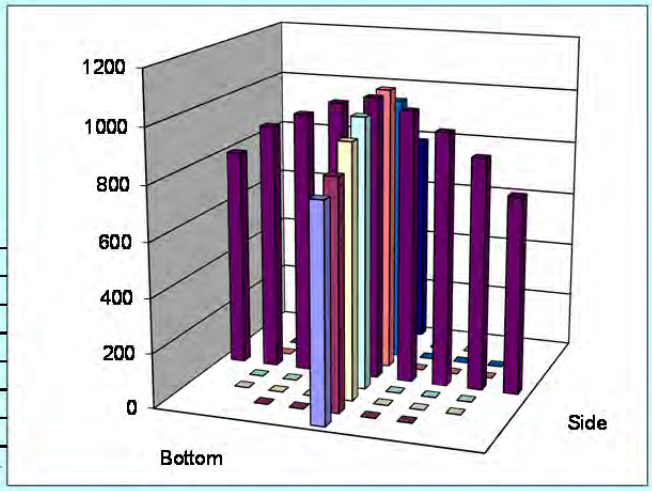
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	904.3		Mean	925.9	964.3	945.1
Min Point	700.0	-22.6%	Std. Dev.	63.3	74.5	69.4
Max Point	1046.7	15.7%	COV as %	6.8	7.7	7.3

Flow w/o C-Pt 690 acfm
Vel Avg w/o C-Pt 890 afpm

Instuments Used:

		Cal Due
TSI VelociCalc	T95351203001	12/10/13
Fisher Scientific Barometer	90936818	12/11/2013

	Start	Finish	
Stack temp	66.8	72.5	F
Equipment temp	na	na	F
Ambient temp	64.4	67.1	F
Stack static	na	na	mbars
Ambient pressure	29.88	29.91	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	33%	32%	RH



Notes:

SS 7/15/2013

Entries made by:	Susan Sande 7/15/2013	Technical Data Review performed by:	Carmen Arimescu
Signature/date	Signature on file with original	Signature/date	12/9/2013
		Signature on file with original TI-WTSP-119	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	FC-3
Date	7/15/13	Fan Configuration	Fans B&C
Testers	SS, EA	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	82.1 deg F
Stack X-Area	111.6 in.2	Start/End Time	0705 / 0738
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Velocity units	aft/min	Data Files:	NA

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1294	1271	1280	**1281.7**	1175	1303	1232	**1236.7**
2	1.25	1416	1451	1456	**1441.0**	1412	1451	1410	**1424.3**
3	2.31	1625	1615	1590	**1610.0**	1570	1577	1602	**1583.0**
4	3.85	1703	1743	1711	**1719.0**	1686	1705	1709	**1700.0**
Center	5.96	1729	1750	1747	**1742.0**	1763	1896	1743	**1800.7**
5	8.07	1700	1690	1704	**1698.0**	1719	1716	1723	**1719.3**
6	9.61	1627	1602	1618	**1615.7**	1667	1683	1634	**1661.3**
7	10.67	1484	1512	1500	**1498.7**	1491	1554	1506	**1517.0**
8	11.42	1351	1369	1370	**1363.3**	1290	1318	1313	**1307.0**
Averages ———>		**1547.7**	**1555.9**	**1552.9**	**1552.1**	**1530.3**	**1578.1**	**1541.3**	**1549.9**

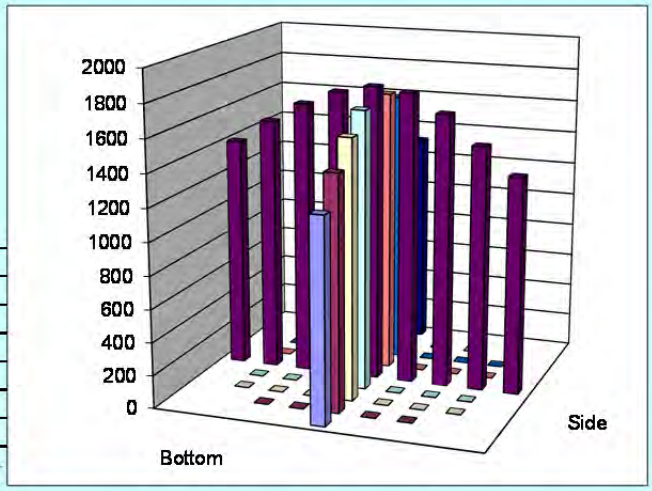
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1551.0		Mean	1617.8	1629.4	1623.6
Min Point	1236.7	-20.3%	Std. Dev.	113.7	129.3	117.1
Max Point	1800.7	16.1%	COV as %	7.0	7.9	7.2

Flow w/o C-Pt 1181 acfm
Vel Avg w/o C-Pt 1524 afpm

Instuments Used:

		Cal Due
TSI VelociCalc	T95351203001	12/10/13
Fisher Scientific Barometer	90936818	12/11/2013

	Start	Finish	
Stack temp	81.1	83.1	F
Equipment temp	na	na	F
Ambient temp	82.4	88.7	F
Stack static	na	na	mbars
Ambient pressure	29.91	29.91	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	29%	22%	RH



Notes:

SS 7/15/2013

Entries made by:	Susan Sande 7/15/2013	Technical Data Review performed by:	Carmen Arimescu
Signature/date	Signature on file with original	Signature/date	12/9/2013
		Signature on file with original TI-WTSP-119	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	FC-4
Date	7/15/13	Fan Configuration	Fan A
Testers	SS, EA	Fan Setting	32 Hz
Stack Dia.	11.922 in.	Stack Temp	89.0 deg F
Stack X-Area	111.6 in.2	Start/End Time	0915 / 0943
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Velocity units	aft/min	Data Files:	NA

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	748	807	777	777.3	744	804	789	779.0
2	1.25	902	896	885	894.3	856	882	864	867.3
3	2.31	985	977	956	972.7	934	949	971	951.3
4	3.85	1024	1002	1037	1021.0	1012	1008	1047	1022.3
Center	5.96	1054	1073	1052	1059.7	1070	1066	1075	1070.3
5	8.07	1037	1048	1025	1036.7	1053	1055	1067	1058.3
6	9.61	997	980	989	988.7	1007	986	1015	1002.7
7	10.67	936	914	902	917.3	895	892	921	902.7
8	11.42	840	856	849	848.3	786	767	793	782.0
Averages ———>		947.0	950.3	941.3	946.2	928.6	934.3	949.1	937.3

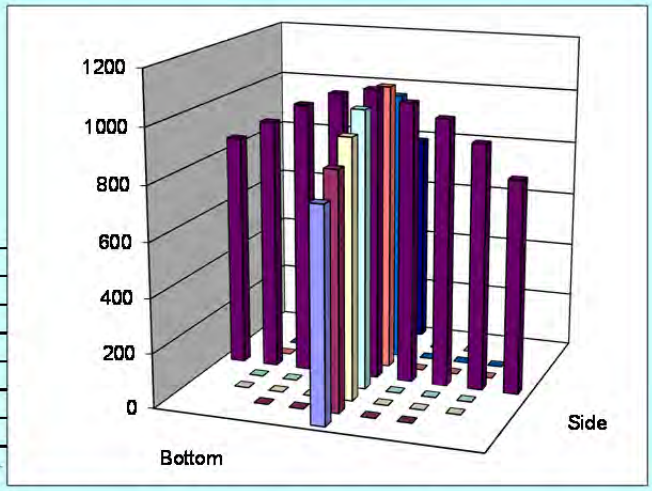
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	941.8		Mean	984.3	982.1	983.2
Min Point	777.3	-17.5%	Std. Dev.	61.2	77.5	67.1
Max Point	1070.3	13.7%	COV as %	6.2	7.9	6.8

Flow w/o C-Pt 718 acfm
Vel Avg w/o C-Pt 926 afpm

Instuments Used:

		Cal Due
TSI VelociCalc	T95351203001	12/10/13
Fisher Scientific Barometer	90936818	12/11/2013

	Start	Finish	
Stack temp	89.2	88.7	F
Equipment temp	na	na	F
Ambient temp	82.4	94.1	F
Stack static	na	na	mbars
Ambient pressure	29.94	29.94	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	22%	18%	RH



Notes:

SS 7/15/2013

Entries made by:	EA 7/15/13	Technical Data Review performed by:	Carmen Arimescu
Signature/date	Signature on file with original	Signature/date	12/9/2013
		Signature on file with original TI-WTSP-119	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	FC-5
Date	7/15/13	Fan Configuration	Fans A&C
Testers	SS, EA	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	92.5 deg F
Stack X-Area	111.6 in.2	Start/End Time	1022 / 1056
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Velocity units	aft/min	Data Files:	NA

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1337	1350	1322	**1336.3**	1202	1309	1332	**1281.0**
2	1.25	1507	1491	1541	**1513.0**	1438	1484	1492	**1471.3**
3	2.31	1634	1633	1643	**1636.7**	1596	1612	1594	**1600.7**
4	3.85	1763	1756	1778	**1765.7**	1727	1748	1757	**1744.0**
Center	5.96	1773	1786	1912	**1823.7**	1752	1793	1786	**1777.0**
5	8.07	1737	1722	1904	**1787.7**	1737	1759	1786	**1760.7**
6	9.61	1658	1662	1812	**1710.7**	1660	1649	1668	**1659.0**
7	10.67	1563	1541	1650	**1584.7**	1550	1486	1490	**1508.7**
8	11.42	1459	1391	1484	**1444.7**	1258	1308	1275	**1280.3**
Averages ———>		**1603.4**	**1592.4**	**1671.8**	**1622.6**	**1546.7**	**1572.0**	**1575.6**	**1564.7**

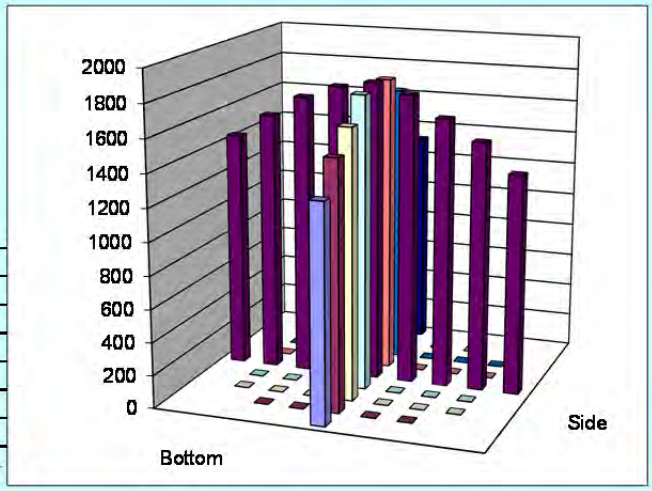
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1593.6		Mean	1688.9	1645.9	1667.4
Min Point	1280.3	-19.7%	Std. Dev.	114.6	123.5	116.6
Max Point	1823.7	14.4%	COV as %	6.8	7.5	7.0

Flow w/o C-Pt 1215 acfm
Vel Avg w/o C-Pt 1568 afpm

Instuments Used:

		Cal Due
TSI VelociCalc	T95351203001	12/10/13
Fisher Scientific Barometer	90936818	12/11/2013

	Start	Finish	
Stack temp	91.1	93.9	F
Equipment temp	na	na	F
Ambient temp	89.6	96.8	F
Stack static	na	na	mbars
Ambient pressure	29.94	29.94	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	19%	18%	RH



Notes:

SS 7/15/2013

Entries made by:	EA 7/15/13	Technical Data Review performed by:	Carmen Arimescu
Signature/date	Signature on file with original	Signature/date	12/9/2013
		Signature on file with original TI-WTSP-119	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	FC-6
Date	7/15/13	Fan Configuration	Fans A&B
Testers	CB, TH, EA	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	98.8 deg F
Stack X-Area	111.6 in.2	Start/End Time	1325/1400
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Velocity units	aft/min	Data Files:	NA

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1284	1261	1220	**1255.0**	1031	1148	1137	**1105.3**
2	1.25	1451	1425	1412	**1429.3**	1279	1330	1344	**1317.7**
3	2.31	1568	1557	1595	**1573.3**	1457	1472	1502	**1477.0**
4	3.85	1694	1669	1688	**1683.7**	1608	1603	1647	**1619.3**
Center	5.96	1746	1733	1706	**1728.3**	1885	1688	1692	**1755.0**
5	8.07	1697	1703	1687	**1695.7**	1662	1685	1671	**1672.7**
6	9.61	1630	1622	1609	**1620.3**	1587	1576	1595	**1586.0**
7	10.67	1477	1512	1493	**1494.0**	1497	1499	1470	**1488.7**
8	11.42	1381	1412	1396	**1396.3**	1290	1290	1268	**1282.7**
Averages ———>		**1547.6**	**1543.8**	**1534.0**	**1541.8**	**1477.3**	**1476.8**	**1480.7**	**1478.3**

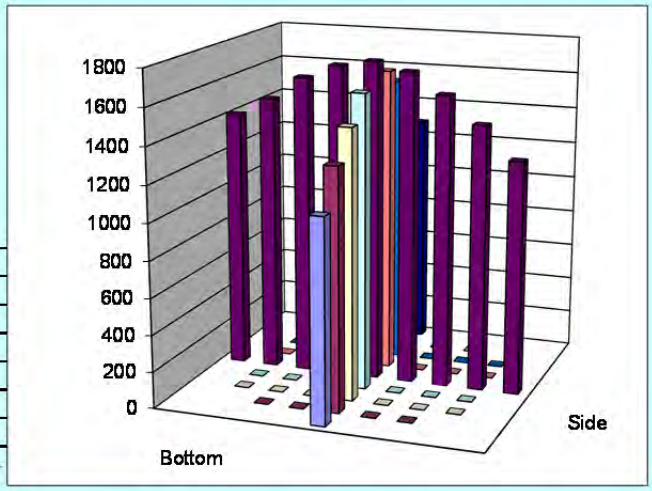
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1510.0		Mean	1603.5	1559.5	1581.5
Min Point	1105.3	-26.8%	Std. Dev.	111.1	144.7	126.0
Max Point	1755.0	16.2%	COV as %	6.9	9.3	8.0

Flow w/o C-Pt 1148 acfm
Vel Avg w/o C-Pt 1481 afpm

Instuments Used:

		Cal Due
TSI VelociCalc	T95351203001	12/10/13
Fisher Scientific Barometer	90936818	12/11/2013

	Start	Finish	
Stack temp	98.4	99.1	F
Equipment temp	na	na	F
Ambient temp	87.8	99.5	F
Stack static	na	na	mbars
Ambient pressure	30.00	30.00	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	21%	17%	RH



Notes:

EA 7/15/2013

Entries made by:	EA 7/15/13	Technical Data Review performed by:	Carmen Arimescu
Signature/date	Signature on file with original	Signature/date	12/9/2013
		Signature on file with original TI-WTSP-119	

VELOCITY vs. FREQUENCY DATA FORM

Site	**LV-S3 model**	Run No.	**VF-1**
Date	7/12/2013	Stack Temp	104.4
Tester	CB, EA	Stack RH%	20%
Stack Dia.	11.922 in.	Baro Press	29.91
Stack X-Area	111.6 in2	Fan Configuration	Fan C
Test Port	2	Start/End Time	1450 / 1520

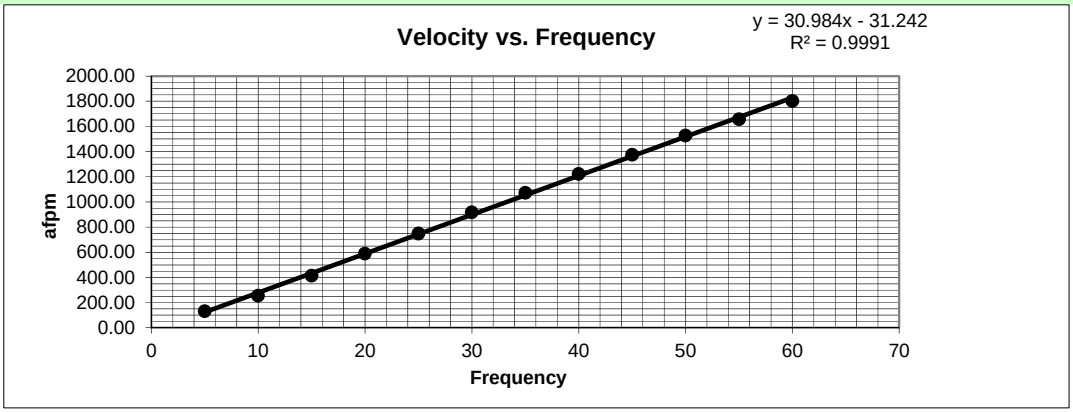
Dist. from disturbance 510.25 inches Reference point from velocity test VC : Side 7

Velocity Readings,units = afpm

	Target acfm	Target afpm	Estmtd Hz	
	695	885	29.57	max
	626	797	26.73	normal
	292	372	13.01	min

	afpm						
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	169	108	115	130.67	33.38	66.76	101.30
10	235	269	258	254.00	17.35	34.70	196.91
15	402	421	419	414.00	10.44	20.88	320.94
20	599	575	596	590.00	13.08	26.15	457.38
25	752	759	734	748.33	12.90	25.79	580.12
30	914	923	913	916.67	5.51	11.02	710.62
35	1086	1066	1062	1071.33	12.86	25.72	830.52
40	1235	1195	1238	1222.67	24.01	48.01	947.84
45	1401	1344	1379	1374.67	28.75	57.49	1065.67
50	1566	1493	1524	1527.67	36.64	73.28	1184.28
55	1680	1645	1647	1657.33	19.66	39.31	1284.80
60	1810	1779	1816	1801.67	19.86	39.72	1396.69

Instuments Used:		**Cal Exp. Date:**
TSI VelociCalc	T95351203001	12/10/2013
Fisher Scientific Barometer	9E+07	12/11/2013



Entries made by: CB 7/12/2013	Technical Data Review performed by: Carmen Arimescu
Signature/date Signature on file with original	Signature/date 12/9/2013
	Signature on file with original TI-WTSP-119

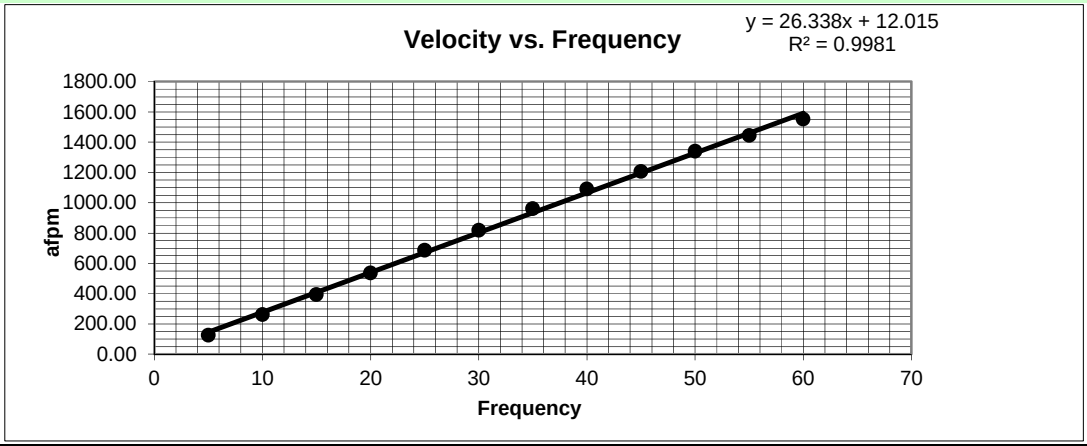
VELOCITY vs. FREQUENCY DATA FORM

Site	**LV-S3 model**		Run No.	**VF-2**	
Date	7/15/2013		Stack Temp	78.1	
Tester	SS, EA		Stack RH%	30%	
Stack Dia.	11.922	in.	Baro Press	29.91	
Stack X-Area	111.6	in2	Fan Configuration	Fan B Only	
Test Port	2		Start/End Time	0630 / 0655	
Dist. from disturbance	510.25	inches	Reference point from velocity test VC :		Side 7
Velocity Readings,units =		afpm			

Target acfm	Target afpm	Estmtd Hz	
695	885	34.06	max
626	797	30.72	normal
292	372	14.58	min

	afpm						
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	118	138	120	125.33	11.02	22.03	97.16
10	255	270	261	262.00	7.55	15.10	203.11
15	382	400	400	394.00	10.39	20.78	305.44
20	523	537	549	536.33	13.01	26.03	415.78
25	692	666	698	685.33	17.01	34.02	531.28
30	795	823	839	819.00	22.27	44.54	634.91
35	960	949	971	960.00	11.00	22.00	744.21
40	1081	1089	1102	1090.67	10.60	21.20	845.51
45	1220	1196	1206	1207.33	12.06	24.11	935.95
50	1325	1364	1332	1340.33	20.79	41.59	1039.05
55	1415	1473	1445	1444.33	29.01	58.01	1119.68
60	1552	1506	1596	1551.33	45.00	90.01	1202.63

Instuments Used:		**Cal Exp. Date:**
TSI VelociCalc	T95351203001	12/10/2013
Fisher Scientific Barometer	90936818	12/11/2013



Entries made by: SS 7/15/2013	Technical Data Review performed by: Carmen Arimescu
Signature/date Signature on file with original	Signature/date 12/9/2013
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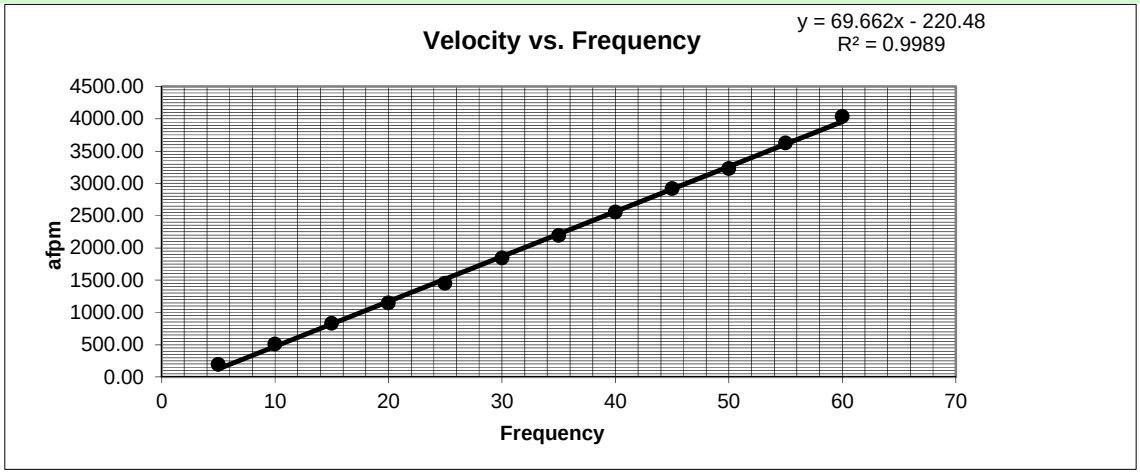
VELOCITY vs. FREQUENCY DATA FORM

Site	**LV-S3 model**	Run No.	**VF-3**
Date	7/15/2013	Stack Temp	84.7
Tester	SS, EA	Stack RH%	21%
Stack Dia.	11.922 in.	Baro Press	29.91
Stack X-Area	111.6 in2	Fan Configuration	Fans B&C
Test Port	2	Start/End Time	0742 / 0816
Dist. from disturbance	510.25 inches	Reference point from velocity test VC :	Bottom 7
Velocity Readings,units =	afpm		

Target acfm	Target afpm	Estmtd Hz	
695	885	15.89	max
626	797	14.63	normal
292	372	8.53	min

	afpm						
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	191	201	189	193.67	6.43	12.86	150.13
10	495	522	507	508.00	13.53	27.06	393.81
15	827	841	822	830.00	9.85	19.70	643.43
20	1138	1149	1151	1146.00	7.00	14.00	888.40
25	1416	1487	1453	1452.00	35.51	71.02	1125.62
30	1803	1883	1839	1841.67	40.07	80.13	1427.70
35	2168	2210	2193	2190.33	21.13	42.25	1697.99
40	2499	2543	2623	2555.00	62.86	125.73	1980.69
45	2897	2944	2910	2917.00	24.27	48.54	2261.32
50	3307	3169	3203	3226.33	71.90	143.80	2501.12
55	3664	3666	3551	3627.00	65.83	131.65	2811.73
60	4076	4067	3963	4035.33	62.80	125.61	3128.28

Instuments Used:		**Cal Exp. Date:**
TSI VelociCalc	T95351203001	12/10/2013
Fisher Scientific Barometer	90936818	12/11/2013



Entries made by: EA 7/15/2013	Technical Data Review performed by: Carmen Arimescu
Signature/date Signature on file with original	Signature/date 12/9/2013
	Signature on file with original TI-WTSP-119

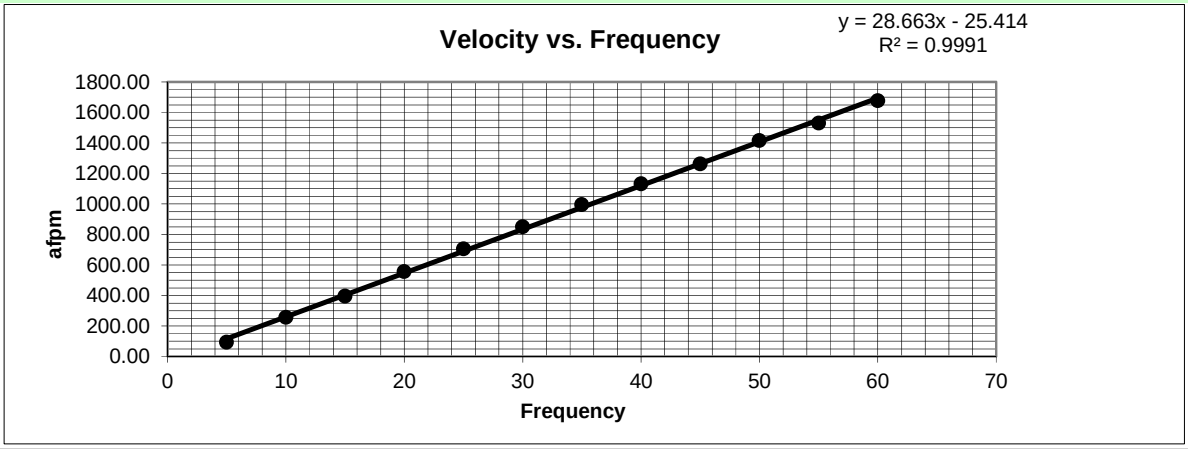
VELOCITY vs. FREQUENCY DATA FORM

Site	**LV-S3 model**	Run No.	**VF-4**
Date	7/15/2013	Stack Temp	90.8
Tester	SS, EA	Stack RH%	19%
Stack Dia.	11.922 in.	Baro Press	29.94
Stack X-Area	111.6 in2	Fan Configuration	Fan A
Test Port	2	Start/End Time	0946 / 1015
Dist. from disturbance	510.25 inches	Reference point from velocity test VC :	Side 7
Velocity Readings,units =	afpm		

Target acfm	Target afpm	Estmtd Hz	
695	885	31.76	max
626	797	28.69	normal
292	372	13.87	min

	afpm						
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	135	87	56	92.67	39.80	79.61	71.84
10	238	267	266	257.00	16.46	32.92	199.23
15	380	415	391	395.33	17.90	35.80	306.47
20	556	564	551	557.00	6.56	13.11	431.80
25	712	712	694	706.00	10.39	20.78	547.31
30	871	856	826	851.00	22.91	45.83	659.71
35	1006	1008	973	995.67	19.66	39.31	771.86
40	1152	1113	1132	1132.33	19.50	39.00	877.81
45	1258	1265	1266	1263.00	4.36	8.72	979.10
50	1421	1433	1396	1416.67	18.88	37.75	1098.23
55	1504	1542	1543	1529.67	22.23	44.47	1185.83
60	1654	1700	1678	1677.33	23.01	46.01	1300.30

Instuments Used:		**Cal Exp. Date:**
TSI VelociCalc	T95351203001	12/10/2013
Fisher Scientific Barometer	90936818	12/11/2013



Entries made by: EA 7/15/2013	Technical Data Review performed by: Carmen Arimescu
Signature/date Signature on file with original	Signature/date 12/9/2013
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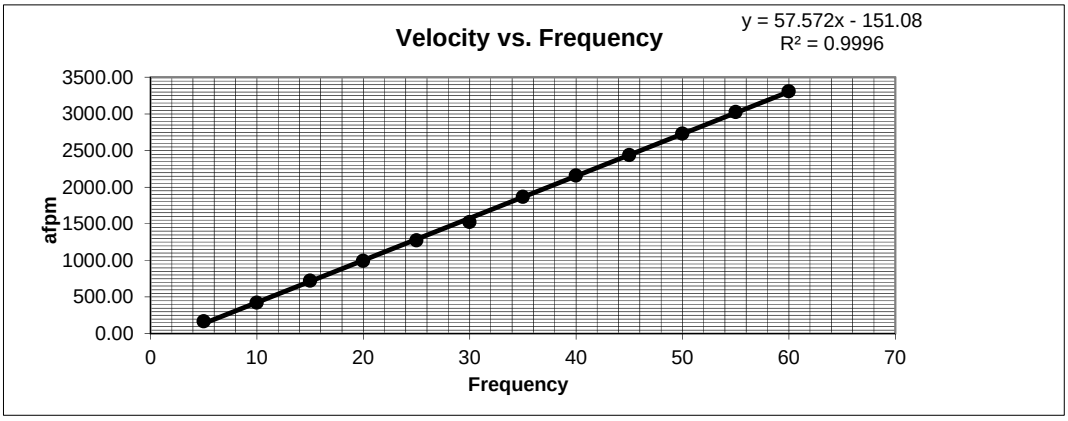
VELOCITY vs. FREQUENCY DATA FORM

Site	**LV-S3 model**	Run No.	**VF-5**
Date	7/15/2013	Stack Temp	94.6
Tester	SS, EA	Stack RH%	17%
Stack Dia.	11.922 in.	Baro Press	29.94
Stack X-Area	111.6 in2	Fan Configuration	Fans A&C
Test Port	2	Start/End Time	1058 / 1131
Dist. from disturbance	510.25 inches	Reference point from velocity test VC :	Side 7
Velocity Readings,units =	afpm		

Target acfm	Target afpm	Estmtd Hz	
695	885	18.00	max
626	797	16.47	normal
292	372	9.09	min

	afpm						
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	145	169	186	166.67	20.60	41.20	129.20
10	407	405	460	424.00	31.19	62.39	328.69
15	711	725	733	723.00	11.14	22.27	560.48
20	969	1007	1001	992.33	20.43	40.86	769.28
25	1271	1259	1286	1272.00	13.53	27.06	986.08
30	1506	1539	1528	1524.33	16.80	33.61	1181.70
35	1890	1828	1885	1867.67	34.44	68.89	1447.85
40	2166	2161	2154	2160.33	6.03	12.06	1674.74
45	2454	2389	2475	2439.33	44.84	89.67	1891.02
50	2725	2764	2704	2731.00	30.45	60.89	2117.13
55	3039	2994	3050	3027.67	29.67	59.34	2347.11
60	3283	3305	3347	3311.67	32.52	65.03	2567.27

Instuments Used:		**Cal Exp. Date:**
TSI VelociCalc	T95351203001	12/10/2013
Fisher Scientific Barometer	90936818	12/11/2013



Entries made by: EA 7/15/2013	Technical Data Review performed by: Carmen Arimescu
Signature/date Signature on file with original	Signature/date 12/9/2013
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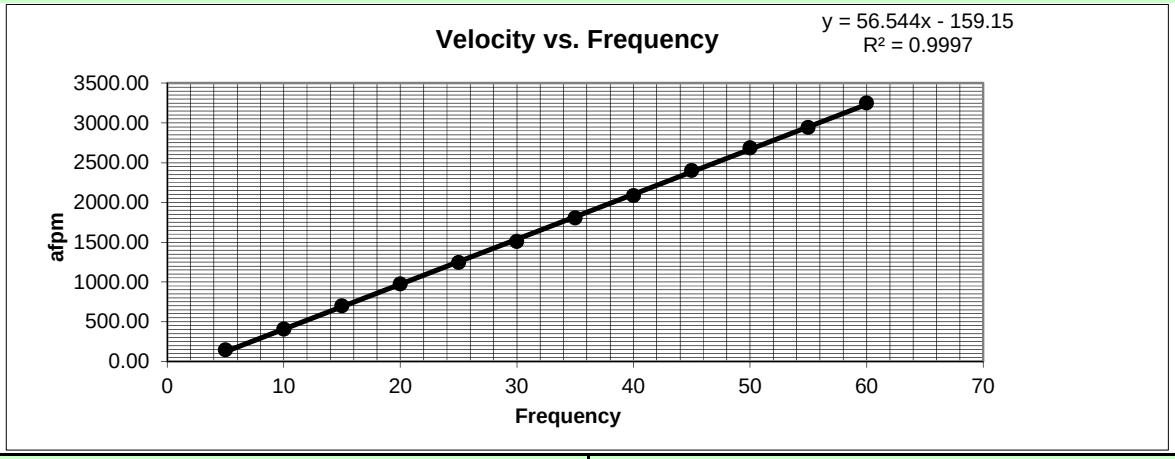
VELOCITY vs. FREQUENCY DATA FORM

Site	**LV-S3 model**	Run No.	**VF-6**
Date	7/15/2013	Stack Temp	99.1
Tester	SS, TH. EA	Stack RH%	17%
Stack Dia.	11.922 in.	Baro Press	30
Stack X-Area	111.6 in2	Fan Configuration	Fans A&B
Test Port	2	Start/End Time	1405 / 1438
Dist. from disturbance	510.25 inches	Reference point from velocity test VC :	Bottom 3
Velocity Readings,units =	afpm		

	Target acfm	Target afpm	Estmtd Hz	
	695	885	18.47	max
	626	797	16.91	normal
	292	372	9.39	min

	afpm						
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	88	185	165	146.00	51.22	102.43	113.18
10	395	411	409	405.00	8.72	17.44	313.96
15	688	716	687	697.00	16.46	32.92	540.33
20	954	979	989	974.00	18.03	36.06	755.07
25	1209	1273	1250	1244.00	32.42	64.84	964.38
30	1510	1513	1501	1508.00	6.24	12.49	1169.03
35	1831	1817	1762	1803.33	36.47	72.95	1397.98
40	2075	2097	2085	2085.67	11.02	22.03	1616.85
45	2449	2393	2362	2401.33	44.09	88.19	1861.56
50	2693	2676	2690	2686.33	9.07	18.15	2082.50
55	2957	2955	2911	2941.00	26.00	52.00	2279.93
60	3274	3276	3202	3250.67	42.16	84.32	2519.99

Instuments Used:		**Cal Exp. Date:**
TSI VelociCalc	T95351203001	12/10/2013
Fisher Scientific Barometer	90936818	12/11/2013



Entries made by: TH 7/15/2013	Technical Data Review performed by: Carmen Arimescu
Signature/date Signature on file with original	Signature/date 12/9/2013
	Signature on file with original TI-WTSP-119

D.2 LV-S3 Velocity Uniformity Data Sheets

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-1
Date	7/16/13	Fan Configuration	Fans A&B
Testers	EA, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	87.6 deg F
Stack X-Area	111.6 in.2	Start/End Time	0855 / 0921
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	2600	2626	2600	2608.7	2373	2457	2372	2400.7
2	1.25	3030	2816	2861	2902.3	2772	2789	2775	2778.7
3	2.31	3149	3070	3117	3112.0	3042	3008	3025	3025.0
4	3.85	3270	3306	3309	3295.0	3212	3196	3302	3236.7
Center	5.96	3338	3342	3376	3352.0	3342	3359	3328	3343.0
5	8.07	3302	3285	3294	3293.7	3302	3292	3416	3336.7
6	9.61	3089	3132	3127	3116.0	3136	3124	3147	3135.7
7	10.67	2979	2932	3023	2978.0	2958	2979	2927	2954.7
8	11.42	2700	2766	2725	2730.3	2759	2772	2666	2732.3
Averages ------>		3050.8	3030.6	3048.0	3043.1	2988.4	2997.3	2995.3	2993.7

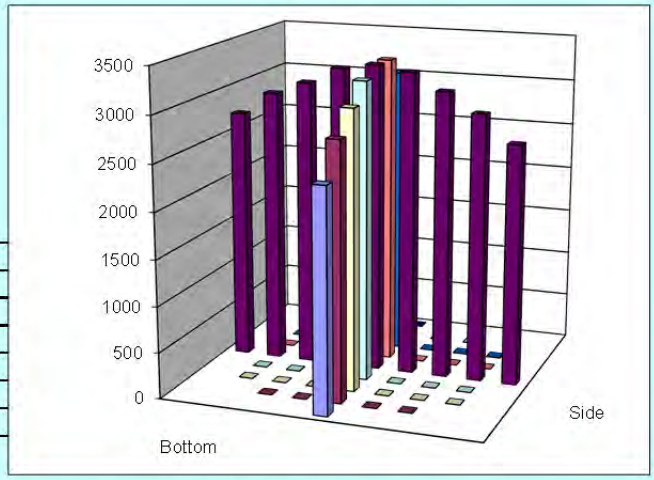
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3018.4		Mean	3149.9	3115.8	3132.8
Min Point	2400.7	-20.5%	Std. Dev.	171.3	209.5	184.7
Max Point	3352.0	11.1%	COV as %	5.4	6.7	5.9

Flow w/o C-Pt 2308 acfm
Vel Avg w/o C-Pt 2977 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	86.3	88.8	F
Equipment temp	na	na	F
Ambient temp	83.3	87.7	F
Stack static	na	na	mbars
Ambient pressure	29.91	29.91	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	24%	21.00	RH



Notes: Wind on ragged edge out of North.

SS 7/16/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/16/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-2
Date	7/17/13	Fan Configuration	Fans B&C MAX
Testers	EA, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	75.0
Stack X-Area	111.6 in.2	Start/End Time	0540 / 0606
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	2926	2863	2852	**2880.3**	2750	2707	2596	**2684.3**
2	1.25	3168	3145	3119	**3144.0**	3150	3065	3076	**3097.0**
3	2.31	3446	3444	3378	**3422.7**	3389	3317	3376	**3360.7**
4	3.85	3828	3625	3628	**3693.7**	3611	3660	3610	**3627.0**
Center	5.96	3753	3706	3699	**3719.3**	3714	3711	3764	**3729.7**
5	8.07	3654	3624	3650	**3642.7**	3706	3657	3670	**3677.7**
6	9.61	3664	3535	3481	**3560.0**	3482	3522	3495	**3499.7**
7	10.67	3462	3264	3239	**3321.7**	3348	3320	3313	**3327.0**
8	11.42	3104	3073	3140	**3105.7**	3116	3151	3145	**3137.3**
Averages ------>		**3445.0**	**3364.3**	**3354.0**	**3387.8**	**3362.9**	**3345.6**	**3338.3**	**3348.9**

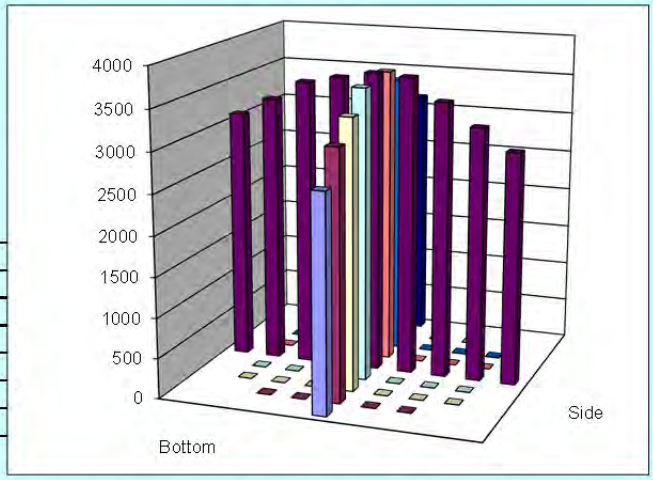
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3368.4		Mean	3500.6	3474.1	3487.3
Min Point	2684.3	-20.3%	Std. Dev.	213.7	226.4	212.0
Max Point	3729.7	10.7%	COV as %	6.1	6.5	6.1

Flow w/o C-Pt 2577 acfm
Vel Avg w/o C-Pt 3324 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	73.6	76.4	F
Equipment temp	na	na	F
Ambient temp	68.9	73.4	F
Stack static	na	na	mbars
Ambient pressure	29.80	29.80	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	40%	40%	RH



Notes: Prior to testing checked velocity at bottom 7 = 3547 afpm.

SS 7/17/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-3		
Date	7/17/13	Fan Configuration	Fans B&C MAX		
Testers	EA, SS	Fan Setting	60	Hz	
Stack Dia.	11.922 in.	Stack Temp	75.5	deg F	
Stack X-Area	111.6 in.2	Start/End Time	0608 / 0630		
Test Port	2	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial –––>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	2833	2835	2835	**2834.3**	2485	2794	2641	**2640.0**
2	1.25	3140	3136	3150	**3142.0**	3087	3076	3111	**3091.3**
3	2.31	3378	3354	3406	**3379.3**	3364	3418	3372	**3384.7**
4	3.85	3609	3615	3601	**3608.3**	3582	3658	3560	**3600.0**
Center	5.96	3682	3675	3686	**3681.0**	3727	3693	3675	**3698.3**
5	8.07	3634	3636	3631	**3633.7**	3703	3683	3669	**3685.0**
6	9.61	3462	3476	3455	**3464.3**	3506	3458	3492	**3485.3**
7	10.67	3265	3265	3277	**3269.0**	3329	3349	3308	**3328.7**
8	11.42	3103	3081	3072	**3085.3**	3163	3055	3094	**3104.0**
Averages ––––>		**3345.1**	**3341.4**	**3345.9**	**3344.1**	**3327.3**	**3353.8**	**3324.7**	**3335.3**

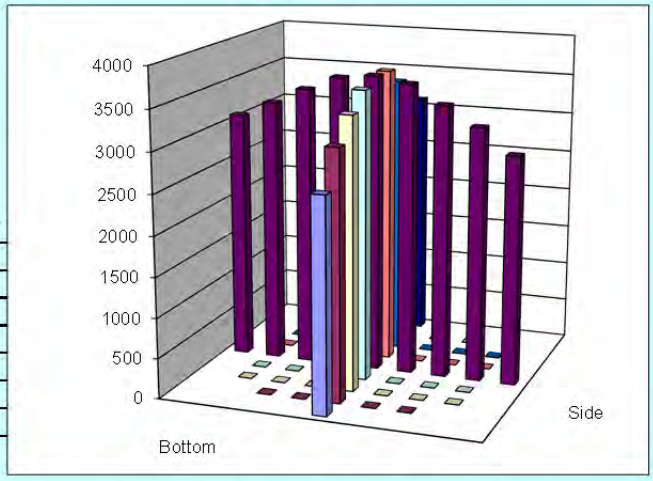
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3339.7		Mean	3454.0	3467.6	3460.8
Min Point	2640.0	-21.0%	Std. Dev.	202.0	218.4	202.2
Max Point	3698.3	10.7%	COV as %	5.8	6.3	5.8

Flow w/o C-Pt 2555 acfm
Vel Avg w/o C-Pt 3296 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	76.4	74.5	F
Equipment temp	na	na	F
Ambient temp	73.4	71.6	F
Stack static	na	na	mbars
Ambient pressure	29.80	29.80	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	42%	43%	RH



Notes:

SS 7/17/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-4		
Date	7/17/13	Fan Configuration	Fans B&C MAX		
Testers	EA, SS	Fan Setting	60 Hz		
Stack Dia.	11.922 in.	Stack Temp	74.5 deg F		
Stack X-Area	111.6 in.2	Start/End Time	0630 / 0651		
Test Port	2	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	2716	2786	2846	**2782.7**	2604	2770	2711	**2695.0**
2	1.25	3126	3146	3143	**3138.3**	3084	3087	3092	**3087.7**
3	2.31	3423	3389	3376	**3396.0**	3362	3357	3358	**3359.0**
4	3.85	3606	3633	3640	**3626.3**	3622	3602	3590	**3604.7**
Center	5.96	3665	3658	3682	**3668.3**	3687	3799	3717	**3734.3**
5	8.07	3607	3618	3624	**3616.3**	3692	3766	3665	**3707.7**
6	9.61	3451	3522	3461	**3478.0**	3602	3577	3483	**3554.0**
7	10.67	3272	3320	3289	**3293.7**	3343	3338	3307	**3329.3**
8	11.42	3078	3062	3040	**3060.0**	3086	3089	3092	**3089.0**
Averages ---->		**3327.1**	**3348.2**	**3344.6**	**3340.0**	**3342.4**	**3376.1**	**3335.0**	**3351.2**

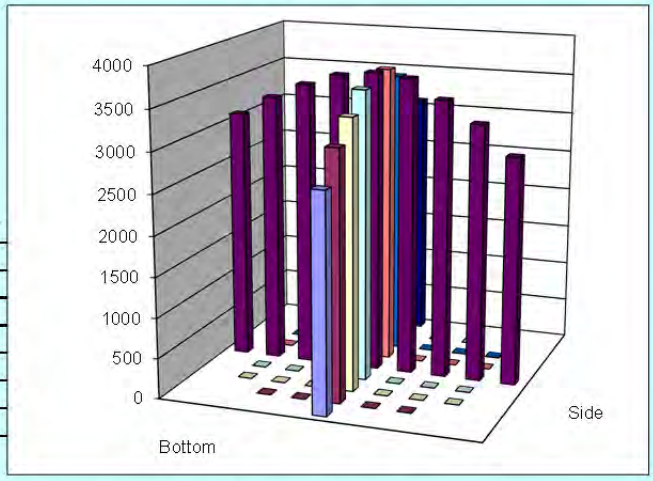
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3345.6		Mean	3459.6	3482.4	3471.0
Min Point	2695.0	-19.4%	Std. Dev.	196.2	234.1	207.9
Max Point	3734.3	11.6%	COV as %	5.7	6.7	6.0

Flow w/o C-Pt 2559 acfm
Vel Avg w/o C-Pt 3301 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	74.5	74.5	F
Equipment temp	na	na	F
Ambient temp	71.6	70.7	F
Stack static	na	na	mbars
Ambient pressure	29.80	29.80	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	42%	45%	RH



Notes:

SS 7/17/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-5		
Date	7/17/13	Fan Configuration	Fans B&C MAX		
Testers	EA, SS	Fan Setting	60 Hz		
Stack Dia.	11.922 in.	Stack Temp	86.6 deg F		
Stack X-Area	111.6 in.2	Start/End Time	0735 / 0806		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	2751	2887	2878	**2838.7**	2808	2916	2842	**2855.3**
2	1.25	3216	3234	3224	**3224.7**	3163	3197	3203	**3187.7**
3	2.31	3608	3471	3531	**3536.7**	3457	3431	3419	**3435.7**
4	3.85	3869	3689	3642	**3733.3**	3687	3757	3721	**3721.7**
Center	5.96	3709	3710	3674	**3697.7**	3794	3812	3737	**3781.0**
5	8.07	3619	3653	3636	**3636.0**	3736	3705	3763	**3734.7**
6	9.61	3498	3487	3531	**3505.3**	3630	3591	3587	**3602.7**
7	10.67	3315	3336	3341	**3330.7**	3389	3318	3366	**3357.7**
8	11.42	3108	3123	3107	**3112.7**	2971	2935	2984	**2963.3**
Averages ---->		**3410.3**	**3398.9**	**3396.0**	**3401.7**	**3403.9**	**3406.9**	**3402.4**	**3404.4**

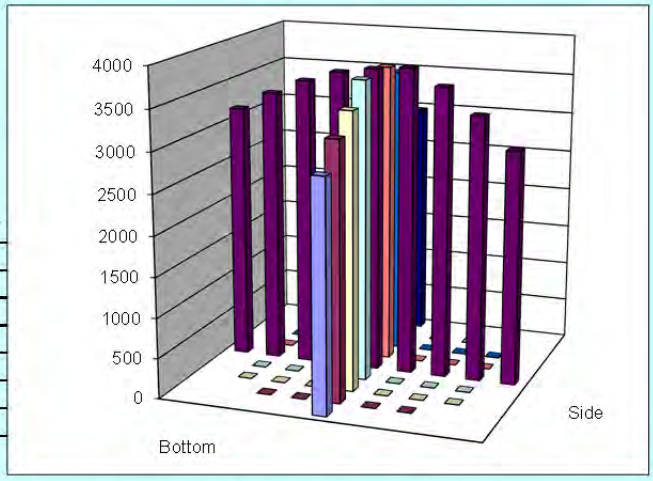
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3403.1		Mean	3523.5	3545.9	3534.7
Min Point	2838.7	-16.6%	Std. Dev.	188.9	224.0	199.4
Max Point	3781.0	11.1%	COV as %	5.4	6.3	5.6

Flow w/o C-Pt 2606 acfm
Vel Avg w/o C-Pt 3361 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	85.2	87.9	F
Equipment temp	na	na	F
Ambient temp	81.5	82.4	F
Stack static	na	na	mbars
Ambient pressure	29.80	29.83	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	31%	30%	RH



Notes:

SS 7/17/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-6		
Date	7/17/13	Fan Configuration	Fans B&C MAX		
Testers	EA, SS	Fan Setting	60 Hz		
Stack Dia.	11.922 in.	Stack Temp	89.4 deg F		
Stack X-Area	111.6 in.2	Start/End Time	0807 / 0832		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	2795	2928	2971	**2898.0**	2694	2884	2872	**2816.7**
2	1.25	3167	3278	3188	**3211.0**	3127	3203	3144	**3158.0**
3	2.31	3444	3591	3480	**3505.0**	3440	3409	3421	**3423.3**
4	3.85	3691	3784	3695	**3723.3**	3644	3709	3645	**3666.0**
Center	5.96	3700	3835	3678	**3737.7**	3765	3776	3755	**3765.3**
5	8.07	3667	3667	3640	**3658.0**	3702	3684	3676	**3687.3**
6	9.61	3491	3585	3488	**3521.3**	3576	3614	3593	**3594.3**
7	10.67	3324	3366	3349	**3346.3**	3363	3382	3311	**3352.0**
8	11.42	3056	3131	3191	**3126.0**	2907	2946	2950	**2934.3**
Averages ------>		**3370.6**	**3462.8**	**3408.9**	**3414.1**	**3357.6**	**3400.8**	**3374.1**	**3377.5**

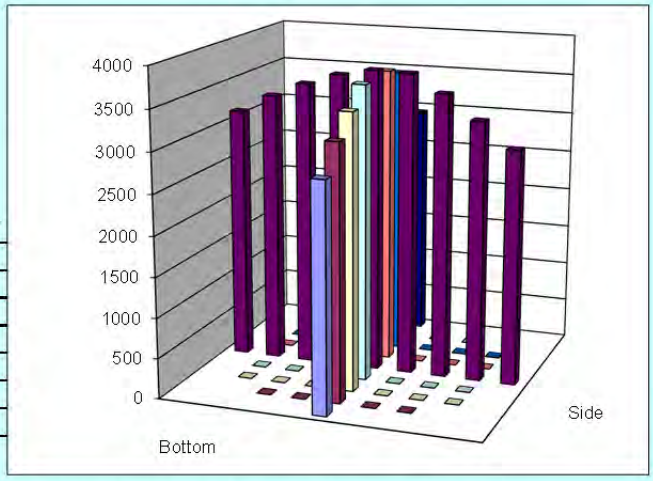
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3395.8		Mean	3529.0	3520.9	3524.9
Min Point	2816.7	-17.1%	Std. Dev.	197.1	217.4	199.4
Max Point	3765.3	10.9%	COV as %	5.6	6.2	5.7

Flow w/o C-Pt 2598 acfm
Vel Avg w/o C-Pt 3351 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	87.9	90.9	F
Equipment temp	na	na	F
Ambient temp	82.4	84.2	F
Stack static	na	na	mbars
Ambient pressure	29.83	29.83	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	30%	29%	RH



Notes:

SS 7/17/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	**Run No.**	VT-7		
Date	7/17/13	**Fan Configuration**	Fans B&C MAX		
Testers	EA, SS	**Fan Setting**	60 Hz		
Stack Dia.	11.922 in.	**Stack Temp**	93.1 deg F		
Stack X-Area	111.6 in.2	**Start/End Time**	0841 / 0905		
Test Port	1	**Center 2/3 from**	1.09	to:	10.83
Distance to disturbance	426.25 inches	**Points in Center 2/3**	2	to:	7
Velocity units	ft/min	**Data Files:**	NA		

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial –––>		**1**	**2**	**3**	**Mean**	**1**	**2**	**3**	**Mean**
Point	**Depth, in.**	**Velocity**				**Velocity**			
1	0.50	2842	2877	2849	**2856.0**	2746	2933	2834	**2837.7**
2	1.25	3221	3171	3260	**3217.3**	3203	3135	3176	**3171.3**
3	2.31	3445	3493	3477	**3471.7**	3415	3455	3409	**3426.3**
4	3.85	3724	3730	3707	**3720.3**	3648	3669	3618	**3645.0**
Center	5.96	3724	3713	3717	**3718.0**	3719	3696	3715	**3710.0**
5	8.07	3616	3629	3620	**3621.7**	3654	3660	3704	**3672.7**
6	9.61	3489	3501	3487	**3492.3**	3579	3569	3535	**3561.0**
7	10.67	3296	3339	3361	**3332.0**	3309	3364	3375	**3349.3**
8	11.42	3055	3082	3085	**3074.0**	3057	2984	2931	**2990.7**
Averages –––––>		**3379.1**	**3392.8**	**3395.9**	**3389.3**	**3370.0**	**3385.0**	**3366.3**	**3373.8**

All	**ft/min**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	**3381.5**		**Mean**	**3510.5**	**3505.1**	**3507.8**
Min Point	**2837.7**	**-16.1%**	**Std. Dev.**	**191.1**	**197.7**	**186.8**
Max Point	**3720.3**	**10.0%**	**COV as %**	**5.4**	**5.6**	**5.3**

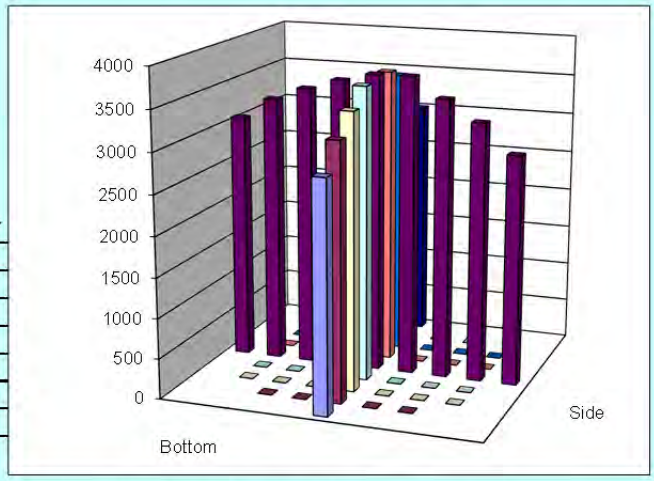
Flow w/o C-Pt **2589** acfm

Vel Avg w/o C-Pt **3340** fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	92.2	94	F
Equipment temp	na	na	F
Ambient temp	86.9	88.7	F
Stack static	na	na	mbars
Ambient pressure	29.83	29.83	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	28%	26%	RH



Notes:

SS 7/17/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

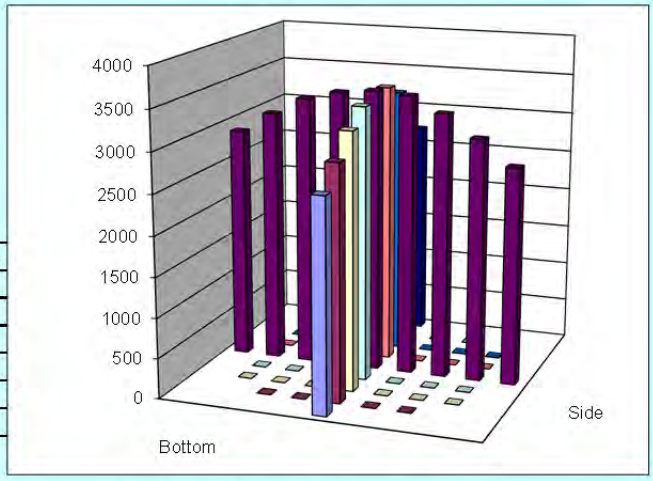
Site	LV-S3 Model	Run No.	VT-8		
Date	7/17/13	Fan Configuration	Fans B&C Norm		
Testers	EA, SS	Fan Setting	55	Hz	
Stack Dia.	11.922 in.	Stack Temp	98.0	deg F	
Stack X-Area	111.6 in.2	Start/End Time	0910 / 0939		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	2621	2646	2638	**2635.0**	2529	2687	2680	**2632.0**
2	1.25	2961	2920	2936	**2939.0**	2893	2928	2929	**2916.7**
3	2.31	3194	3195	3227	**3205.3**	3183	3203	3207	**3197.7**
4	3.85	3411	3374	3389	**3391.3**	3424	3412	3374	**3403.3**
Center	5.96	3414	3413	3442	**3423.0**	3528	3543	3473	**3514.7**
5	8.07	3332	3406	3399	**3379.0**	3476	3476	3492	**3481.3**
6	9.61	3276	3280	3267	**3274.3**	3342	3349	3340	**3343.7**
7	10.67	3083	3070	3046	**3066.3**	3021	3138	3109	**3089.3**
8	11.42	2856	2818	2791	**2821.7**	2710	2811	2621	**2714.0**
Averages ------>		**3127.6**	**3124.7**	**3126.1**	**3126.1**	**3122.9**	**3171.9**	**3136.1**	**3143.6**

All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3134.9		Mean	3239.8	3278.1	3258.9
Min Point	2632.0	-16.0%	Std. Dev.	182.0	219.8	194.9
Max Point	3514.7	12.1%	COV as %	5.6	6.7	6.0

Flow w/o C-Pt	2398 acfm	Instuments Used:	Cal Due
Vel Avg w/o C-Pt	3093 fpm	Fishcer Scientific Barometer SN 90936818	12/11/2013
		TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	97.2	98.8	F
Equipment temp	na	na	F
Ambient temp	89.6	90.5	F
Stack static	na	na	mbars
Ambient pressure	29.83	29.83	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	25%	23%	RH



Notes:

Prior to testing checked velocity at bottom 7 equals 3000 afpm 55 Hz.

SS 7/17/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-9		
Date	7/17/13	Fan Configuration	Fans B&C Min		
Testers	EA, SS	Fan Setting	30	Hz	
Stack Dia.	11.922 in.	Stack Temp	103.6	deg F	
Stack X-Area	111.6 in.2	Start/End Time	0940 / 1015		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1319	1322	1323	**1321.3**	1247	1365	1351	**1321.0**
2	1.25	1502	1527	1547	**1525.3**	1498	1502	1514	**1504.7**
3	2.31	1712	1682	1668	**1687.3**	1624	1661	1670	**1651.7**
4	3.85	1799	1795	1894	**1829.3**	1763	1825	1764	**1784.0**
Center	5.96	1827	1827	1884	**1846.0**	1832	1820	1839	**1830.3**
5	8.07	1777	1793	1821	**1797.0**	1768	1796	1819	**1794.3**
6	9.61	1665	1683	1697	**1681.7**	1694	1684	1744	**1707.3**
7	10.67	1567	1574	1634	**1591.7**	1569	1546	1560	**1558.3**
8	11.42	1419	1416	1499	**1444.7**	1366	1347	1371	**1361.3**
Averages ------>		**1620.8**	**1624.3**	**1663.0**	**1636.0**	**1595.7**	**1616.2**	**1625.8**	**1612.6**

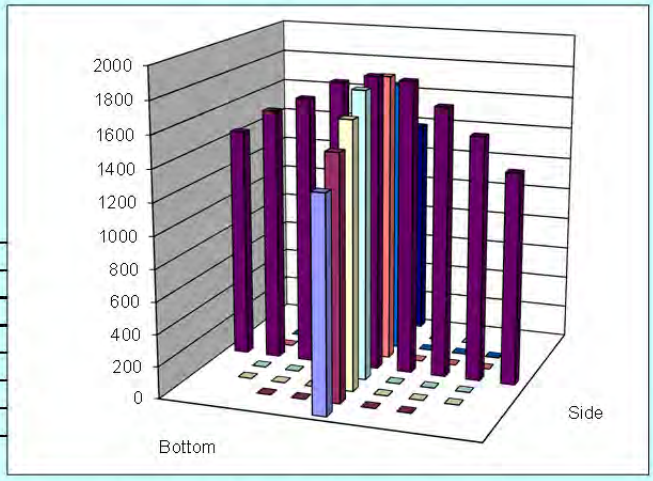
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1624.3		Mean	1708.3	1690.1	1699.2
Min Point	1321.0	-18.7%	Std. Dev.	122.3	124.4	118.9
Max Point	1846.0	13.6%	COV as %	7.2	7.4	7.0

Flow w/o C-Pt 1238 acfm
Vel Avg w/o C-Pt 1598 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	103.6	103.5	F
Equipment temp	na	na	F
Ambient temp	92.3	97.7	F
Stack static	na	na	mbars
Ambient pressure	29.85	29.85	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	22%	19%	RH



Notes: Prior to testing checked velocity at Bottom 7 equals 1540 AFPM 30Hz.

SS 7/17/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-10
Date	7/17/13	Fan Configuration	Fans B Min
Testers	EA, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	104.1 deg F
Stack X-Area	111.6 in.2	Start/End Time	1020 / 1052
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial –––>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	680	729	735	**714.7**	632	746	758	**712.0**
2	1.25	780	803	832	**805.0**	755	844	798	**799.0**
3	2.31	901	912	905	**906.0**	864	899	892	**885.0**
4	3.85	959	959	981	**966.3**	947	964	980	**963.7**
Center	5.96	995	993	996	**994.7**	981	989	999	**989.7**
5	8.07	956	980	940	**958.7**	965	964	973	**967.3**
6	9.61	935	941	909	**928.3**	921	903	924	**916.0**
7	10.67	860	848	867	**858.3**	821	842	840	**834.3**
8	11.42	791	764	795	**783.3**	747	732	728	**735.7**
Averages ––––>		**873.0**	**881.0**	**884.4**	**879.5**	**848.1**	**875.9**	**876.9**	**867.0**

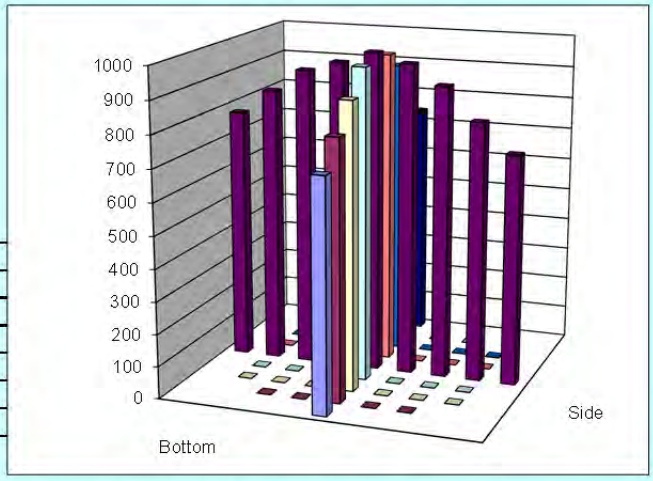
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	873.2		Mean	916.8	907.9	912.3
Min Point	712.0	-18.5%	Std. Dev.	66.4	72.1	66.7
Max Point	994.7	13.9%	COV as %	7.2	7.9	7.3

Flow w/o C-Pt 665 acfm
Vel Avg w/o C-Pt 858 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	102.8	105.3	F
Equipment temp	na	na	F
Ambient temp	97.7	96.8	F
Stack static	na	na	mbars
Ambient pressure	29.85	29.88	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	19%	20%	RH



Notes:

SS 7/17/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-11		
Date	7/17/13	Fan Configuration	Fans B Min		
Testers	EA, SS	Fan Setting	30 Hz		
Stack Dia.	11.922 in.	Stack Temp	107.1 deg F		
Stack X-Area	111.6 in.2	Start/End Time	1108 / 1135		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	727	712	741	726.7	627	757	786	723.3
2	1.25	848	844	842	844.7	768	817	818	801.0
3	2.31	916	921	932	923.0	858	880	895	877.7
4	3.85	986	982	977	981.7	965	975	962	967.3
Center	5.96	995	1018	999	1004.0	995	1008	1001	1001.3
5	8.07	976	995	953	974.7	974	985	976	978.3
6	9.61	936	933	929	932.7	955	927	942	941.3
7	10.67	856	873	853	860.7	866	821	830	839.0
8	11.42	772	795	772	779.7	743	752	757	750.7
Averages ---->		890.2	897.0	888.7	892.0	861.2	880.2	885.2	875.6

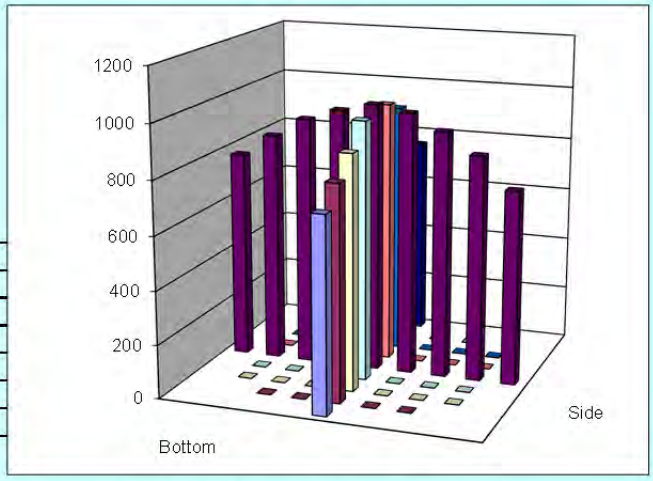
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	883.8		Mean	931.6	915.1	923.4
Min Point	723.3	-18.2%	Std. Dev.	60.9	76.4	67.0
Max Point	1004.0	13.6%	COV as %	6.5	8.4	7.3

Flow w/o C-Pt 674 acfm
Vel Avg w/o C-Pt 869 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	108.9	105.3	F
Equipment temp	na	na	F
Ambient temp	99.5	100.4	F
Stack static	na	na	mbars
Ambient pressure	28.88	29.88	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	19%	18%	RH



Notes:

SS 7/17/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-12		
Date	7/17/13	Fan Configuration	Fans B Min		
Testers	TH, CB, SFS	Fan Setting	30	Hz	
Stack Dia.	11.922 in.	Stack Temp	113.9	deg F	
Stack X-Area	111.6 in.2	Start/End Time	1335 / 1410		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	731	838	826	**798.3**	674	765	734	**724.3**
2	1.25	879	955	935	**923.0**	844	905	876	**875.0**
3	2.31	974	1024	1033	**1010.3**	980	976	976	**977.3**
4	3.85	1077	1103	1112	**1097.3**	1079	1098	1049	**1075.3**
Center	5.96	1111	1137	1135	**1127.7**	1122	1149	1134	**1135.0**
5	8.07	1112	1104	1086	**1100.7**	1112	1113	1093	**1106.0**
6	9.61	1027	1065	1043	**1045.0**	1017	1047	1001	**1021.7**
7	10.67	956	952	974	**960.7**	954	977	955	**962.0**
8	11.42	887	886	881	**884.7**	850	846	873	**856.3**
Averages ------>		**972.7**	**1007.1**	**1002.8**	**994.2**	**959.1**	**986.2**	**965.7**	**970.3**

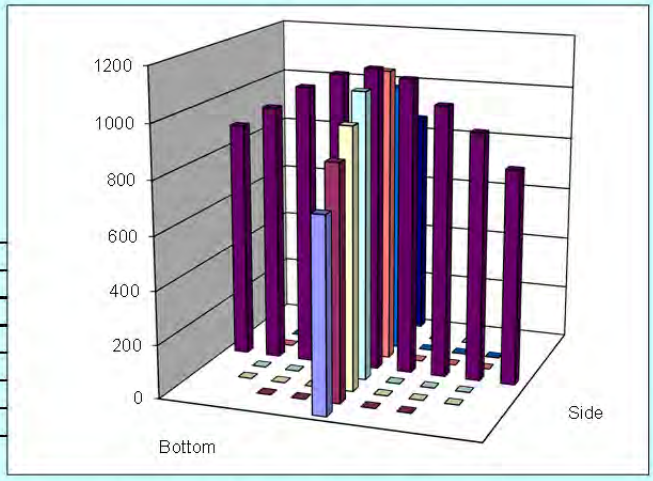
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	982.3		Mean	1037.8	1021.8	1029.8
Min Point	724.3	-26.3%	Std. Dev.	76.9	91.2	81.5
Max Point	1135.0	15.5%	COV as %	7.4	8.9	7.9

Flow w/o C-Pt 747 acfm
Vel Avg w/o C-Pt 964 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	112.7	115.1	F
Equipment temp	na	na	F
Ambient temp	93.2	96.8	F
Stack static	na	na	mbars
Ambient pressure	29.94	29.97	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	20%	19%	RH



Notes:

CB 7/17/2013

Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-13		
Date	7/17/13	Fan Configuration	Fans C Min		
Testers	TH, CB, SFS	Fan Setting	30	Hz	
Stack Dia.	11.922 in.	Stack Temp	113.6	deg F	
Stack X-Area	111.6 in.2	Start/End Time	1420 / 1446		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	998	1053	1027	**1026.0**	897	890	867	**884.7**
2	1.25	1156	1203	1150	**1169.7**	1086	1084	1107	**1092.3**
3	2.31	1284	1370	1277	**1310.3**	1245	1212	1216	**1224.3**
4	3.85	1364	1381	1375	**1373.3**	1319	1373	1356	**1349.3**
Center	5.96	1405	1414	1405	**1408.0**	1432	1411	1395	**1412.7**
5	8.07	1370	1358	1383	**1370.3**	1406	1389	1412	**1402.3**
6	9.61	1314	1308	1293	**1305.0**	1342	1292	1337	**1323.7**
7	10.67	1208	1211	1202	**1207.0**	1224	1202	1262	**1229.3**
8	11.42	1077	1107	1080	**1088.0**	1054	1062	1082	**1066.0**
Averages ---->		**1241.8**	**1267.2**	**1243.6**	**1250.9**	**1222.8**	**1212.8**	**1226.0**	**1220.5**

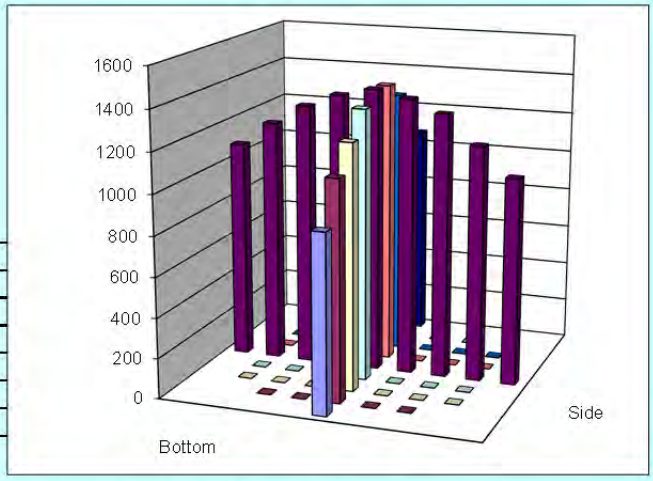
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1235.7		Mean	1306.2	1290.6	1298.4
Min Point	884.7	-28.4%	Std. Dev.	89.0	115.0	99.1
Max Point	1412.7	14.3%	COV as %	6.8	8.9	7.6

Flow w/o C-Pt 941 acfm
Vel Avg w/o C-Pt 1214 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	113.6	113.5	F
Equipment temp	NA	NA	F
Ambient temp	96.8	97.7	F
Stack static	na	na	mbars
Ambient pressure	29.97	30.00	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	19%	18%	RH



Notes:

CB 7/17/2013

Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-14
Date	7/17/13	Fan Configuration	Fans A normal
Testers	TH, CB, SS	Fan Setting	55 Hz
Stack Dia.	11.922 in.	Stack Temp	112.4 deg F
Stack X-Area	111.6 in.2	Start/End Time	1620 / 1647
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1318	1440	1472	**1410.0**	1330	1364	1292	**1328.7**
2	1.25	1615	1674	1690	**1659.7**	1496	1495	1476	**1489.0**
3	2.31	1867	1843	1853	**1854.3**	1662	1682	1673	**1672.3**
4	3.85	1974	1997	1969	**1980.0**	1818	1830	1825	**1824.3**
Center	5.96	2011	2014	1992	**2005.7**	1891	1889	1880	**1886.7**
5	8.07	1950	1949	1967	**1955.3**	1858	1855	1868	**1860.3**
6	9.61	1845	1835	1844	**1841.3**	1780	1793	1813	**1795.3**
7	10.67	1758	1703	1745	**1735.3**	1585	1624	1612	**1607.0**
8	11.42	1526	1524	1567	**1539.0**	1391	1396	1391	**1392.7**
Averages ---->		**1762.7**	**1775.4**	**1788.8**	**1775.6**	**1645.7**	**1658.7**	**1647.8**	**1650.7**

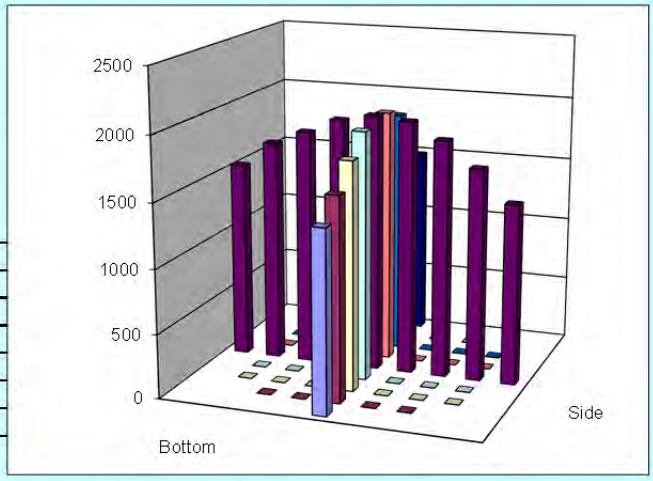
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1713.2		Mean	1861.7	1733.6	1797.6
Min Point	1328.7	-22.4%	Std. Dev.	129.6	147.8	149.2
Max Point	2005.7	17.1%	COV as %	7.0	8.5	8.3

Flow w/o C-Pt 1306 acfm
Vel Avg w/o C-Pt 1684 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	111.6	113.2	F
Equipment temp	NA	NA	F
Ambient temp	97.7	97.7	F
Stack static	na	na	mbars
Ambient pressure	30.00	30.00	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	17%	17%	RH



Notes:

CB 7/17/2013

Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-15		
Date	7/17/13	Fan Configuration	Fans A normal		
Testers	TH, CB, SFS	Fan Setting	55	Hz	
Stack Dia.	11.922 in.	Stack Temp	111.7	deg F	
Stack X-Area	111.6 in.2	Start/End Time	1650 / 1715		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1405	1487	1445	**1445.7**	1220	1298	1221	**1246.3**
2	1.25	1561	1686	1680	**1642.3**	1454	1498	1447	**1466.3**
3	2.31	1820	1850	1855	**1841.7**	1625	1687	1638	**1650.0**
4	3.85	1977	1996	1939	**1970.7**	1802	1833	1824	**1819.7**
Center	5.96	1993	2034	1989	**2005.3**	1879	1896	1876	**1883.7**
5	8.07	1945	1954	1941	**1946.7**	1841	1858	1872	**1857.0**
6	9.61	1853	1868	1868	**1863.0**	1787	1753	1778	**1772.7**
7	10.67	1701	1699	1690	**1696.7**	1610	1642	1642	**1631.3**
8	11.42	1532	1543	1542	**1539.0**	1452	1438	1428	**1439.3**
Averages ---->		**1754.1**	**1790.8**	**1772.1**	**1772.3**	**1630.0**	**1655.9**	**1636.2**	**1640.7**

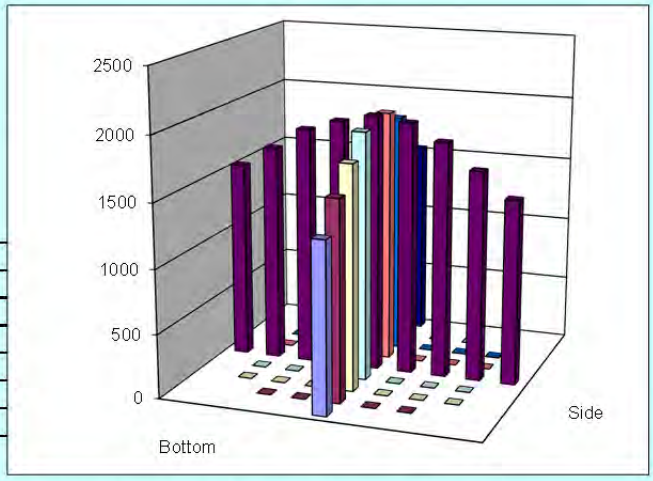
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1706.5		Mean	1852.3	1725.8	1789.1
Min Point	1246.3	-27.0%	Std. Dev.	138.4	150.1	153.4
Max Point	2005.3	17.5%	COV as %	7.5	8.7	8.6

Flow w/o C-Pt 1300 acfm
Vel Avg w/o C-Pt 1677 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	113.2	110.1	F
Equipment temp	NA	NA	F
Ambient temp	97.7	97.7	F
Stack static	na	na	mbars
Ambient pressure	30.00	30.00	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	17%	17%	RH



Notes:

wind increased/peaked to 23 mph at 16:45. Average of 14 mph (Hanford station 11). Wind settled down. Started bottom at 1700.

Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/17/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-16		
Date	7/18/13	Fan Configuration	Fan A Norm		
Testers	EA, SS	Fan Setting	55	Hz	
Stack Dia.	11.922 in.	Stack Temp	71.8	deg F	
Stack X-Area	111.6 in.2	Start/End Time	0547 / 0618		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1331	1352	1377	**1353.3**	1369	1362	1349	**1360.0**
2	1.25	1530	1583	1565	**1559.3**	1565	1538	1577	**1560.0**
3	2.31	1727	1762	1740	**1743.0**	1698	1717	1689	**1701.3**
4	3.85	1837	1901	1884	**1874.0**	1875	1852	1812	**1846.3**
Center	5.96	1871	1929	1912	**1904.0**	1897	1879	1885	**1887.0**
5	8.07	1826	1908	1843	**1859.0**	1881	1874	1851	**1868.7**
6	9.61	1767	1790	1772	**1776.3**	1783	1763	1775	**1773.7**
7	10.67	1653	1707	1606	**1655.3**	1634	1630	1632	**1632.0**
8	11.42	1545	1533	1418	**1498.7**	1410	1387	1366	**1387.7**
Averages ---->		**1676.3**	**1718.3**	**1679.7**	**1691.4**	**1679.1**	**1666.9**	**1659.6**	**1668.5**

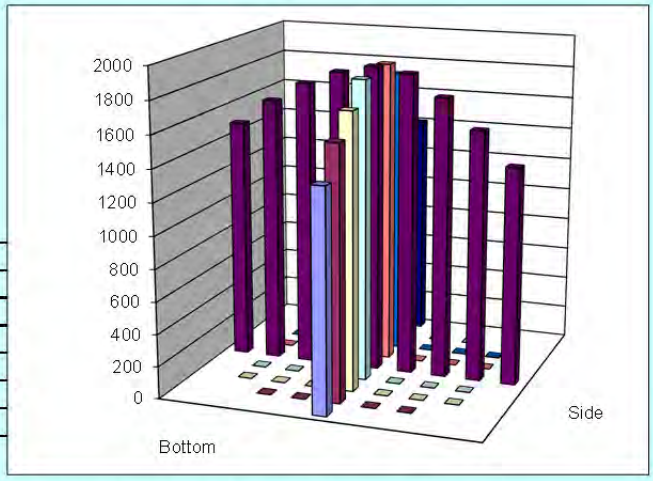
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1680.0		Mean	1767.3	1752.7	1760.0
Min Point	1353.3	-19.4%	Std. Dev.	125.8	125.9	121.1
Max Point	1904.0	13.3%	COV as %	7.1	7.2	6.9

Flow w/o C-Pt 1281 acfm
Vel Avg w/o C-Pt 1653 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	68.8	74.8	F
Equipment temp	na	na	F
Ambient temp	66.2	69.8	F
Stack static	na	na	mbars
Ambient pressure	30.03	30.03	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	41%	39%	RH



Notes:

SS 7-18-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-17		
Date	7/18/13	Fan Configuration	Fan A Norm		
Testers	EA, SS	Fan Setting	55	Hz	
Stack Dia.	11.922 in.	Stack Temp	77.0	deg F	
Stack X-Area	111.6 in.2	Start/End Time	0628 / 0650		
Test Port	2	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

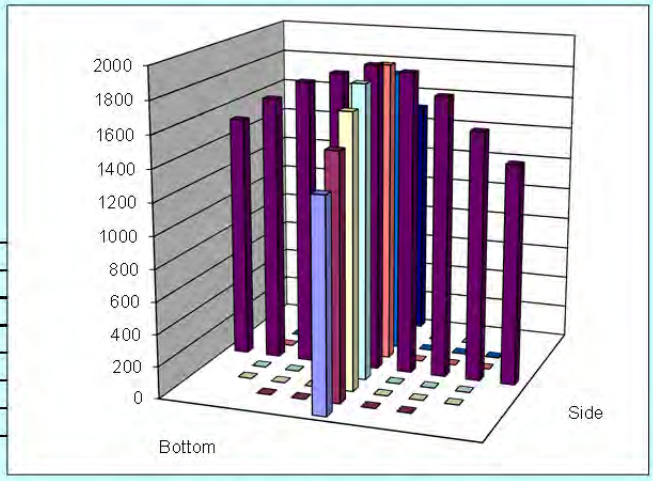
Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1331	1376	1408	**1371.7**	1304	1321	1334	**1319.7**
2	1.25	1513	1604	1549	**1555.3**	1561	1529	1488	**1526.0**
3	2.31	1740	1767	1744	**1750.3**	1727	1706	1701	**1711.3**
4	3.85	1855	1882	1906	**1881.0**	1853	1836	1822	**1837.0**
Center	5.96	1883	1908	1949	**1913.3**	1906	1927	1903	**1912.0**
5	8.07	1862	1848	1844	**1851.3**	1872	1881	1888	**1880.3**
6	9.61	1810	1783	1762	**1785.0**	1794	1787	1793	**1791.3**
7	10.67	1641	1668	1691	**1666.7**	1645	1634	1636	**1638.3**
8	11.42	1505	1532	1527	**1521.3**	1493	1510	1491	**1498.0**
Averages ---->		**1682.2**	**1707.6**	**1708.9**	**1699.6**	**1683.9**	**1681.2**	**1672.9**	**1679.3**

All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1689.4		Mean	1771.9	1756.6	1764.2
Min Point	1319.7	-21.9%	Std. Dev.	127.0	139.2	128.3
Max Point	1913.3	13.3%	COV as %	7.2	7.9	7.3

Flow w/o C-Pt	1288	acfm	
Vel Avg w/o C-Pt	1662	fpm	

Instuments Used:	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	76	77.9	F
Equipment temp	na	na	F
Ambient temp	69.8	74.3	F
Stack static	na	na	mbars
Ambient pressure	30.03	30.03	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	36%	36%	RH



Notes:

SS 7-18-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-18		
Date	7/18/13	Fan Configuration	Fan AC Max		
Testers	EA, SS	Fan Setting	60	Hz	
Stack Dia.	11.922 in.	Stack Temp	81.3	deg F	
Stack X-Area	111.6 in.2	Start/End Time	0713 / 0735		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	2843	2830	2839	**2837.3**	2764	2861	2906	**2843.7**
2	1.25	3175	3179	3162	**3172.0**	3093	3184	3220	**3165.7**
3	2.31	3456	3488	3513	**3485.7**	3458	3434	3453	**3448.3**
4	3.85	3659	3621	3648	**3642.7**	3611	3617	3612	**3613.3**
Center	5.96	3688	3675	3674	**3679.0**	3654	3671	3679	**3668.0**
5	8.07	3620	3581	3613	**3604.7**	3661	3661	3650	**3657.3**
6	9.61	3457	3508	3513	**3492.7**	3520	3520	3497	**3512.3**
7	10.67	3357	3348	3358	**3354.3**	3265	3309	3302	**3292.0**
8	11.42	3059	3050	3104	**3071.0**	2948	2952	2926	**2942.0**
Averages ------>		**3368.2**	**3364.4**	**3380.4**	**3371.0**	**3330.4**	**3356.6**	**3360.6**	**3349.2**

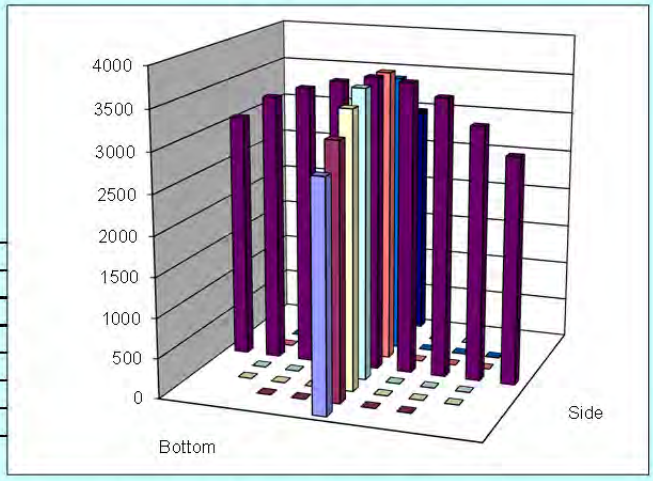
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3360.1		Mean	3490.1	3479.6	3484.9
Min Point	2837.3	-15.6%	Std. Dev.	178.8	191.8	178.2
Max Point	3679.0	9.5%	COV as %	5.1	5.5	5.1

Flow w/o C-Pt 2574 acfm
Vel Avg w/o C-Pt 3321 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	82.2	80.3	F
Equipment temp	na	na	F
Ambient temp	75.2	79.7	F
Stack static	na	na	mbars
Ambient pressure	30.03	30.03	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	33%	31%	RH



Notes:

SS 7-18-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-19		
Date	7/18/13	Fan Configuration	Fan AC Min		
Testers	EA, SS	Fan Setting	30 Hz		
Stack Dia.	11.922 in.	Stack Temp	87.7 deg F		
Stack X-Area	111.6 in.2	Start/End Time	0738 / 0815		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1309	1321	1359	**1329.7**	1342	1301	1357	**1333.3**
2	1.25	1520	1505	1510	**1511.7**	1482	1483	1509	**1491.3**
3	2.31	1639	1692	1696	**1675.7**	1660	1655	1681	**1665.3**
4	3.85	1795	1805	1804	**1801.3**	1790	1822	1790	**1800.7**
Center	5.96	1840	1845	1817	**1834.0**	1840	1840	1846	**1842.0**
5	8.07	1769	1758	1792	**1773.0**	1833	1811	1815	**1819.7**
6	9.61	1708	1689	1682	**1693.0**	1718	1744	1706	**1722.7**
7	10.67	1584	1571	1582	**1579.0**	1585	1570	1578	**1577.7**
8	11.42	1421	1392	1430	**1414.3**	1332	1383	1397	**1370.7**
Averages ---->		**1620.6**	**1619.8**	**1630.2**	**1623.5**	**1620.2**	**1623.2**	**1631.0**	**1624.8**

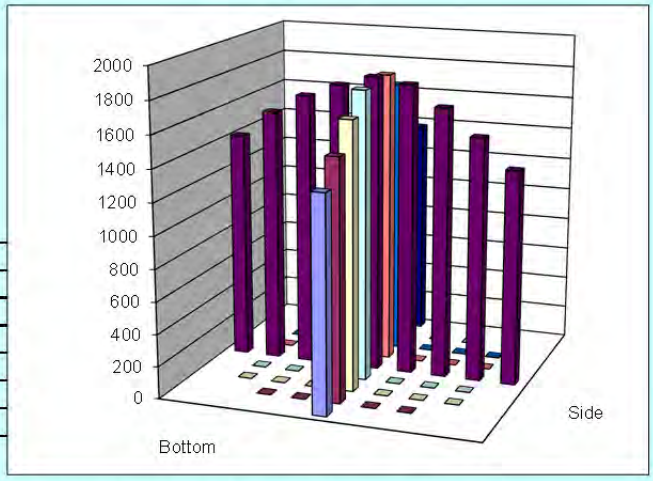
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1624.2		Mean	1695.4	1702.8	1699.1
Min Point	1329.7	-18.1%	Std. Dev.	118.4	132.2	120.6
Max Point	1842.0	13.4%	COV as %	7.0	7.8	7.1

Flow w/o C-Pt 1238 acfm
Vel Avg w/o C-Pt 1597 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	86.8	88.5	F
Equipment temp	na	na	F
Ambient temp	79.7	81.5	F
Stack static	na	na	mbars
Ambient pressure	30.03	30.03	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	30%	28%	RH



Notes:

SS 7-18-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-20		
Date	7/18/13	Fan Configuration	AB Min		
Testers	EA, SS	Fan Setting	30	Hz	
Stack Dia.	11.922 in.	Stack Temp	97.7	deg F	
Stack X-Area	111.6 in.2	Start/End Time	0909 / 0930		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1229	1259	1229	**1239.0**	1126	1245	1268	**1213.0**
2	1.25	1369	1381	1384	**1378.0**	1301	1368	1327	**1332.0**
3	2.31	1528	1502	1542	**1524.0**	1468	1490	1498	**1485.3**
4	3.85	1609	1627	1606	**1614.0**	1624	1608	1662	**1631.3**
Center	5.96	1688	1708	1689	**1695.0**	1671	1706	1684	**1687.0**
5	8.07	1638	1641	1640	**1639.7**	1678	1648	1662	**1662.7**
6	9.61	1551	1546	1556	**1551.0**	1598	1561	1578	**1579.0**
7	10.67	1450	1468	1424	**1447.3**	1459	1460	1410	**1443.0**
8	11.42	1331	1320	1317	**1322.7**	1228	1252	1229	**1236.3**
Averages ---->		**1488.1**	**1494.7**	**1487.4**	**1490.1**	**1461.4**	**1482.0**	**1479.8**	**1474.4**

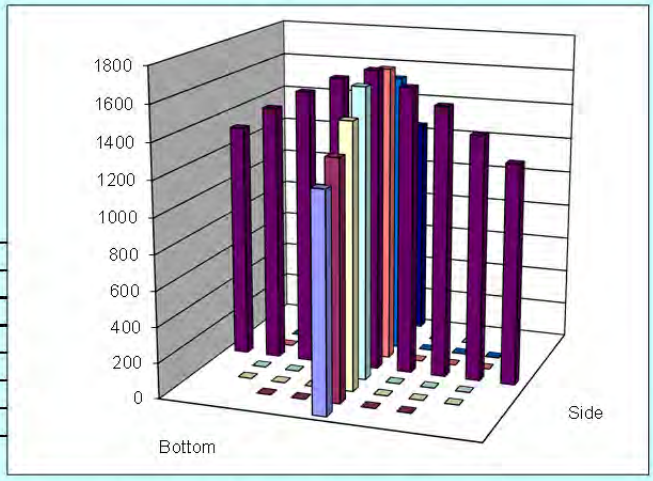
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1482.2		Mean	1549.9	1545.8	1547.8
Min Point	1213.0	-18.2%	Std. Dev.	111.0	130.4	116.3
Max Point	1695.0	14.4%	COV as %	7.2	8.4	7.5

Flow w/o C-Pt 1129 acfm
Vel Avg w/o C-Pt 1456 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	96.7	98.7	F
Equipment temp	na	na	F
Ambient temp	84.2	86.9	F
Stack static	na	na	mbars
Ambient pressure	30.06	30.06	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	23%	22%	RH



Notes:

SS 7-18-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-21		
Date	7/18/13	Fan Configuration	AB Min		
Testers	EA, SS	Fan Setting	30	Hz	
Stack Dia.	11.922 in.	Stack Temp	100.1	deg F	
Stack X-Area	111.6 in.2	Start/End Time	0932 / 0954		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1121	1219	1226	**1188.7**	1215	1262	1298	**1258.3**
2	1.25	1358	1397	1371	**1375.3**	1365	1352	1373	**1363.3**
3	2.31	1481	1499	1495	**1491.7**	1503	1513	1472	**1496.0**
4	3.85	1623	1591	1614	**1609.3**	1626	1650	1660	**1645.3**
Center	5.96	1669	1677	1666	**1670.7**	1704	1691	1681	**1692.0**
5	8.07	1635	1639	1635	**1636.3**	1674	1654	1622	**1650.0**
6	9.61	1536	1548	1522	**1535.3**	1546	1593	1575	**1571.3**
7	10.67	1408	1479	1470	**1452.3**	1417	1425	1438	**1426.7**
8	11.42	1276	1323	1341	**1313.3**	1217	1268	1256	**1247.0**
Averages ---->		**1456.3**	**1485.8**	**1482.2**	**1474.8**	**1474.1**	**1489.8**	**1486.1**	**1483.3**

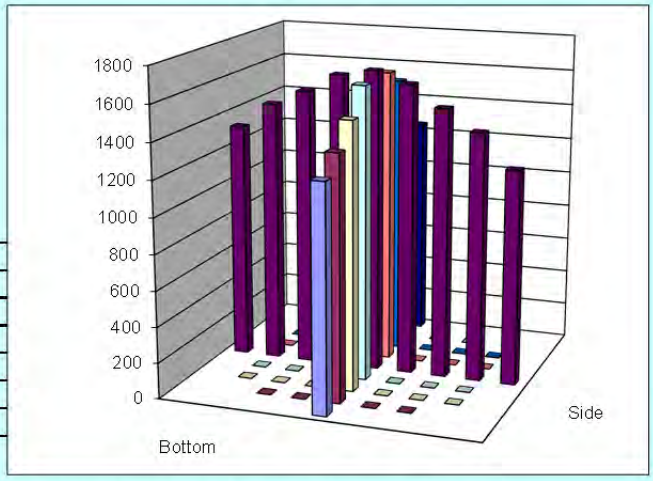
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1479.1		Mean	1538.7	1549.2	1544.0
Min Point	1188.7	-19.6%	Std. Dev.	106.7	124.3	111.4
Max Point	1692.0	14.4%	COV as %	6.9	8.0	7.2

Flow w/o C-Pt 1127 acfm
Vel Avg w/o C-Pt 1454 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	100.9	99.2	F
Equipment temp	na	na	F
Ambient temp	86.9	92.3	F
Stack static	na	na	mbars
Ambient pressure	30.06	30.06	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	22%	20%	RH



Notes:

SS 7-18-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-22		
Date	7/18/13	Fan Configuration	AB Min		
Testers	EA, SS	Fan Setting	30	Hz	
Stack Dia.	11.922 in.	Stack Temp	98.3	deg F	
Stack X-Area	111.6 in.2	Start/End Time	1000 / 1022		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1253	1217	1213	**1227.7**	1131	1252	1267	**1216.7**
2	1.25	1367	1384	1375	**1375.3**	1327	1358	1350	**1345.0**
3	2.31	1507	1553	1502	**1520.7**	1479	1528	1460	**1489.0**
4	3.85	1595	1604	1594	**1597.7**	1594	1633	1605	**1610.7**
Center	5.96	1643	1687	1665	**1665.0**	1643	1675	1671	**1663.0**
5	8.07	1641	1621	1618	**1626.7**	1633	1624	1617	**1624.7**
6	9.61	1537	1558	1548	**1547.7**	1560	1519	1535	**1538.0**
7	10.67	1425	1428	1420	**1424.3**	1423	1460	1452	**1445.0**
8	11.42	1261	1304	1274	**1279.7**	1257	1224	1251	**1244.0**
Averages ---->		**1469.9**	**1484.0**	**1467.7**	**1473.9**	**1449.7**	**1474.8**	**1467.6**	**1464.0**

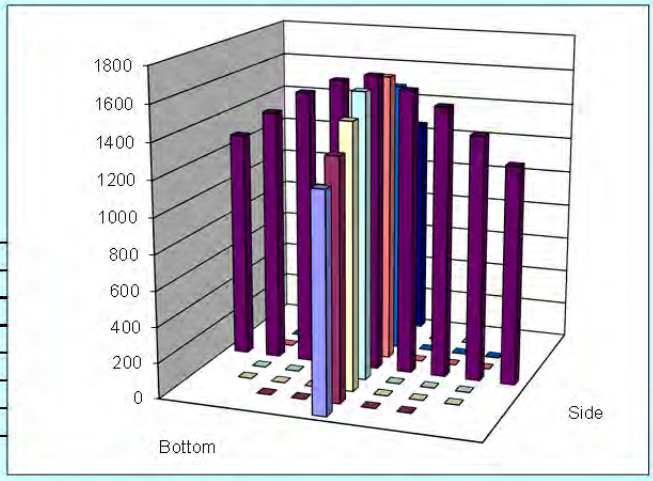
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1468.9		Mean	1536.8	1530.8	1533.8
Min Point	1216.7	-17.2%	Std. Dev.	105.9	112.8	105.2
Max Point	1665.0	13.3%	COV as %	6.9	7.4	6.9

Flow w/o C-Pt 1120 acfm
Vel Avg w/o C-Pt 1445 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	98.4	98.1	F
Equipment temp	na	na	F
Ambient temp	92.3	95.9	F
Stack static	na	na	mbars
Ambient pressure	30.06	30.06	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	20%	18%	RH



Notes:

SS 7-18-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

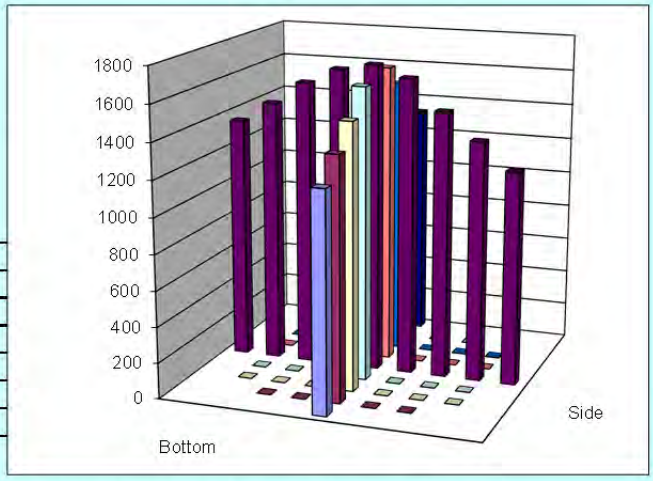
Site	LV-S3 Model	Run No.	VT-23		
Date	7/18/13	Fan Configuration	AB Min		
Testers	EA, SS	Fan Setting	30	Hz	
Stack Dia.	11.922 in.	Stack Temp	101.0	deg F	
Stack X-Area	111.6 in.2	Start/End Time	1029 / 1052		
Test Port	2	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1145	1233	1206	**1194.7**	1223	1243	1169	**1211.7**
2	1.25	1298	1359	1376	**1344.3**	1354	1352	1329	**1345.0**
3	2.31	1474	1467	1536	**1492.3**	1490	1489	1458	**1479.0**
4	3.85	1653	1648	1683	**1661.3**	1624	1631	1625	**1626.7**
Center	5.96	1759	1695	1718	**1724.0**	1703	1712	1718	**1711.0**
5	8.07	1673	1696	1697	**1688.7**	1651	1677	1666	**1664.7**
6	9.61	1583	1598	1627	**1602.7**	1524	1571	1537	**1544.0**
7	10.67	1451	1469	1507	**1475.7**	1432	1451	1423	**1435.3**
8	11.42	1373	1344	1372	**1363.0**	1317	1295	1328	**1313.3**
Averages ---->		**1489.9**	**1501.0**	**1524.7**	**1505.2**	**1479.8**	**1491.2**	**1472.6**	**1481.2**

All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1493.2		Mean	1569.9	1543.7	1556.8
Min Point	1194.7	-20.0%	Std. Dev.	137.3	132.2	130.2
Max Point	1724.0	15.5%	COV as %	8.7	8.6	8.4

Flow w/o C-Pt	1136 acfm	Instuments Used:	Cal Due
Vel Avg w/o C-Pt	1465 fpm	Fishcer Scientific Barometer SN 90936818	12/11/2013
		TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	100.5	101.5	F
Equipment temp	na	na	F
Ambient temp	95.9	95.9	F
Stack static	na	na	mbars
Ambient pressure	30.06	30.06	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	18%	19%	RH



Notes:

SS 7-18-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-24		
Date	7/18/13	Fan Configuration	AB Min		
Testers	EA, SS	Fan Setting	30	Hz	
Stack Dia.	11.922 in.	Stack Temp	101.2	deg F	
Stack X-Area	111.6 in.2	Start/End Time	1056 / 1120		
Test Port	2	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial --->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1234	1200	1235	**1223.0**	1089	1262	1222	**1191.0**
2	1.25	1337	1361	1373	**1357.0**	1271	1350	1325	**1315.3**
3	2.31	1504	1498	1486	**1496.0**	1479	1507	1526	**1504.0**
4	3.85	1682	1639	1645	**1655.3**	1644	1690	1701	**1678.3**
Center	5.96	1708	1696	1700	**1701.3**	1772	1780	1819	**1790.3**
5	8.07	1739	1643	1683	**1688.3**	1724	1745	1798	**1755.7**
6	9.61	1538	1594	1632	**1588.0**	1652	1629	1662	**1647.7**
7	10.67	1443	1468	1491	**1467.3**	1460	1384	1527	**1457.0**
8	11.42	1358	1346	1370	**1358.0**	1359	1347	1373	**1359.7**
Averages ------>		**1504.8**	**1493.9**	**1512.8**	**1503.8**	**1494.4**	**1521.6**	**1550.3**	**1522.1**

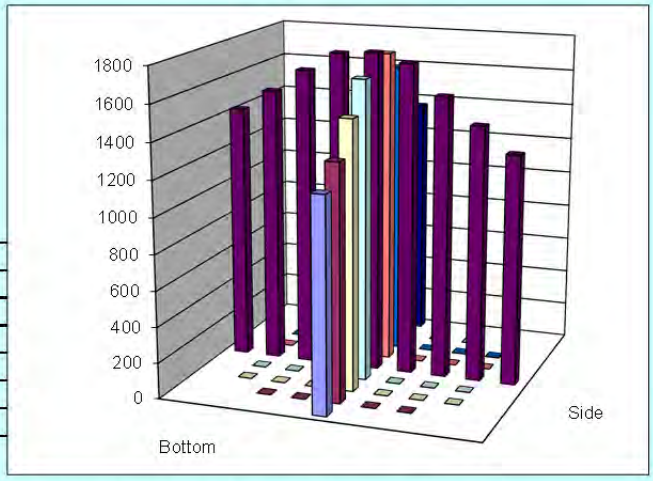
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1513.0		Mean	1564.8	1592.6	1578.7
Min Point	1191.0	-21.3%	Std. Dev.	129.1	172.8	147.3
Max Point	1790.3	18.3%	COV as %	8.3	10.9	9.3

Flow w/o C-Pt 1150 acfm
Vel Avg w/o C-Pt 1484 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	102.2	100.1	F
Equipment temp	na	na	F
Ambient temp	95.9	96.8	F
Stack static	na	na	mbars
Ambient pressure	30.06	30.09	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	18%	19%	RH



Notes:

SS 7-18-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

Site	LV-S3 Model	Run No.	VT-25		
Date	7/18/13	Fan Configuration	AB Min		
Testers	CB,JG,SFS	Fan Setting	30	Hz	
Stack Dia.	11.922 in.	Stack Temp	108.1	deg F	
Stack X-Area	111.6 in.2	Start/End Time	1340 / 1404		
Test Port	2	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	1164	1210	1208	**1194.0**	1132	1222	1097	**1150.3**
2	1.25	1346	1363	1391	**1366.7**	1328	1370	1351	**1349.7**
3	2.31	1538	1536	1511	**1528.3**	1497	1519	1550	**1522.0**
4	3.85	1635	1680	1634	**1649.7**	1604	1633	1645	**1627.3**
Center	5.96	1696	1703	1684	**1694.3**	1686	1702	1709	**1699.0**
5	8.07	1651	1649	1660	**1653.3**	1647	1657	1665	**1656.3**
6	9.61	1566	1556	1555	**1559.0**	1547	1543	1523	**1537.7**
7	10.67	1448	1410	1430	**1429.3**	1406	1382	1362	**1383.3**
8	11.42	1329	1317	1313	**1319.7**	1270	1297	1277	**1281.3**
Averages ---->		**1485.9**	**1491.6**	**1487.3**	**1488.3**	**1457.4**	**1480.6**	**1464.3**	**1467.4**

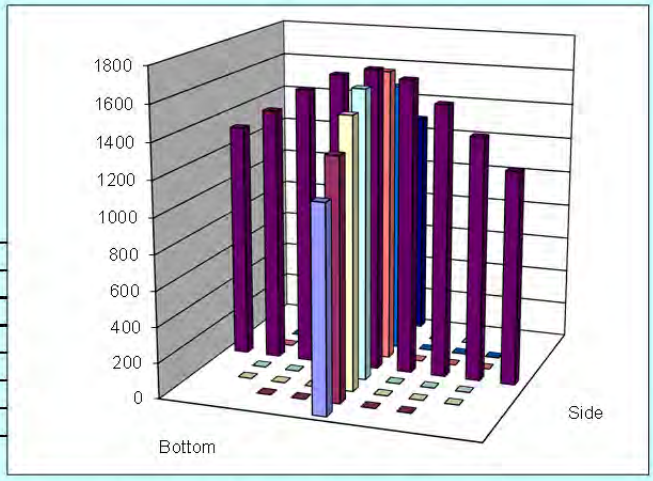
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	1477.9		Mean	1554.4	1539.3	1546.9
Min Point	1150.3	-22.2%	Std. Dev.	122.5	133.9	123.5
Max Point	1699.0	15.0%	COV as %	7.9	8.7	8.0

Flow w/o C-Pt 1124 acfm
Vel Avg w/o C-Pt 1451 fpm

Instuments Used:

	Cal Due
Fishcer Scientific Barometer SN 90936818	12/11/2013
TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	107.1	109.1	F
Equipment temp	na	na	F
Ambient temp	94.1	93.2	F
Stack static	na	na	mbars
Ambient pressure	30.12	30.12	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	20%	20%	RH



Notes:

CB 7/18/13

Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

VELOCITY TRAVERSE DATA FORM

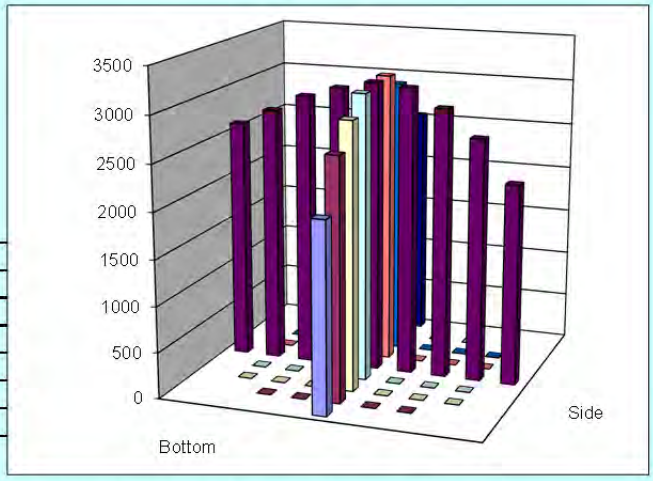
Site	LV-S3 Model	Run No.	VT-26		
Date	7/18/13	Fan Configuration	AB NORM		
Testers	CB,TH,SFS	Fan Setting	55	Hz	
Stack Dia.	11.922 in.	Stack Temp	106.9	deg F	
Stack X-Area	111.6 in.2	Start/End Time	1420 / 1450		
Test Port	1	Center 2/3 from	1.09	to:	10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2	to:	7
Velocity units	ft/min	Data Files:	NA		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.50	2126	2101	2211	**2146.0**	2029	2135	2020	**2061.3**
2	1.25	2584	2559	2642	**2595.0**	2769	2571	2537	**2625.7**
3	2.31	2873	2859	2914	**2882.0**	3070	2818	2833	**2907.0**
4	3.85	3081	3070	3072	**3074.3**	3255	3044	3046	**3115.0**
Center	5.96	3105	3130	3090	**3108.3**	3330	3073	3093	**3165.3**
5	8.07	2996	3034	3051	**3027.0**	3300	3117	3104	**3173.7**
6	9.61	2913	2914	2924	**2917.0**	3164	2945	2959	**3022.7**
7	10.67	2742	2738	2742	**2740.7**	3036	2738	2729	**2834.3**
8	11.42	2581	2569	2563	**2571.0**	2703	2444	2451	**2532.7**
Averages ---->		**2777.9**	**2774.9**	**2801.0**	**2784.6**	**2961.8**	**2765.0**	**2752.4**	**2826.4**

All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	2805.5		Mean	2906.3	2977.7	2942.0
Min Point	2061.3	-26.5%	Std. Dev.	186.5	201.6	190.2
Max Point	3173.7	13.1%	COV as %	6.4	6.8	6.5

Flow w/o C-Pt	2143 acfm	Instuments Used:	Cal Due
Vel Avg w/o C-Pt	2764 fpm	Fishcer Scientific Barometer SN 90936818	12/11/2013
		TSI VelociCalc SN T95351203001	12/10/2013

	Start	Finish	
Stack temp	107.4	106.4	F
Equipment temp	na	na	F
Ambient temp	94.1	95	F
Stack static	na	na	mbars
Ambient pressure	30.12	30.12	in Hg
Total Stack pressure	na	na	mbars
Ambient humidity	19%	20%	RH



Notes:

CB 7/18/13

Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	1/6/2014
	Signature on file with original	Signature on file with original TI-WTPSP 120	

D.3 LV-S3 Flow Angle Data Sheets

TI-WTPSP-121
Page

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model		Run No.	FA-1	
Date	7/18/2013		Fan Setting	60	Hz
Tester	cb,th, jg, sfs		Fan configuration	AB max	
Stack Dia.	11.922	in	Approx. air vel.	3196	fpm at point >> port 2, bottom
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	1	
Distance to disturbance	426.25	in	Stack Temp	106.9	degrees F at start of test
Start/End Time	1605/1700				

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	5	8	6	**6.3**	14	8	10	**10.7**
2	1.25	10	10	9	**9.7**	17	15	15	**15.7**
3	2.31	13	9	10	**10.7**	15	14	15	**14.7**
4	3.85	9	11	10	**10.0**	14	12	12	**12.7**
Center	5.96	8	6	9	**7.7**	12	10	10	**10.7**
5	8.07	4	2	3	**3.0**	6	4	5	**5.0**
6	9.61	1	1	1	**1.0**	4	5	4	**4.3**
7	10.67	1	1	1	**1.0**	4	5	4	**4.3**
8	11.42	2	2	2	**2.0**	4	4	4	**4.0**
Mean of absolute values:					**5.7**				**9.1**
" " w/o points by wall:					**6.1**				**9.6**

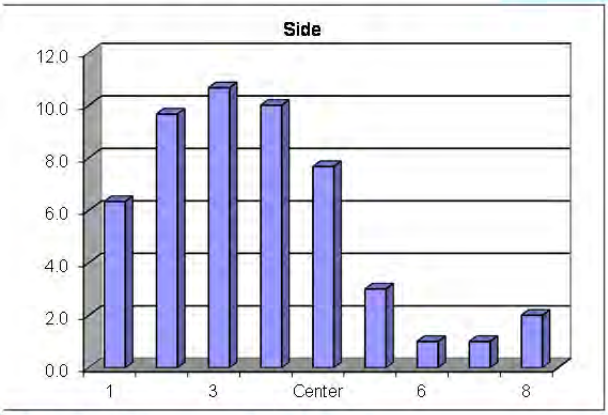
Grand mean ABS	**7.4**
" " w/o wall pts	**7.9**

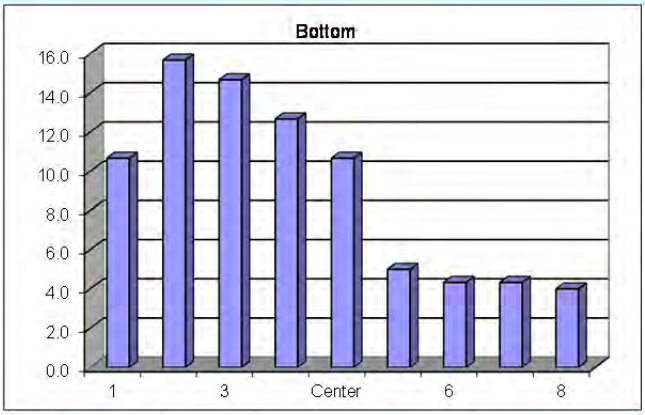
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N [28293]	Cat. 3

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

CB 7/18/13





Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-#####

Site	LV-S3 Scale Model		Run No.	FA-2	
Date	7/19/2013		Fan Setting	55	Hz
Tester	CB, SS		Fan configuration	AB Norm	
Stack Dia.	11.922	in	Approx. air vel.	3104	fpm at point >>
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	1	
Distance to disturbance	426.25	in	Stack Temp	76.6	degrees F
Start/End Time	0700 / 0730				

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-18	-21	-22	**-20.3**	3	0	-4	**-0.3**
2	1.25	-21	-21	-22	**-21.3**	-2	0	-1	**-1.0**
3	2.31	-21	-20	-21	**-20.7**	-1	-1	-2	**-1.3**
4	3.85	-18	-19	-19	**-18.7**	-3	1	-1	**-1.0**
Center	5.96	-15	-16	-15	**-15.3**	-3	-2	-1	**-2.0**
5	8.07	-10	-7	-7	**-8.0**	0	1	1	**0.7**
6	9.61	-6	-3	-3	**-4.0**	0	2	1	**1.0**
7	10.67	-3	-2	-2	**-2.3**	1	3	0	**1.3**
8	11.42	-2	-2	-2	**-2.0**	1	1	2	**1.3**
Mean of absolute values:					**12.5**				**1.1**
" " w/o points by wall:					**12.9**				**1.2**

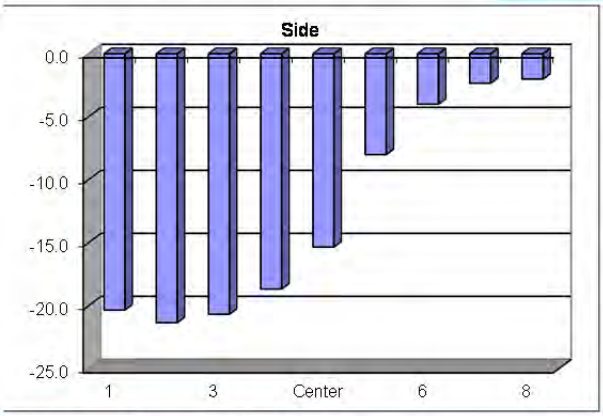
Grand mean ABS	**6.8**
" " w/o wall pts	**7.0**

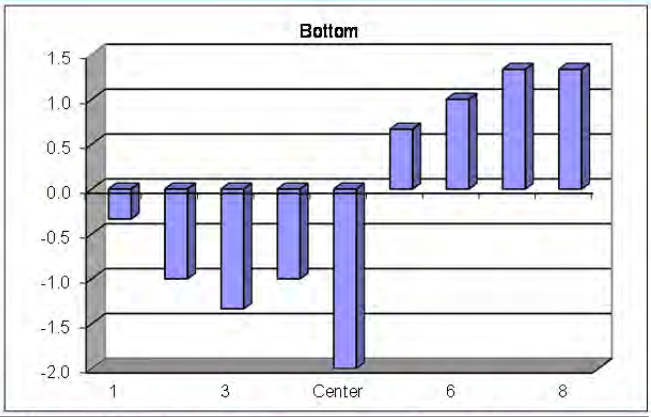
Instuments Used:			**Cal. Due**	
S-type pitot	Dwyer 24-inch S-type Pitot#10		Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001		10-Dec-13	
Angle indicator	Shop built		Cat. 3	
Manometer	Dwyer 400-5, S36N	28293	Cat. 3	MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS 7/19/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/19/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-#####

Site	LV-S3 Scale Model		Run No.	FA-3	
Date	7/19/2013		Fan Setting	30	Hz
Tester	CB, SS		Fan configuration	AB Min	
Stack Dia.	11.922	in	Approx. air vel.	1517	fpm at point >>
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	1	
Distance to disturbance	426.25	in	Stack Temp	78.8	degrees F
Start/End Time	0733 / 0754				

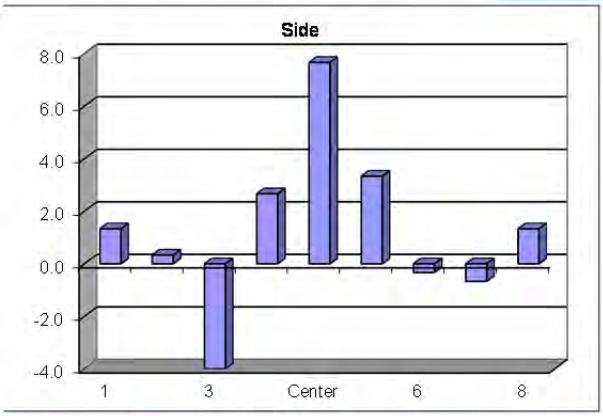
Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-11	7	8	**1.3**	10	13	14	**12.3**
2	1.25	-2	10	-7	**0.3**	20	18	19	**19.0**
3	2.31	-11	9	-10	**-4.0**	17	15	15	**15.7**
4	3.85	-10	11	7	**2.7**	12	14	14	**13.3**
Center	5.96	4	10	9	**7.7**	13	11	11	**11.7**
5	8.07	1	4	5	**3.3**	6	5	8	**6.3**
6	9.61	-2	2	-1	**-0.3**	3	4	4	**3.7**
7	10.67	-2	2	-2	**-0.7**	4	4	4	**4.0**
8	11.42	2	1	1	**1.3**	6	5	4	**5.0**
Mean of absolute values:					**2.4**				**10.1**
" " w/o points by wall:					**2.7**				**10.5**
								Grand mean ABS	**6.3**
								" " w/o wall pts	**6.6**

Instruments Used:		**Cal. Due**	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N 28293	Cat. 3	MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS 7/19/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/19/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model		Run No.	FA-4	
Date	7/19/2013		Fan Setting	30	Hz
Tester	CB, SS		Fan configuration	AB Min	
Stack Dia.	11.922	in	Approx. air vel.	1533	fpm at point >>
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	1	
Distance to disturbance	426.25	in	Stack Temp	82.2	degrees F
Start/End Time	0756 / 0810				

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-16	-16	-20	**-17.3**	-16	-17	-15	**-16.0**
2	1.25	-21	-15	-16	**-17.3**	-21	-20	-25	**-22.0**
3	2.31	-18	-16	-18	**-17.3**	-19	-20	-19	**-19.3**
4	3.85	-17	-10	9	**-6.0**	-17	-17	-18	**-17.3**
Center	5.96	4	-7	8	**1.7**	-14	-14	-14	**-14.0**
5	8.07	0	1	4	**1.7**	-10	-11	-9	**-10.0**
6	9.61	-5	1	1	**-1.0**	-6	-8	-4	**-6.0**
7	10.67	-2	-2	-1	**-1.7**	-5	-3	-2	**-3.3**
8	11.42	-4	0	-1	**-1.7**	-4	-3	-3	**-3.3**
Mean of absolute values:					**7.3**				**12.4**
" " w/o points by wall:					**6.7**				**13.1**

Grand mean ABS	**9.8**
" " w/o wall pts	**9.9**

Instuments Used:

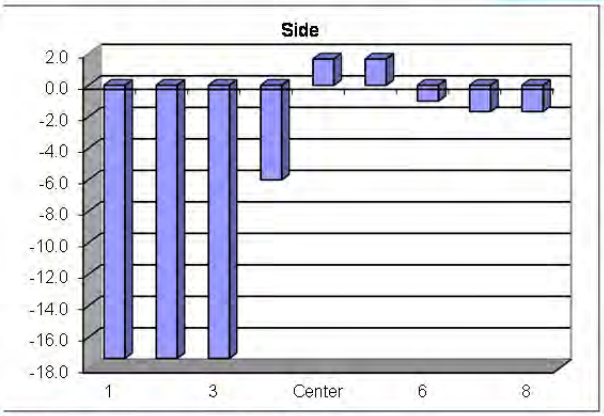
		Cal. Due	
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N	28293 Cat. 3	MAN-5

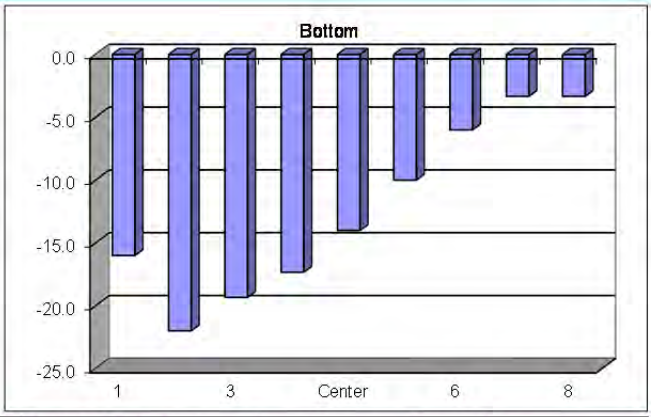
Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS

7/19/2013





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/19/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model		Run No.	FA-5	
Date	7/19/2013		Fan Setting	30	Hz
Tester	CB, SS		Fan configuration	AB Min	
Stack Dia.	11.922	in	Approx. air vel.	1533	fpm at point >>
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	1	
Distance to disturbance	426.25	in	Stack Temp	82.2	degrees F
Start/End Time	0825 / 0848				

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial --->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	3	3	0	2.0	4	8	11	7.7
2	1.25	-5	-6	-4	-5.0	15	15	15	15.0
3	2.31	-8	-4	-7	-6.3	13	14	13	13.3
4	3.85	-2	-8	-5	-5.0	11	12	10	11.0
Center	5.96	-8	8	9	3.0	10	9	11	10.0
5	8.07	3	3	2	2.7	1	5	3	3.0
6	9.61	-1	2	1	0.7	2	1	1	1.3
7	10.67	1	1	2	1.3	1	1	1	1.0
8	11.42	1	1	-2	0.0	2	1	1	1.3
Mean of absolute values:					2.9				7.1
" "w/o points by wall:					3.4				7.8

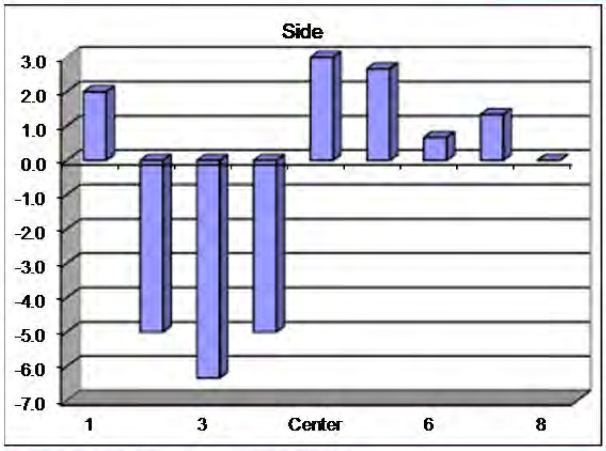
Grand mean ABS	5.0
" "w/o wall pts	5.6

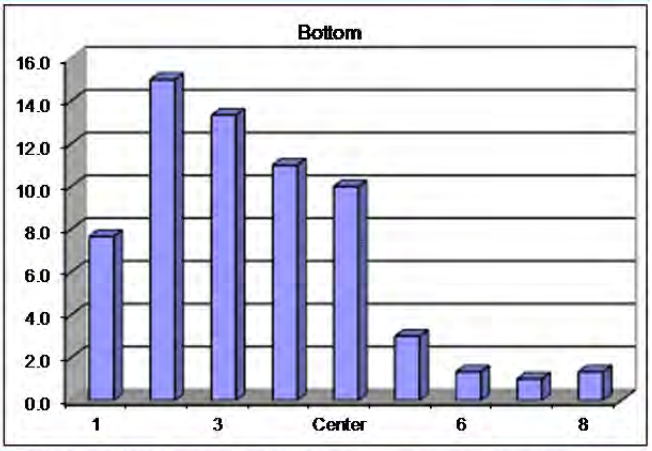
Instuments Used:			Cal. Due	
S-type pitot	Dwyer 24-inch S-type Pitot#10		Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001		10-Dec-13	
Angle indicator	Shop built		Cat. 3	
Manometer	Dwyer 400-5, S36N	28293	Cat. 3	MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS
7/19/2013





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/19/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model		Run No.	FA-6
Date	7/19/2013		Fan Setting	30 Hz
Tester	CB, SS		Fan configuration	B Min
Stack Dia.	11.922	in	Approx. air vel.	797 fpm at point >>
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A.	ft	Port	1
Distance to disturbance	426.25	in	Stack Temp	96.8 degrees F
Start/End Time	0900 / 0952			

Order -->		1stt				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	16	14	10	**13.3**	-13	-21	-24	**-19.3**
2	1.25	14	12	9	**11.7**	-27	-22	-25	**-24.7**
3	2.31	18	17	7	**14.0**	-11	-17	-19	**-15.7**
4	3.85	16	12	10	**12.7**	-17	-19	-14	**-16.7**
Center	5.96	14	11	10	**11.7**	-16	-5	-13	**-11.3**
5	8.07	14	3	2	**6.3**	-16	-12	-8	**-12.0**
6	9.61	15	1	4	**6.7**	-8	-4	-2	**-4.7**
7	10.67	13	5	4	**7.3**	-4	-3	-1	**-2.7**
8	11.42	2	-2	-1	**-0.3**	-5	-3	1	**-2.3**
Mean of absolute values:					**9.3**				**12.1**
" " w/o points by wall:					**10.0**				**12.5**
								Grand mean ABS	**10.7**
								" " w/o wall pts	**11.3**

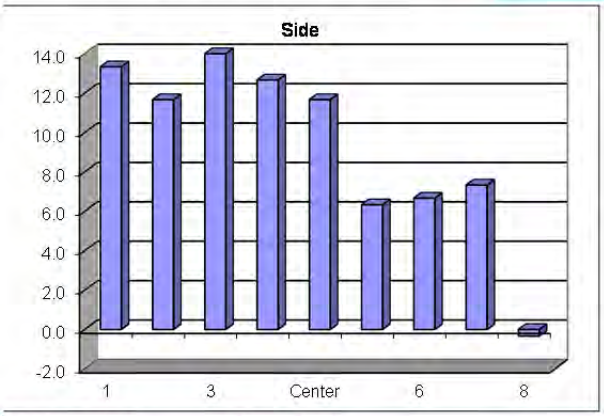
Instruments Used:			Cal. Due	
S-type pitot	Dwyer 24-inch S-type Pitot#10		Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001		10-Dec-13	
Angle indicator	Shop built		Cat. 3	
Manometer	Dwyer 400-5, S36N	28293	Cat. 3	MAN-5

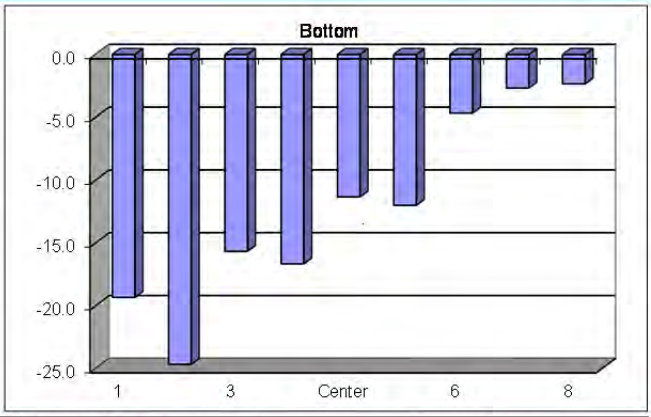
Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS

7/19/2013





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/19/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-#####

Site	LV-S3 Scale Model		Run No.	FA-7	
Date	7/19/2013		Fan Setting	55	Hz
Tester	CB, SS		Fan configuration	Fan A Norm	
Stack Dia.	11.922	in	Approx. air vel.	1800	fpm at point >>
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	1	
Distance to disturbance	426.25	in	Stack Temp	105.9	degrees F
Start/End Time	1030 / 1100				

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial --->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-24	-23	-21	**-22.7**	-4	-10	-9	**-7.7**
2	1.25	-22	-19	-18	**-19.7**	-2	-6	-4	**-4.0**
3	2.31	-22	-19	-20	**-20.3**	-4	-5	-4	**-4.3**
4	3.85	-21	-17	-16	**-18.0**	-3	-3	-2	**-2.7**
Center	5.96	-3	-16	-13	**-10.7**	-3	-2	-1	**-2.0**
5	8.07	-9	-7	-8	**-8.0**	-6	-7	-7	**-6.7**
6	9.61	-4	-3	-1	**-2.7**	-3	-3	-3	**-3.0**
7	10.67	-3	-1	-1	**-1.7**	-2	-3	-3	**-2.7**
8	11.42	-3	0	-1	**-1.3**	-1	-2	-2	**-1.7**
Mean of absolute values:					**11.7**				**3.9**
" " w/o points by wall:					**11.6**				**3.6**
								Grand mean ABS	**7.8**
								" " w/o wall pts	**7.6**

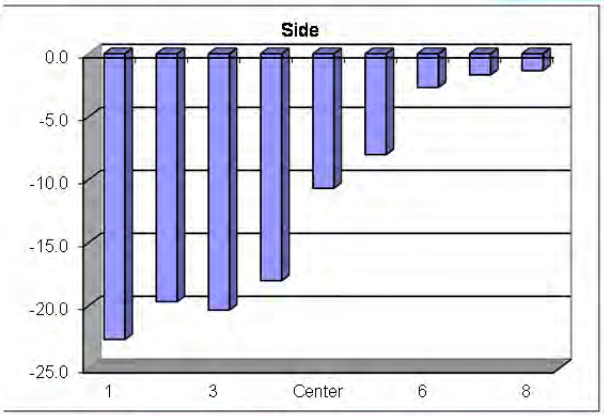
Instruments Used:			Cal. Due	
S-type pitot	Dwyer 24-inch S-type Pitot#10		Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001		10-Dec-13	
Angle indicator	Shop built		Cat. 3	
Manometer	Dwyer 400-5, S36N	28293	Cat. 3	MAN-5

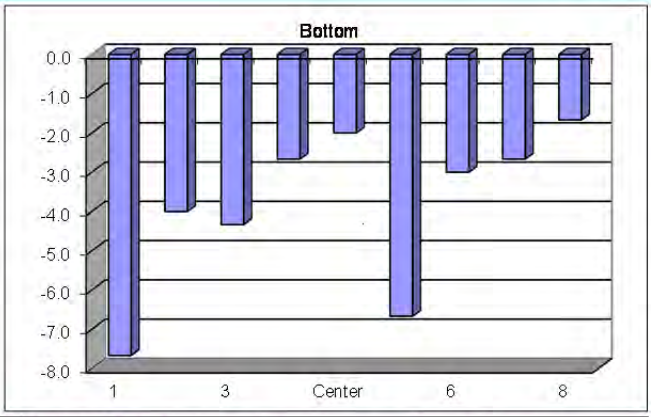
Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS

7/19/2013





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/19/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-#####

Site	LV-S3 Scale Model		Run No.	FA-8	
Date	7/19/2013		Fan Setting	55	Hz
Tester	CB, SS		Fan configuration	Fan A Norm	
Stack Dia.	11.922	in	Approx. air vel.	1710	fpm at point >>
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	2	
Distance to disturbance	510.25	in	Stack Temp	107.6	degrees F
Start/End Time	1116 / 1145				

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-7	5	-4	**-2.0**	4	12	7	**7.7**
2	1.25	-8	9	-14	**-4.3**	13	20	21	**18.0**
3	2.31	8	9	6	**7.7**	14	16	17	**15.7**
4	3.85	6	8	5	**6.3**	14	15	16	**15.0**
Center	5.96	4	4	4	**4.0**	8	9	13	**10.0**
5	8.07	1	0	-1	**0.0**	5	5	8	**6.0**
6	9.61	-1	-1	-1	**-1.0**	4	3	6	**4.3**
7	10.67	-1	-2	-2	**-1.7**	3	0	6	**3.0**
8	11.42	0	-1	-1	**-0.7**	3	1	5	**3.0**
Mean of absolute values:					**3.1**				**9.2**
" " w/o points by wall:					**3.6**				**10.3**

Grand mean ABS	**6.1**
" " w/o wall pts	**6.9**

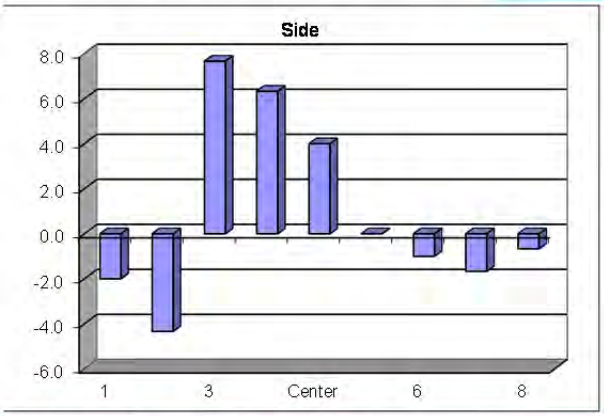
Instruments Used:			**Cal. Due**	
S-type pitot	Dwyer 24-inch S-type Pitot#10		Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001		10-Dec-13	
Angle indicator	Shop built		Cat. 3	
Manometer	Dwyer 400-5, S36N	28293	Cat. 3	MAN-5

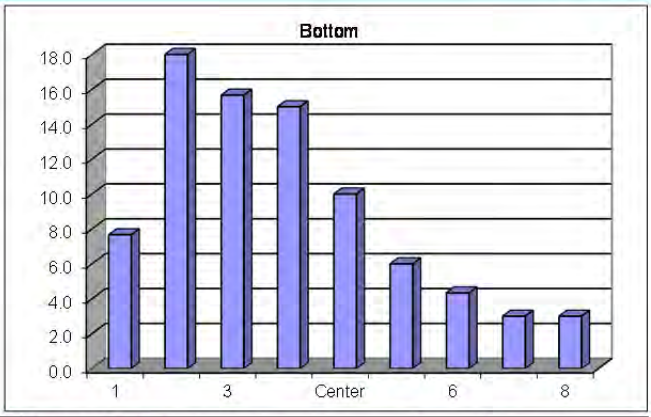
Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS

7/19/2013





Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/18/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-#####

Site	LV-S3 Scale Model		Run No.	FA-9	
Date	7/22/2013		Fan Setting	55	Hz
Tester	SS, EA		Fan configuration	Fan A Norm	
Stack Dia.	11.922	in	Approx. air vel.	1699	fpm at point >>
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	2	
Distance to disturbance	510.25	in	Stack Temp	82.4	degrees F
Start/End Time	0719 / 0745				

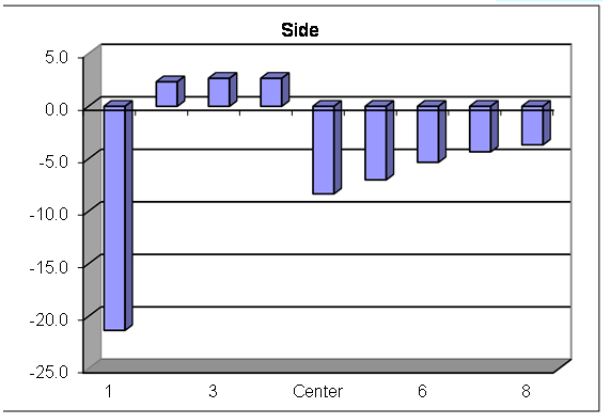
Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-19	-22	-23	**-21.3**	-10	-7	-9	**-8.7**
2	1.25	7	0	0	**2.3**	-5	-4	-6	**-5.0**
3	2.31	8	-3	3	**2.7**	-7	-2	-1	**-3.3**
4	3.85	5	3	0	**2.7**	-6	-2	-1	**-3.0**
Center	5.96	-1	-9	-15	**-8.3**	-1	-1	-9	**-3.7**
5	8.07	-5	-8	-8	**-7.0**	-2	-2	-3	**-2.3**
6	9.61	-4	-6	-6	**-5.3**	-1	-2	-2	**-1.7**
7	10.67	-4	-5	-4	**-4.3**	0	-2	-2	**-1.3**
8	11.42	-3	-4	-4	**-3.7**	-2	-2	-2	**-2.0**
Mean of absolute values:					**6.4**				**3.4**
" " w/o points by wall:					**4.7**				**2.9**
								Grand mean ABS	**4.9**
								" " w/o wall pts	**3.8**

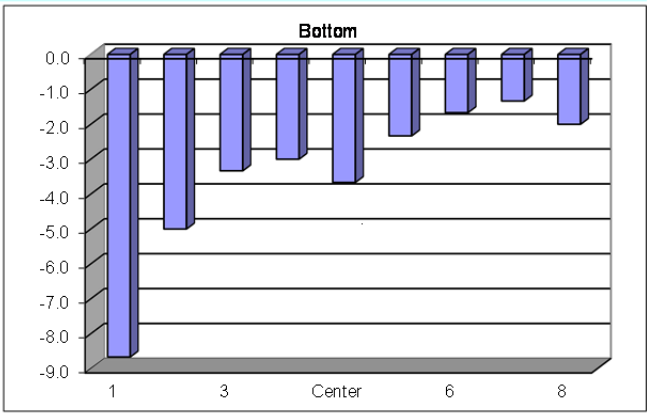
Instruments Used:		Cal. Due
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N *28293*	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS 7/22/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-#####

Site	LV-S3 Scale Model		Run No.	FA-10	
Date	7/22/2013		Fan Setting	55	Hz
Tester	SS, EA		Fan configuration	Fan A Norm	
Stack Dia.	11.922	in	Approx. air vel.	1577	fpm at point >>
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	2	
Distance to disturbance	510.25	in	Stack Temp	88.1	degrees F
Start/End Time	0750 / 0823				

Order –>		1st				2nd			
Traverse–>		Side				Bottom			
Trial —>		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-21	-20	-21	**-20.7**	-4	0	-1	**-1.7**
2	1.25	-2	-1	-1	**-1.3**	-16	-3	-4	**-7.7**
3	2.31	7	-2	-3	**0.7**	10	-4	-7	**-0.3**
4	3.85	5	-4	-4	**-1.0**	8	-4	-5	**-0.3**
Center	5.96	0	0	0	**0.0**	6	5	5	**5.3**
5	8.07	-6	-5	-5	**-5.3**	0	1	0	**0.3**
6	9.61	-4	-5	-4	**-4.3**	-1	-1	0	**-0.7**
7	10.67	-4	-3	-3	**-3.3**	0	0	0	**0.0**
8	11.42	-3	-3	-2	**-2.7**	0	0	1	**0.3**
Mean of absolute values:					**4.4**				**1.9**
" " w/o points by wall:					**2.3**				**2.1**

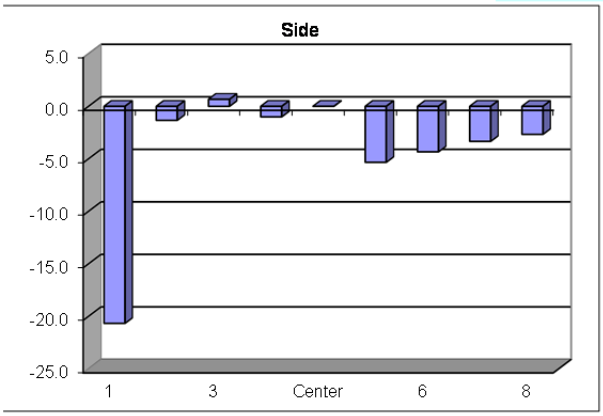
Grand mean ABS	**3.1**
" " w/o wall pts	**2.2**

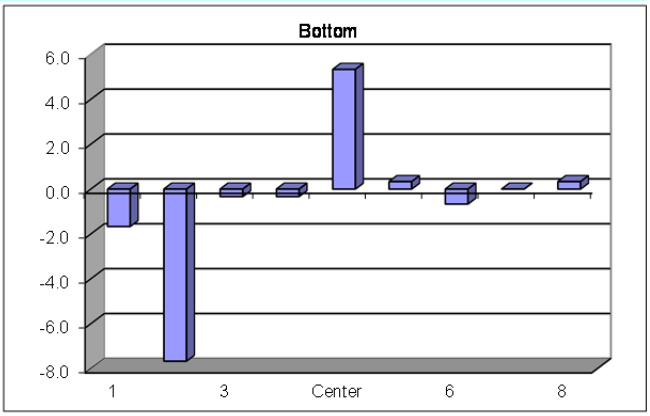
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N *28293*	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS 7/22/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-11
Date	7/22/2013	Fan Setting	30 Hz
Tester	SS, EA	Fan configuration	AB MIN
Stack Dia.	11.922 in	Approx. air vel.	1516 fpm at point >>
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	2
Distance to disturbance	510.25 in	Stack Temp	91 degrees F
Start/End Time	0826 / 0913		

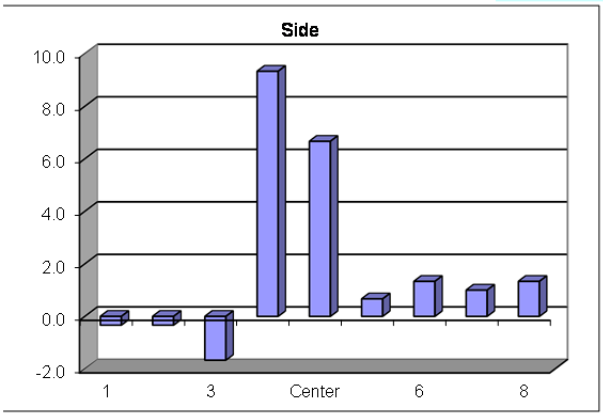
Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-18	5	12	**-0.3**	-2	-4	-1	**-2.3**
2	1.25	-1	0	0	**-0.3**	-2	-3	-3	**-2.7**
3	2.31	-3	-1	-1	**-1.7**	-4	-5	-3	**-4.0**
4	3.85	9	9	10	**9.3**	-4	5	6	**2.3**
Center	5.96	7	5	8	**6.7**	-3	4	-6	**-1.7**
5	8.07	1	2	-1	**0.7**	-1	0	-2	**-1.0**
6	9.61	1	1	2	**1.3**	0	1	0	**0.3**
7	10.67	1	1	1	**1.0**	-1	0	1	**0.0**
8	11.42	2	2	0	**1.3**	1	0	1	**0.7**
Mean of absolute values:					**2.5**				**1.7**
" " w/o points by wall:					**3.0**				**1.7**
								Grand mean ABS	**2.1**
								" " w/o wall pts	**2.4**

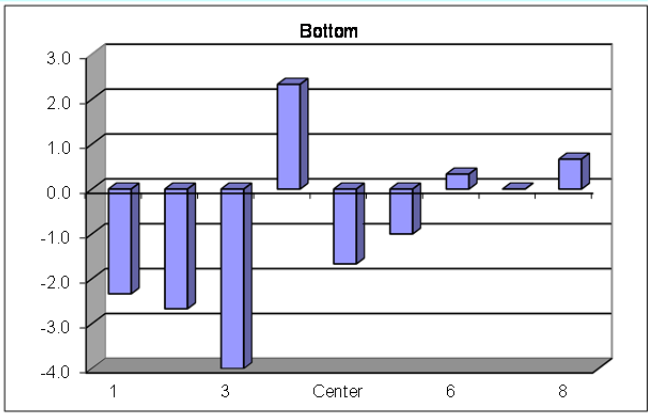
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N *28293*	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS 7/22/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-12
Date	7/22/2013	Fan Setting	30 Hz
Tester	SS, EA	Fan configuration	AB MIN
Stack Dia.	11.922 in	Approx. air vel.	NA fpm at point >>
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	2
Distance to disturbance	510.25 in	Stack Temp	NA degrees F
Start/End Time	0915 / 0943		

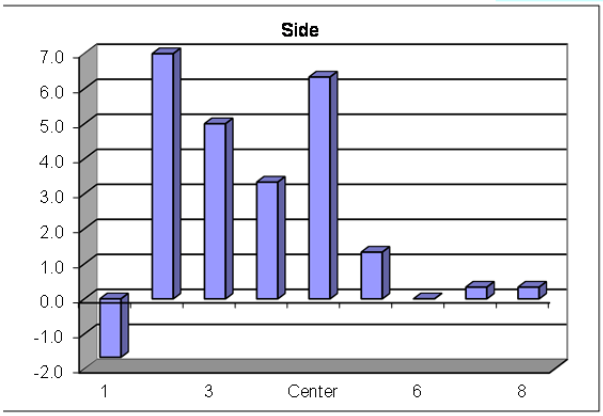
Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-1	7	-11	**-1.7**	-2	-15	-5	**-7.3**
2	1.25	13	-2	10	**7.0**	10	-1	-1	**2.7**
3	2.31	-4	10	9	**5.0**	-10	5	1	**-1.3**
4	3.85	-6	8	8	**3.3**	7	-5	10	**4.0**
Center	5.96	7	6	6	**6.3**	-1	-1	-7	**-3.0**
5	8.07	2	0	2	**1.3**	1	1	-1	**0.3**
6	9.61	0	1	-1	**0.0**	1	1	1	**1.0**
7	10.67	0	0	1	**0.3**	1	2	2	**1.7**
8	11.42	-1	1	1	**0.3**	-2	2	2	**0.7**
Mean of absolute values:					**2.8**				**2.4**
" " w/o points by wall:					**3.3**				**2.0**
								Grand mean ABS	**2.6**
								" " w/o wall pts	**2.7**

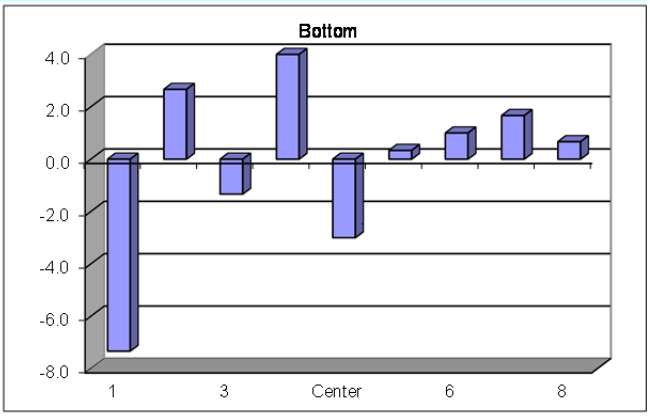
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N *28293*	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS 7/22/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-13
Date	7/22/2013	Fan Setting	30 Hz
Tester	SS, EA	Fan configuration	AB MIN
Stack Dia.	11.922 in	Approx. air vel.	1544 fpm at point >>
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	2
Distance to disturbance	510.25 in	Stack Temp	97.1 degrees F
Start/End Time	0945 /1020		

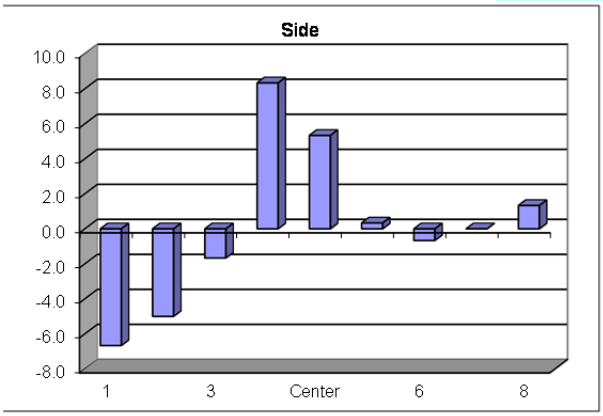
Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-14	5	-11	**-6.7**	-1	0	-1	**-0.7**
2	1.25	-16	0	1	**-5.0**	-1	-1	0	**-0.7**
3	2.31	0	0	-5	**-1.7**	-2	-2	2	**-0.7**
4	3.85	9	7	9	**8.3**	0	-1	0	**-0.3**
Center	5.96	0	7	9	**5.3**	5	0	-5	**0.0**
5	8.07	1	-2	2	**0.3**	1	2	1	**1.3**
6	9.61	0	-1	-1	**-0.7**	3	2	2	**2.3**
7	10.67	0	1	-1	**0.0**	3	3	2	**2.7**
8	11.42	1	2	1	**1.3**	4	3	3	**3.3**
Mean of absolute values:					**3.3**				**1.3**
" " w/o points by wall:					**3.0**				**1.1**
								Grand mean ABS	**2.3**
								" " w/o wall pts	**2.1**

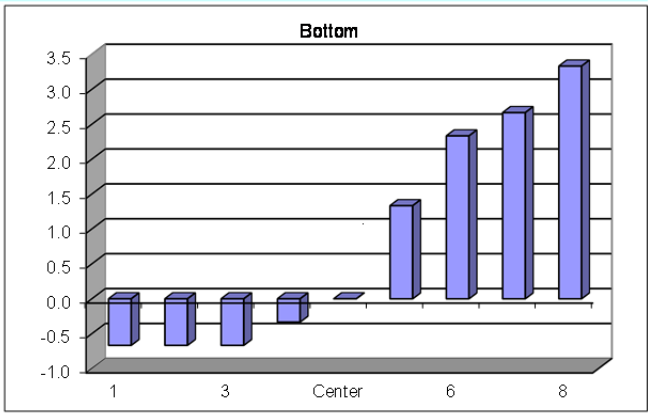
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N *28293*	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

SS 7/22/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-14
Date	7/22/2013	Fan Setting	30 Hz
Tester	EA, SFS	Fan configuration	AC MIN
Stack Dia.	11.922 in	Approx. air vel.	1744 fpm at point >>
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	2
Distance to disturbance	510.25 in	Stack Temp	108.7 degrees F
Start/End Time	1105 / 1140		

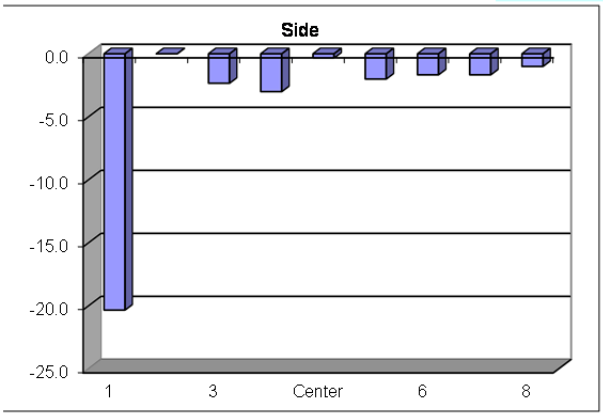
Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-20	-21	-20	**-20.3**	-9	-9	-18	**-12.0**
2	1.25	-1	0	1	**0.0**	3	4	7	**4.7**
3	2.31	-3	-3	-1	**-2.3**	-1	-1	-3	**-1.7**
4	3.85	-4	-4	-1	**-3.0**	-1	-1	-2	**-1.3**
Center	5.96	2	-3	0	**-0.3**	1	0	0	**0.3**
5	8.07	-4	0	-2	**-2.0**	-5	-2	-3	**-3.3**
6	9.61	-2	-2	-1	**-1.7**	-2	-1	0	**-1.0**
7	10.67	-2	-1	-2	**-1.7**	-1	0	-1	**-0.7**
8	11.42	-1	-1	-1	**-1.0**	-1	2	-1	**0.0**
Mean of absolute values:					**3.6**				**2.8**
" " w/o points by wall:					**1.6**				**1.9**
								Grand mean ABS	**3.2**
								" " w/o wall pts	**1.7**

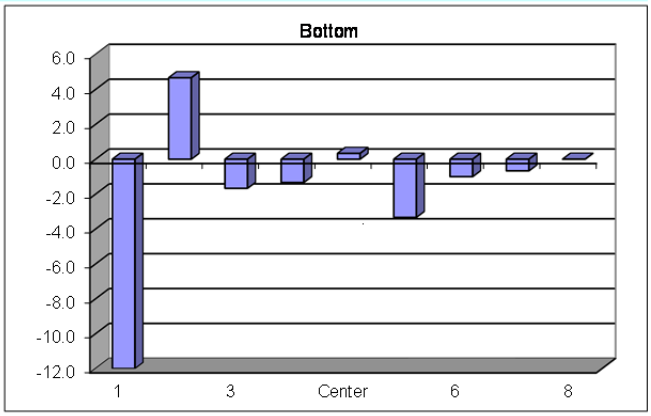
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N *28293*	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Ambient T 95.0 F
Ambient P 29.83 in.Hg
Ambient T at end of side readings 99.5 F

SFS 2/22/13





Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original		Signature on file with original TI-WTSP-121

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-15
Date	7/22/2013	Fan Setting	30 Hz
Tester	CB,SFS	Fan configuration	C MIN
Stack Dia.	11.922 in	Approx. air vel.	1091 fpm at point >>
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	2
Distance to disturbance	510.25 in	Stack Temp	111.1 degrees F
Start/End Time	1209 / 1242		

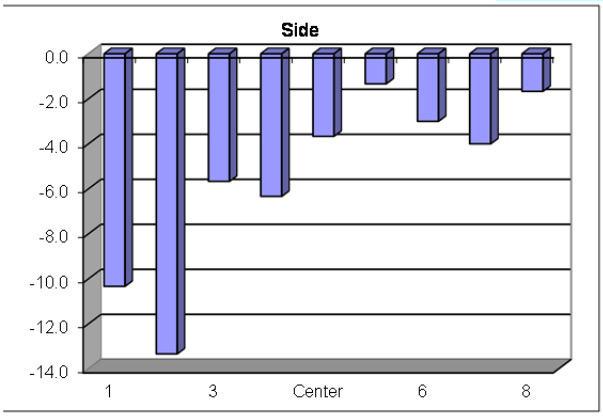
Order -->	2nd				1st			
Traverse-->	Side				Bottom			
Trial -->	1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	6	-17	-20	**-10.3**	-12	-19	-20	**-17.0**
2	1.25	-4	-19	-17	**-13.3**	-22	-22	-22	**-22.0**
3	2.31	7	-5	-19	**-5.7**	-5	-20	-21	**-15.3**
4	3.85	6	-16	-9	**-6.3**	-16	-20	-17	**-17.7**
Center	5.96	5	-11	-5	**-3.7**	-11	-14	-14	**-13.0**
5	8.07	-1	-4	1	**-1.3**	-9	-9	-12	**-10.0**
6	9.61	-3	-4	-2	**-3.0**	-4	-4	-6	**-4.7**
7	10.67	-4	-4	-4	**-4.0**	-2	-5	-4	**-3.7**
8	11.42	-3	-3	1	**-1.7**	-2	-3	-3	**-2.7**
Mean of absolute values:					**5.5**				**11.8**
" " w/o points by wall:					**5.3**				**12.3**
								Grand mean ABS	**8.6**
								" " w/o wall pts	**8.8**

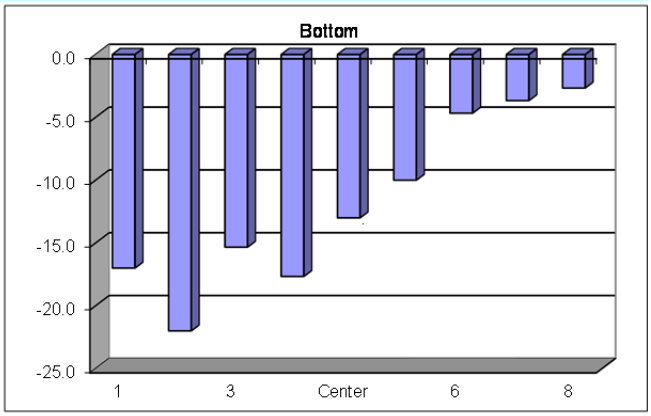
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N *28293*	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Ambient P 29.85 in.Hg
Amb.T 93.2 start ; 95.0 F end

SFS 2/22/13





Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA- 16
Date	7/22/2013	Fan Setting	30 Hz
Tester	CB, SFS,TH	Fan configuration	C MIN
Stack Dia.	11.922 in	Approx. air vel.	1184 fpm at point >>
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	2
Distance to disturbance	510.25 in	Stack Temp	116.5 degrees F
Start/End Time	12:43 / 13:35		

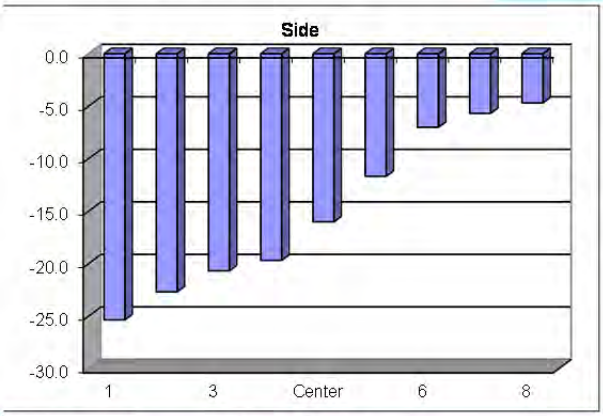
Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-26	-25	-25	-25.3	-13	-12	-13	-12.7
2	1.25	-20	-24	-24	-22.7	-5	-4	-19	-9.3
3	2.31	-21	-21	-20	-20.7	-4	-4	-16	-8.0
4	3.85	-21	-19	-19	-19.7	-6	-4	-12	-7.3
Center	5.96	-17	-15	-16	-16.0	-4	-5	-11	-6.7
5	8.07	-11	-9	-15	-11.7	-6	-3	-7	-5.3
6	9.61	-7	-7	-7	-7.0	-1	-2	-1	-1.3
7	10.67	-6	-6	-5	-5.7	-1	0	-1	-0.7
8	11.42	-5	-4	-5	-4.7	1	-1	-1	-0.3
Mean of absolute values:					14.8				5.7
" " w/o points by wall:					14.8				5.5
								Grand mean ABS	10.3
								" " w/o wall pts	10.1

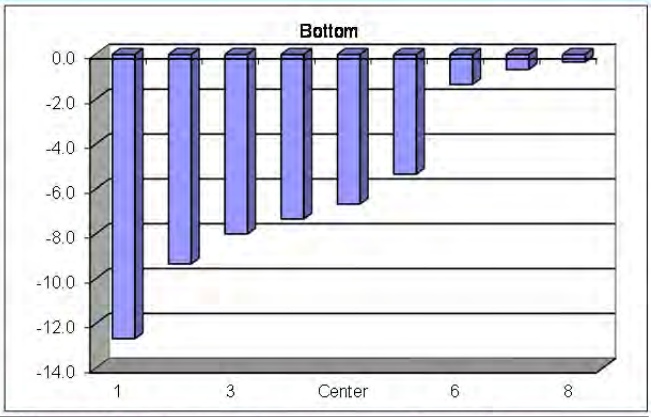
Instruments Used:		Cal. Due
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes: Amb. T - 95.0 F start ; 96.8 F
Amb. P 29.85 in Hg

SS 7/22/13





Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original		Signature on file with original TI-WTSP-121

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-17
Date	7/22/2013	Fan Setting	30 Hz
Tester	TH, SFS	Fan configuration	C MIN
Stack Dia.	11.922 in	Approx. air vel.	1032 fpm at point >>rt2, position7
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	426.25 in	Stack Temp	113.6 degrees F
Start/End Time	1344 / 1407		

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	7	4	6	5.7	9	11	8	9.3
2	1.25	9	10	11	10.0	11	7	12	10.0
3	2.31	7	9	8	8.0	12	7	11	10.0
4	3.85	8	10	9	9.0	10	7	8	8.3
Center	5.96	6	6	7	6.3	6	6	5	5.7
5	8.07	4	4	3	3.7	3	4	4	3.7
6	9.61	4	1	0	1.7	0	0	-1	-0.3
7	10.67	8	-1	-1	2.0	-2	-1	-1	-1.3
8	11.42	6	-2	-2	0.7	-1	-2	-2	-1.7
Mean of absolute values:					5.2				5.6
" " w/o points by wall:					5.8				5.6
								Grand mean ABS	5.4
								" " w/o wall pts	5.7

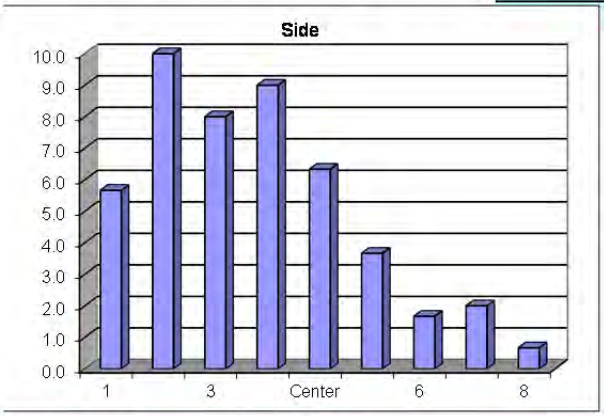
Instruments Used:		Cal. Due
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3

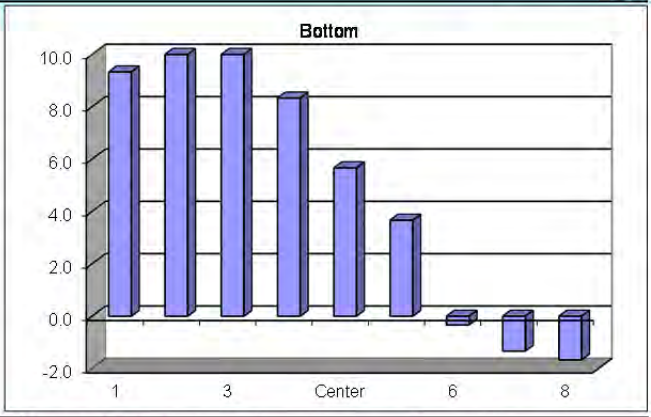
Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:

101.3F amb T at start; 98.6F at end
Amb P 29.88 in Hg

SS 7/22/13





Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original		Signature on file with original TI-WTSP-121

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model		Run No.	FA-18	
Date	7/22/2013		Fan Setting	30	Hz
Tester	cb, TH		Fan configuration	Fan C Min	
Stack Dia.	11.922	in	Approx. air vel.	1032	fpm at point >> side # 7
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	1	
Distance to disturbance	426.25	in	Stack Temp	113.6	degrees F
Start/End Time	14:20 /14:35				

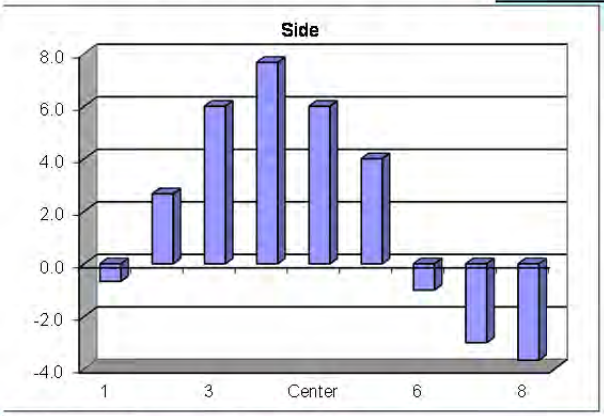
Order -->	1 st				2 nd			
Traverse-->	Side				Bottom			
Trial -->	1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	2	-5	1	**-0.7**	10	13	16	**13.0**
2	1.25	6	-5	7	**2.7**	12	14	15	**13.7**
3	2.31	8	4	6	**6.0**	13	13	14	**13.3**
4	3.85	8	6	9	**7.7**	10	13	14	**12.3**
Center	5.96	5	8	5	**6.0**	10	11	10	**10.3**
5	8.07	2	6	4	**4.0**	5	9	8	**7.3**
6	9.61	-2	2	-3	**-1.0**	3	4	5	**4.0**
7	10.67	-4	-2	-3	**-3.0**	0	3	3	**2.0**
8	11.42	-4	-3	-4	**-3.7**	1	3	2	**2.0**
Mean of absolute values:					**3.9**				**8.7**
" " w/o points by wall:					**4.3**				**9.0**
							Grand mean ABS		**6.3**
							" " w/o wall pts		**6.7**

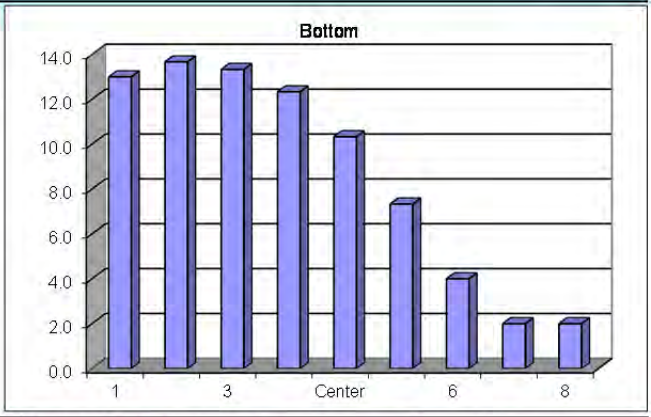
Instruments Used:		Cal. Due
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Start Amb T=101.3
End Amb. T = 102.2

CB 7/22/13





Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model		Run No.	FA-19	
Date	7/22/2013		Fan Setting	30	Hz
Tester	cb,TH		Fan configuration	Fan C-Min	
Stack Dia.	11.922	in	Approx. air vel.	1060	fpm at point >> 7 side
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	1	
Distance to disturbance	426.25	in	Stack Temp	115.3	degrees F
Start/End Time	14:45 / 15:05				

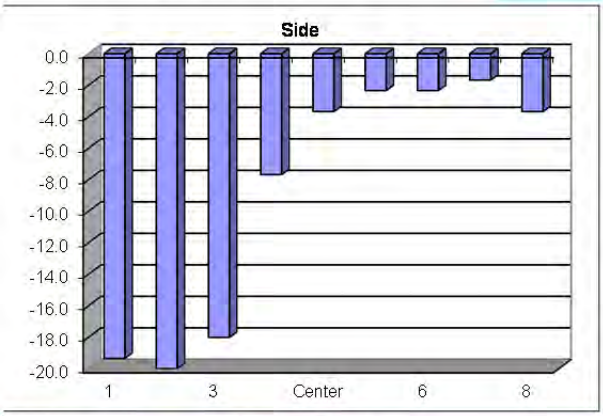
Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-18	-19	-21	**-19.3**	11	15	15	**13.7**
2	1.25	-21	-20	-19	**-20.0**	14	14	14	**14.0**
3	2.31	-18	-18	-18	**-18.0**	12	14	13	**13.0**
4	3.85	-7	-9	-7	**-7.7**	11	12	11	**11.3**
Center	5.96	-2	-7	-2	**-3.7**	10	11	11	**10.7**
5	8.07	-4	-2	-1	**-2.3**	7	9	7	**7.7**
6	9.61	-3	-2	-2	**-2.3**	3	4	5	**4.0**
7	10.67	-1	-3	-1	**-1.7**	2	3	4	**3.0**
8	11.42	-4	-5	-2	**-3.7**	1	1	3	**1.7**
Mean of absolute values:					**8.7**				**8.8**
" " w/o points by wall:					**8.0**				**9.1**
								Grand mean ABS	**8.8**
								" " w/o wall pts	**8.5**

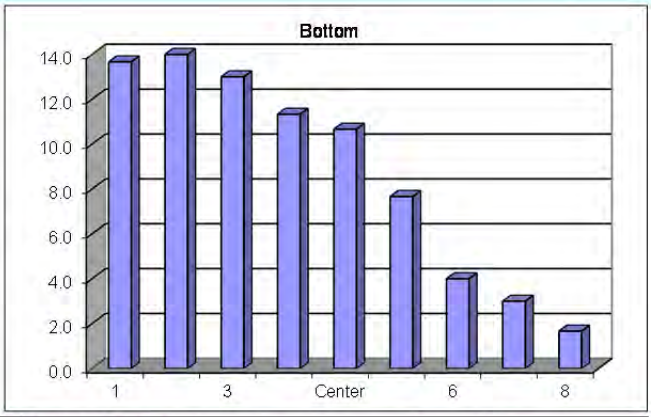
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Start Amb T=102.2
End Amb. T = 105.8

cb 07/22/2013





Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-20
Date	7/22/2013	Fan Setting	30 Hz
Tester	cb,TH	Fan configuration	Fan A & C-Min
Stack Dia.	11.922 in	Approx. air vel.	1636 fpm at point >> 7 side
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	426.25 in	Stack Temp	117.3 degrees F
Start/End Time	3:10/3:40 pm		

Order -->	1 st				2 nd			
Traverse-->	Side				Bottom			
Trial -->	1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-20	-16	-20	**-18.7**	-4	-6	-10	**-6.7**
2	1.25	-18	-19	-18	**-18.3**	-2	-4	-2	**-2.7**
3	2.31	-17	-18	-16	**-17.0**	-1	-2	-3	**-2.0**
4	3.85	-16	-17	-15	**-16.0**	-4	2	-2	**-1.3**
Center	5.96	-10	-11	4	**-5.7**	1	1	-7	**-1.7**
5	8.07	-5	-2	1	**-2.0**	-4	-4	-4	**-4.0**
6	9.61	0	-3	-2	**-1.7**	-1	-1	0	**-0.7**
7	10.67	-3	-2	-2	**-2.3**	-2	0	-1	**-1.0**
8	11.42	-3	-3	-1	**-2.3**	-1	-1	1	**-0.3**
Mean of absolute values:					**9.3**				**2.3**
" " w/o points by wall:					**9.0**				**1.9**

-2
-1

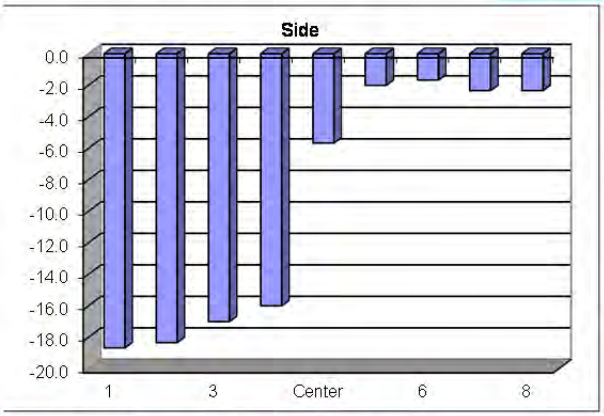
Grand mean ABS 5.8
" " w/o wall pts 5.5

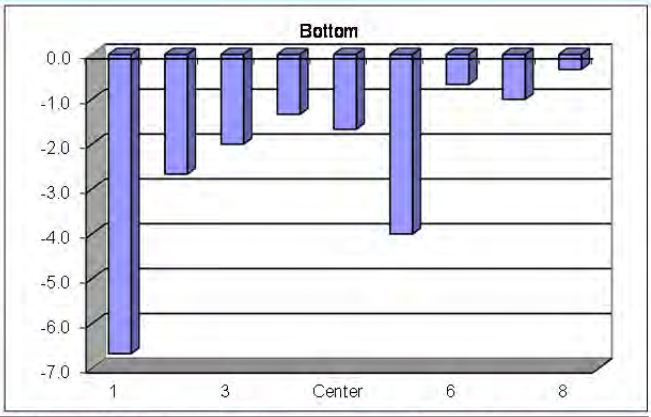
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Start Amb T=105.8
End Amb. T = 107.6

cb 07/22/2013





Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original		Signature on file with original TI-WTSP-121

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-21
Date	7/22/2013	Fan Setting	60 Hz
Tester	cb,TH	Fan configuration	Fan A & C-Max
Stack Dia.	11.922 in	Approx. air vel.	3549 fpm at point >> 7 side
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	426.25 in	Stack Temp	115.8 degrees F
Start/End Time	15:55/17:05		

Order -->		2 nd				1 st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-5	-16	-8	**-9.7**	-5	-6	-9	**-6.7**
2	1.25	-4	-17	-3	**-8.0**	-4	-3	-3	**-3.3**
3	2.31	-4	-3	-4	**-3.7**	-4	-3	-4	**-3.7**
4	3.85	-3	-1	-3	**-2.3**	-5	-4	-3	**-4.0**
Center	5.96	-6	-6	-9	**-7.0**	-1	-6	-8	**-5.0**
5	8.07	-3	-4	-3	**-3.3**	-5	-4	-4	**-4.3**
6	9.61	-1	-2	-2	**-1.7**	-4	-3	-2	**-3.0**
7	10.67	-1	-2	-3	**-2.0**	-2	-3	-1	**-2.0**
8	11.42	0	0	-2	**-0.7**	-3	-2	-1	**-2.0**
Mean of absolute values:					**4.3**				**3.8**
" " w/o points by wall:					**4.0**				**3.6**

-2 1

Grand mean ABS 4.0
" " w/o wall pts 3.8

Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

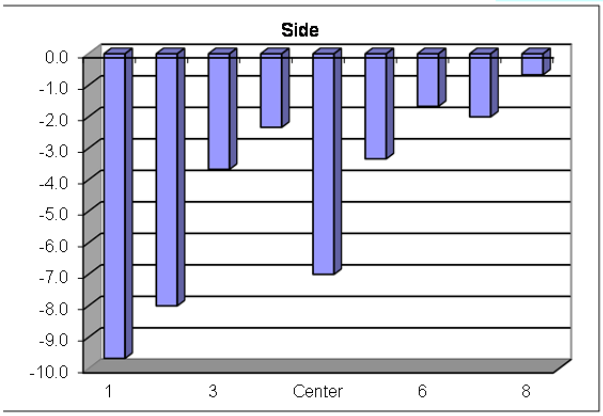
Notes:

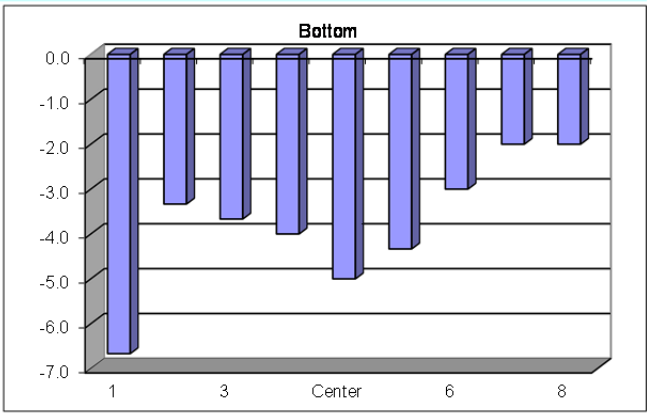
Start Amb T=103.1

End Amb. T = 105.8

repeated run #2 siide, Fan B blew off and needed to be reattached. air velocity at end 3511 afpm

cb 07/22/2013





Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/22/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model		Run No.	FA-22	
Date	7/23/2013		Fan Setting	30	Hz
Tester	SS,SFS, EA		Fan configuration	Fan B&C Min	
Stack Dia.	11.922	in	Approx. air vel.	1587	fpm at point >> 7 bottom
Stack X-Area	111.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	N.A.	ft	Port	1	
Distance to disturbance	426.25	in	Stack Temp	80.8	degrees F
Start/End Time	0650 / 0728				

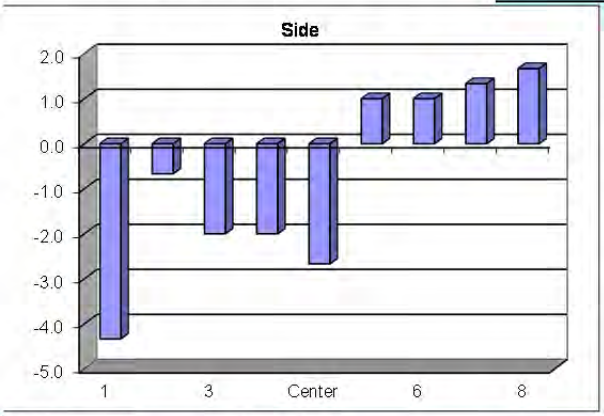
Order -->		2 nd				1 st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-7	-11	5	**-4.3**	-5	1	1	**-1.0**
2	1.25	-2	1	-1	**-0.7**	-3	-7	-4	**-4.7**
3	2.31	-2	-2	-2	**-2.0**	-4	-6	-5	**-5.0**
4	3.85	-1	-2	-3	**-2.0**	-3	-5	-4	**-4.0**
Center	5.96	-4	-2	-2	**-2.7**	-5	-4	-2	**-3.7**
5	8.07	-2	1	4	**1.0**	-2	2	-4	**-1.3**
6	9.61	0	2	1	**1.0**	-1	-1	-2	**-1.3**
7	10.67	2	1	1	**1.3**	-1	0	-2	**-1.0**
8	11.42	1	2	2	**1.7**	-1	0	-1	**-0.7**
Mean of absolute values:					**1.9**				**2.5**
" " w/o points by wall:					**1.5**				**3.0**
						-2		**Grand mean ABS**	**2.2**
						5		**" " w/o wall pts**	**2.3**

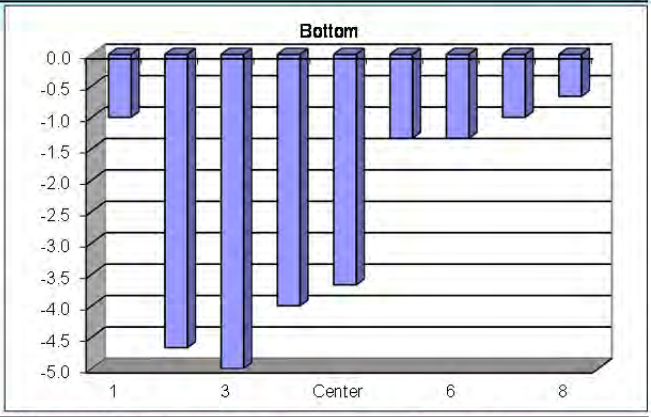
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Start Amb T= 78.8
End Amb. T = 81.5

SS 7/23/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/23/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-23
Date	7/23/2013	Fan Setting	55 Hz
Tester	SS,SFS, EA	Fan configuration	Fan B&C Norm
Stack Dia.	11.922 in	Approx. air vel.	3311 fpm at point >> 7 bottom
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	426.25 in	Stack Temp	82.5 degrees F
Start/End Time	0730 / 0805		

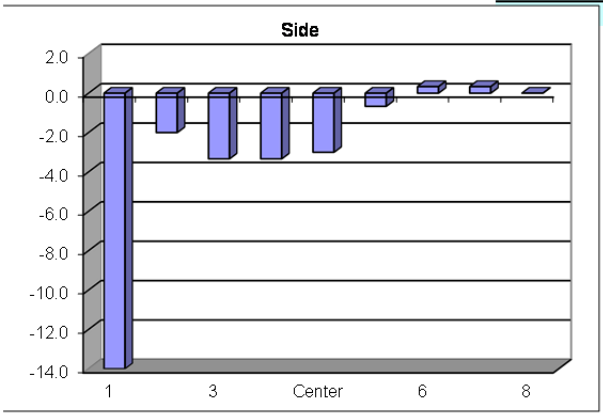
Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-9	-16	-17	**-14.0**	-2	5	-15	**-4.0**
2	1.25	-1	-2	-3	**-2.0**	-4	-3	-4	**-3.7**
3	2.31	-3	-3	-4	**-3.3**	-3	-4	-5	**-4.0**
4	3.85	-3	-3	-4	**-3.3**	-3	-1	-3	**-2.3**
Center	5.96	2	-5	-6	**-3.0**	-7	-4	-10	**-7.0**
5	8.07	-1	0	-1	**-0.7**	-4	-3	-4	**-3.7**
6	9.61	0	-1	2	**0.3**	-2	0	0	**-0.7**
7	10.67	-1	0	2	**0.3**	0	1	1	**0.7**
8	11.42	-1	-2	3	**0.0**	-1	1	1	**0.3**
Mean of absolute values:					**3.0**				**2.9**
" " w/o points by wall:					**1.9**				**3.1**
						-2		**Grand mean ABS**	**3.0**
						7		**" " w/o wall pts**	**2.5**

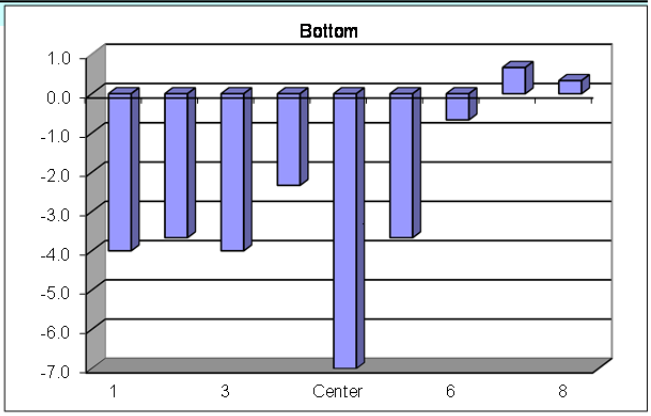
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Start Amb T= 82.4
End Amb. T = 84.2

SS 7/23/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/23/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

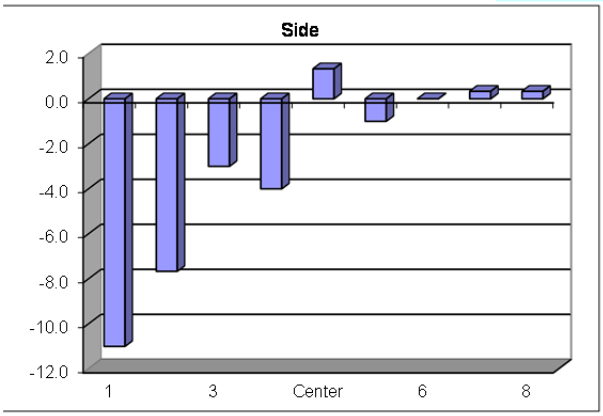
Site	LV-S3 Scale Model	Run No.	FA-24
Date	7/23/2013	Fan Setting	60 Hz
Tester	SS,SFS, EA	Fan configuration	B&C Max
Stack Dia.	11.922 in	Approx. air vel.	3334 fpm at point >> bottom 7 port
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	426.25 in	Stack Temp	82.5 degrees F
Start/End Time	0810 / 0901		

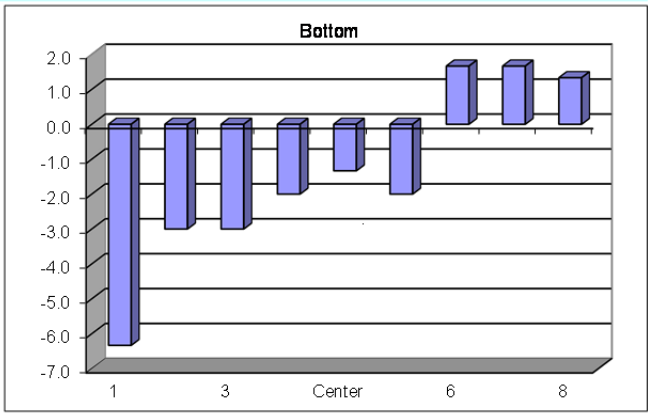
Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-2	-15	-16	**-11.0**	-17	-1	-1	**-6.3**
2	1.25	-1	-2	-20	**-7.7**	-3	-3	-3	**-3.0**
3	2.31	0	-3	-6	**-3.0**	-4	-3	-2	**-3.0**
4	3.85	-2	-4	-6	**-4.0**	-4	0	-2	**-2.0**
Center	5.96	-4	5	3	**1.3**	0	3	-7	**-1.3**
5	8.07	-1	-1	-1	**-1.0**	-1	-2	-3	**-2.0**
6	9.61	0	0	0	**0.0**	2	1	2	**1.7**
7	10.67	1	0	0	**0.3**	2	2	1	**1.7**
8	11.42	1	1	-1	**0.3**	2	1	1	**1.3**
Mean of absolute values:					**3.2**				**2.5**
" " w/o points by wall:					**2.5**				**2.1**

		-2	**Grand mean ABS** **2.8**
Instruments Used:	**Cal. Due**	**0**	**" " w/o wall pts** **2.3**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance	
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13	
Angle indicator	Shop built	Cat. 3	
Manometer	Dwyer 400-5, S36N #28293	Cat. 3 MAN-5	

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Start Amb T= 84.2 F
End Amb. T = 89.6
Amb P = 29.91 in Hg
Took 2nd air vel measurement at port 2, 7,bottom.Suspect initial measurement had instrument out of alignment.
SS 7/23/13





Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/23/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-25
Date	7/23/2013	Fan Setting	60 Hz
Tester	SS, SFS	Fan configuration	B&C MAX
Stack Dia.	11.922 in	Approx. air vel.	3296 fpm at point >> 7 bottom, por
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	426.25 in	Stack Temp	92.2 degrees F
Start/End Time	911/933		

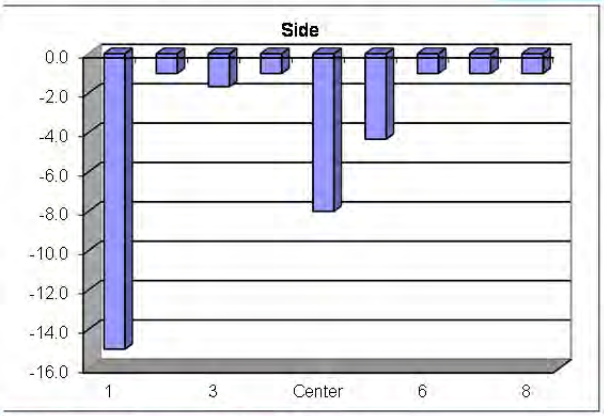
Order -->	1st				2nd			
Traverse-->	Side				Bottom			
Trial -->	1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-11	-20	-14	**-15.0**	2	5	-4	**1.0**
2	1.25	-2	-2	1	**-1.0**	-4	-2	10	**1.3**
3	2.31	-2	-1	-2	**-1.7**	-4	-3	10	**1.0**
4	3.85	-1	-1	-1	**-1.0**	-1	-7	10	**0.7**
Center	5.96	-6	-9	-9	**-8.0**	-1	-7	-6	**-4.7**
5	8.07	-3	-4	-6	**-4.3**	-3	-4	-4	**-3.7**
6	9.61	-1	-1	-1	**-1.0**	-2	-2	-2	**-2.0**
7	10.67	-1	-1	-1	**-1.0**	-1	-1	0	**-0.7**
8	11.42	-1	-1	-1	**-1.0**	0	-1	-1	**-0.7**
Mean of absolute values:					**3.8**				**1.7**
" " w/o points by wall:					**2.6**				**2.0**
							Grand mean ABS		**2.8**
							" " w/o wall pts		**2.3**

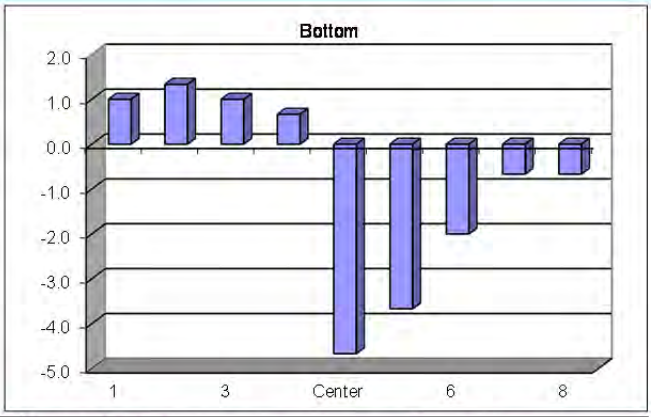
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N	Cat. 3

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
start Amb T =
end Amb T =
Amb P =

SS 7/23/13





Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/23/2013	Signature/date	12/2/2013
	Signature on file with original		Signature on file with original TI-WTSP-121

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-26
Date	7/23/2013	Fan Setting	60 Hz
Tester	SS, SFS	Fan configuration	B&C MAX
Stack Dia.	11.922 in	Approx. air vel.	3577 fpm at point >> 7, bottom Por
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	1
Distance to disturbance	426.25 in	Stack Temp	95.6 degrees F
Start/End Time	0936 / 1012		

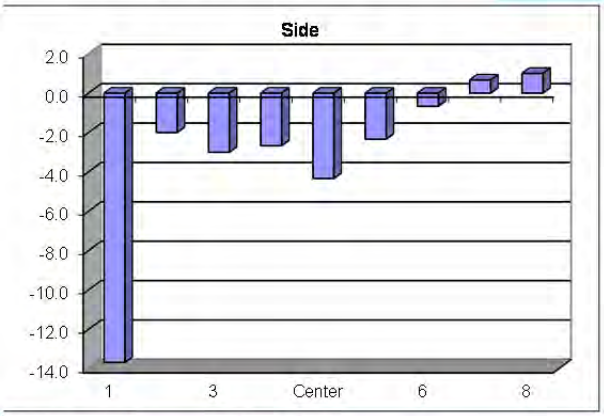
Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-14	-14	-13	**-13.7**	-11	-7	-11	**-9.7**
2	1.25	-2	-2	-2	**-2.0**	-4	-5	-5	**-4.7**
3	2.31	-3	-3	-3	**-3.0**	-2	-4	-4	**-3.3**
4	3.85	-3	-3	-2	**-2.7**	-4	-4	-3	**-3.7**
Center	5.96	-6	0	-7	**-4.3**	-1	0	-8	**-3.0**
5	8.07	-4	-1	-2	**-2.3**	-2	-3	-2	**-2.3**
6	9.61	-2	0	0	**-0.7**	-1	-1	-1	**-1.0**
7	10.67	0	1	1	**0.7**	-1	0	-1	**-0.7**
8	11.42	1	1	1	**1.0**	-1	0	0	**-0.3**
Mean of absolute values:					**3.4**				**3.2**
" " w/o points by wall:					**2.2**				**2.7**
								Grand mean ABS	**3.3**
								" " w/o wall pts	**2.5**

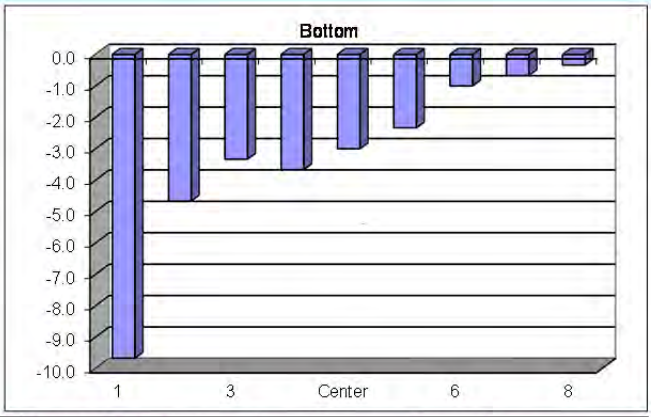
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Start Amb T 89.6F
End Amb T 93.2F
Amb P = 29.91 in Hg

SS 7/23/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/23/2013	Signature/date	12/2/2013
	Signature on file with original		Signature on file with original TI-WTSP-121

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-27
Date	7/23/2013	Fan Setting	60 Hz
Tester	SS, SFS	Fan configuration	B&C MAX
Stack Dia.	11.922 in	Approx. air vel.	3668 fpm at point >> 7, bottom Por
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	2
Distance to disturbance	510.25 in	Stack Temp	103 degrees F
Start/End Time	1020 / 1105		

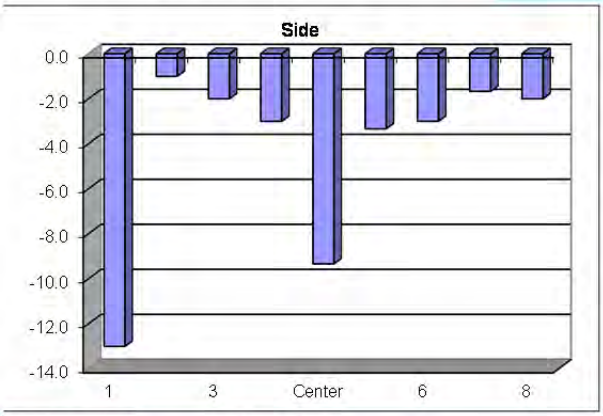
Order -->		2ND				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-13	-17	-9	**-13.0**	-6	-5	-8	**-6.3**
2	1.25	1	-2	-2	**-1.0**	-6	-3	-1	**-3.3**
3	2.31	0	-3	-3	**-2.0**	-2	-3	-1	**-2.0**
4	3.85	-3	-3	-3	**-3.0**	-3	0	0	**-1.0**
Center	5.96	-8	-10	-10	**-9.3**	0	3	-7	**-1.3**
5	8.07	-3	-3	-4	**-3.3**	-2	-1	-1	**-1.3**
6	9.61	-2	-4	-3	**-3.0**	0	-1	0	**-0.3**
7	10.67	-1	-2	-2	**-1.7**	2	2	1	**1.7**
8	11.42	-1	-2	-3	**-2.0**	2	2	1	**1.7**
Mean of absolute values:					**4.3**				**2.1**
" " w/o points by wall:					**3.3**				**1.6**
								Grand mean ABS	**3.2**
								" " w/o wall pts	**2.5**

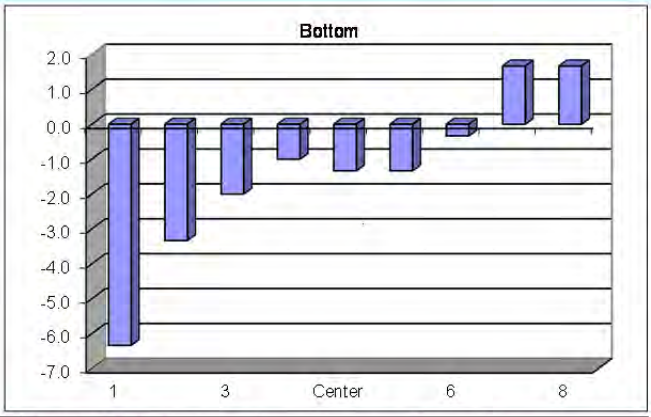
Instruments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Start Amb T 93.2f
End Amb T 93.2f
Amb P = 29.94 in Hg

SS 7/23/13





Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/23/2013	Signature/date	12/2/2013
	Signature on file with original		Signature on file with original TI-WTSP-121

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-28
Date	7/23/2013	Fan Setting	60 Hz
Tester	SS, SFS	Fan configuration	B&C MAX
Stack Dia.	11.922 in	Approx. air vel.	3668 fpm at point >> 7, bottom Por
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	2
Distance to disturbance	510.25 in	Stack Temp	103 degrees F
Start/End Time	1115 / 1140		

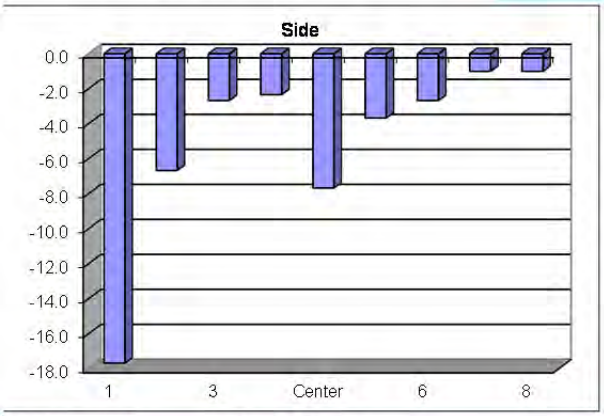
Order -->		1ST				2ND			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-18	-15	-20	-17.7	-5	-4	-11	-6.7
2	1.25	-2	-16	-2	-6.7	-4	-4	-11	-6.3
3	2.31	-3	-3	-2	-2.7	-4	-4	-3	-3.7
4	3.85	-2	-3	-2	-2.3	-4	-3	-4	-3.7
Center	5.96	-6	-9	-8	-7.7	-5	0	1	-1.3
5	8.07	-4	-3	-4	-3.7	0	1	0	0.3
6	9.61	-3	-2	-3	-2.7	0	2	1	1.0
7	10.67	-1	-1	-1	-1.0	1	1	1	1.0
8	11.42	-1	-1	-1	-1.0	2	1	1	1.3
Mean of absolute values:					5.0				2.8
" " w/o points by wall:					3.8				2.5
								Grand mean ABS	3.9
								" " w/o wall pts	3.1

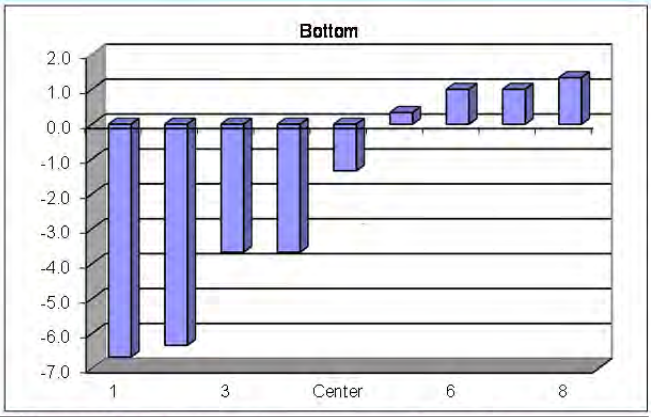
Instruments Used:		Cal. Due
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Start Amb T 93.2f
End Amb T
Amb P = 29.94 in Hg

SS 7/23/13





Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/23/2013	Signature/date	12/2/2013
	Signature on file with original		Signature on file with original TI-WTSP-121

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-28
Date	7/23/2013	Fan Setting	60 Hz
Tester	SS, SFS	Fan configuration	B&C MAX
Stack Dia.	11.922 in	Approx. air vel.	3668 fpm at point >> 7, bottom Por
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	2
Distance to disturbance	510.25 in	Stack Temp	103 degrees F
Start/End Time	1115 / 1140		

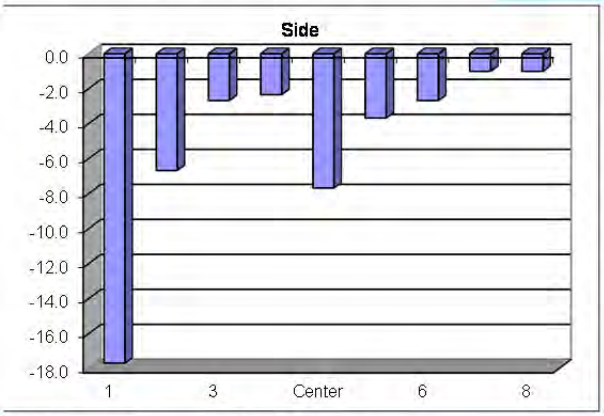
Order -->		1ST				2ND			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	-18	-15	-20	-17.7	-5	-4	-11	-6.7
2	1.25	-2	-16	-2	-6.7	-4	-4	-11	-6.3
3	2.31	-3	-3	-2	-2.7	-4	-4	-3	-3.7
4	3.85	-2	-3	-2	-2.3	-4	-3	-4	-3.7
Center	5.96	-6	-9	-8	-7.7	-5	0	1	-1.3
5	8.07	-4	-3	-4	-3.7	0	1	0	0.3
6	9.61	-3	-2	-3	-2.7	0	2	1	1.0
7	10.67	-1	-1	-1	-1.0	1	1	1	1.0
8	11.42	-1	-1	-1	-1.0	2	1	1	1.3
Mean of absolute values:					5.0				2.8
" " w/o points by wall:					3.8				2.5
								Grand mean ABS	3.9
								" " w/o wall pts	3.1

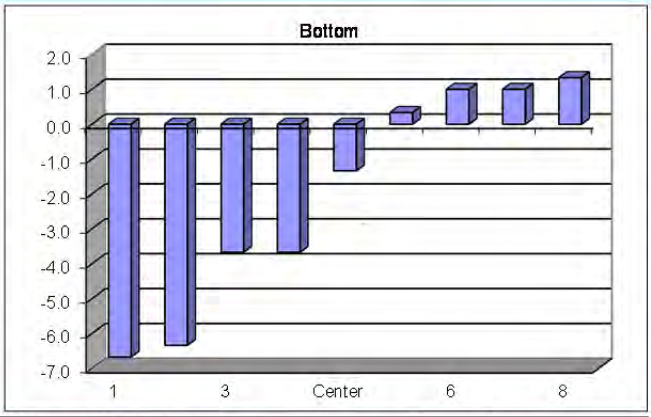
Instruments Used:		Cal. Due
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N #28293	Cat. 3 MAN-5

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Start Amb T 93.2f
End Amb T
Amb P = 29.94 in Hg

SS 7/23/13





Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/23/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

FLOW ANGLE DATA FORM

LV-S3_FlowAngle.xlsx

CCP-WTPSP-####

Site	LV-S3 Scale Model	Run No.	FA-29
Date	7/23/2013	Fan Setting	60 Hz
Tester	SS, SFS	Fan configuration	B&C MAX
Stack Dia.	11.922 in	Approx. air vel.	3569 fpm at point >>
Stack X-Area	111.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	N.A. ft	Port	2
Distance to disturbance	510.25 in	Stack Temp	107.8 degrees F
Start/End Time	1148/1210		

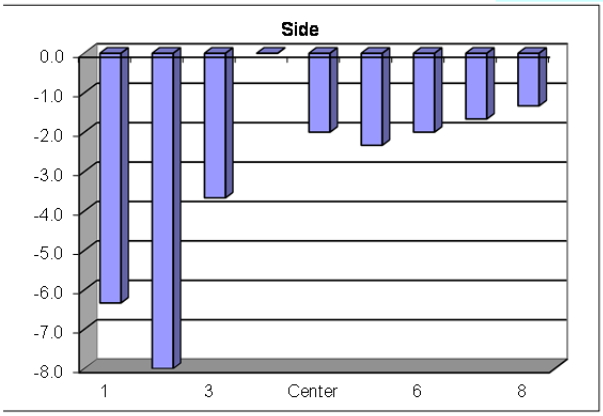
Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3		1	2	3	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	2	-9	-12	**-6.3**	-4	-6	-3	**-4.3**
2	1.25	-2	-10	-12	**-8.0**	-18	-19	-3	**-13.3**
3	2.31	6	-13	-4	**-3.7**	-4	-3	12	**1.7**
4	3.85	-2	5	-3	**0.0**	-4	-2	-2	**-2.7**
Center	5.96	-1	0	-5	**-2.0**	0	-2	0	**-0.7**
5	8.07	-3	-2	-2	**-2.3**	-1	2	-1	**0.0**
6	9.61	-2	-2	-2	**-2.0**	0	1	-1	**0.0**
7	10.67	-1	-2	-2	**-1.7**	0	1	-1	**0.0**
8	11.42	-1	-2	-1	**-1.3**	2	2	0	**1.3**
Mean of absolute values:					**3.0**				**2.7**
" " w/o points by wall:					**2.8**				**2.6**
								Grand mean ABS	**2.9**
								" " w/o wall pts	**2.7**

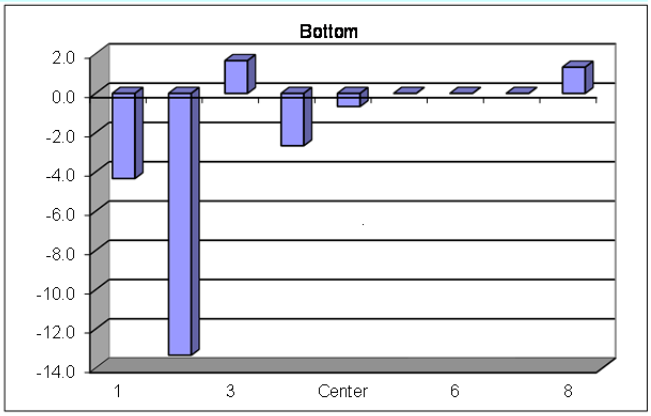
Instuments Used:		**Cal. Due**
S-type pitot	Dwyer 24-inch S-type Pitot#10	Cert. of conformance
Velocity sensor	TSI Velocicalc SN#T95351203001	10-Dec-13
Angle indicator	Shop built	Cat. 3
Manometer	Dwyer 400-5, S36N	Cat. 3

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
start Amb T =93.2F
end Amb T = 95.0 F
Amb P =29.94 in Hg

SS 7/23/13





Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/23/2013	Signature/date	12/2/2013
	Signature on file with original	Signature on file with original TI-WTSP-121	

D.4 LV-S3 Gas Tracer Calibration and Uniformity Data Sheets

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-1
Date	7/24/2013	Fan Configuration	BC Max
Testers	EA, SFS, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	92.1 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0746 0931
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Center

Order –>		2ND				1ST			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	52.0	51.9	51.4	51.8	53.1	52.6	52.7	52.8
2	1.25	52.1	51.9	51.8	51.9	53.2	52.6	52.6	52.8
3	2.31	52.0	51.7	51.9	51.9	53.1	52.6	52.5	52.7
4	3.85	52.0	51.6	51.7	51.8	53.2	52.6	52.3	52.7
Center	5.96	52.1	51.7	51.6	51.8	53.0	52.6	52.5	52.7
5	8.07	52.1	51.6	51.5	51.7	53.3	52.4	52.5	52.7
6	9.61	52.0	51.7	51.6	51.8	53.0	52.7	52.5	52.7
7	10.67	52.0	51.8	52.0	51.9	53.0	52.6	52.4	52.7
8	11.42	51.8	51.8	52.0	51.9	53.3	53.2	52.1	52.9
Averages ——>		52.0	51.7	51.7	51.8	53.1	52.7	52.5	52.7

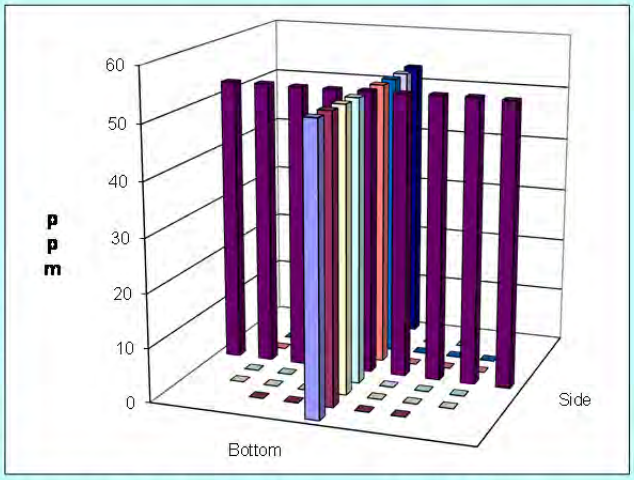
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	52.29		Mean	51.83	52.72	52.28
Min Point	51.73	-1.1%	Std. Dev.	0.08	0.04	0.47
Max Point	52.87	1.1%	COV as %	0.2	0.1	0.9

Avg. Conc. 52.29 ppm

Instruments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	800	850	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	86	98.1	°F
Mean stack velocity	3635	3545	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1012	1013	mbar
Ambient humidity	38%	24%	RH
Ambient Temp	77	86	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.4, 0.3, 0.3, 0.3, 0.3	0.7,0.4, 0.4, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/24/2013

Notes: supply line = 88 3/16 inches = 7.3 ft
(supply line to B&K)

3.5 target injection flowmeter for 60 Hz
Sampling flowmeter pump - ROC 12 w/HiQmeter

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/24/2013	Signature/date	1/27/2014
	Signature on file with original		Signature on file with original TI-WTPSP 122

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-2
Date	7/24/2013	Fan Configuration	BC Max
Testers	EA, SFS, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	101.7 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0942 / 1123
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Top

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	50.7	51.0	50.7	**50.8**	50.7	50.8	50.8	**50.8**
2	1.25	51.1	50.7	50.5	**50.8**	51.0	50.8	50.9	**50.9**
3	2.31	51.2	51.1	51.3	**51.2**	51.2	50.7	51.2	**51.0**
4	3.85	50.9	50.1	50.7	**50.6**	51.0	50.8	51.0	**50.9**
Center	5.96	51.1	51.0	50.9	**51.0**	51.1	50.7	51.1	**51.0**
5	8.07	51.0	51.1	51.2	**51.1**	51.1	50.7	50.9	**50.9**
6	9.61	50.8	51.3	51.1	**51.1**	51.1	50.6	50.9	**50.9**
7	10.67	51.0	50.9	51.1	**51.0**	50.9	50.9	50.6	**50.8**
8	11.42	51.1	51.0	50.9	**51.0**	50.9	51.0	51.0	**51.0**
Averages ---->		**51.0**	**50.9**	**50.9**	**50.9**	**51.0**	**50.8**	**50.9**	**50.9**

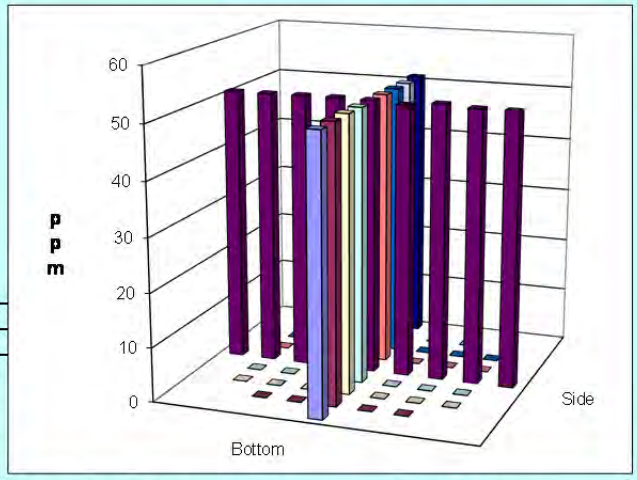
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	50.92		Mean	50.96	50.91	50.94
Min Point	50.57	-0.7%	Std. Dev.	0.22	0.07	0.16
Max Point	51.20	0.5%	COV as %	0.4	0.1	0.3

Avg. Conc. 50.92 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	850	850	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	98.1	105.2	°F
Mean stack velocity	3545	3380	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1013	mbar
Ambient humidity	24%	19%	RH
Ambient Temp	86	95.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.7, .4, .4, .3, .3	.6, .4, .3, .3, .3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/24/2013

Notes: 3.5 target injection flowmeter for 60 Hz
Sampling flowmeter pump - ROC 12 w/HiQmeter

SS 7/24/2013

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/24/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-3
Date	7/24/2013	Fan Configuration	BC Max
Testers	EA, SFS, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	107.0 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1125 /1300
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Bottom

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	51.0	50.5	51.1	**50.9**	50.6	51.1	51.3	**51.0**
2	1.25	51.5	51.0	51.2	**51.2**	50.9	51.2	50.8	**51.0**
3	2.31	51.0	51.0	51.2	**51.1**	51.0	51.1	50.9	**51.0**
4	3.85	51.1	50.9	51.2	**51.1**	51.2	51.1	51.2	**51.2**
Center	5.96	50.9	50.9	51.1	**51.0**	51.0	51.1	50.8	**51.0**
5	8.07	51.5	50.6	51.4	**51.2**	50.8	51.1	51.5	**51.1**
6	9.61	51.2	50.9	51.3	**51.1**	51.1	51.2	51.2	**51.2**
7	10.67	51.4	51.6	51.0	**51.3**	51.3	51.1	51.1	**51.2**
8	11.42	50.9	51.1	51.1	**51.0**	51.7	50.9	51.2	**51.3**
Averages ———>		**51.2**	**50.9**	**51.2**	**51.1**	**51.1**	**51.1**	**51.1**	**51.1**

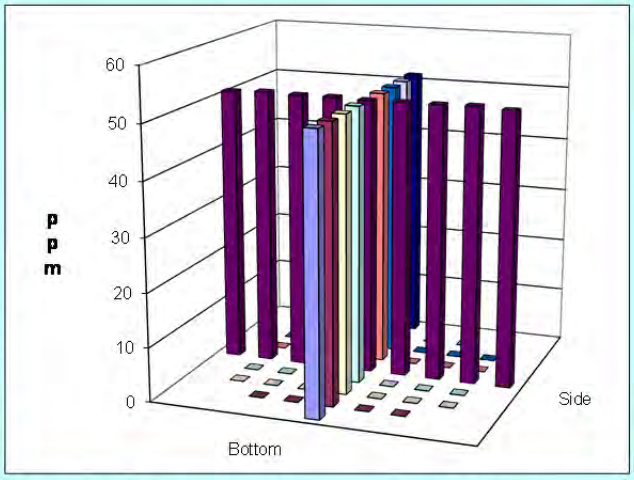
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	51.09		Mean	51.14	51.08	51.11
Min Point	50.87	-0.4%	Std. Dev.	0.12	0.10	0.11
Max Point	51.33	0.5%	COV as %	0.2	0.2	0.2

Avg. Conc. 51.11 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	850	850	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	105.2	108.7	°F
Mean stack velocity	3380	3265	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1014	mbar
Ambient humidity	19%	18%	RH
Ambient Temp	95.9	95	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.6, .4, .3, .3, .3	0.6, 0.4, 0.3, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/24/2013

Notes:

SFS 7/24/13

Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/24/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-4
Date	7/24/2013	Fan Configuration	B&C MAX
Testers	CB,TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	111.9 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1342 / 15:14
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5-far

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	52.0	52.0	51.7	**51.9**	51.0	51.1	51.6	**51.2**
2	1.25	51.7	51.6	51.4	**51.6**	51.4	51.6	51.5	**51.5**
3	2.31	52.2	51.8	51.3	**51.8**	51.6	50.9	51.5	**51.3**
4	3.85	52.1	51.9	51.7	**51.9**	51.5	51.5	51.4	**51.5**
Center	5.96	51.9	51.8	51.7	**51.8**	51.4	51.4	51.4	**51.4**
5	8.07	52.1	51.8	51.7	**51.9**	51.3	51.7	51.4	**51.5**
6	9.61	52.3	51.8	51.7	**51.9**	51.4	51.6	51.6	**51.5**
7	10.67	51.5	51.5	51.5	**51.5**	51.3	51.6	51.2	**51.4**
8	11.42	51.8	51.4	51.7	**51.6**	51.2	51.5	51.3	**51.3**
Averages ---->		**52.0**	**51.7**	**51.6**	**51.8**	**51.3**	**51.4**	**51.4**	**51.4**

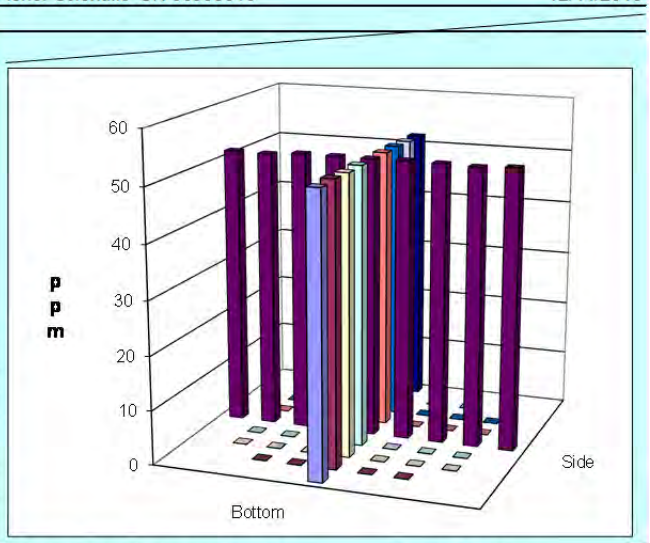
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	51.58		Mean	51.76	51.44	51.60
Min Point	51.23	-0.7%	Std. Dev.	0.17	0.07	0.21
Max Point	51.93	0.7%	COV as %	0.3	0.1	0.4

Avg. Conc. 51.58 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	800	750	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	111.8	112	°F
Mean stack velocity	3459	3458	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1015	1014	mbar
Ambient humidity	18%	17%	RH
Ambient Temp	96.8	99.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.3, 0.3, 0.3, 0.3, 0.3	0.7, 0.4, 0.3, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/24/2013

Notes:

cb 07/24/2014

Entries made by:	Caroline Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/24/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-5
Date	7/24/2013	Fan Configuration	B&C MAX
Testers	CB,TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	111.2 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1525 / 16:55
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5-near

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	50.7	52.0	51.2	**51.3**	51.3	51.5	51.0	**51.3**
2	1.25	51.2	51.3	50.8	**51.1**	50.7	51.3	51.2	**51.1**
3	2.31	51.8	51.4	51.3	**51.5**	51.2	51.3	51.2	**51.2**
4	3.85	51.2	51.6	51.3	**51.4**	51.2	51.3	51.2	**51.2**
Center	5.96	51.4	51.2	51.0	**51.2**	51.1	51.2	51.2	**51.2**
5	8.07	51.4	51.2	50.9	**51.2**	51.1	51.3	51.2	**51.2**
6	9.61	51.5	51.2	51.4	**51.4**	50.9	51.2	51.6	**51.2**
7	10.67	51.8	51.3	51.3	**51.5**	51.2	51.2	51.3	**51.2**
8	11.42	51.7	51.4	51.2	**51.4**	51.4	51.4	51.4	**51.4**
Averages ---->		**51.4**	**51.4**	**51.2**	**51.3**	**51.1**	**51.3**	**51.3**	**51.2**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	51.27		Mean	51.31	51.20	51.25
Min Point	51.07	-0.4%	Std. Dev.	0.15	0.06	0.13
Max Point	51.50	0.4%	COV as %	0.3	0.1	0.2

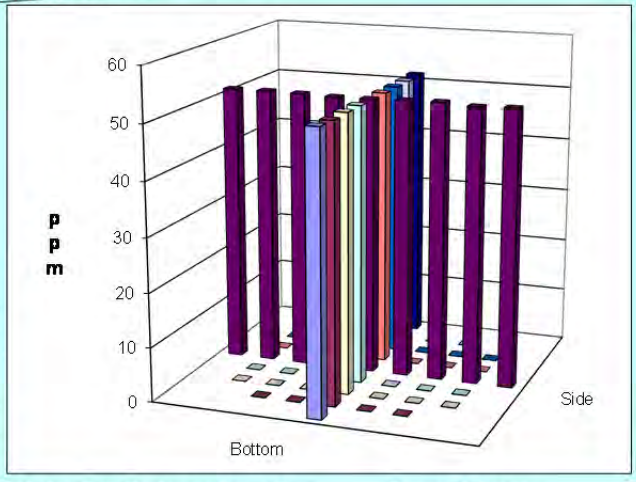
Avg. Conc. 51.29 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

cb 07/24/2013

	Start	Finish	
Tracer tank pressure	750	700	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	112	110.3	°F
Mean stack velocity	3458	3424	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1014	1014	mbar
Ambient humidity	17%	17%	RH
Ambient Temp	99.5	100.4	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.7, 0.4, 0.3, 0.3, 0.3	0.6, 0.4, 0.4, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/24/2013

Notes:

cb 07/24/2014

Entries made by:	Caroline Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/24/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-6
Date	7/25/2013	Fan Configuration	B&C MAX
Testers	EA, SFS, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	78.7 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0609 / 0749
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5-near

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	53.3	53.0	52.8	**53.0**	53.9	53.9	53.2	**53.7**
2	1.25	53.8	53.2	52.6	**53.2**	53.8	53.5	53.6	**53.6**
3	2.31	52.8	52.9	53.2	**53.0**	54.0	53.5	53.3	**53.6**
4	3.85	53.1	52.7	52.8	**52.9**	54.1	53.2	53.5	**53.6**
Center	5.96	52.9	52.8	52.7	**52.8**	54.0	53.6	53.3	**53.6**
5	8.07	53.2	52.4	52.8	**52.8**	54.0	53.5	52.9	**53.5**
6	9.61	52.8	52.7	52.9	**52.8**	54.4	53.7	53.3	**53.8**
7	10.67	52.9	52.5	52.7	**52.7**	53.9	53.3	53.1	**53.4**
8	11.42	53.3	53.0	52.5	**52.9**	53.3	53.6	53.0	**53.3**
Averages ———>		**53.1**	**52.8**	**52.8**	**52.9**	**53.9**	**53.5**	**53.2**	**53.6**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	53.24		Mean	52.88	53.60	53.24
Min Point	52.70	-1.0%	Std. Dev.	0.16	0.12	0.40
Max Point	53.80	1.1%	COV as %	0.3	0.2	0.7

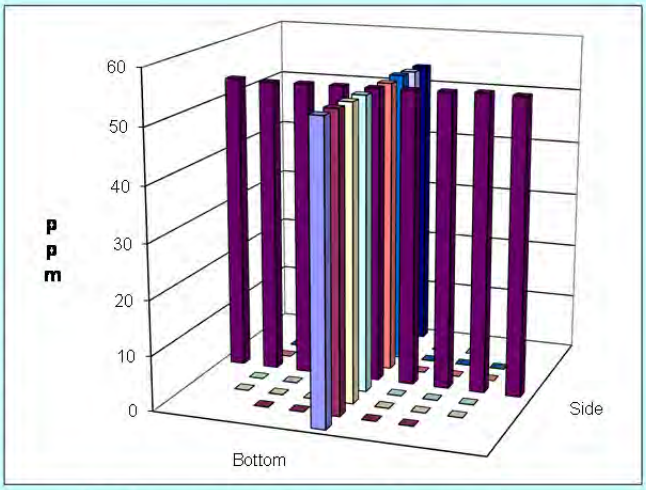
Avg. Conc. 53.24 ppm

Instruments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	600	600	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	74.2	83.1	°F
Mean stack velocity	3582	3345	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1012	1013	mbar
Ambient humidity	46%	41%	RH
Ambient Temp	67.0	74.3	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4, .4, .4 .4, .4	.7, .4, .4, .3,.3,.3	ppm
No. Bk-Gd samples	5	6	n

Gas analyzer checked: 7/24/2013



Notes:
SFS
07/25/2014

Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/25/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-7
Date	7/25/2013	Fan Configuration	B&C MAX
Testers	EA, SFS, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	90.4 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0757 / 0940
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5-Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	51.6	52.2	52.1	**52.0**	52.4	51.6	52.0	**52.0**
2	1.25	51.9	52.3	52.0	**52.1**	52.2	51.9	52.2	**52.1**
3	2.31	52.1	52.3	52.2	**52.2**	52.3	52.0	52.1	**52.1**
4	3.85	52.3	52.1	52.4	**52.3**	52.5	52.0	51.9	**52.1**
Center	5.96	52.0	52.2	52.1	**52.1**	52.6	52.2	51.7	**52.2**
5	8.07	52.2	52.5	52.5	**52.4**	52.1	52.3	51.9	**52.1**
6	9.61	52.3	52.3	52.2	**52.3**	52.0	52.1	51.9	**52.0**
7	10.67	52.1	52.1	51.8	**52.0**	51.9	52.2	51.7	**51.9**
8	11.42	52.3	52.5	52.6	**52.5**	51.9	52.2	51.9	**52.0**
Averages ---------->		**52.1**	**52.3**	**52.2**	**52.2**	**52.2**	**52.1**	**51.9**	**52.1**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	52.13		Mean	52.19	52.08	52.13
Min Point	51.93	-0.4%	Std. Dev.	0.14	0.08	0.12
Max Point	52.47	0.7%	COV as %	0.3	0.2	0.2

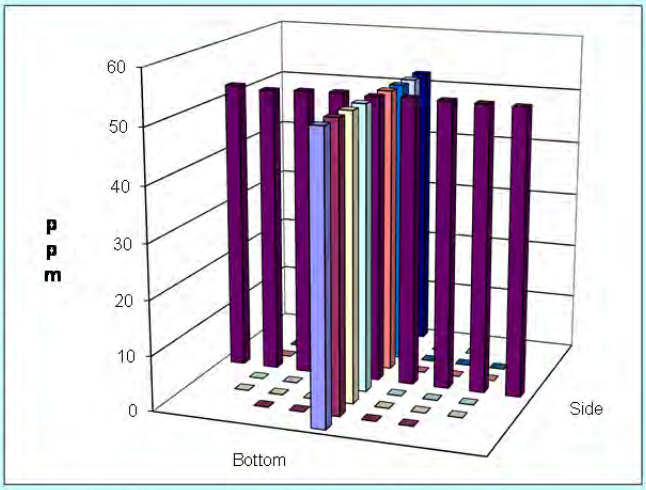
Avg. Conc. 52.13 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	600	550	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	83.1	97.6	°F
Mean stack velocity	3345	3474	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1013	mbar
Ambient humidity	41%	27%	RH
Ambient Temp	74.3	85.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.7, .4, .4, .3,.3	.7, .7, .4, .4, .3	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 7/24/2013



Notes:
SFS
07/25/2014

Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/25/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-8
Date	7/25/2013	Fan Configuration	B&C MAX
Testers	EA, SS, SFS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	100.4 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0945 / 1105
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5-Far

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	51.8	51.6	51.9	**51.8**	51.4	51.5	51.8	**51.6**
2	1.25	52.2	51.8	51.6	**51.9**	51.8	51.7	51.9	**51.8**
3	2.31	52.2	51.6	52.0	**51.9**	51.5	51.6	51.9	**51.7**
4	3.85	52.0	51.8	51.6	**51.8**	51.9	51.7	51.8	**51.8**
Center	5.96	52.0	51.8	51.8	**51.9**	52.2	52.2	52.2	**52.2**
5	8.07	51.8	51.9	52.0	**51.9**	52.1	52.2	52.0	**52.1**
6	9.61	51.8	51.8	51.7	**51.8**	52.1	52.1	52.0	**52.1**
7	10.67	52.1	52.1	51.7	**52.0**	51.8	51.9	52.0	**51.9**
8	11.42	51.8	52.0	51.5	**51.8**	52.0	52.3	51.7	**52.0**
Averages ———>		**52.0**	**51.8**	**51.8**	**51.8**	**51.9**	**51.9**	**51.9**	**51.9**

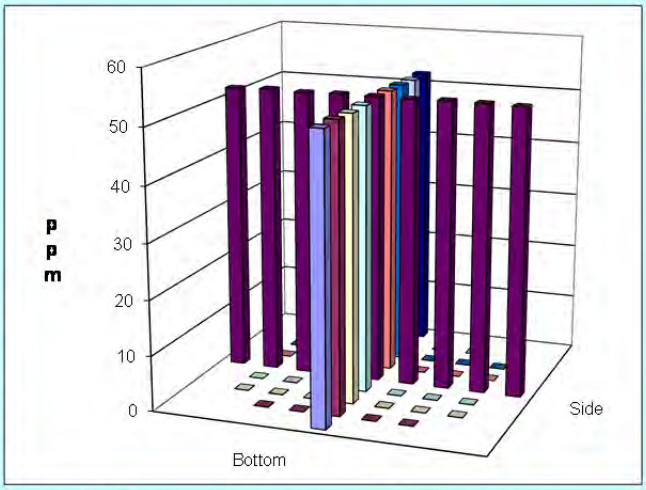
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	51.87		Mean	51.87	51.93	51.90
Min Point	51.57	-0.6%	Std. Dev.	0.07	0.19	0.14
Max Point	52.20	0.6%	COV as %	0.1	0.4	0.3

Avg. Conc. 51.85 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013
EA 7/25/13		

	Start	Finish	
Tracer tank pressure	550	500	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	97.6	103.2	°F
Mean stack velocity	3474	3334	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1014	mbar
Ambient humidity	27%	19%	RH
Ambient Temp	85.1	95.0	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.7, .7, .4, .4, .3	.6, .4, .3, .3, .3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/24/2013

Notes:
EA
07/25/2014

Entries made by:	Ernest Antonio	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/25/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-9
Date	7/25/2013	Fan Configuration	B&C MAX
Testers	EA, CB, SFS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	106.0 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1125 / 1255
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5- TOP

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	51.2	51.1	51.3	**51.2**	51.1	50.8	51.4	**51.1**
2	1.25	51.2	51.4	51.1	**51.2**	50.9	50.9	51.1	**51.0**
3	2.31	51.4	51.3	51.1	**51.3**	51.3	51.0	51.2	**51.2**
4	3.85	51.4	51.2	51.3	**51.3**	51.3	51.3	51.2	**51.3**
Center	5.96	51.4	51.5	50.9	**51.3**	51.2	51.3	51.3	**51.3**
5	8.07	51.6	51.4	51.2	**51.4**	51.2	51.6	51.3	**51.4**
6	9.61	51.3	51.5	51.3	**51.4**	51.0	51.5	51.3	**51.3**
7	10.67	51.4	51.6	51.5	**51.5**	51.1	51.5	51.3	**51.3**
8	11.42	51.2	51.4	51.3	**51.3**	51.0	51.5	51.2	**51.2**
Averages ---->		**51.3**	**51.4**	**51.2**	**51.3**	**51.1**	**51.3**	**51.3**	**51.2**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	51.26		Mean	51.33	51.23	51.28
Min Point	50.97	-0.6%	Std. Dev.	0.09	0.13	0.12
Max Point	51.50	0.5%	COV as %	0.2	0.3	0.2

Avg. Conc. 51.26 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013
EA 7/25/13		

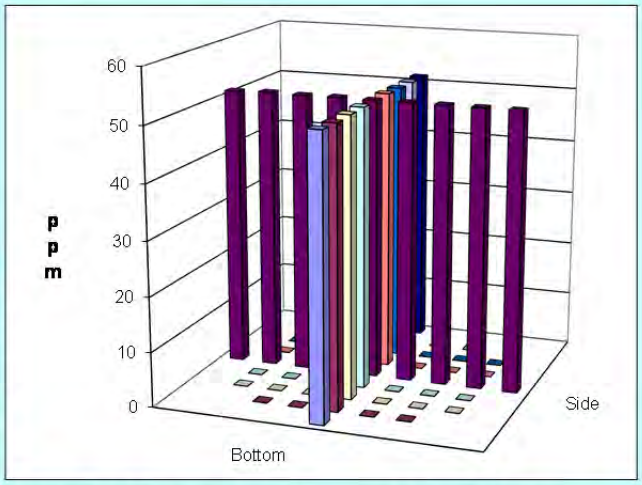
	Start	Finish	
Tracer tank pressure	500	500	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	103.2	108.8	°F
Mean stack velocity	3334	3975	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1014	1015	mbar
Ambient humidity	19%	19%	RH
Ambient Temp	95.0	95.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.6, .4, .3, .3, .3	0.6, 0.4, 0.3, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 7/24/2013

Notes:

SFS

07/25/2014



Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/25/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-10
Date	7/25/2013	Fan Configuration	B&C MAX
Testers	CB,TH, SFS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	110.5 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1258 / 15:00
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 bottom

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	51.0	50.9	51.3	**51.1**	51.2	50.8	51.2	**51.1**
2	1.25	51.1	50.6	51.3	**51.0**	51.3	51.1	51.1	**51.2**
3	2.31	50.9	50.8	51.1	**50.9**	51.1	51.3	51.1	**51.2**
4	3.85	51.2	51.0	51.2	**51.1**	51.5	51.3	51.1	**51.3**
Center	5.96	51.2	50.9	51.2	**51.1**	51.4	51.2	51.1	**51.2**
5	8.07	51.2	50.8	51.4	**51.1**	51.4	51.1	51.1	**51.2**
6	9.61	51.3	51.1	51.0	**51.1**	51.2	51.4	51.3	**51.3**
7	10.67	51.3	51.3	51.1	**51.2**	51.2	51.4	51.3	**51.3**
8	11.42	51.1	51.1	50.9	**51.0**	51.0	51.2	51.1	**51.1**
Averages ---->		**51.1**	**50.9**	**51.2**	**51.1**	**51.3**	**51.2**	**51.2**	**51.2**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	51.14		Mean	51.10	51.24	51.17
Min Point	50.93	-0.4%	Std. Dev.	0.10	0.06	0.11
Max Point	51.30	0.3%	COV as %	0.2	0.1	0.2

Avg. Conc. 51.14 ppm

	Start	Finish	
Tracer tank pressure	350	~0	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	108.8	112.1	°F
Mean stack velocity	3975	3702	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1015	1016	mbar
Ambient humidity	18%	17%	RH
Ambient Temp	97.7	99.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.6, 0.4, 0.3, 0.3, 0.3	0.3, 0.3, 0.3, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 7/24/2013

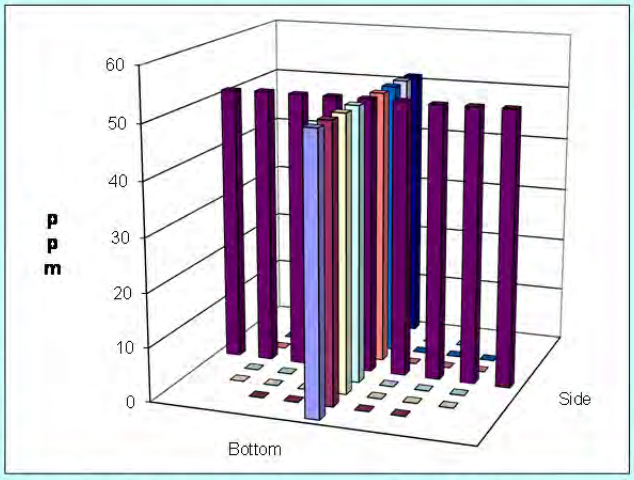
Notes: Gas ran out at the end of the test, pressure just above 0.

Gas cylindar switched out.

cb 07/25/2014

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013



Entries made by:	Caroline Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/25/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-11
Date	7/25/2013	Fan Configuration	B Min
Testers	CB,TH	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	113.6 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	16:10/17:40
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	60.1	60.1	59.6	**59.9**	60.5	60.3	60.2	**60.3**
2	1.25	60.2	60.1	60.5	**60.3**	59.9	60.1	59.6	**59.9**
3	2.31	60.0	60.0	60.5	**60.2**	60.6	60.8	59.6	**60.3**
4	3.85	59.9	61.0	60.0	**60.3**	60.8	60.9	58.7	**60.1**
Center	5.96	60.5	60.6	59.8	**60.3**	60.1	60.7	58.5	**59.8**
5	8.07	60.1	60.6	59.6	**60.1**	59.9	61.0	58.4	**59.8**
6	9.61	60.0	60.8	60.6	**60.5**	60.2	60.5	58.4	**59.7**
7	10.67	60.2	60.9	60.3	**60.5**	60.2	60.4	58.1	**59.6**
8	11.42	60.1	60.5	59.5	**60.0**	60.0	60.3	57.4	**59.2**
Averages ---->		**60.1**	**60.5**	**60.0**	**60.2**	**60.2**	**60.6**	**58.8**	**59.9**

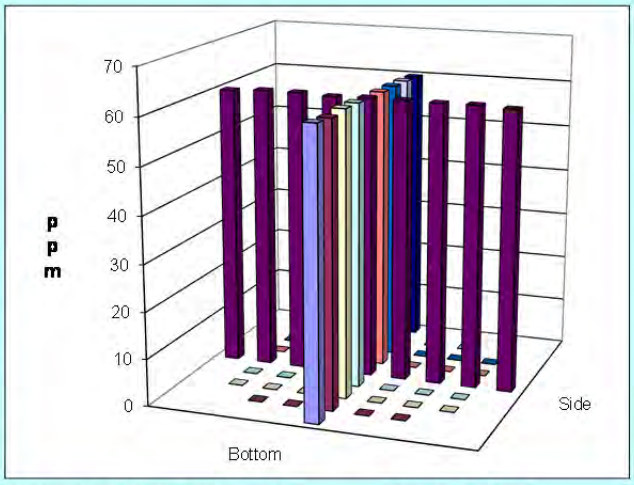
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	60.04		Mean	60.30	59.88	60.09
Min Point	59.23	-1.3%	Std. Dev.	0.14	0.27	0.30
Max Point	60.47	0.7%	COV as %	0.2	0.4	0.5

Avg. Conc. 60.04 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	400	400	psig
Injection flowmeter	1.25	1.216	slpm
Stack Temp	117.3	109.8	°F
Mean stack velocity	975	937	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1016	1016	mbar
Ambient humidity	16%	17%	RH
Ambient Temp	102.2	101.3	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.3, 0.3, 0.3, 0.3, 0.3	0.3, 0.4, 0.3, 0.4, 0.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/24/2013

Notes: Checked injection flow meter after low value obtained for bottom run 3 #6. Flow had decreased to 1.216 slpm.

cb 07/25/2014

Entries made by:	Caroline Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/25/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-12
Date	7/26/2013	Fan Configuration	B Min
Testers	CB,SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	91.6 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	7:30/9:30
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	63.4	64.1	64.0	**63.8**	64.4	64.7	64.3	**64.5**
2	1.25	63.4	64.0	63.6	**63.7**	64.6	64.1	64.2	**64.3**
3	2.31	64.3	63.8	65.0	**64.4**	65.3	64.0	64.8	**64.7**
4	3.85	64.1	64.1	64.3	**64.2**	64.5	64.3	64.0	**64.3**
Center	5.96	64.5	64.1	64.8	**64.5**	64.0	64.6	64.2	**64.3**
5	8.07	63.8	63.8	64.3	**64.0**	64.8	64.1	64.8	**64.6**
6	9.61	64.1	63.8	64.8	**64.2**	64.5	64.4	64.0	**64.3**
7	10.67	64.1	64.7	64.3	**64.4**	64.4	64.8	63.9	**64.4**
8	11.42	63.7	64.4	64.2	**64.1**	64.3	64.1	64.0	**64.1**
Averages ---->		**63.9**	**64.1**	**64.4**	**64.1**	**64.5**	**64.3**	**64.2**	**64.4**

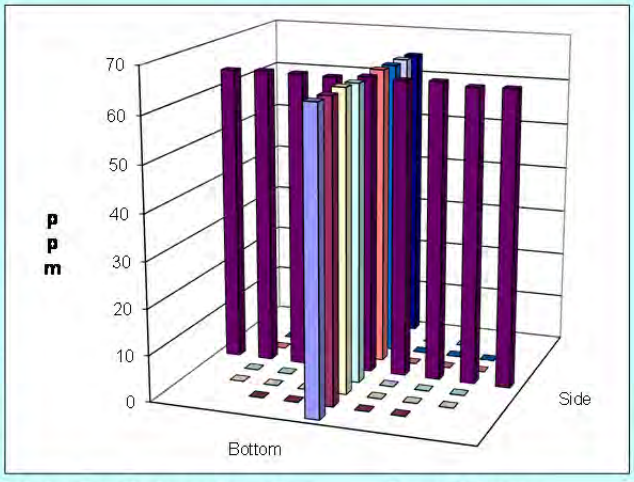
All	**ppm**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	64.25		Mean	64.18	64.40	64.29
Min Point	63.67	-0.9%	Std. Dev.	0.28	0.17	0.25
Max Point	64.70	0.7%	COV as %	0.4	0.3	0.4

Avg. Conc. 64.24 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	300	300	psig
Injection flowmeter	1.25	1.25	slpm
Stack Temp	84.3	98.9	°F
Mean stack velocity	963	929	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1014	1015	mbar
Ambient humidity	31%	23%	RH
Ambient Temp	78.8	85.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.5, 0.5, 0.4, 0.4, 0.4	0.3, 0.3, 0.3, 0.3, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/24/2013

Notes:

cb 07/26/2014

Entries made by:	Caroline Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/26/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-13
Date	7/26/2013	Fan Configuration	C Min
Testers	CB,SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	110.2 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	10:00/11:37
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	56.2	56.4	56.1	**56.2**	56.2	56.1	56.1	**56.1**
2	1.25	55.8	55.9	56.2	**56.0**	56.2	55.9	55.7	**55.9**
3	2.31	55.6	56.6	55.6	**55.9**	56.5	56.4	56.0	**56.3**
4	3.85	56.3	55.7	55.9	**56.0**	56.6	56.8	56.1	**56.5**
Center	5.96	55.9	56.5	56.1	**56.2**	56.5	56.8	56.5	**56.6**
5	8.07	56.1	56.2	56.2	**56.2**	55.6	56.2	56.4	**56.1**
6	9.61	57.2	56.2	56.0	**56.5**	56.0	56.1	56.2	**56.1**
7	10.67	56.0	55.8	55.9	**55.9**	56.3	56.2	56.5	**56.3**
8	11.42	56.4	56.2	56.4	**56.3**	56.4	56.1	56.3	**56.3**
Averages ---------->		**56.2**	**56.2**	**56.0**	**56.1**	**56.3**	**56.3**	**56.2**	**56.2**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	56.19		Mean	56.08	56.26	56.17
Min Point	55.90	-0.5%	Std. Dev.	0.20	0.24	0.23
Max Point	56.60	0.7%	COV as %	0.4	0.4	0.4

Avg. Conc. 56.16 ppm

	Start	Finish	
Tracer tank pressure	300	300	psig
Injection flowmeter	1.25	1.25	slpm
Stack Temp	112.1	108.2	°F
Mean stack velocity	1121	1050	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1014	1015	mbar
Ambient humidity	19%	19%	RH
Ambient Temp	91.4	91.4	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.3, 0.4, 0.4, 0.3, 0.3	0.4, 0.3, 0.3, 0.3, 0.3, 0.4	ppm
No. Bk-Gd samples	5	5	n

Instruments Used:

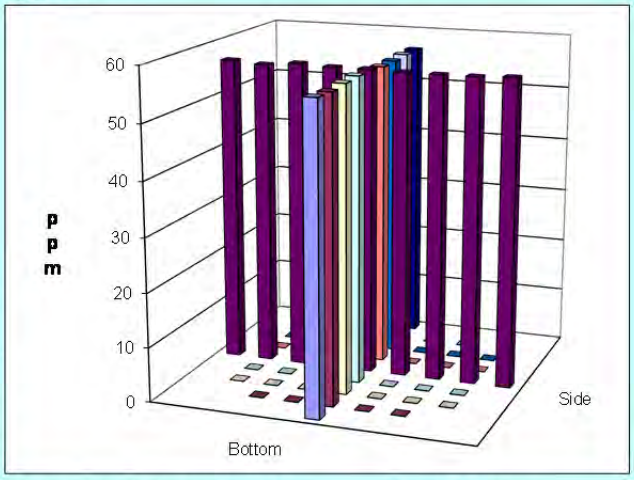
B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

Gas analyzer checked: 7/24/2013

Notes:

cb 07/26/2014

cb 7/26/2013



Entries made by:	Caroline Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/26/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-14
Date	7/29/2013	Fan Configuration	Fan C Min
Testers	EA, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	79.1 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0651 / 0902
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 - Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	30.1	29.4	29.3	**29.6**	29.4	29.5	29.6	**29.5**
2	1.25	30.2	28.8	29.7	**29.6**	29.4	29.3	29.4	**29.4**
3	2.31	30.0	27.7	29.4	**29.0**	29.4	29.2	29.6	**29.4**
4	3.85	29.8	27.0	29.4	**28.7**	29.5	29.8	29.1	**29.5**
Center	5.96	30.0	26.8	29.5	**28.8**	29.4	29.5	29.4	**29.4**
5	8.07	30.0	25.9	29.5	**28.5**	29.6	29.5	29.6	**29.6**
6	9.61	30.0	25.2	29.6	**28.3**	29.3	29.9	29.5	**29.6**
7	10.67	30.0	24.7	29.7	**28.1**	29.6	29.5	29.3	**29.5**
8	11.42	30.2	24.1	29.6	**28.0**	29.4	29.6	29.2	**29.4**
Averages ---->		**30.0**	**26.6**	**29.5**	**28.7**	**29.4**	**29.5**	**29.4**	**29.5**

All	**ppm**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	29.09		Mean	28.71	29.47	29.09
Min Point	27.97	-3.9%	Std. Dev.	0.49	0.08	0.52
Max Point	29.60	1.7%	COV as %	1.7	0.3	1.8

Avg. Conc. 29.09 ppm

	Start	Finish	
Tracer tank pressure	200	250	psig
Injection flowmeter	0.65	0.65	slpm
Stack Temp	74.4	83.8	°F
Mean stack velocity	1045	1036	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1010	1010	mbar
Ambient humidity	35%	32%	RH
Ambient Temp	70.7	75.2	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4, .4, .4, .3, .3	.5, .4, .3, .3, .3	ppm
No. Bk-Gd samples	5	5	n

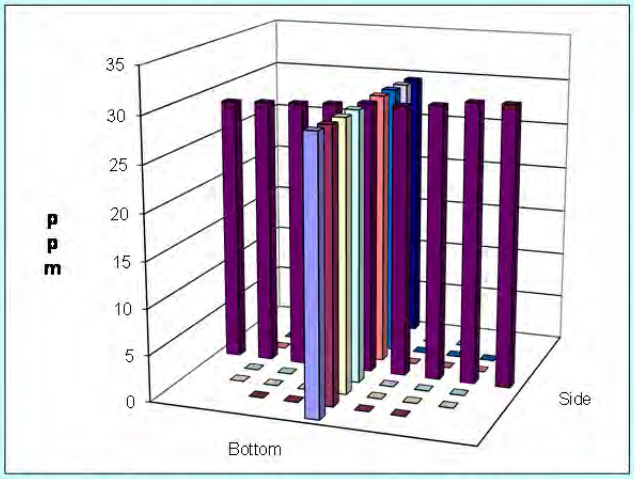
Gas analyzer checked: 7/29/2013

Notes: Injection Flowmeter variable during last side traverse.
Adjusted and redid last traverse.

ss 7/29/13

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013
EA 7/29/13		



Entries made by:	Sandra Snyder	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/29/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-15
Date	7/29/2013	Fan Configuration	B C Min
Testers	EA, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	92.7 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0915 / 1055
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 - Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	22.5	22.7	22.6	**22.6**	22.9	22.7	22.7	**22.8**
2	1.25	22.5	22.8	22.6	**22.6**	23.0	22.8	22.7	**22.8**
3	2.31	22.7	22.7	22.7	**22.7**	22.9	22.7	22.6	**22.7**
4	3.85	22.7	22.7	22.7	**22.7**	22.8	22.8	22.7	**22.8**
Center	5.96	22.8	22.9	22.6	**22.8**	22.9	23.0	22.9	**22.9**
5	8.07	22.7	22.8	22.9	**22.8**	23.1	22.8	22.7	**22.9**
6	9.61	22.9	22.9	22.6	**22.8**	22.8	22.8	22.9	**22.8**
7	10.67	22.7	22.8	22.7	**22.7**	22.9	22.8	22.7	**22.8**
8	11.42	23.0	22.9	22.7	**22.9**	22.6	22.7	22.7	**22.7**
Averages ---->		22.7	22.8	22.7	22.7	22.9	22.8	22.7	22.8

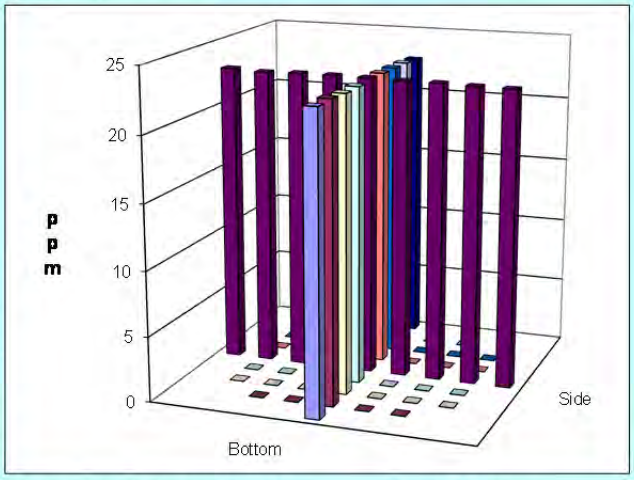
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	22.77		Mean	22.73	22.82	22.78
Min Point	22.60	-0.7%	Std. Dev.	0.06	0.07	0.08
Max Point	22.93	0.7%	COV as %	0.3	0.3	0.3

Avg. Conc. 22.76 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013
EA 7/29/13		

	Start	Finish	
Tracer tank pressure	250	250	psig
Injection flowmeter	0.75	0.75	slpm
Stack Temp	85.8	99.6	°F
Mean stack velocity	1586	1541	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1010	1011	mbar
Ambient humidity	32%	22%	RH
Ambient Temp	78.2	86.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	3, .3, .3, .3, .3	5, .4, .3, .3, .3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/29/2013

Notes:

EA 7/29/13

Entries made by:	Ernest Antonio	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/29/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-16
Date	7/29/2013	Fan Configuration	B C Min
Testers	EA, CB, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	100.9 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1100 / 12:30
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 - Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	22.9	22.7	22.4	22.7	22.6	22.6	22.5	22.6
2	1.25	22.9	22.9	22.4	22.7	22.6	22.5	22.6	22.6
3	2.31	22.9	22.6	22.3	22.6	22.7	22.5	22.5	22.6
4	3.85	22.8	22.9	22.6	22.8	22.6	22.4	22.3	22.4
Center	5.96	23.0	22.7	22.4	22.7	22.5	22.7	22.5	22.6
5	8.07	22.9	22.7	22.3	22.6	22.7	22.5	22.4	22.5
6	9.61	22.6	22.6	22.6	22.6	22.6	22.5	22.3	22.5
7	10.67	22.9	22.7	22.3	22.6	22.4	22.6	22.6	22.5
8	11.42	22.7	22.6	22.6	22.6	22.6	22.8	22.5	22.6
Averages ---->		22.8	22.7	22.4	22.7	22.6	22.6	22.5	22.5

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	22.60		Mean	22.67	22.52	22.60
Min Point	22.43	-0.7%	Std. Dev.	0.07	0.05	0.09
Max Point	22.77	0.7%	COV as %	0.3	0.2	0.4

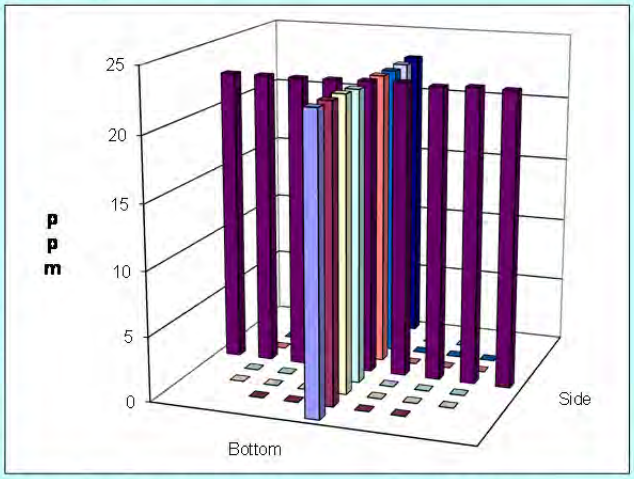
Avg. Conc. 22.60 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

cb 7/29/13

	Start	Finish	
Tracer tank pressure	250	200	psig
Injection flowmeter	0.75	0.75	slpm
Stack Temp	99.6	102.2	°F
Mean stack velocity	1541	1569	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1011	1011	mbar
Ambient humidity	22%	22%	RH
Ambient Temp	86.9	87.8	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5, .4, .3, .3, .3	0.5, 0.3, 0.4, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/29/2013

Notes:

cb 7/29/13

Entries made by:	Caroline Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/29/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-17
Date	7/29/2013	Fan Configuration	B C Min
Testers	cb, Th	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	103.2 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	12:45/14:15
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 - Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	22.6	22.4	22.4	22.5	22.4	22.4	22.6	22.5
2	1.25	22.7	22.8	22.6	22.7	22.4	22.5	22.7	22.5
3	2.31	22.7	22.6	22.5	22.6	22.6	22.4	22.5	22.5
4	3.85	22.6	22.7	22.5	22.6	22.4	22.5	22.6	22.5
Center	5.96	22.6	22.6	22.5	22.6	22.5	22.6	22.7	22.6
5	8.07	22.4	22.5	22.4	22.4	22.4	22.5	22.6	22.5
6	9.61	22.8	22.4	22.4	22.5	22.4	22.6	22.8	22.6
7	10.67	22.7	22.6	22.5	22.6	22.3	22.7	22.9	22.6
8	11.42	22.7	22.9	22.6	22.7	22.4	22.6	22.5	22.5
Averages ---->		22.6	22.6	22.5	22.6	22.4	22.5	22.7	22.5

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	22.56		Mean	22.58	22.55	22.56
Min Point	22.43	-0.6%	Std. Dev.	0.08	0.06	0.07
Max Point	22.73	0.8%	COV as %	0.4	0.3	0.3

Avg. Conc. 22.56 ppm

	Start	Finish	
Tracer tank pressure	200	200	psig
Injection flowmeter	0.75	0.75	slpm
Stack Temp	102.2	104.1	°F
Mean stack velocity	1569	1723	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1011	1012	mbar
Ambient humidity	22%	20%	RH
Ambient Temp	87.8	89.6	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.5, 0.3, 0.4, 0.3, 0.3	0.5, 0.3, 0.3, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 7/29/2013

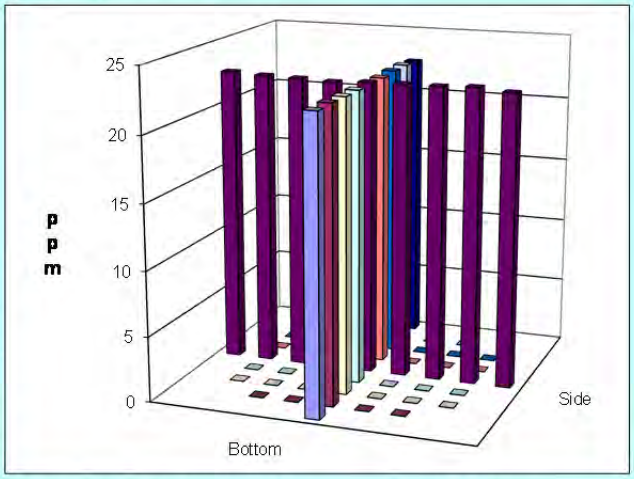
Notes:

cb 7/29/13

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

cb 7/29/13



Entries made by:	Caroline Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/29/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-18
Date	7/29/2013	Fan Configuration	B C Norm
Testers	cb, TH	Fan Setting	55 Hz
Stack Dia.	11.922 in.	Stack Temp	102.9 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	14:30/16:00
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 - Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	15.8	15.8	15.8	**15.8**	15.9	15.9	16.0	**15.9**
2	1.25	15.7	15.9	15.7	**15.8**	15.9	16.0	16.0	**16.0**
3	2.31	15.7	15.8	15.7	**15.7**	15.8	16.1	15.9	**15.9**
4	3.85	15.8	15.8	15.8	**15.8**	16.0	16.0	15.9	**16.0**
Center	5.96	15.8	15.8	15.8	**15.8**	15.9	16.0	15.9	**15.9**
5	8.07	15.8	15.8	15.8	**15.8**	15.9	16.0	15.9	**15.9**
6	9.61	15.9	15.8	15.9	**15.9**	16.0	15.9	16.1	**16.0**
7	10.67	15.9	15.8	15.8	**15.8**	16.0	16.0	15.9	**16.0**
8	11.42	15.8	15.9	16.0	**15.9**	15.9	16.0	16.0	**16.0**
Averages ---->		**15.8**	**15.8**	**15.8**	**15.8**	**15.9**	**16.0**	**16.0**	**16.0**

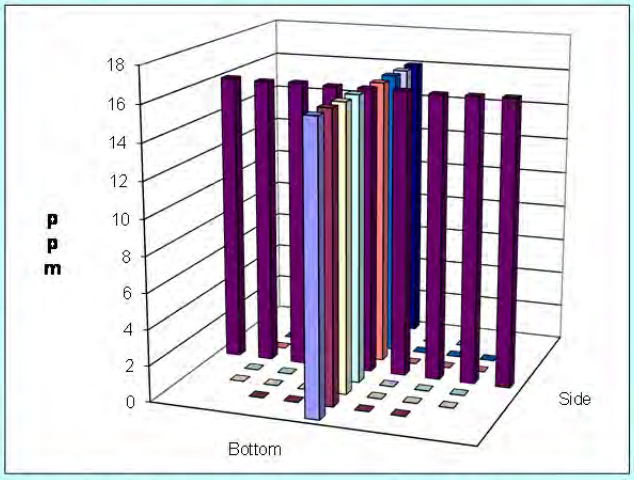
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	15.88		Mean	15.80	15.96	15.88
Min Point	15.73	-0.9%	Std. Dev.	0.04	0.03	0.09
Max Point	16.00	0.7%	COV as %	0.3	0.2	0.6

Avg. Conc. 15.89 ppm

	Start	Finish	
Tracer tank pressure	200	175	psig
Injection flowmeter	1.000	1.000	slpm
Stack Temp	102.8	103	°F
Mean stack velocity	3344	3190	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1012	1013	mbar
Ambient humidity	20%	20%	RH
Ambient Temp	89.6	90.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.3, 0.3, 0.3, 0.3, 0.3	0.5, 0.3, 0.3, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n

Instruments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013
cb 7/29/13	



Gas analyzer checked: 7/29/2013

Notes:

cb 7/29/13

Entries made by:	Caroline Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/29/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-19
Date	7/29/2013	Fan Configuration	B C Norm
Testers	cb, TH	Fan Setting	55 Hz
Stack Dia.	11.922 in.	Stack Temp	100.9 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	16:05/17:30
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 - Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	15.9	16.0	16.0	**16.0**	15.8	16.0	16.0	**15.9**
2	1.25	15.9	16.1	16.1	**16.0**	15.8	16.1	16.0	**16.0**
3	2.31	16.1	16.1	16.0	**16.1**	15.9	16.0	16.0	**16.0**
4	3.85	16.0	16.0	16.1	**16.0**	16.1	16.0	16.0	**16.0**
Center	5.96	16.0	16.0	16.1	**16.0**	16.0	16.0	16.0	**16.0**
5	8.07	16.1	16.0	16.1	**16.1**	15.9	16.1	16.0	**16.0**
6	9.61	16.0	16.0	16.1	**16.0**	16.0	16.0	16.0	**16.0**
7	10.67	16.1	16.1	16.2	**16.1**	16.1	16.0	16.0	**16.0**
8	11.42	16.1	16.1	16.1	**16.1**	16.0	16.1	16.0	**16.0**
Averages ---->		**16.0**	**16.0**	**16.1**	**16.1**	**16.0**	**16.0**	**16.0**	**16.0**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	16.02		Mean	16.06	16.00	16.03
Min Point	15.93	-0.6%	Std. Dev.	0.04	0.03	0.04
Max Point	16.13	0.7%	COV as %	0.2	0.2	0.3

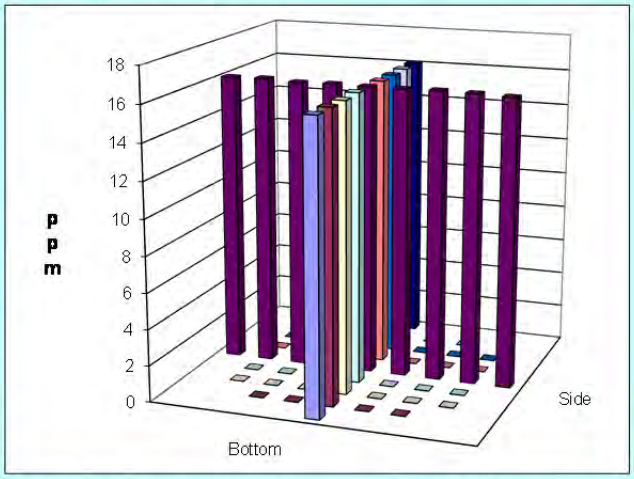
Avg. Conc. 16.03 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

cb 7/29/13

	Start	Finish	
Tracer tank pressure	150	125	psig
Injection flowmeter	1.000	1.000	slpm
Stack Temp	103	98.8	°F
Mean stack velocity	3190	3151	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1013	1011	mbar
Ambient humidity	20%	20%	RH
Ambient Temp	90.5	90.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.5, 0.3, 0.3, 0.3, 0.3	0.4, 0.3, 0.3, 0.3, 0.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 7/29/2013

Notes:

cb 7/29/13

Entries made by:	Caroline Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/29/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-20
Date	8/15/2013	Fan Configuration	BC max
Testers	JEF, CB, SS, TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	107.6 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1145 / 1400
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 near

Order -->		2ND				1ST			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	49.6	49.7	49.7	**49.7**	50.3	49.4	49.7	**49.8**
2	1.25	49.3	49.6	49.4	**49.4**	50.3	49.6	49.4	**49.8**
3	2.31	49.4	49.0	49.2	**49.2**	49.8	49.8	49.2	**49.6**
4	3.85	49.5	49.5	49.1	**49.4**	50.2	49.4	49.6	**49.7**
Center	5.96	49.7	49.5	49.2	**49.5**	50.4	49.7	49.3	**49.8**
5	8.07	49.4	49.6	49.3	**49.4**	50.3	49.0	49.0	**49.4**
6	9.61	49.4	49.9	49.6	**49.6**	50.3	49.5	49.8	**49.9**
7	10.67	49.3	49.3	49.2	**49.3**	50.1	49.4	49.8	**49.8**
8	11.42	49.6	49.5	49.3	**49.5**	50.2	49.8	49.2	**49.7**
Averages ---->		**49.5**	**49.5**	**49.3**	**49.4**	**50.2**	**49.5**	**49.4**	**49.7**

All	**ppm**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	49.58		Mean	49.40	49.71	49.55
Min Point	49.20	-0.8%	Std. Dev.	0.14	0.15	0.21
Max Point	49.87	0.6%	COV as %	0.3	0.3	0.4

Avg. Conc. 49.57 ppm

	Start	Finish	
Tracer tank pressure	1150	1125	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	106.7	108.4	°F
Mean stack velocity	3359	3304	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1047	1047	mbar
Ambient humidity	25%	18%	RH
Ambient Temp	92.3	95.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas			ppm
	3, .3, .3, .3, .3	6, .3, .3. .3, .3	
No. Bk-Gd samples	5	5	n

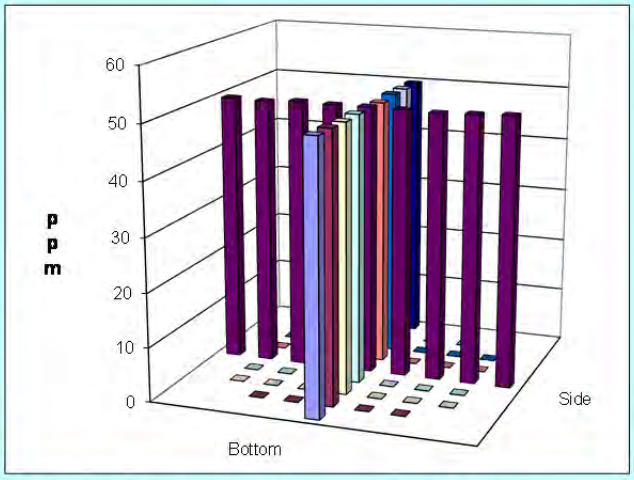
Gas analyzer checked: 8/14/2013

Notes: Repeat worst case Port 1 Test

need to verify this with Ernie
CB 8/15/13

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013



Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/15/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-21
Date	8/16/2013	Fan Configuration	BC MAX
Testers	EA, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	75.2 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0636 / 0815
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Near

Order -->		1ST				2ND			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	54.3	53.4	52.9	**53.5**	52.4	51.9	51.8	**52.0**
2	1.25	54.1	53.4	52.9	**53.5**	52.3	51.9	51.9	**52.0**
3	2.31	54.3	53.5	52.8	**53.5**	52.4	51.9	51.6	**52.0**
4	3.85	54.2	53.6	53.0	**53.6**	52.4	52.0	51.5	**52.0**
Center	5.96	54.1	53.4	52.7	**53.4**	52.2	52.0	51.7	**52.0**
5	8.07	53.9	53.5	52.7	**53.4**	52.2	52.2	51.5	**52.0**
6	9.61	54.0	53.5	52.8	**53.4**	52.4	52.0	51.8	**52.1**
7	10.67	53.7	53.3	52.5	**53.2**	52.1	52.0	51.8	**52.0**
8	11.42	53.6	53.2	52.6	**53.1**	51.9	52.1	51.5	**51.8**
Averages ---->		**54.0**	**53.4**	**52.8**	**53.4**	**52.3**	**52.0**	**51.7**	**52.0**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	52.69		Mean	53.42	51.99	52.71
Min Point	51.83	-1.6%	Std. Dev.	0.14	0.04	0.75
Max Point	53.60	1.7%	COV as %	0.3	0.1	1.4

Avg. Conc. 52.69 ppm

Instuments Used:

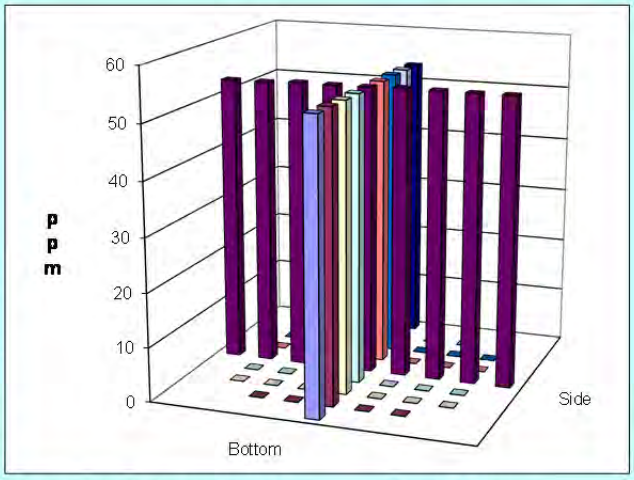
B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	750	750	psig
Injection flowmeter	3.7	3.7	slpm
Stack Temp	71.9	78.4	°F
Mean stack velocity	3378	3323	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1047	1047	mbar
Ambient humidity	68%	52%	RH
Ambient Temp	67.1	75.2	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4, .4, .4,.4,.4	.7, .4,.4,.3, .3	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 8/14/2013

Notes:

SS 8-16-13



Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/16/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-22
Date	8/16/2013	Fan Configuration	BC MAX
Testers	EA, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	78.4 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0823 / 0938
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	50.6	50.1	49.6	**50.1**	50.1	50.7	50.6	**50.5**
2	1.25	50.4	50.2	49.7	**50.1**	50.1	50.9	50.7	**50.6**
3	2.31	50.1	50.2	49.6	**50.0**	50.4	50.8	50.7	**50.6**
4	3.85	50.4	50.2	49.7	**50.1**	50.3	50.7	50.6	**50.5**
Center	5.96	50.2	50.2	49.7	**50.0**	50.8	50.7	50.4	**50.6**
5	8.07	50.2	49.9	49.6	**49.9**	50.8	50.6	50.7	**50.7**
6	9.61	50.3	50.0	49.6	**50.0**	50.8	50.2	50.7	**50.6**
7	10.67	50.3	49.9	49.5	**49.9**	50.7	50.6	50.8	**50.7**
8	11.42	50.3	50.2	49.7	**50.1**	50.9	50.6	50.7	**50.7**
Averages ---->		**50.3**	**50.1**	**49.6**	**50.0**	**50.5**	**50.6**	**50.7**	**50.6**

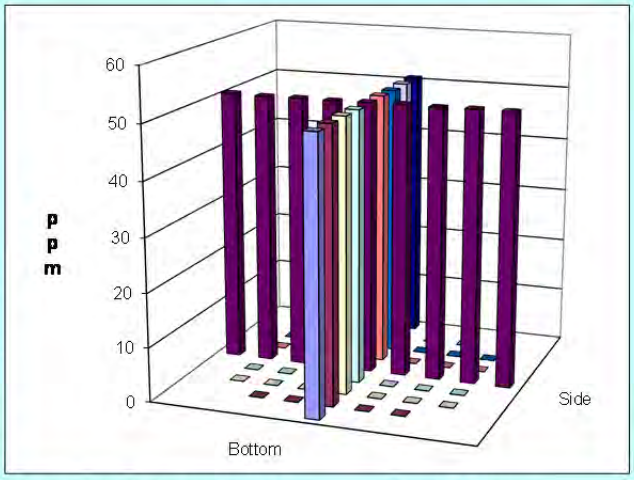
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	50.31		Mean	50.00	50.62	50.31
Min Point	49.90	-0.8%	Std. Dev.	0.08	0.07	0.33
Max Point	50.73	0.8%	COV as %	0.2	0.1	0.7

Avg. Conc. 50.31 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	750	750	psig
Injection flowmeter	3.7	3.6	slpm
Stack Temp	78.4	86	°F
Mean stack velocity	3323	3272	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1047	1047	mbar
Ambient humidity	52%	37%	RH
Ambient Temp	75.2	83.3	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4, .4,.4,.3, .3	.6,.3,,3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/14/2013

Notes:

SS 8-16-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/16/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-23
Date	8/16/2013	Fan Configuration	BC MAX
Testers	EA, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	86.0 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0943 / 1105
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	48.7	49.0	49.0	**48.9**	49.2	48.6	48.3	**48.7**
2	1.25	49.0	49.6	49.4	**49.3**	49.2	48.3	48.3	**48.6**
3	2.31	49.2	49.4	48.8	**49.1**	49.4	48.2	48.0	**48.5**
4	3.85	49.1	49.7	49.2	**49.3**	49.3	48.6	47.9	**48.6**
Center	5.96	49.2	49.7	49.1	**49.3**	49.3	48.3	48.0	**48.5**
5	8.07	49.2	49.3	49.5	**49.3**	49.0	48.4	48.1	**48.5**
6	9.61	49.1	49.3	49.6	**49.3**	48.9	48.3	48.1	**48.4**
7	10.67	49.1	49.2	49.2	**49.2**	48.8	48.6	48.0	**48.5**
8	11.42	49.3	49.0	49.2	**49.2**	48.5	48.6	47.9	**48.3**
Averages ---->		**49.1**	**49.4**	**49.2**	**49.2**	**49.1**	**48.4**	**48.1**	**48.5**

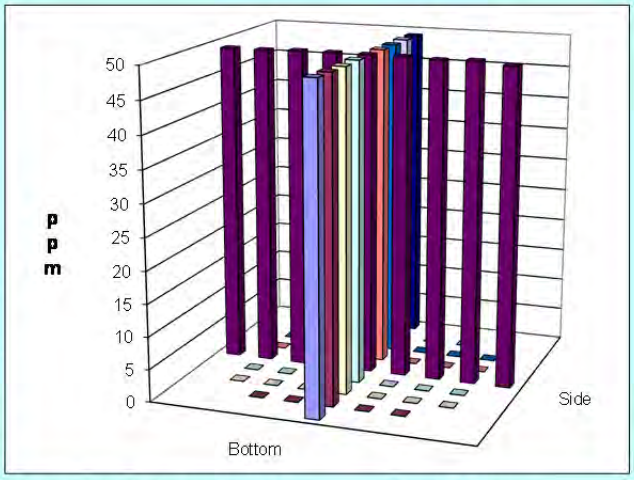
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	48.87		Mean	49.28	48.52	48.90
Min Point	48.33	-1.1%	Std. Dev.	0.09	0.06	0.40
Max Point	49.33	0.9%	COV as %	0.2	0.1	0.8

Avg. Conc. 48.87 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	800	900	psig
Injection flowmeter	3.6	3.5	slpm
Stack Temp	86	98.8	°F
Mean stack velocity	3272	3342	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1047	1048	mbar
Ambient humidity	37%	28%	RH
Ambient Temp	83.3	88.7	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.6,.3,.3,.3,.3	.6, .3,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/14/2013

Notes:

SS 8-16-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/16/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-24
Date	8/16/2013	Fan Configuration	A Norm
Testers	cb,Th	Fan Setting	55 Hz
Stack Dia.	11.922 in.	Stack Temp	102.6 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	13:45/14:20
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	43.8	44.0	43.6	**43.8**	43.8	42.8	42.8	**43.1**
2	1.25	44.0	43.8	43.8	**43.9**	43.7	43.1	42.8	**43.2**
3	2.31	44.2	43.6	43.6	**43.8**	43.3	42.6	42.7	**42.9**
4	3.85	43.9	43.2	43.7	**43.6**	43.5	42.7	42.8	**43.0**
Center	5.96	43.8	43.4	43.7	**43.6**	43.5	42.9	42.7	**43.0**
5	8.07	43.8	43.5	43.5	**43.6**	43.7	42.7	42.6	**43.0**
6	9.61	43.9	43.6	43.4	**43.6**	43.4	42.9	42.8	**43.0**
7	10.67	43.9	43.5	43.4	**43.6**	43.2	43.0	43.0	**43.1**
8	11.42	43.8	44.0	43.2	**43.7**	43.3	43.1	42.8	**43.1**
Averages ---->		**43.9**	**43.6**	**43.5**	**43.7**	**43.5**	**42.9**	**42.8**	**43.0**

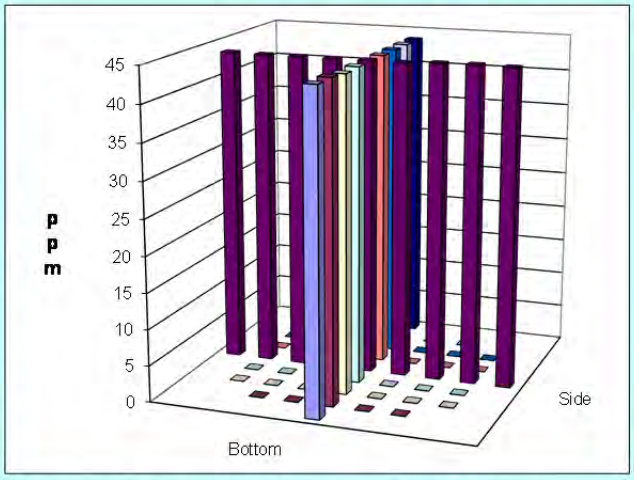
All	**ppm**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	43.37		Mean	43.68	43.03	43.35
Min Point	42.87	-1.2%	Std. Dev.	0.11	0.10	0.35
Max Point	43.87	1.2%	COV as %	0.3	0.2	0.8

Avg. Conc. 43.37 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	1100	1100	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	109.8	95.3	°F
Mean stack velocity	1594	1564	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1049	1049	mbar
Ambient humidity	25%	23%	RH
Ambient Temp	92.3	91.4	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.4,0.3,0.3,0.3,0.3	0.6,0.4,0.3,0.3,0.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/14/2013

Notes: Started to rain

cb 8-16-13

Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/16/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-25
Date	8/19/2013	Fan Configuration	A Norm
Testers	YFS,SS	Fan Setting	52 Hz
Stack Dia.	11.922 in.	Stack Temp	80.0 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0642 / 0838
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	44.1	43.2	43.1	**43.5**	45.1	44.3	44.3	**44.6**
2	1.25	43.8	43.2	43.3	**43.4**	45.1	44.4	44.2	**44.6**
3	2.31	43.5	43.4	42.9	**43.3**	44.9	44.5	44.0	**44.5**
4	3.85	43.5	43.2	42.6	**43.1**	44.8	43.9	43.9	**44.2**
Center	5.96	43.6	43.4	42.8	**43.3**	44.6	44.2	44.1	**44.3**
5	8.07	43.8	43.2	42.8	**43.3**	44.7	44.3	43.8	**44.3**
6	9.61	43.7	43.1	43.0	**43.3**	44.8	44.4	43.7	**44.3**
7	10.67	43.4	43.5	42.9	**43.3**	44.9	44.2	43.7	**44.3**
8	11.42	43.2	43.2	43.0	**43.1**	44.7	44.3	43.6	**44.2**
Averages ---->		**43.6**	**43.3**	**42.9**	**43.3**	**44.8**	**44.3**	**43.9**	**44.3**

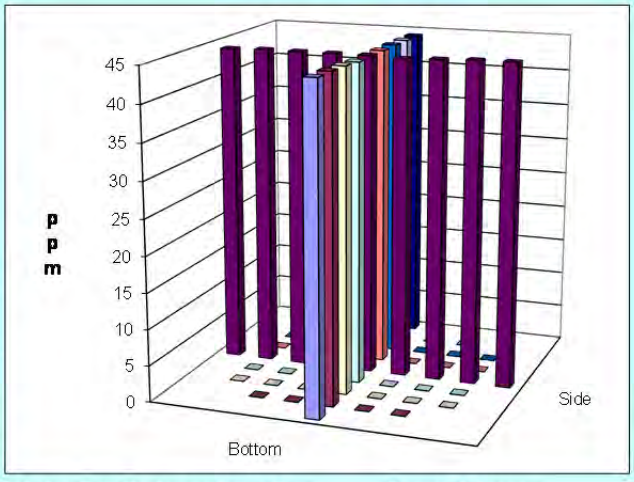
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	43.81		Mean	43.27	44.34	43.80
Min Point	43.10	-1.6%	Std. Dev.	0.10	0.13	0.57
Max Point	44.57	1.7%	COV as %	0.2	0.3	1.3

Avg. Conc. 43.81 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	750	800	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	73.2	86.8	°F
Mean stack velocity	1540	1542	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1049	1049	mbar
Ambient humidity	55%	27%	RH
Ambient Temp	67.1	89.6	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.4, .4,.4,.4,.3	.6,.4,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/14/2013

Notes:

ss 8-19-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/19/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-26
Date	8/19/2013	Fan Configuration	AC MIN
Testers	YFS,SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	97.4 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0855 / 1031
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	41.9	42.5	42.0	**42.1**	42.4	42.0	42.1	**42.2**
2	1.25	42.1	42.3	42.0	**42.1**	42.4	42.2	41.9	**42.2**
3	2.31	41.9	42.4	41.8	**42.0**	42.1	42.4	41.8	**42.1**
4	3.85	42.1	42.2	42.1	**42.1**	42.7	42.1	42.3	**42.4**
Center	5.96	42.0	41.9	42.2	**42.0**	42.8	42.3	42.1	**42.4**
5	8.07	42.2	42.1	42.0	**42.1**	42.2	42.0	42.3	**42.2**
6	9.61	42.0	41.9	42.2	**42.0**	42.5	42.3	42.2	**42.3**
7	10.67	41.9	42.1	42.0	**42.0**	42.4	42.4	42.2	**42.3**
8	11.42	42.1	42.1	42.4	**42.2**	42.0	42.1	41.5	**41.9**
Averages ---->		**42.0**	**42.2**	**42.1**	**42.1**	**42.4**	**42.2**	**42.0**	**42.2**

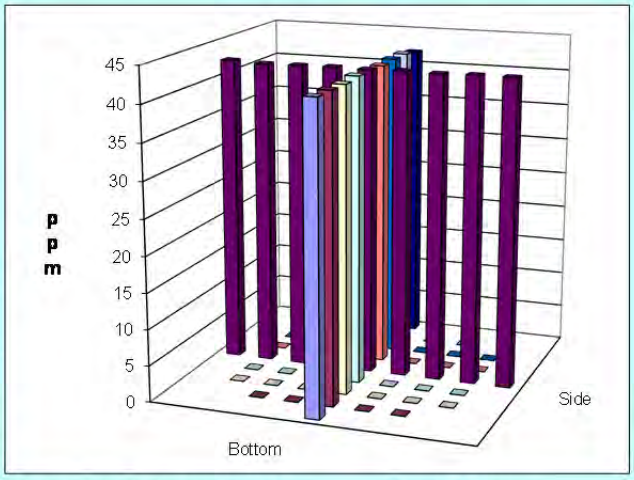
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	42.15		Mean	42.07	42.27	42.17
Min Point	41.87	-0.7%	Std. Dev.	0.05	0.12	0.14
Max Point	42.40	0.6%	COV as %	0.1	0.3	0.3

Avg. Conc. 42.14 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	1000	1000	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	85.3,	97.4	°F
Mean stack velocity	1541	1686	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1049	1049	mbar
Ambient humidity	80%	28%	RH
Ambient Temp	79.7	85.1	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.3,.3,.3,.3,.2	.6,.3,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/14/2013

Notes:

ss 8-19-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/19/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-27
Date	8/19/2013	Fan Configuration	AC MIN
Testers	YFS,SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	100.7 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1040 /1215
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 NEAR TOP

Order -->		1ST				2ND			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	41.3	41.9	41.9	**41.7**	41.7	42.0	41.7	**41.8**
2	1.25	41.6	41.5	41.3	**41.5**	42.1	42.1	42.2	**42.1**
3	2.31	41.8	42.0	42.1	**42.0**	42.3	42.0	42.1	**42.1**
4	3.85	41.5	41.9	41.8	**41.7**	41.7	41.7	42.1	**41.8**
Center	5.96	42.0	42.0	41.9	**42.0**	41.8	42.1	41.9	**41.9**
5	8.07	41.2	41.7	42.2	**41.7**	42.0	42.5	41.9	**42.1**
6	9.61	42.4	41.9	42.3	**42.2**	42.1	42.0	42.0	**42.0**
7	10.67	42.2	42.0	42.2	**42.1**	42.0	42.3	42.1	**42.1**
8	11.42	42.2	41.9	42.1	**42.1**	41.9	41.9	41.8	**41.9**
Averages ---->		**41.8**	**41.9**	**42.0**	**41.9**	**42.0**	**42.1**	**42.0**	**42.0**

All	ppm	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	41.94		Mean	41.88	42.05	41.96
Min Point	41.47	-1.1%	Std. Dev.	0.26	0.12	0.21
Max Point	42.20	0.6%	COV as %	0.6	0.3	0.5

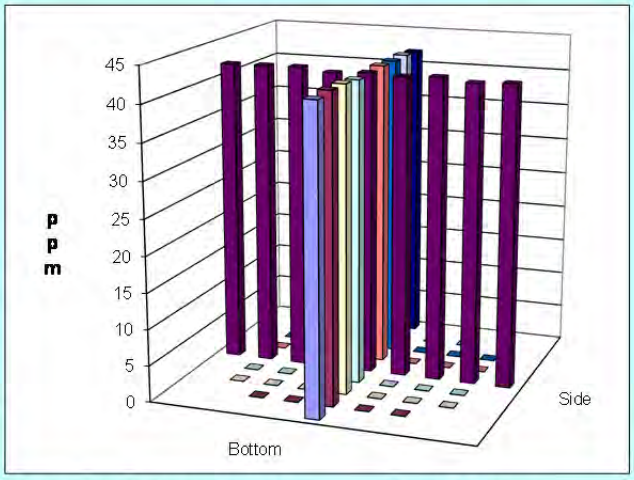
Avg. Conc. 41.94 ppm

Instruments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	1000	1100	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	97.4	103.9	°F
Mean stack velocity	1686	1545	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1049	1050	mbar
Ambient humidity	28%	22%	RH
Ambient Temp	85.1	89.6	°F
B&K vapor correction	Y	y	Y/N
Back-Gd gas	.3,.3,.3,.3,.3	.6,.3,.3,.3,.3	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 8/14/2013



Notes:	
	At the end of test GT-28 it was discovered that the gas probe was pointing upstream of the air flow. cb 08/19/2013

ss 8-19-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/19/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-28
Date	8/19/2013	Fan Configuration	AC MIN
Testers	cb,th	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	104.4 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	12:30/14:30
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Far TOP

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	42.6	42.6	42.9	**42.7**	42.6	42.9	42.7	**42.7**
2	1.25	42.3	43.0	43.0	**42.8**	43.0	43.0	42.9	**43.0**
3	2.31	42.7	42.6	42.5	**42.6**	42.6	43.1	43.0	**42.9**
4	3.85	42.4	42.8	42.6	**42.6**	42.7	43.9	42.8	**43.1**
Center	5.96	42.9	42.7	42.6	**42.7**	42.6	43.1	42.8	**42.8**
5	8.07	42.9	42.8	42.4	**42.7**	42.6	43.1	43.2	**43.0**
6	9.61	42.7	43.0	43.4	**43.0**	43.3	43.1	43.1	**43.2**
7	10.67	42.9	42.8	42.9	**42.9**	43.2	42.8	43.0	**43.0**
8	11.42	42.3	43.1	48.2	**44.5**	43.2	42.7	42.9	**42.9**
Averages ---------->		**42.6**	**42.8**	**43.4**	**42.9**	**42.9**	**43.1**	**42.9**	**43.0**

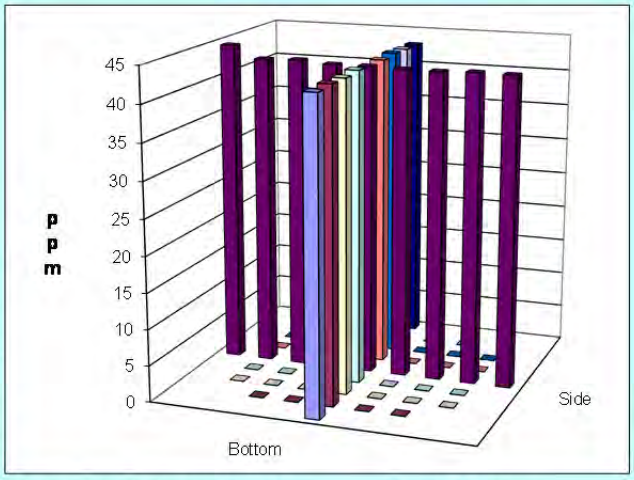
All	**ppm**	**Dev. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	42.95		Mean	42.76	43.00	42.88
Min Point	42.60	-0.8%	Std. Dev.	0.15	0.12	0.18
Max Point	44.53	3.7%	COV as %	0.4	0.3	0.4

Avg. Conc. 42.98 ppm

Instruments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	1100	1100	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	103.9	104.8	°F
Mean stack velocity	1532	1516	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1050	1051	mbar
Ambient humidity	21%	19%	RH
Ambient Temp	90.5	93.2	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.3,0.2,0.3,0.3,0.3	0.8,0.5,0.5,0.5,0.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/14/2013

Notes: At the beginning of GT-29 it was found the gas probe was facing upstream

CB 8-19-23

Entries made by:	Carolyne Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/19/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-29
Date	8/20/2013	Fan Configuration	AC MIN
Testers	SFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	81.9 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0717 / 0845
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Far

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	43.4	43.2	43.3	**43.3**	43.0	43.2	43.3	**43.2**
2	1.25	43.4	43.4	43.4	**43.4**	43.0	43.3	43.1	**43.1**
3	2.31	43.4	43.5	43.2	**43.4**	43.2	43.4	43.3	**43.3**
4	3.85	43.4	43.4	43.3	**43.4**	43.3	43.1	43.3	**43.2**
Center	5.96	43.6	43.4	43.4	**43.5**	43.3	43.1	43.4	**43.3**
5	8.07	43.4	43.4	43.3	**43.4**	43.6	43.4	43.6	**43.5**
6	9.61	43.3	43.0	43.4	**43.2**	43.5	43.2	43.4	**43.4**
7	10.67	43.2	43.5	42.9	**43.2**	43.2	43.5	43.5	**43.4**
8	11.42	43.3	43.4	43.1	**43.3**	43.2	43.0	43.4	**43.2**
Averages ---->		**43.4**	**43.4**	**43.3**	**43.3**	**43.3**	**43.2**	**43.4**	**43.3**

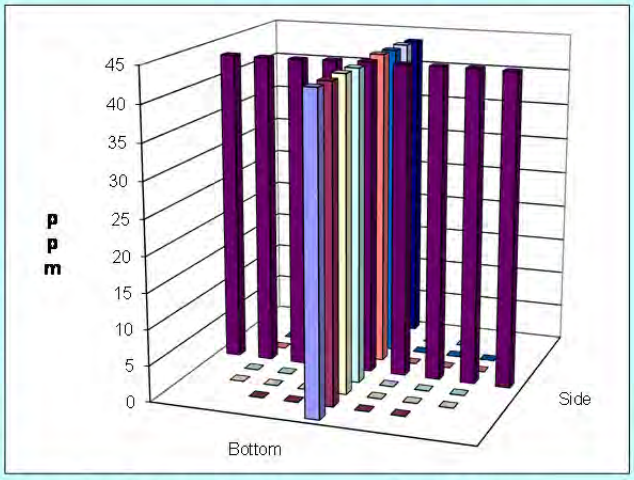
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	43.31		Mean	43.34	43.32	43.33
Min Point	43.13	-0.4%	Std. Dev.	0.09	0.13	0.11
Max Point	43.53	0.5%	COV as %	0.2	0.3	0.3

Avg. Conc. 43.30 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	800	900	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	76.1	87.6	°F
Mean stack velocity	1663	1651	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1048	1049	mbar
Ambient humidity	48%	32%	RH
Ambient Temp	69.8	75.2	°F
B&K vapor correction	Y	y	Y/N
Back-Gd gas	.5,.5,.5,.5,.4	.8,.5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/14/2013

Notes:

ss 8-20-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/20/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-30
Date	8/20/2013	Fan Configuration	AC MIN
Testers	SFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	89.9 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0905 / 1022
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Bottom

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	42.6	42.6	42.6	**42.6**	43.0	42.7	43.1	**42.9**
2	1.25	42.8	42.6	42.8	**42.7**	43.1	42.7	43.0	**42.9**
3	2.31	42.8	42.1	42.9	**42.6**	42.1	42.6	42.9	**42.5**
4	3.85	42.6	43.1	43.0	**42.9**	42.6	43.1	42.8	**42.8**
Center	5.96	42.5	42.6	43.1	**42.7**	42.9	43.0	43.0	**43.0**
5	8.07	42.8	42.8	43.1	**42.9**	42.9	43.2	42.6	**42.9**
6	9.61	42.7	42.8	42.9	**42.8**	43.0	43.1	42.6	**42.9**
7	10.67	42.5	42.9	43.0	**42.8**	43.0	42.9	43.0	**43.0**
8	11.42	42.5	42.9	42.8	**42.7**	42.8	42.9	42.8	**42.8**
Averages ---->		**42.6**	**42.7**	**42.9**	**42.8**	**42.8**	**42.9**	**42.9**	**42.9**

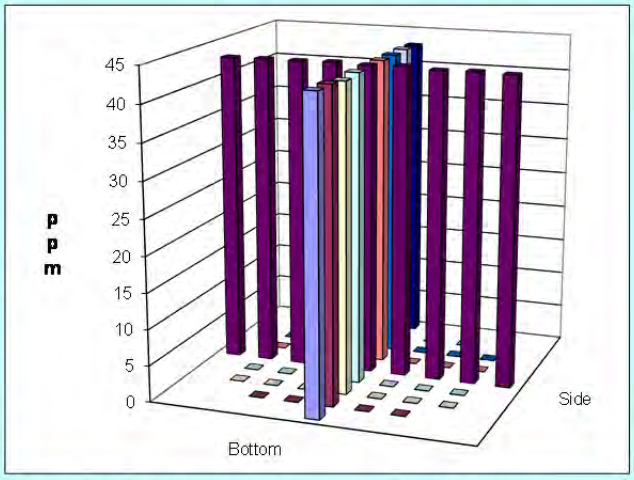
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	42.81		Mean	42.78	42.86	42.82
Min Point	42.53	-0.6%	Std. Dev.	0.11	0.15	0.13
Max Point	42.97	0.4%	COV as %	0.2	0.4	0.3

Avg. Conc. 42.81 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	1000	1000	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	87.6	92.2	°F
Mean stack velocity	1651	1603	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1049	1050	mbar
Ambient humidity	31%	31%	RH
Ambient Temp	77.0	78.8	°F
B&K vapor correction	y	y	Y/N
Back-Gd gas	.4,.4,.4,.4,.4	.7,.7,.5,.5,.5	ppm
No. Bk-Gd samples	5		n



Gas analyzer checked: 8/14/2013

Notes:

ss 8-20-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/20/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-31
Date	8/20/2013	Fan Configuration	AC MIN
Testers	SFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	94.5 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1025 / 1135
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Top

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	43.3	42.6	42.9	**42.9**	42.4	42.8	43.0	**42.7**
2	1.25	42.7	42.9	43.1	**42.9**	42.8	43.1	43.1	**43.0**
3	2.31	43.3	43.2	43.1	**43.2**	42.9	43.2	43.1	**43.1**
4	3.85	43.2	43.1	42.9	**43.1**	43.1	43.0	43.0	**43.0**
Center	5.96	43.0	43.0	43.1	**43.0**	43.0	43.2	43.0	**43.1**
5	8.07	42.9	43.2	43.0	**43.0**	43.1	42.9	43.0	**43.0**
6	9.61	43.0	43.2	43.1	**43.1**	43.4	43.3	43.1	**43.3**
7	10.67	43.1	43.0	42.9	**43.0**	43.2	43.5	43.3	**43.3**
8	11.42	43.1	43.1	42.7	**43.0**	42.9	43.2	43.1	**43.1**
Averages ---->		**43.1**	**43.0**	**43.0**	**43.0**	**43.0**	**43.1**	**43.1**	**43.1**

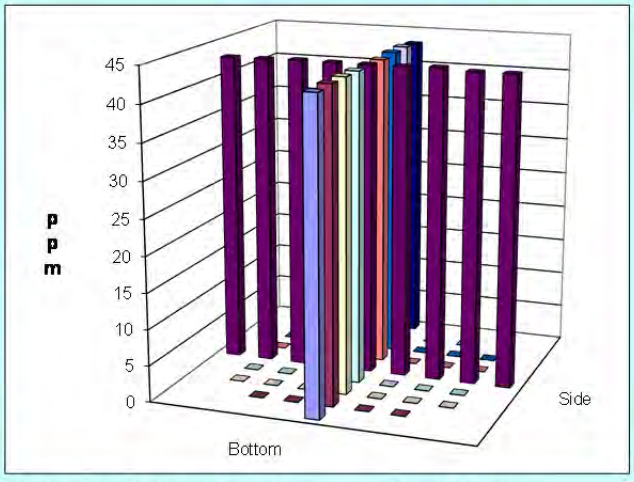
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	43.04		Mean	43.05	43.11	43.08
Min Point	42.73	-0.7%	Std. Dev.	0.09	0.13	0.12
Max Point	43.33	0.7%	COV as %	0.2	0.3	0.3

Avg. Conc. 43.04 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	1000	1000	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	92.2	96.7	°F
Mean stack velocity	1603	1726	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1050	1050	mbar
Ambient humidity	31%	25%	RH
Ambient Temp	78.8	83.3	°F
B&K vapor correction	y	y	Y/N
Back-Gd gas	.7,.7,.5,.5,.5	.8,.5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/14/2013

Notes:

ss 8-20-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/20/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-32
Date	8/21/2013	Fan Configuration	AC MIN
Testers	SFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	72.3 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0655 / 0825
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Near

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	43.8	43.8	43.5	**43.7**	43.6	43.4	42.8	**43.3**
2	1.25	43.6	43.5	43.6	**43.6**	43.4	43.4	43.3	**43.4**
3	2.31	43.9	43.6	43.4	**43.6**	43.4	43.0	42.9	**43.1**
4	3.85	43.9	43.8	43.6	**43.8**	43.2	43.1	43.4	**43.2**
Center	5.96	44.1	43.7	43.3	**43.7**	43.4	43.2	43.3	**43.3**
5	8.07	43.7	43.6	43.9	**43.7**	43.4	43.3	43.6	**43.4**
6	9.61	43.9	44.0	43.6	**43.8**	43.2	43.5	43.4	**43.4**
7	10.67	44.0	43.4	43.4	**43.6**	43.5	43.2	43.2	**43.3**
8	11.42	44.1	43.4	43.5	**43.7**	43.3	43.4	43.3	**43.3**
Averages ---->		**43.9**	**43.6**	**43.5**	**43.7**	**43.4**	**43.3**	**43.2**	**43.3**

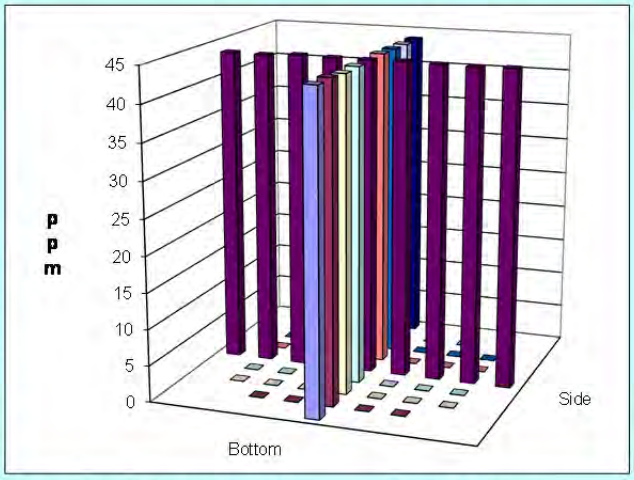
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	43.49		Mean	43.69	43.30	43.50
Min Point	43.10	-0.9%	Std. Dev.	0.10	0.11	0.23
Max Point	43.83	0.8%	COV as %	0.2	0.3	0.5

Avg. Conc. 43.49 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	725	800	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	66	78.5	°F
Mean stack velocity	1580	1606	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1049	1049	mbar
Ambient humidity	54%	30%	RH
Ambient Temp	61.7	80.6	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.6,.6,.6,.6,.6	.8,.6,.6,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes: Tubing loose on B&K, ran Side 1 &2 over.

ss 8-21-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/21/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-33
Date	8/21/2013	Fan Configuration	A Norm
Testers	SFS,SS	Fan Setting	53 Hz
Stack Dia.	11.922 in.	Stack Temp	84.4 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0844 / 0955
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	42.1	42.2	42.0	**42.1**	41.8	42.2	42.1	**42.0**
2	1.25	42.2	42.5	42.3	**42.3**	42.3	42.1	42.4	**42.3**
3	2.31	42.5	42.4	42.5	**42.5**	41.9	42.4	42.4	**42.2**
4	3.85	42.2	42.4	42.4	**42.3**	42.3	42.2	42.2	**42.2**
Center	5.96	42.2	42.1	42.2	**42.2**	42.3	42.3	42.1	**42.2**
5	8.07	42.2	42.1	42.3	**42.2**	42.4	42.5	42.0	**42.3**
6	9.61	42.1	42.3	42.4	**42.3**	42.2	42.4	42.5	**42.4**
7	10.67	42.3	42.2	42.5	**42.3**	42.6	42.7	42.4	**42.6**
8	11.42	42.6	42.6	42.3	**42.5**	42.3	42.2	42.4	**42.3**
Averages ---->		**42.3**	**42.3**	**42.3**	**42.3**	**42.2**	**42.3**	**42.3**	**42.3**

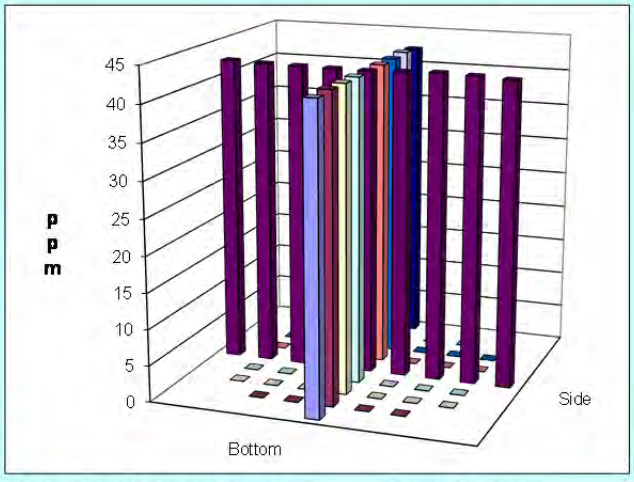
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	42.29		Mean	42.30	42.31	42.31
Min Point	42.03	-0.6%	Std. Dev.	0.10	0.12	0.11
Max Point	42.57	0.7%	COV as %	0.2	0.3	0.3

Avg. Conc. 42.30 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	800	850	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	82.8	86	°F
Mean stack velocity	1634	1598	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1049	1049	mbar
Ambient humidity	31%	24%	RH
Ambient Temp	76.1	85.1	°F
B&K vapor correction	Y	y	Y/N
Back-Gd gas	.8,.5,.5,.5,.5	.8,.5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

ss 8-21-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/21/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-34
Date	8/21/2013	Fan Configuration	A Norm
Testers	SFS,SS	Fan Setting	53 Hz
Stack Dia.	11.922 in.	Stack Temp	87.0 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0957 / 1110
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	41.8	42.2	42.4	**42.1**	42.6	42.3	42.4	**42.4**
2	1.25	42.3	42.3	42.5	**42.4**	42.1	42.2	42.4	**42.2**
3	2.31	42.2	42.1	42.2	**42.2**	42.5	42.4	42.2	**42.4**
4	3.85	42.0	42.3	42.2	**42.2**	42.7	42.5	42.4	**42.5**
Center	5.96	42.3	42.4	42.6	**42.4**	42.5	42.6	42.5	**42.5**
5	8.07	42.7	42.2	42.5	**42.5**	42.5	42.4	42.5	**42.5**
6	9.61	42.4	42.7	42.6	**42.6**	42.5	42.8	42.3	**42.5**
7	10.67	42.5	42.6	42.5	**42.5**	42.5	42.3	42.7	**42.5**
8	11.42	42.4	42.6	42.5	**42.5**	42.7	42.3	42.3	**42.4**
Averages ---->		**42.3**	**42.4**	**42.4**	**42.4**	**42.5**	**42.4**	**42.4**	**42.4**

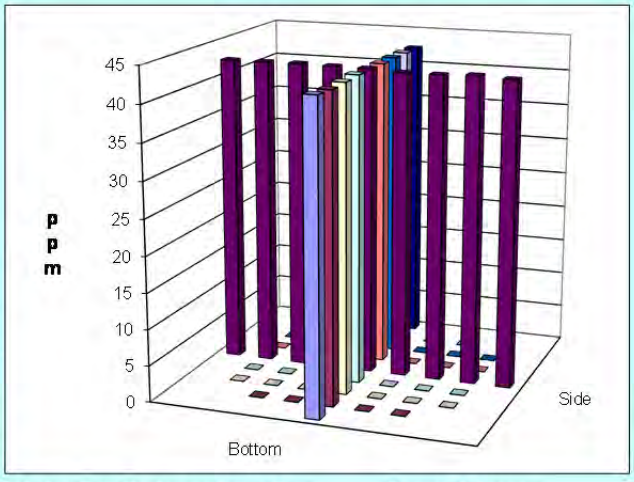
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	42.41		Mean	42.39	42.45	42.42
Min Point	42.13	-0.7%	Std. Dev.	0.16	0.11	0.14
Max Point	42.57	0.4%	COV as %	0.4	0.3	0.3

Avg. Conc. 42.40 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	900	900	psig
Injection flowmeter	1.5	1.5	slpm
Stack Temp	86.0	88.0	°F
Mean stack velocity	1598	1621	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1049	1049	mbar
Ambient humidity	24%	22%	RH
Ambient Temp	85.1	84.2	°F
B&K vapor correction	y	y	Y/N
Back-Gd gas	.8,.5,.5,.5,.5	.8,.5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

ss 8-21-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/21/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-35
Date	8/21/2013	Fan Configuration	AC Max
Testers	cb,TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	101.5 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	13:30/15:00
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	51.7	51.3	50.9	**51.3**	50.5	50.1	49.9	**50.2**
2	1.25	51.7	51.7	50.9	**51.4**	50.5	49.9	49.7	**50.0**
3	2.31	51.3	51.3	50.9	**51.2**	50.3	50.1	50.1	**50.2**
4	3.85	51.9	51.2	51.0	**51.4**	50.4	50.2	50.2	**50.3**
Center	5.96	51.6	50.9	51.0	**51.2**	50.7	50.5	50.1	**50.4**
5	8.07	51.3	51.1	50.6	**51.0**	50.4	50.3	49.8	**50.2**
6	9.61	51.6	51.2	51.0	**51.3**	50.5	50.3	50.2	**50.3**
7	10.67	51.3	51.3	50.7	**51.1**	50.4	50.2	49.7	**50.1**
8	11.42	51.4	51.1	50.8	**51.1**	50.5	50.2	49.7	**50.1**
Averages ---->		**51.5**	**51.2**	**50.9**	**51.2**	**50.5**	**50.2**	**49.9**	**50.2**

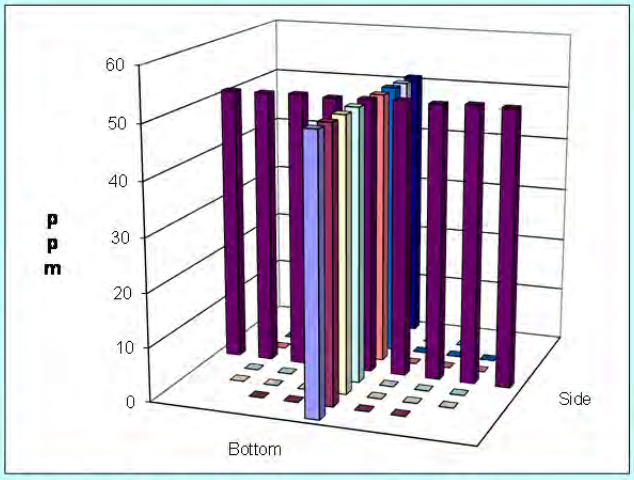
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	50.71		Mean	51.21	50.21	50.71
Min Point	50.03	-1.3%	Std. Dev.	0.15	0.14	0.54
Max Point	51.43	1.4%	COV as %	0.3	0.3	1.1

Avg. Conc. 50.69 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	1000	1000	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	98.1	104.8	°F
Mean stack velocity	3480	3486	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1050	1050	mbar
Ambient humidity	19%	19%	RH
Ambient Temp	92.3	92.3	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.5,0.5,0.5, 0.5,0.5	0.5,0.5,0.5, 0.5,0.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

cb 8-21-13

Entries made by:	Carolyn Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/21/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-36
Date	8/21/2013	Fan Configuration	AC Max
Testers	cb,TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	105.8 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	15:10/16:10
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Center

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	49.2	49.1	49.0	**49.1**	49.1	49.5	49.2	**49.3**
2	1.25	49.5	49.4	49.1	**49.3**	48.9	49.5	49.3	**49.2**
3	2.31	49.3	49.3	49.0	**49.2**	49.3	49.7	49.6	**49.5**
4	3.85	49.7	49.5	49.2	**49.5**	49.2	49.8	49.7	**49.6**
Center	5.96	49.5	49.4	49.4	**49.4**	49.4	49.5	49.9	**49.6**
5	8.07	49.3	49.6	49.6	**49.5**	49.6	49.3	49.6	**49.5**
6	9.61	49.5	49.5	49.2	**49.4**	49.6	49.8	49.7	**49.7**
7	10.67	49.6	49.5	49.4	**49.5**	49.2	49.7	49.8	**49.6**
8	11.42	49.6	49.2	49.4	**49.4**	49.7	49.7	49.6	**49.7**
Averages ---->		**49.5**	**49.4**	**49.3**	**49.4**	**49.3**	**49.6**	**49.6**	**49.5**

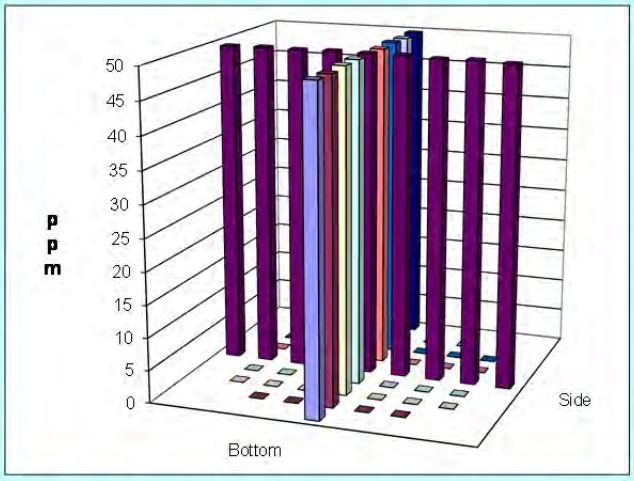
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	49.44		Mean	49.40	49.53	49.47
Min Point	49.10	-0.7%	Std. Dev.	0.11	0.14	0.14
Max Point	49.70	0.5%	COV as %	0.2	0.3	0.3

Avg. Conc. 49.43 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	1050	1050	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	104.8	106.7	°F
Mean stack velocity	3486	3483	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1050	1050	mbar
Ambient humidity	19%	17%	RH
Ambient Temp	92.3	98.6	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.5,0.5,0.5, 0.5,0.5	0.8, 0.5, 0.5, 0.5, 0.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

ss 8-21-13

Entries made by:	Carolyn Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/21/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-37
Date	8/22/2013	Fan Configuration	AB MIN
Testers	SFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	72.5 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0710 / 0819
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Center

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	51.1	51.0	50.7	**50.9**	50.6	50.6	50.6	**50.6**
2	1.25	51.2	50.8	50.8	**50.9**	50.6	50.6	50.3	**50.5**
3	2.31	50.9	50.6	50.6	**50.7**	50.7	50.4	50.5	**50.5**
4	3.85	51.5	51.2	51.1	**51.3**	50.6	50.0	50.6	**50.4**
Center	5.96	50.9	51.0	50.8	**50.9**	50.6	50.5	50.2	**50.4**
5	8.07	51.5	51.0	50.8	**51.1**	50.6	50.1	50.3	**50.3**
6	9.61	51.3	51.3	50.5	**51.0**	50.4	50.6	50.4	**50.5**
7	10.67	51.2	51.0	50.5	**50.9**	50.7	50.7	50.4	**50.6**
8	11.42	51.0	50.9	50.7	**50.9**	50.6	50.3	50.4	**50.4**
Averages ---->		**51.2**	**51.0**	**50.7**	**51.0**	**50.6**	**50.4**	**50.4**	**50.5**

All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	50.72		Mean	50.98	50.47	50.72
Min Point	50.33	-0.8%	Std. Dev.	0.18	0.09	0.30
Max Point	51.27	1.1%	COV as %	0.4	0.2	0.6

Avg. Conc. 50.73 ppm

Instruments Used:

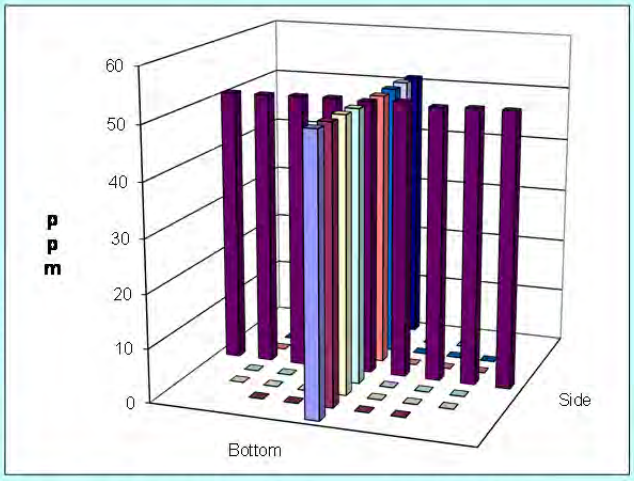
B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	725	725	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	69.1	75.8	°F
Mean stack velocity	1532	1531	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1046	1046	mbar
Ambient humidity	50%	41%	RH
Ambient Temp	68.0	72.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.5,.5,.5,.5	.8,..6,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n

Gas analyzer checked: 8/21/2013

Notes:

ss 8-22-13



Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/22/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-38
Date	8/22/2013	Fan Configuration	AB MIN
Testers	SFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	82.3 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0825 / 0935
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Near

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	50.2	49.8	49.7	**49.9**	49.4	50.1	49.7	**49.7**
2	1.25	49.9	49.9	49.5	**49.8**	49.7	50.1	50.3	**50.0**
3	2.31	49.3	49.4	50.0	**49.6**	50.0	50.5	50.6	**50.4**
4	3.85	49.9	49.7	49.3	**49.6**	50.2	50.3	50.3	**50.3**
Center	5.96	49.7	49.7	49.2	**49.5**	50.2	50.4	50.0	**50.2**
5	8.07	49.9	49.8	49.2	**49.6**	50.0	50.1	50.1	**50.1**
6	9.61	50.2	50.1	49.7	**50.0**	50.2	49.9	50.4	**50.2**
7	10.67	50.3	49.6	49.2	**49.7**	50.2	50.2	49.5	**50.0**
8	11.42	50.0	49.7	49.5	**49.7**	50.7	50.2	49.9	**50.3**
Averages ---->		**49.9**	**49.7**	**49.5**	**49.7**	**50.1**	**50.2**	**50.1**	**50.1**

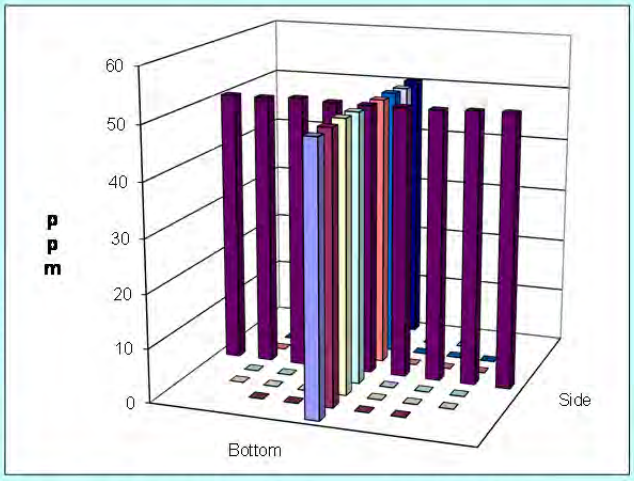
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	49.92		Mean	49.69	50.15	49.92
Min Point	49.53	-0.8%	Std. Dev.	0.16	0.14	0.28
Max Point	50.37	0.9%	COV as %	0.3	0.3	0.6

Avg. Conc. 49.93 ppm

Instruments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	820	825	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	75.8	88.7	°F
Mean stack velocity	1531	1551	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1046	1046	mbar
Ambient humidity	38%	29%	RH
Ambient Temp	74.3	82.4	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.5,.5,.5.4	.8,.5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

ss 8-22-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/22/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-39
Date	8/22/2013	Fan Configuration	AB MIN
Testers	SFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	91.2 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0950 / 1100
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Far

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	49.0	49.4	50.2	**49.5**	49.9	49.7	49.6	**49.7**
2	1.25	49.2	49.7	50.0	**49.6**	49.9	49.3	49.7	**49.6**
3	2.31	49.4	49.6	50.0	**49.7**	49.8	50.0	50.0	**49.9**
4	3.85	49.4	50.1	49.7	**49.7**	49.7	49.3	49.9	**49.6**
Center	5.96	49.9	50.1	49.8	**49.9**	49.6	49.8	49.7	**49.7**
5	8.07	49.8	49.6	49.7	**49.7**	49.4	49.4	49.6	**49.5**
6	9.61	50.1	50.5	49.5	**50.0**	49.9	49.5	49.9	**49.8**
7	10.67	49.9	50.2	49.7	**49.9**	49.9	49.6	49.9	**49.8**
8	11.42	49.8	49.8	49.7	**49.8**	49.8	49.6	49.5	**49.6**
Averages ---->		**49.6**	**49.9**	**49.8**	**49.8**	**49.8**	**49.6**	**49.8**	**49.7**

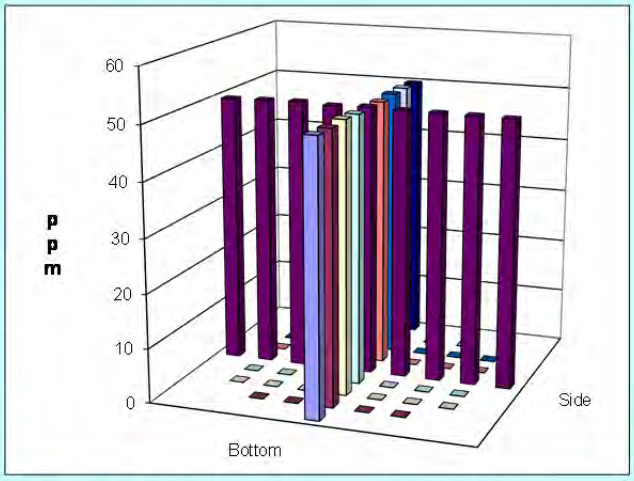
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	49.74		Mean	49.80	49.70	49.75
Min Point	49.47	-0.5%	Std. Dev.	0.16	0.15	0.16
Max Point	50.03	0.6%	COV as %	0.3	0.3	0.3

Avg. Conc. 49.73 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	900	925	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	88.7	93.6	°F
Mean stack velocity	1551	1474	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1046	1046	mbar
Ambient humidity	29%	20%	RH
Ambient Temp	81.5	88.7	°F
B&K vapor correction	Y	y	Y/N
Back-Gd gas	.4,.5,.4,.4,.4	.8,.5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

ss 8-22-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/22/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-40
Date	8/23/2013	Fan Configuration	AB MIN
Testers	YFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	72.0 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0630 / 0748
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Top

Order –>		2nd				1st			
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	51.7	51.4	50.9	**51.3**	52.1	51.3	51.6	**51.7**
2	1.25	50.9	51.6	50.8	**51.1**	51.7	51.6	52.0	**51.8**
3	2.31	51.8	51.0	50.8	**51.2**	52.1	51.8	51.3	**51.7**
4	3.85	51.3	51.3	50.9	**51.2**	51.5	52.3	52.1	**52.0**
Center	5.96	51.4	51.3	51.0	**51.2**	52.0	52.0	51.6	**51.9**
5	8.07	50.6	50.9	51.4	**51.0**	51.9	52.0	52.1	**52.0**
6	9.61	51.7	51.7	50.8	**51.4**	52.1	51.7	50.9	**51.6**
7	10.67	51.1	51.0	51.4	**51.2**	52.0	51.8	51.4	**51.7**
8	11.42	51.4	51.1	51.1	**51.2**	52.2	52.0	51.7	**52.0**
Averages ———>		**51.3**	**51.3**	**51.0**	**51.2**	**52.0**	**51.8**	**51.6**	**51.8**

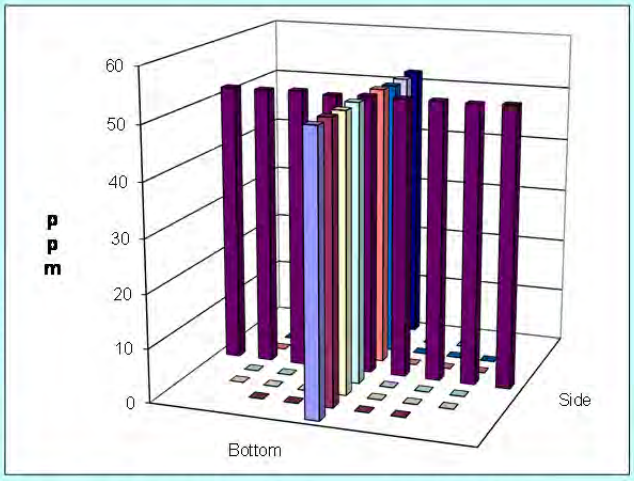
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	51.50		Mean	51.18	51.80	51.49
Min Point	50.97	-1.0%	Std. Dev.	0.13	0.15	0.35
Max Point	52.00	1.0%	COV as %	0.3	0.3	0.7

Avg. Conc. 51.50 ppm

Instuments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	750	750	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	70.2	73.7	°F
Mean stack velocity	1503	1522	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1042	1042	mbar
Ambient humidity	53%	44%	RH
Ambient Temp	68.9	73.4	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.5,.5,.5,.5	.9,.6,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

ss 8-23-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/22/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-41
Date	8/23/2013	Fan Configuration	AB MIN
Testers	YFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	76.1 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0750 / 0856
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Bottom

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	50.3	50.7	50.9	**50.6**	50.8	50.9	50.6	**50.8**
2	1.25	50.3	50.4	51.0	**50.6**	50.7	50.5	50.6	**50.6**
3	2.31	50.7	50.7	50.7	**50.7**	50.8	51.3	50.8	**51.0**
4	3.85	50.6	50.6	50.8	**50.7**	50.8	51.0	50.4	**50.7**
Center	5.96	50.4	50.9	50.9	**50.7**	50.8	50.7	51.0	**50.8**
5	8.07	50.3	50.5	50.0	**50.3**	50.6	50.6	50.7	**50.6**
6	9.61	50.4	50.8	51.1	**50.8**	51.2	50.2	50.6	**50.7**
7	10.67	50.6	50.6	51.2	**50.8**	51.3	50.4	51.0	**50.9**
8	11.42	50.5	50.9	50.5	**50.6**	50.4	51.0	51.3	**50.9**
Averages ---->		**50.5**	**50.7**	**50.8**	**50.6**	**50.8**	**50.7**	**50.8**	**50.8**

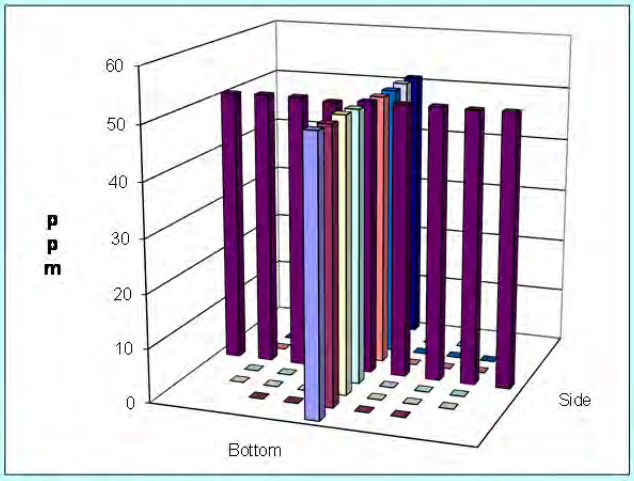
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	50.71		Mean	50.64	50.76	50.70
Min Point	50.27	-0.9%	Std. Dev.	0.18	0.14	0.17
Max Point	50.97	0.5%	COV as %	0.4	0.3	0.3

Avg. Conc. 50.70 ppm

	Start	Finish	
Tracer tank pressure	750	750	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	73.7	78.4	°F
Mean stack velocity	1522	1516	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1042	1042	mbar
Ambient humidity	44%	44%	RH
Ambient Temp	73.4	75.2	°F
B&K vapor correction	Y	y	Y/N
Back-Gd gas	.9,.6,.5,.5,.5	.8,.5,..5,.5,.5	ppm
No. Bk-Gd samples	5	5	n

Instruments Used:

B&K 1302 Gas Analyzer SN 1804888		Cat2 M&TE
TSI VelociCalc SN T95351203001		12/10/2013
Fisher Scientific SN 90936818		12/11/2013



Gas analyzer checked: 8/21/2013

Notes:

ss 8-23-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/23/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-42
Date	8/23/2013	Fan Configuration	AB MIN
Testers	YFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	82.0 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0905 / 1010
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Top

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	50.3	50.9	50.5	**50.6**	50.0	50.5	50.8	**50.4**
2	1.25	50.4	50.1	50.6	**50.4**	51.1	50.5	50.7	**50.8**
3	2.31	51.0	50.9	50.1	**50.7**	51.1	51.4	51.1	**51.2**
4	3.85	50.5	51.3	50.8	**50.9**	50.7	51.0	50.8	**50.8**
Center	5.96	50.6	50.5	50.7	**50.6**	50.5	51.0	51.1	**50.9**
5	8.07	51.2	50.8	51.1	**51.0**	51.1	50.9	50.9	**51.0**
6	9.61	51.1	50.7	49.6	**50.5**	51.1	51.2	50.8	**51.0**
7	10.67	50.8	50.8	50.8	**50.8**	51.2	50.8	50.5	**50.8**
8	11.42	50.9	50.7	50.5	**50.7**	51.2	50.8	50.9	**51.0**
Averages ---->		**50.8**	**50.7**	**50.5**	**50.7**	**50.9**	**50.9**	**50.8**	**50.9**

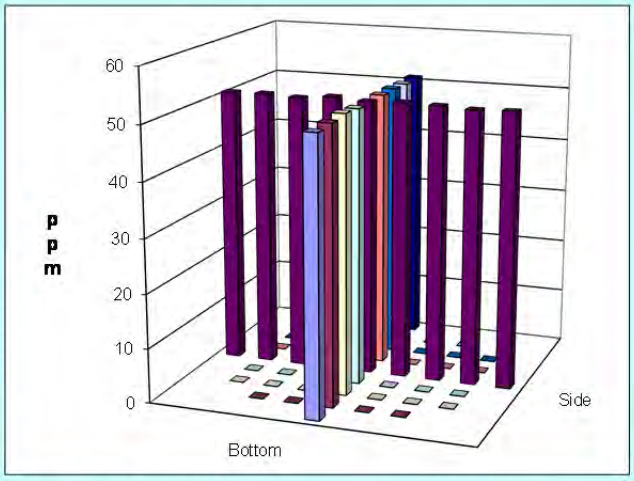
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	50.78		Mean	50.69	50.93	50.81
Min Point	50.37	-0.8%	Std. Dev.	0.23	0.15	0.23
Max Point	51.20	0.8%	COV as %	0.5	0.3	0.4

Avg. Conc. 50.78 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	750	750	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	78.4	85.5	°F
Mean stack velocity	1516	1498	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1042	1042	mbar
Ambient humidity	44%	36%	RH
Ambient Temp	75.2	80.6	°F
B&K vapor correction	y	y	Y/N
Back-Gd gas	.8,.5,..5,.5,.5	.9,.5,.5,.5,.	ppm
No. Bk-Gd samples	5		n



Gas analyzer checked: 8/21/2013

Notes:

ss 8-23-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/23/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-43
Date	8/23/2013	Fan Configuration	AB MIN
Testers	YFS, SS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	87.5 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1015 / 1121
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Top

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	49.9	50.0	50.5	**50.1**	51.1	51.1	50.9	**51.0**
2	1.25	50.3	50.7	50.2	**50.4**	50.4	50.5	49.9	**50.3**
3	2.31	50.3	50.6	51.1	**50.7**	50.9	50.7	50.6	**50.7**
4	3.85	50.4	50.6	50.2	**50.4**	50.8	50.1	50.7	**50.5**
Center	5.96	50.5	50.5	50.7	**50.6**	50.6	50.7	50.6	**50.6**
5	8.07	50.7	50.8	50.7	**50.7**	50.4	50.3	50.1	**50.3**
6	9.61	50.7	50.5	50.7	**50.6**	50.4	50.4	50.7	**50.5**
7	10.67	50.3	50.7	50.7	**50.6**	50.3	51.2	50.5	**50.7**
8	11.42	50.9	50.3	50.7	**50.6**	50.8	50.2	50.7	**50.6**
Averages ---->		**50.4**	**50.5**	**50.6**	**50.5**	**50.6**	**50.6**	**50.5**	**50.6**

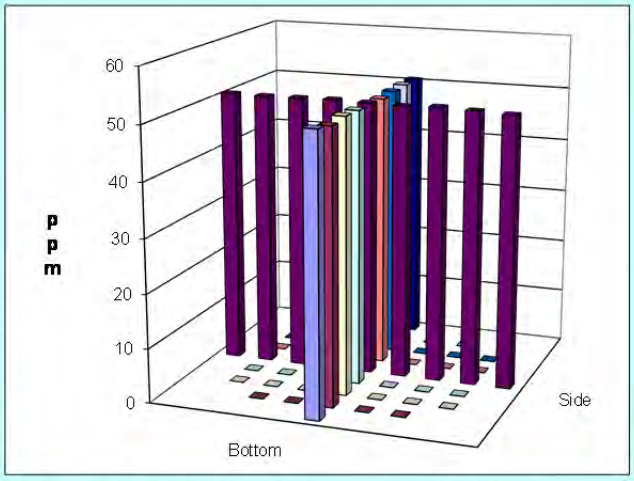
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	50.55		Mean	50.57	50.51	50.54
Min Point	50.13	-0.8%	Std. Dev.	0.13	0.19	0.16
Max Point	51.03	1.0%	COV as %	0.3	0.4	0.3

Avg. Conc. 50.55 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	750	900	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	85.5	89.5	°F
Mean stack velocity	1498	1492	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1042	1042	mbar
Ambient humidity	35%	30%	RH
Ambient Temp	81.5	84.2	°F
B&K vapor correction	y	y	Y/N
Back-Gd gas	.9,.5,.5,.5,.5	.8,.5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

ss 8-23-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/23/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-44
Date	8/23/2013	Fan Configuration	ab min
Testers	th, ea, bf	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	102.4 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	1:15:00 PM / 14:25
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 top

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	53.7	52.5	52.2	**52.8**	51.8	51.6	50.5	**51.3**
2	1.25	53.8	52.7	52.2	**52.9**	51.0	51.3	51.6	**51.3**
3	2.31	53.8	52.6	52.1	**52.8**	51.2	51.2	51.1	**51.2**
4	3.85	53.3	52.7	52.4	**52.8**	51.8	51.3	50.9	**51.3**
Center	5.96	52.9	52.5	52.2	**52.5**	51.2	51.2	50.7	**51.0**
5	8.07	53.4	52.8	52.4	**52.9**	51.4	51.0	51.2	**51.2**
6	9.61	53.7	52.4	52.2	**52.8**	51.2	51.3	50.9	**51.1**
7	10.67	52.9	51.9	51.8	**52.2**	51.3	51.2	50.8	**51.1**
8	11.42	53.1	51.8	52.0	**52.3**	50.8	51.5	50.3	**50.9**
Averages ---->		**53.4**	**52.4**	**52.2**	**52.7**	**51.3**	**51.3**	**50.9**	**51.2**

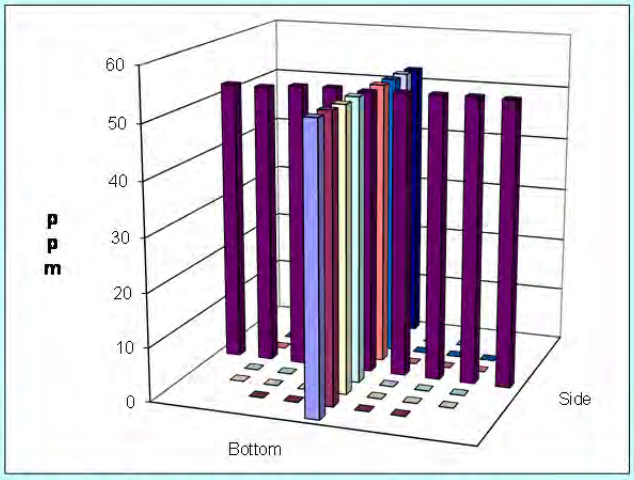
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	51.91		Mean	52.70	51.18	51.94
Min Point	50.87	-2.0%	Std. Dev.	0.25	0.11	0.81
Max Point	52.90	1.9%	COV as %	0.5	0.2	1.6

Avg. Conc. 51.93 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	1000	1000	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	102.2	102.6	°F
Mean stack velocity	1359	1388	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1042	1042	mbar
Ambient humidity	24%	22%	RH
Ambient Temp	90.5	92.3	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.5,.5,.5,.5	.5,.5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

Entries made by:	Tristan Hay	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/23/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-45
Date	8/23/2013	Fan Configuration	ab min
Testers	th, ea, bf	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	102.1 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	14:25/15:30
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 top

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	51.1	50.7	50.7	**50.8**	50.3	50.5	50.6	**50.5**
2	1.25	50.5	50.6	50.8	**50.6**	50.4	50.8	50.6	**50.6**
3	2.31	50.6	50.8	51.1	**50.8**	50.7	50.4	50.7	**50.6**
4	3.85	50.5	50.7	51.3	**50.8**	50.7	50.4	50.8	**50.6**
Center	5.96	50.6	50.9	51.4	**51.0**	50.6	50.8	50.8	**50.7**
5	8.07	50.7	51.0	50.6	**50.8**	50.6	50.9	50.9	**50.8**
6	9.61	51.0	51.1	50.7	**50.9**	50.8	50.8	50.7	**50.8**
7	10.67	49.8	50.9	50.6	**50.4**	49.9	51.1	50.5	**50.5**
8	11.42	50.7	51.2	50.9	**50.9**	50.2	51.3	51.0	**50.8**
Averages ---->		**50.6**	**50.9**	**50.9**	**50.8**	**50.5**	**50.8**	**50.7**	**50.7**

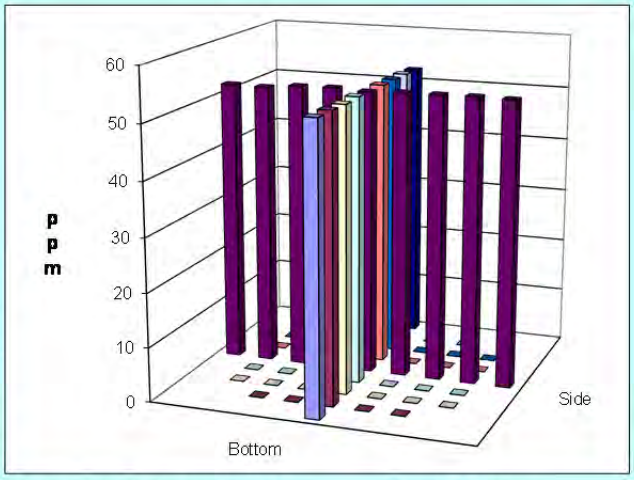
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	50.73		Mean	50.77	50.66	50.72
Min Point	50.43	-0.6%	Std. Dev.	0.19	0.11	0.16
Max Point	50.97	0.5%	COV as %	0.4	0.2	0.3

Avg. Conc. 50.71 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	1000	1000	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	102.6	101.5	°F
Mean stack velocity	1388	1356	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1042	1042	mbar
Ambient humidity	22%	20%	RH
Ambient Temp	92.3	95.0	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.5,.5,.5,.5	.5,.5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

TH 8/23/2013

Entries made by:	Tristan Hay	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/23/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-46
Date	8/26/2013	Fan Configuration	AB NORM
Testers	yfs, ss	Fan Setting	55 Hz
Stack Dia.	11.922 in.	Stack Temp	69.3 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0650 / 0810
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 top

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	27.3	27.6	27.4	**27.4**	28.1	28.0	27.7	**27.9**
2	1.25	27.5	27.3	27.2	**27.3**	27.9	28.1	27.8	**27.9**
3	2.31	27.5	27.2	27.4	**27.4**	28.4	28.0	27.6	**28.0**
4	3.85	27.5	27.3	27.4	**27.4**	28.2	27.9	27.7	**27.9**
Center	5.96	27.4	27.4	27.3	**27.4**	28.2	28.1	27.7	**28.0**
5	8.07	27.5	27.4	27.5	**27.5**	28.2	27.7	27.9	**27.9**
6	9.61	27.4	27.3	27.3	**27.3**	27.9	27.9	27.6	**27.8**
7	10.67	27.3	27.3	27.4	**27.3**	28.1	27.8	27.5	**27.8**
8	11.42	27.5	27.2	27.4	**27.4**	28.2	27.8	27.5	**27.8**
Averages ---->		**27.4**	**27.3**	**27.4**	**27.4**	**28.1**	**27.9**	**27.7**	**27.9**

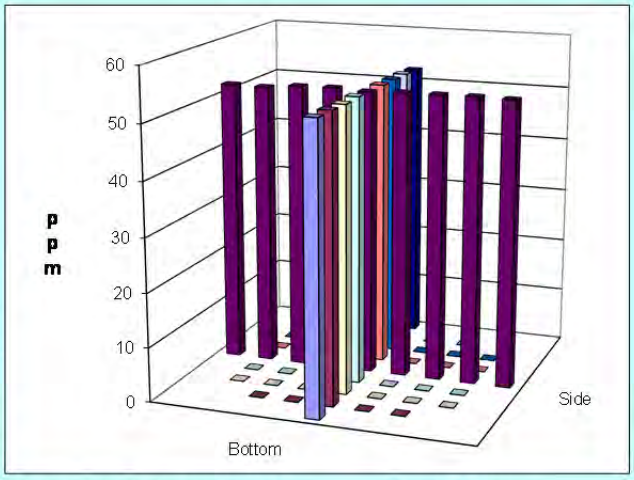
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	27.64		Mean	27.37	27.91	27.64
Min Point	27.33	-1.1%	Std. Dev.	0.05	0.08	0.29
Max Point	28.00	1.3%	COV as %	0.2	0.3	1.0

Avg. Conc. 27.64 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	700	725	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	65.1	73.4	°F
Mean stack velocity	2867	2877	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1043	1045	mbar
Ambient humidity	79%	60%	RH
Ambient Temp	61.7	68.9	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.6,.6,.6,.6,.6	.6, .5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

ss 8-26-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/26/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-47
Date	8/26/2013	Fan Configuration	AB NORM
Testers	yfs, ss	Fan Setting	55 Hz
Stack Dia.	11.922 in.	Stack Temp	73.6 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0812 / 0910
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 TOP

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	27.0	27.1	26.9	**27.0**	27.2	26.9	27.0	**27.0**
2	1.25	26.6	27.1	26.7	**26.8**	27.0	26.9	26.9	**26.9**
3	2.31	26.9	27.0	27.2	**27.0**	26.8	27.1	26.9	**26.9**
4	3.85	26.9	27.0	27.2	**27.0**	26.9	27.1	27.1	**27.0**
Center	5.96	26.9	27.0	26.9	**26.9**	26.9	26.9	27.1	**27.0**
5	8.07	27.0	26.9	27.1	**27.0**	27.0	26.8	27.0	**26.9**
6	9.61	27.0	27.2	27.1	**27.1**	27.1	27.0	26.9	**27.0**
7	10.67	26.9	26.8	27.0	**26.9**	27.1	26.9	27.1	**27.0**
8	11.42	26.9	27.0	27.0	**27.0**	26.9	27.1	26.9	**27.0**
Averages ---->		**26.9**	**27.0**	**27.0**	**27.0**	**27.0**	**27.0**	**27.0**	**27.0**

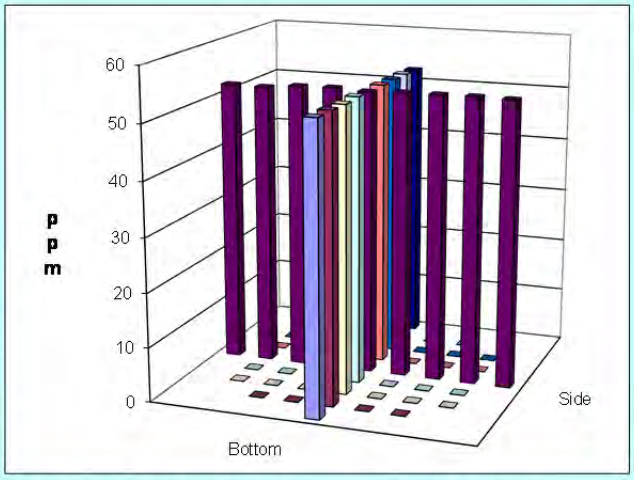
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	26.98		Mean	26.97	26.98	26.97
Min Point	26.80	-0.7%	Std. Dev.	0.10	0.05	0.08
Max Point	27.10	0.5%	COV as %	0.4	0.2	0.3

Avg. Conc. 26.98 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	725	725	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	73.4	73.7	°F
Mean stack velocity	2877	2967	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1045	1045	mbar
Ambient humidity	60%	50%	RH
Ambient Temp	68.9	71.6	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.6, .5,.5,.5,.5	.6,.5,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

ss 8-26-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/26/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-48
Date	8/26/2013	Fan Configuration	AB MIN
Testers	yfs, ss	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	78.8 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0925 / 1030
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 top

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	50.2	49.6	50.0	**49.9**	49.0	49.9	49.7	**49.5**
2	1.25	49.7	50.0	49.4	**49.7**	49.7	49.7	49.7	**49.7**
3	2.31	49.8	50.5	50.1	**50.1**	49.5	49.9	49.5	**49.6**
4	3.85	50.1	50.4	49.5	**50.0**	49.2	49.4	49.5	**49.4**
Center	5.96	49.5	50.3	50.3	**50.0**	49.5	49.7	49.2	**49.5**
5	8.07	49.3	50.3	49.6	**49.7**	49.4	50.0	49.8	**49.7**
6	9.61	50.0	49.8	49.5	**49.8**	50.3	49.8	49.4	**49.8**
7	10.67	49.5	49.9	49.9	**49.8**	49.9	49.5	49.5	**49.6**
8	11.42	49.8	50.1	49.4	**49.8**	49.8	50.0	49.6	**49.8**
Averages ---->		**49.8**	**50.1**	**49.7**	**49.9**	**49.6**	**49.8**	**49.5**	**49.6**

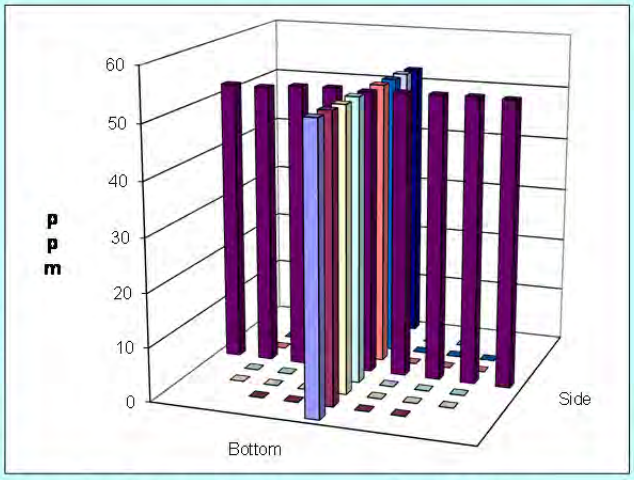
All	ppm	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	49.75		Mean	49.88	49.62	49.75
Min Point	49.37	-0.8%	Std. Dev.	0.17	0.16	0.21
Max Point	50.13	0.8%	COV as %	0.3	0.3	0.4

Avg. Conc. 49.75 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	750	800	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	76.1	81.4	°F
Mean stack velocity	1499	1565	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1045	1045	mbar
Ambient humidity	49%	40%	RH
Ambient Temp	74.3	77.0	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.5,.4,.4,.4,.4	.8,.6,.5,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes: Replaces GT-40.

ss 8-26-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/26/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-49
Date	8/26/2013	Fan Configuration	AB Max
Testers	EA, cb	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	91.8 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	14:00/15:05
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 top

Order -->		2nd				1st			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	55.8	55.7	55.1	**55.5**	57.0	56.6	56.1	**56.6**
2	1.25	55.6	55.7	55.1	**55.5**	56.5	56.8	56.4	**56.6**
3	2.31	55.9	55.0	55.1	**55.3**	56.9	57.0	56.0	**56.6**
4	3.85	55.1	54.9	55.0	**55.0**	56.6	57.2	56.1	**56.6**
Center	5.96	55.5	55.1	55.1	**55.2**	56.9	56.9	56.2	**56.7**
5	8.07	55.7	55.1	54.9	**55.2**	57.4	56.7	55.8	**56.6**
6	9.61	55.3	55.4	55.4	**55.4**	57.1	56.5	56.0	**56.5**
7	10.67	55.6	55.5	54.9	**55.3**	57.1	56.8	55.5	**56.5**
8	11.42	55.3	55.3	55.1	**55.2**	56.8	56.4	55.6	**56.3**
Averages ---->		**55.5**	**55.3**	**55.1**	**55.3**	**56.9**	**56.8**	**56.0**	**56.6**

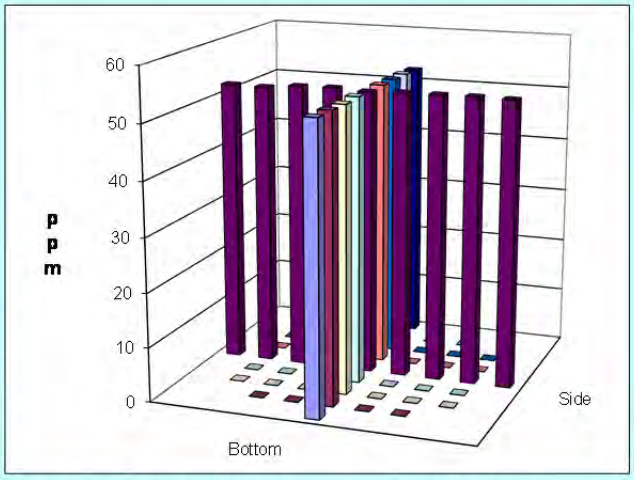
All	ppm	5.5 v. from mean	*Center 2/3*	Side	Bottom	All
Mean	55.93		Mean	55.28	56.59	55.94
Min Point	55.00	-1.7%	Std. Dev.	0.15	0.07	0.69
Max Point	56.67	1.3%	COV as %	0.3	0.1	1.2

Avg. Conc. 55.93 ppm

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	900	900	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	86.8	96.8	°F
Mean stack velocity	3016	3076	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1046	1046	mbar
Ambient humidity	26%	23%	RH
Ambient Temp	88.7	95.0	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.5,0.5,0.5,0.5,0.5	0.7,0.5,0.5,0.4,0.4	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes:

cb 8-26-13

Entries made by:	Carolyn Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/26/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-50
Date	8/26/2013	Fan Configuration	AB Max
Testers	EA, cb	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	97.6 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	15:10/16:10
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 top

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	53.7	54.6	54.7	**54.3**	54.8	54.4	54.7	**54.6**
2	1.25	53.6	54.5	54.6	**54.2**	54.7	54.5	55.0	**54.7**
3	2.31	54.0	54.7	54.6	**54.4**	55.1	54.5	54.7	**54.8**
4	3.85	54.5	54.7	54.7	**54.6**	55.1	54.7	54.8	**54.9**
Center	5.96	54.3	54.9	54.8	**54.7**	55.1	54.7	54.7	**54.8**
5	8.07	54.2	54.9	55.1	**54.7**	55.4	55.1	55.2	**55.2**
6	9.61	54.3	55.1	54.9	**54.8**	54.8	55.1	54.7	**54.9**
7	10.67	54.3	54.9	54.9	**54.7**	54.7	55.1	55.0	**54.9**
8	11.42	54.2	54.7	54.7	**54.5**	54.8	54.8	54.5	**54.7**
Averages ---->		**54.1**	**54.8**	**54.8**	**54.6**	**54.9**	**54.8**	**54.8**	**54.8**

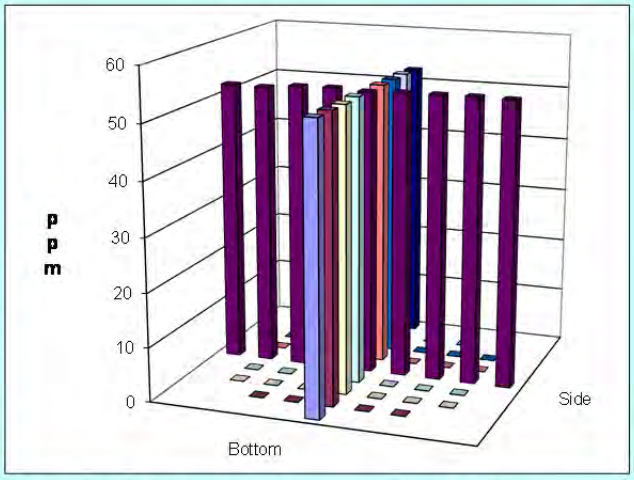
All	ppm	5.5 v. from mean	*Center 2/3*	Side	Bottom	All
Mean	54.70		Mean	54.60	54.89	54.74
Min Point	54.23	-0.9%	Std. Dev.	0.19	0.17	0.23
Max Point	55.23	1.0%	COV as %	0.4	0.3	0.4

Avg. Conc. 54.69 ppm

	Start	Finish	
Tracer tank pressure	900	900	psig
Injection flowmeter	3.6	3.6	slpm
Stack Temp	96.8	98.4	°F
Mean stack velocity	3076	2967	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1046	1047	mbar
Ambient humidity	21%	23%	RH
Ambient Temp	93.2	90.5	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	0.7,0.5,0.5,0.4,0.4	0.8,0.6,0.5,0.5,0.4	ppm
No. Bk-Gd samples	5	5	n

Instruments Used:

B&K 1302 Gas Analyzer	SN 1804888	Cat2 M&TE
TSI VelociCalc	SN T95351203001	12/10/2013
Fisher Scientific	SN 90936818	12/11/2013



Gas analyzer checked: 8/21/2013

Notes:

cb 8-26-13

Entries made by:	Carolyn Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/26/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

TRACER GAS TRAVERSE DATA FORM

Site	LV-S3	Run No.	GT-51
Date	8/27/2013	Fan Configuration	AB Min
Testers	EA, cb	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	66.1 deg F
Stack X-Area	111.6 in.^{2}	Start/End Time	0635 / 0740
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm N2O	Injection Point	I5 Bottom

Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	ppm				ppm			
1	0.50	52.4	52.3	52.0	**52.2**	51.8	51.2	51.0	**51.3**
2	1.25	52.3	52.2	52.0	**52.2**	51.5	51.3	51.0	**51.3**
3	2.31	52.4	52.1	52.1	**52.2**	51.5	51.5	50.8	**51.3**
4	3.85	51.9	52.2	51.9	**52.0**	51.1	51.2	51.1	**51.1**
Center	5.96	52.6	52.1	52.1	**52.3**	51.7	51.2	50.7	**51.2**
5	8.07	52.4	52.0	51.7	**52.0**	51.3	51.1	50.8	**51.1**
6	9.61	52.7	52.5	52.0	**52.4**	51.6	51.4	51.2	**51.4**
7	10.67	52.1	52.2	51.9	**52.1**	51.6	51.0	51.5	**51.4**
8	11.42	52.4	52.2	51.7	**52.1**	51.5	51.5	50.5	**51.2**
Averages ---->		**52.4**	**52.2**	**51.9**	**52.2**	**51.5**	**51.3**	**51.0**	**51.2**

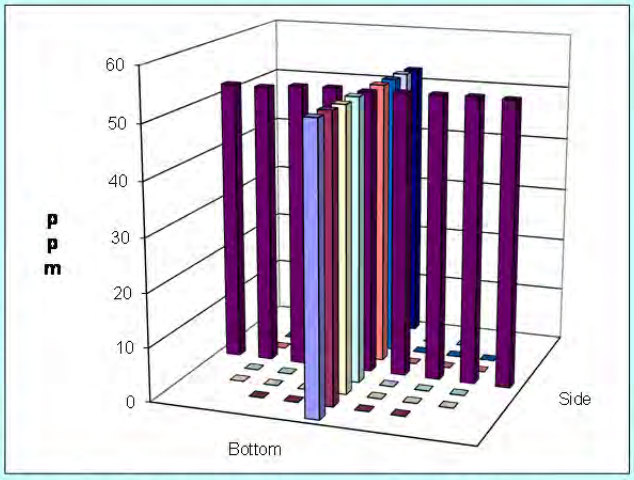
All	**ppm**	**5.5 v. from mean**	***Center 2/3***	**Side**	**Bottom**	**All**
Mean	51.70		Mean	52.16	51.24	51.70
Min Point	51.07	-1.2%	Std. Dev.	0.14	0.12	0.49
Max Point	52.40	1.3%	COV as %	0.3	0.2	1.0

Avg. Conc. 51.70 ppm

Instruments Used:

B&K 1302 Gas Analyzer SN 1804888	Cat2 M&TE
TSI VelociCalc SN T95351203001	12/10/2013
Fisher Scientific SN 90936818	12/11/2013

	Start	Finish	
Tracer tank pressure	675	700	psig
Injection flowmeter	1.6	1.6	slpm
Stack Temp	61.6	70.5	°F
Mean stack velocity	1485	1533	afpm
Sampling flowmeter	5	5	lpm
Ambient pressure	1045	1045	mbar
Ambient humidity	83%	51%	RH
Ambient Temp	59.9	69.8	°F
B&K vapor correction	Y	Y	Y/N
Back-Gd gas	.6,.6,.6,.6,.6	.9,.6,.6,.5,.5	ppm
No. Bk-Gd samples	5	5	n



Gas analyzer checked: 8/21/2013

Notes: Rerun of GT-41.

ss 8-27-13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/26/2013	Signature/date	1/27/2014
	Signature on file with original	Signature on file with original TI-WTPSP 122	

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	LV-S3	Instrument	B&K Model 1302
Date/Time	7/24/13 0600	Serial No.	1804888
Testers	EA, SS, SFS	Property No.	WD54623

Setup:	6.3	ft	B&K sample inlet tube length
	1012	mbar	station pressure
	70.7	deg F	ambient temp — analyzer corrects to 20 deg C
	38	percent	RH ambient humidity

Pre-Test background	**ppb N2O**	compensating for water vapor
625, 456, 435, 514, 486		

,

	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1400	psi	start P =	1300	psi
end P =	1400	psi	end P =	1300	psi

B&K Calibration Readings N2O (ppm)	**B&K Calibration Readings N2O (ppm)**
2.04	61.9
2.09	61.9
2.07	61.7
2.07	62.0
2.05	61.8
2.04	61.8
2.06	61.7
2.05	61.5
2.04	61.7
2.02	61.3
2.05 = avg	**61.73** = avg
1.03 = avg/standard	**1.04** = avg/standard

Standards Used:	Expiration date:
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/11/2013

NOTES:

SS 7/24/13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/24/2013	Signature/date	1/27/2013
	Signature on file with original	Signature on file with original TI-WTPSP-122	

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	LV-S3	Instrument	B&K Model 1302
Date/Time	7/29/13 0548	Serial No.	1804888
Testers	EA, SS	Property No.	WD54623

Setup:
- 6.3 ft — B&K sample inlet tube length
- 1009 mbar station pressure
- 68.9 deg F ambient temp — analyzer corrects to 20 deg C
- 37 percent RH ambient humidity

Pre-Test background **ppb N2O** compensating for water vapor

444, 394, 403, 373, 365, 384, 378

,

	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1400	psi	start P =	1225	psi
end P =	1400	psi	end P =	1225	psi

B&K Calibration Readings N2O (ppm)	B&K Calibration Readings N2O (ppm)
2.07	61.2
2.05	61.4
2.07	61.3
2.04	61.2
2.04	58.2
2.06	54.6
2.03	60.7
2.07	61.6
2.03	61.3
2.03	61.3
2.05 = avg	**60.28** = avg
1.03 = avg/standard	**1.01** = avg/standard

Standards Used:	Expiration date:
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/11/2013

NOTES: Rotameter ball fell below 110 during measurements of SV17805. Adjusted flow and continued with measurements.

SS 7/29/13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	7/29/2013	Signature/date	1/27/2013
	Signature on file with original	Signature on file with original TI-WTPSP-122	

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	LV-S3	Instrument	B&K Model 1302
Date/Time	8-14-13 1540h	Serial No.	1804888
Testers	EA, CB	Property No.	WD54623

Setup:
- 6.3 ft — B&K sample inlet tube length
- 1044 mbar station pressure
- 93.2 deg F ambient temp — analyzer corrects to 20 deg C
- 25 percent RH ambient humidity

Pre-Test background **ppb N2O** compensating for water vapor

308, 333, 300, 302, 309, 279

,

	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1900	psi	start P =	1300	psi
end P =	1900	psi	end P =	1250	psi

B&K Calibration Readings

N2O (ppm)	N2O (ppm)
1.91	57.7
1.95	57.8
1.93	57.7
1.91	57.6
1.92	57.8
1.91	57.4
1.90	57.5
1.91	57.4
1.91	57.5
1.93	57.4
1.92 = avg	**57.58** = avg
0.96 = avg/standard	**0.97** = avg/standard

Standards Used:	Expiration date:
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/11/2013

NOTES: AC in trailer was off when we arrived, End temperature =82.4 F and 29 % RH.

CB 8/14/13

Entries made by:	*Carolyne Burns*	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/14/2013	Signature/date	1/27/2013
	Signature on file with original	Signature on file with original TI-WTPSP-122	

SULFUR HEXAFLUORIDE AND NITROUS OXIDE GAS INSTRUMENT CALIBRATION

Site	LV-S3	Instrument	B&K Model 1302
Date/Time	8/21/2013 0610	Serial No.	1804888
Testers	SFS, SS	Property No.	WD54623

Setup:
- 6.3 ft — B&K sample inlet tube length
- 1049 mbar station pressure
- 61.7 deg F ambient temp — analyzer corrects to 20 deg C
- 55 percent RH ambient humidity

Pre-Test background **ppb N2O** compensating for water vapor

733, 679, 659, 631, 630

,

	1.99	ppm		59.6	ppm
N2O Cylinder	SV17699		N2O Cylinder	SV17805	
start P =	1300	psi	start P =	1150	psi
end P =	1300	psi	end P =	1150	psi

B&K Calibration Readings N2O (ppm)	B&K Calibration Readings N2O (ppm)
2.37	61.3
2.23	61.6
2.19	61.6
2.15	61.6
2.15	61.3
2.15	61.4
2.10	61.3
2.10	61.2
2.07	61.3
2.07	61.1
2.16 = avg	**61.37** = avg
1.08 = avg/standard	**1.03** = avg/standard

Standards Used:	Expiration date:
Air Liquide 1.99 ppm N2O in air, SV17699	6/1/2014
Air Liquide 59.6 ppm N2O in air, SV17805	6/1/2014
Weather Station Used:	
Fisher Scientific, S/N 90936818	12/11/2013

NOTES:

SS 8/21/13

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	8/21/2013	Signature/date	1/27/2013
	Signature on file with original	Signature on file with original TI-WTPSP-122	

D.5 LV-S3 Particle Tracer Uniformity Data Sheets

Rev. 0
3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-1
Date	7/30/2013	Fan configuration	BC MAX
Tester	EA, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	85.1 deg F
Stack X-Area	111.6 in.2	Start/End Time	0755 / 0941
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5

Order —>	2nd				1st			
Traverse-->	Side				Bottom			
Trial —>	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	particles/ft3				particles/ft3			
1 / 0.50	1039	813	904	**918.7**	682	721	813	**738.7**
2 / 1.25	1093	1059	1253	**1135.0**	970	1032	1082	**1028.0**
3 / 2.31	1265	1227	1450	**1314.0**	1267	1289	1342	**1299.3**
4 / 3.85	1261	1562	1652	**1491.7**	1526	1564	1662	**1584.0**
Center / 5.96	1554	1634	1756	**1648.0**	1674	1628	1790	**1697.3**
5 / 8.07	1224	1466	1543	**1411.0**	1514	1564	1645	**1574.3**
6 / 9.61	1073	1226	1414	**1237.7**	1252	1295	1369	**1305.3**
7 / 10.67	714	977	997	**896.0**	645	663	802	**703.3**
8 / 11.42	521	615	632	**589.3**	506	517	495	**506.0**
Averages ———>	**1082.7**	**1175.4**	**1289.0**	**1182.4**	**1115.1**	**1141.4**	**1222.2**	**1159.6**

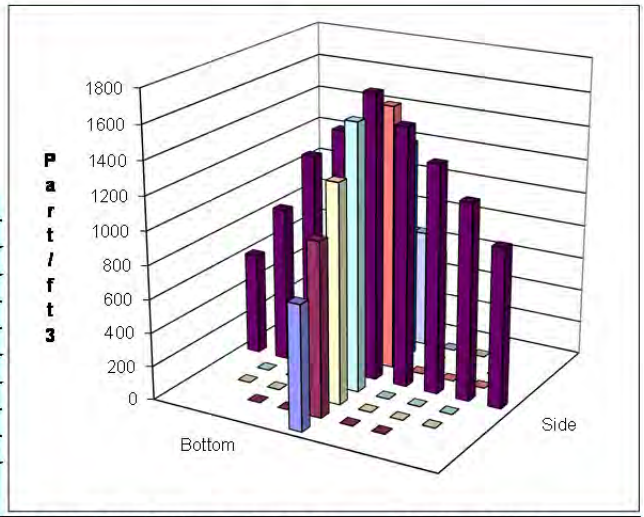
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1171.0		Mean	1304.8	1313.1	1308.9	1328.46
Min Point	506.0	-56.8%	Std. Dev.	246.5	351.8	291.9	295.17
Max Point	1697.3	44.9%	COV as %	18.9	26.8	22.3	22.22

Avg Conc 1108 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	3.2	3.2	psig
Stack Temp	79.5	90.7	F
Centerline vel.	3398	3536	afpm
Ambient pressure	29.88	29.88	inHg
Ambient humidity	42%	28%	RH
Ambient temp	71.6	85.1	F
Back-Gd aerosol	4, 3, 4, 5, 6	6, 4, 3, 3, 4	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	26	20	psig



Notes:

SS 7/30/13

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 7/30/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-2
Date	7/30/2013	Fan configuration	BC MAX
Tester	EA, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	96.75 deg F
Stack X-Area	111.6 in.2	Start/End Time	0955 / 1200
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5

Order —>	1st				2nd			
Traverse-->	Side				Bottom			
Trial —>	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	particles/ft3				particles/ft3			
1 / 0.50	1047	1098	1152	1099.0	1232	1159	1170	1187.0
2 / 1.25	1331	1428	1430	1396.3	1497	1439	1425	1453.7
3 / 2.00	1585	1584	1734	1634.3	1837	1770	1812	1806.3
4 / 3.85	1749	1942	2070	1920.3	2088	2105	2109	2100.7
Center / 5.96	2001	1965	2128	2031.3	2379	2355	2238	2324.0
5 / 8.07	1732	1830	1975	1845.7	2159	2091	2123	2124.3
6 / 9.61	1358	1507	1590	1485.0	1764	1731	1692	1729.0
7 / 10.67	1040	1162	1321	1174.3	924	977	989	963.3
8 / 11.42	566	850	1018	811.3	692	721	789	734.0
Averages ———>	1378.8	1485.1	1602.0	1488.6	1619.1	1594.2	1594.1	1602.5

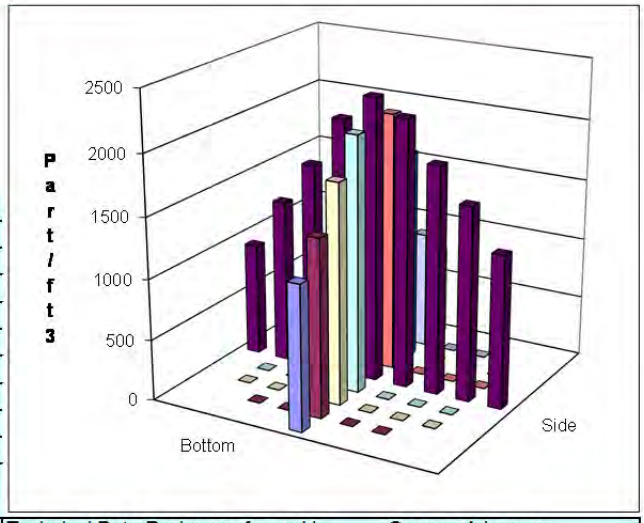
All	pt/ft3	Dev. from mean
Mean	1545.6	
Min Point	734.0	-52.5%
Max Point	2324.0	50.4%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1641.0	1785.9	1713.5	1831.69
Std. Dev.	309.4	464.4	386.5	399.51
COV as %	18.9	26.0	22.6	21.81

Avg Conc 1467 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	3.2	3.2	psig
Stack Temp	90.7	102.8	F
Centerline vel.	3536	3413	afpm
Ambient pressure	29.88	29.94	inHg
Ambient humidity	28%	20%	RH
Ambient temp	85.1	92.3	F
Back-Gd aerosol	8 11,13, 7, 3	2,9,3,5,2	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	42	20	psig



Notes: Distractions at QAVEPAD, redid side 3 because they seemed low.

SS 7/30/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 7/30/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-3
Date	7/30/2013	Fan configuration	BC MAX
Tester	cb, TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	104.05 deg F
Stack X-Area	111.6 in.2	Start/End Time	13:50/15:36
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	2nd		1st

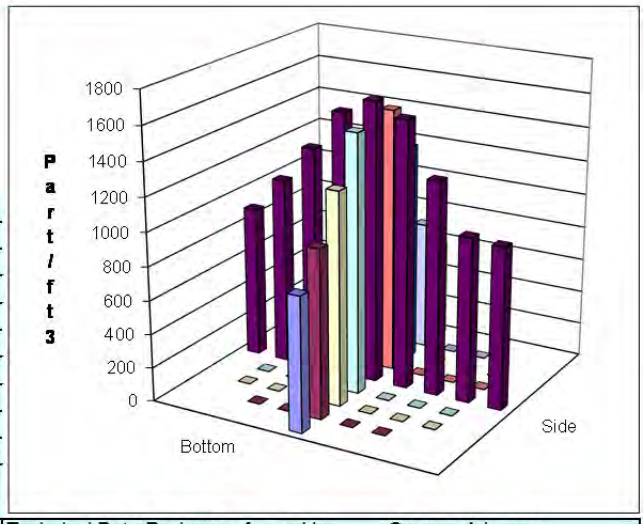
		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	712	826	763	767.0	754	817	811	794.0
2	1.25	610	797	936	781.0	1008	1004	966	992.7
3	2.00	945	986	1105	1012.0	1259	1239	1275	1257.7
4	3.85	1246	1207	1345	1266.0	1501	1548	1541	1530.0
Center	5.96	1316	1275	1385	1325.3	1637	1684	1649	1656.7
5	8.07	1221	1229	1307	1252.3	1594	1582	1497	1557.7
6	9.61	902	1135	1148	1061.7	1328	1266	1274	1289.3
7	10.67	769	940	946	885.0	806	747	734	762.3
8	11.42	526	730	902	719.3	596	553	583	577.3
Averages ———>		916.3	1013.9	1093.0	1007.7	1164.8	1160.0	1147.8	1157.5

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1082.6		Mean	1083.3	1292.3	1187.8	1323.25
Min Point	577.3	-46.7%	Std. Dev.	206.9	324.4	283.0	283.68
Max Point	1656.7	53.0%	COV as %	19.1	25.1	23.8	21.44

Avg Conc 1032 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.5	2.5	psig
Stack Temp	102.6	105.5	F
Centerline vel bottom C	4035	4002	afpm
Ambient pressure	29.97	29.97	inHg
Ambient humidity	20%	18%	RH
Ambient temp	95.9	94.1	F
Back-Gd aerosol	7, 4,3, 4, 1	10,1,5,4,1	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	16	24	psig



Notes:

At start 3643 afpm Bottom # 7 port # 2
Velocity was a little high at 60 Hz
cb 7/30/13
start velocity 4035/ end 4002 at center

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyne Burns
Signature/date 7/30/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Used 3643 afpm for velocity rather than average of Start and Finish velocity values, because they were measured at the center of the duct rather than at the 'sweet spot' that is more representative of the average velocity in duct.

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-4
Date	7/31/2013	Fan configuration	BC NORM
Tester	EA, SS, SFS	Fan Setting	55 Hz
Stack Dia.	11.922 in.	Stack Temp	72.05 deg F
Stack X-Area	111.6 in.2	Start/End Time	0600 /0755
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	2nd		1st

		Side				Bottom			
Traverse—>									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	513	673	765	650.3	643	586	598	609.0
2	1.25	698	986	928	870.7	777	809	817	801.0
3	2.00	1052	1186	1100	1112.7	971	1010	1035	1005.3
4	3.85	1249	1278	1282	1269.7	1152	1213	1322	1229.0
Center	5.96	1361	1330	1388	1359.7	1230	1375	1452	1352.3
5	8.07	1186	1218	1295	1233.0	1302	1197	1296	1265.0
6	9.61	977	1060	1069	1035.3	1056	981	1084	1040.3
7	10.67	670	835	855	786.7	662	579	719	653.3
8	11.42	499	566	469	511.3	482	447	542	490.3
Averages ———>		911.7	1014.7	1016.8	981.0	919.4	910.8	985.0	938.4

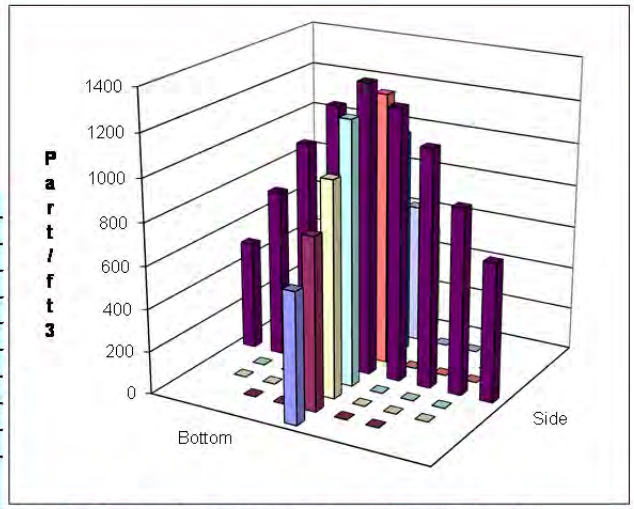
All	pt/ft3	Dev. from mean
Mean	959.7	
Min Point	490.3	-48.9%
Max Point	1359.7	41.7%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1095.4	1049.5	1072.4	1075.27
Std. Dev.	211.7	255.3	226.6	227.00
COV as %	19.3	24.3	21.1	21.11

Avg Conc 910 pt/ft3

	Start	Finish	
Generator Inlet Press	3.0	3.0	psig
Stack Temp	66.9	77.2	F
Centerline vel. center	3150	3116	afpm
Ambient pressure	29.97	29.97	inHg
Ambient humidity	50%	42%	RH
Ambient temp	65.3	73.4	F
Back-Gd aerosol	1,2,0,2,4	1,0,1,1,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	30	36	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes:

ss 7/31/2013

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 7/31/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-5
Date	7/31/2013	Fan configuration	BC MIN
Tester	EA, SS, SFS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	81.6 deg F
Stack X-Area	111.6 in.2	Start/End Time	0802 / 0952
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	1ST		2ND

Traverse—>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1096	1145	1159	1133.3	1150	1213	1256	1206.3
2	1.25	1213	1228	1226	1222.3	1240	1291	1347	1292.7
3	2.00	1282	1323	1190	1265.0	1360	1390	1407	1385.7
4	3.85	1412	1379	1378	1389.7	1446	1434	1597	1492.3
Center	5.96	1379	1400	1375	1384.7	1588	1577	1573	1579.3
5	8.07	1367	1479	1364	1403.3	1546	1461	1567	1524.7
6	9.61	1245	1215	1279	1246.3	1494	1493	1458	1481.7
7	10.67	1172	1210	1218	1200.0	1208	1204	1273	1228.3
8	11.42	1055	1089	1064	1069.3	978	1127	1193	1099.3
Averages ———>		1246.8	1274.2	1250.3	1257.1	1334.4	1354.4	1407.9	1365.6

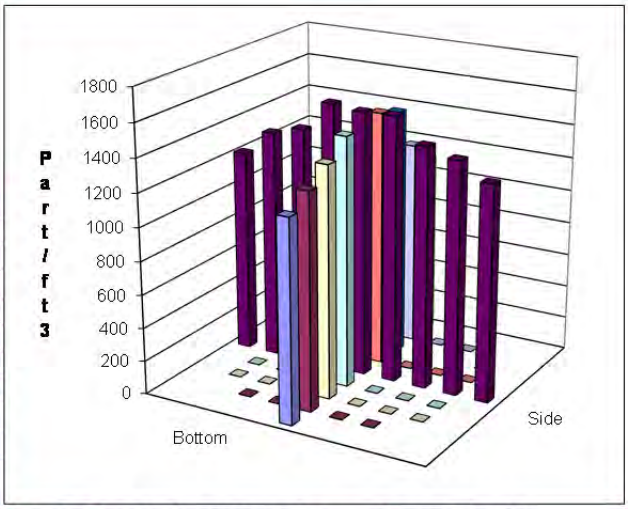
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1311.4		Mean	1301.6	1426.4	1364.0	1455.50
Min Point	1069.3	-18.5%	Std. Dev.	87.6	128.6	123.9	114.67
Max Point	1579.3	20.4%	COV as %	6.7	9.0	9.1	7.88

Avg Conc 1290 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.6	1.6	psig
Stack Temp	79.3	83.9	F
Centerline vel. center	1551	1689	afpm
Ambient pressure	30	30	inHg
Ambient humidity	36%	29%	RH
Ambient temp	77	84.2	F
Back-Gd aerosol	6, 1, 3, 5, 3	6,6,9,8,8	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	30	28	psig



Notes:

SS 7/31/2013

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 7/31/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-6
Date	7/31/2013	Fan configuration	BC
Tester	EA, SS, SFS	Fan Setting	40 Hz
Stack Dia.	11.922 in.	Stack Temp	90.4 deg F
Stack X-Area	111.6 in.2	Start/End Time	1050 / 1225
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	2nd		1st

		Side				Bottom			
Traverse—>									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1338	1175	1068	1193.7	1053	1125	1148	1108.7
2	1.25	1408	1327	1309	1348.0	1220	1315	1360	1298.3
3	2.00	1501	1403	1341	1415.0	1499	1475	1521	1498.3
4	3.85	1600	1478	1554	1544.0	1536	1666	1801	1667.7
Center	5.96	1726	1626	1665	1672.3	1675	1754	1916	1781.7
5	8.07	1753	1577	1510	1613.3	1650	1786	1829	1755.0
6	9.61	1458	1422	1286	1388.7	1496	1621	1557	1558.0
7	10.67	1209	1192	1218	1206.3	1161	1250	1233	1214.7
8	11.42	934	1141	982	1019.0	963	1058	1029	1016.7
Averages ———>		1436.3	1371.2	1325.9	1377.8	1361.4	1450.0	1488.2	1433.2

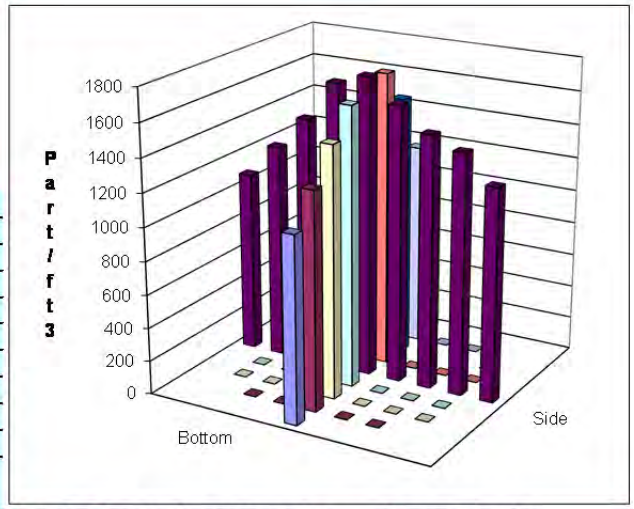
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1405.5		Mean	1455.4	1539.1	1497.2	1544.81
Min Point	1016.7	-27.7%	Std. Dev.	163.0	218.8	190.4	189.88
Max Point	1781.7	26.8%	COV as %	11.2	14.2	12.7	12.29

Avg Conc 1365 pt/ft3

	Start	Finish	
Generator Inlet Press	2.0	2.0	psig
Stack Temp	94.1	86.7	F
Centerline vel. center	2273	2305	afpm
Ambient pressure	30	30	inHg
Ambient humidity	27%	25%	RH
Ambient temp	88.7	88.7	F
Back-Gd aerosol	8,6,3,5,2	8,2,5,2,1	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	24	34	psig

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014



Notes: Targeted velocity of 2/3 actual stack max velocity.
~ 2361 fpm.

EA 7/31/2013

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 7/31/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-7
Date	8/1/2013	Fan configuration	BC
Tester	EA,SFS,SS	Fan Setting	40 Hz
Stack Dia.	11.922 in.	Stack Temp	66.5 deg F
Stack X-Area	111.6 in.2	Start/End Time	0620 / 0800
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	2nd		1st

		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1229	1138	1024	**1130.3**	1146	1303	1166	**1205.0**
2	1.25	1395	1276	1354	**1341.7**	1372	1401	1333	**1368.7**
3	2.31	1487	1408	1464	**1453.0**	1521	1564	1527	**1537.3**
4	3.85	1685	1614	1712	**1670.3**	1848	1831	1973	**1884.0**
Center	5.96	1700	1792	1730	**1740.7**	1854	1980	2042	**1958.7**
5	8.07	1697	1802	1676	**1725.0**	1881	1838	1852	**1857.0**
6	9.61	1480	1567	1603	**1550.0**	1622	1683	1653	**1652.7**
7	10.67	1417	1417	1399	**1411.0**	1469	1389	1437	**1431.7**
8	11.42	1247	1292	1175	**1238.0**	1339	1328	1303	**1323.3**
Averages ———>		**1481.9**	**1478.4**	**1459.7**	**1473.3**	**1561.3**	**1590.8**	**1587.3**	**1579.8**

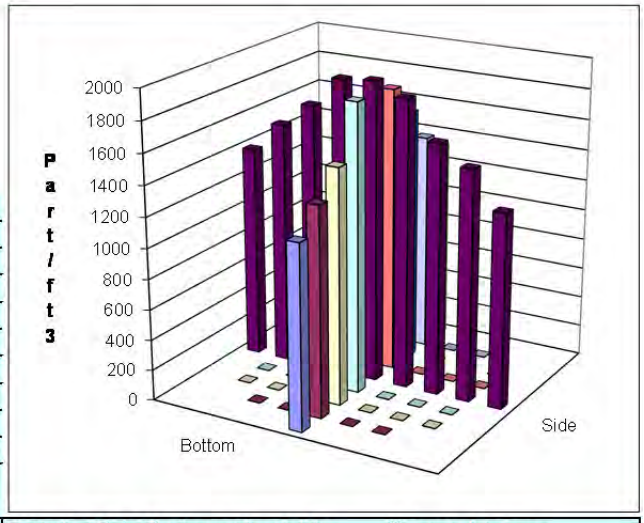
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1526.6		Mean	1556.0	1670.0	1613.0	1710.41
Min Point	1130.3	-26.0%	Std. Dev.	159.9	234.4	201.6	205.05
Max Point	1958.7	28.3%	COV as %	10.3	14.0	12.5	11.99

Avg Conc 1486 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	3.0	3.0	psig
Stack Temp	65.6	67.4	F
Centerline vel.	2103	2159	afpm
Ambient pressure	29.88	29.91	inHg
Ambient humidity	54%	68%	RH
Ambient temp	67.1	65.3	F
Back-Gd aerosol	3,2,15,8,5	6,2,2,4,2	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	30	30	psig



Notes:

SS 8-1-13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande

Signature/date 8/1/2013

Signature on file with original

Technical Data Review performed by: Carmen Arimescu

Signature/date 2/25/2014

Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-8
Date	8/1/2013	Fan configuration	BC
Tester	EA,SFS,SS	Fan Setting	40 Hz
Stack Dia.	11.922 in.	Stack Temp	69.75 deg F
Stack X-Area	111.6 in.2	Start/End Time	0804 /0945
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5

Order —>	1st				2nd			
Traverse-->	Side				Bottom			
Trial —>	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	particles/ft3				particles/ft3			
1 / 0.50	1297	1186	1274	1252.3	1172	1157	1182	1170.3
2 / 1.25	1375	1409	1373	1385.7	1360	1471	1451	1427.3
3 / 2.31	1521	1614	1502	1545.7	1638	1662	1686	1662.0
4 / 3.85	1738	1806	1752	1765.3	1852	1885	1931	1889.3
Center / 5.96	1835	1990	1880	1901.7	2035	2064	2064	2054.3
5 / 8.07	1602	1745	1920	1755.7	1901	1914	1957	1924.0
6 / 9.61	1595	1650	1490	1578.3	1794	1710	1779	1761.0
7 / 10.67	1367	1447	1396	1403.3	1460	1587	1508	1518.3
8 / 11.42	1148	1211	1196	1185.0	1293	1329	1318	1313.3
Averages ———>	1497.6	1562.0	1531.4	1530.3	1611.7	1642.1	1652.9	1635.6

All	pt/ft3	Dev. from mean
Mean	1582.9	
Min Point	1170.3	-26.1%
Max Point	2054.3	29.8%

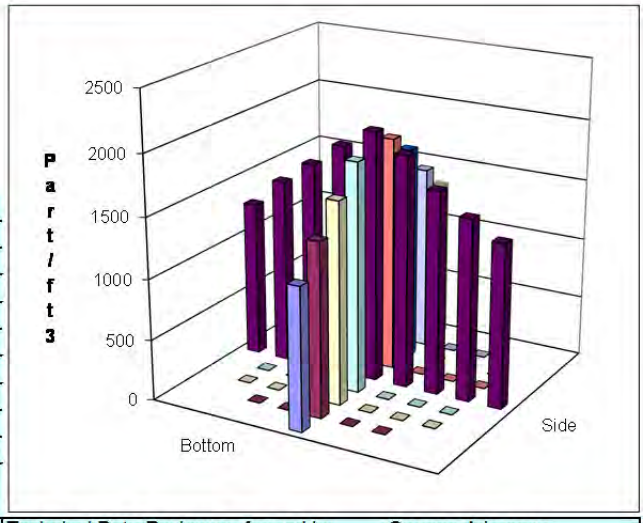
Center 2/3	Side	Bottom	All	Normlzd
Mean	1619.4	1748.0	1683.7	1748.72
Std. Dev.	194.9	226.5	213.7	210.13
COV as %	12.0	13.0	12.7	12.02

Avg Conc 1534 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	3	3	psig
Stack Temp	67.4	72.1	F
Centerline vel.	2159	2300	afpm
Ambient pressure	29.91	29.88	inHg
Ambient humidity	66%	51%	RH
Ambient temp	66.2	70.7	F
Back-Gd aerosol	0,1,3,2,1	6,4,3,2,5	pt/ft3
No. Blk-Gd samples	5	5	
Compressor output	31	30	psig



Notes:

SS 8/1/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande

Signature/date 8/1/2013

Signature on file with original

Technical Data Review performed by: Carmen Arimescu

Signature/date 2/25/2014

Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-9
Date	8/1/2013	Fan configuration	B&C
Tester	EA, SFS,SS	Fan Setting	40 Hz
Stack Dia.	11.922 in.	Stack Temp	76 deg F
Stack X-Area	111.6 in.2	Start/End Time	0950 / 1140
Test Port		Center 2/3 from	1.09 to: 10.83
Distance to disturbance	inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>			2nd 1st

Traverse-->		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1559	1513	1587	**1553.0**	1420	1479	1480	**1459.7**
2	1.25	1747	1692	1772	**1737.0**	1672	1661	1639	**1657.3**
3	2.31	1802	1876	2134	**1937.3**	1879	1899	1929	**1902.3**
4	3.85	2195	2148	2297	**2213.3**	2287	2120	2238	**2215.0**
Center	5.96	2428	2473	2236	**2379.0**	2376	2289	2526	**2397.0**
5	8.07	2269	2225	2302	**2265.3**	2171	2182	2318	**2223.7**
6	9.61	2061	1971	2042	**2024.7**	1865	1899	2063	**1942.3**
7	10.67	1578	1817	1859	**1751.3**	1755	1702	1736	**1731.0**
8	11.42	1520	1577	1391	**1496.0**	1438	1417	1419	**1424.7**
Averages ———>		**1906.6**	**1921.3**	**1957.8**	**1928.6**	**1873.7**	**1849.8**	**1927.6**	**1883.7**

All	pt/ft3	Dev. from mean
Mean	1906.1	
Min Point	1424.7	-25.3%
Max Point	2397.0	25.8%

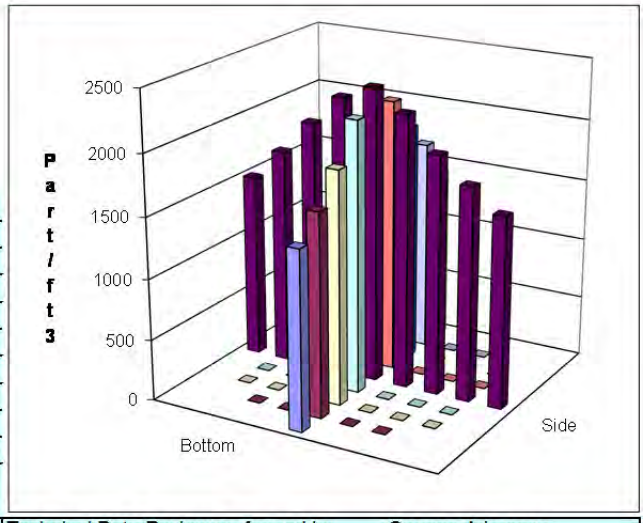
Center 2/3	Side	Bottom	All	Normlzd
Mean	2044.0	2009.8	2026.9	2034.64
Std. Dev.	252.2	275.6	254.4	255.97
COV as %	12.3	13.7	12.6	12.58

Avg Conc 1846 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	3.0	3.0	psig
Stack Temp	72.1	79.9	F
Centerline vel.	2300	2170	afpm
Ambient pressure	29.88	29.88	inHg
Ambient humidity	48%	35%	RH
Ambient temp	70.7	79.7	F
Back-Gd aerosol	4,2,0,0,3	3,1,3,2,5	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	30	36	psig



Notes:

SS 8-1-13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/1/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-10
Date	8/1/2013	Fan configuration	B MIN
Tester	cb, SFS,TH	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	89.15 deg F
Stack X-Area	111.6 in.2	Start/End Time	12:12/14:15
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

Order —>		1st				2nd			
Traverse-->		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1739	1687	1818	**1748.0**	1995	2049	2016	**2020.0**
2	1.25	1859	1793	1808	**1820.0**	2134	2101	2131	**2122.0**
3	2.31	1807	1859	1923	**1863.0**	2213	2212	2182	**2202.3**
4	3.85	1904	1926	1875	**1901.7**	2259	2125	2356	**2246.7**
Center	5.96	1980	1935	1945	**1953.3**	2225	2309	2288	**2274.0**
5	8.07	1897	1798	1844	**1846.3**	2213	2169	2344	**2242.0**
6	9.61	1789	1757	1886	**1810.7**	2166	2161	2255	**2194.0**
7	10.67	1768	1648	1727	**1714.3**	1984	1993	1981	**1986.0**
8	11.42	1609	1671	1771	**1683.7**	1932	1869	1958	**1919.7**
Averages ———>		**1816.9**	**1786.0**	**1844.1**	**1815.7**	**2124.6**	**2109.8**	**2167.9**	**2134.1**

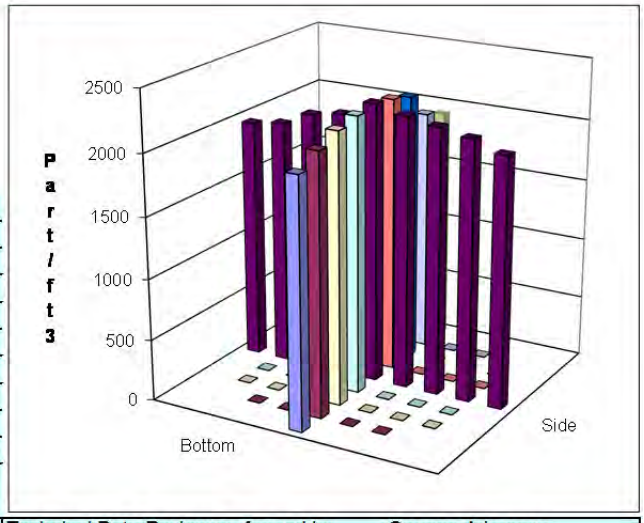
All	pt/ft3	Dev. from mean
Mean	1974.9	
Min Point	1683.7	-14.7%
Max Point	2274.0	15.1%

Center 2/3	Side	Bottom	All	Normlzd
Mean	1844.2	2181.0	2012.6	2163.97
Std. Dev.	75.4	99.0	194.1	91.63
COV as %	4.1	4.5	9.6	4.23

Avg Conc 1958 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	962558675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.3	1.3	psig
Stack Temp	86.1	92.2	F
Centerline vel.	922	920	afpm
Ambient pressure	29.88	29.88	inHg
Ambient humidity	33%	29%	RH
Ambient temp	83.3	87.8	F
Back-Gd aerosol	3,6,4,5,1	9, 5,4,3,4	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	28	30	psig



Notes:

CB 08/01/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyne Burns
Signature/date 8/1/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-11
Date	8/2/2013	Fan configuration	C MIN
Tester	SS,SFS	Fan Setting	30 Hz
Stack Dia.	11.922 in.	Stack Temp	66.3 deg F
Stack X-Area	111.6 in.2	Start/End Time	0620 / 0830
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

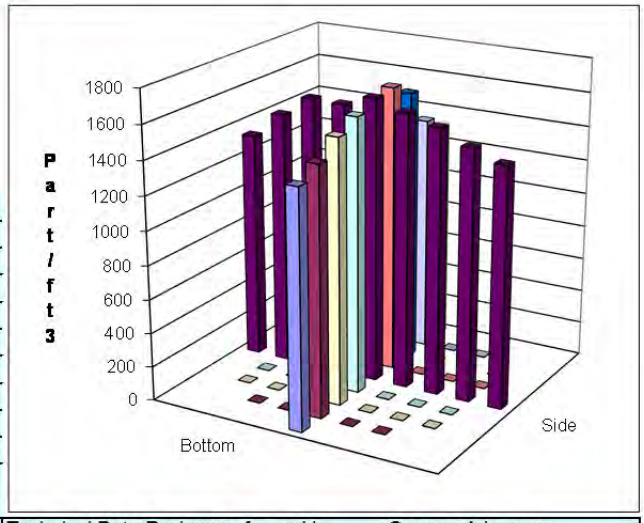
Order —>	2nd				1st			
Traverse-->	Side				Bottom			
Trial —>	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	particles/ft3				particles/ft3			
1 / 0.50	1220	1327	1337	**1294.7**	1445	1336	1387	**1389.3**
2 / 1.25	1381	1353	1325	**1353.0**	1446	1492	1431	**1456.3**
3 / 2.31	1388	1444	1450	**1427.3**	1622	1485	1544	**1550.3**
4 / 3.85	1528	1373	1530	**1477.0**	1598	1634	1606	**1612.7**
Center / 5.96	1451	1540	1594	**1528.3**	1650	1689	1660	**1666.3**
5 / 8.07	1367	1516	1528	**1470.3**	1750	1620	1673	**1681.0**
6 / 9.61	1408	1512	1508	**1476.0**	1620	1621	1563	**1601.3**
7 / 10.67	1321	1338	1436	**1365.0**	1380	1410	1381	**1390.3**
8 / 11.42	1147	1239	1290	**1225.3**	1278	1368	1287	**1311.0**
Averages ———>	**1356.8**	**1404.7**	**1444.2**	**1401.9**	**1532.1**	**1517.2**	**1503.6**	**1517.6**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1459.8		Mean	1442.4	1565.5	1504.0	1569.07
Min Point	1225.3	-16.1%	Std. Dev.	64.2	107.9	106.5	87.44
Max Point	1681.0	15.2%	COV as %	4.4	6.9	7.1	5.57

Avg Conc 1443 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.75	1.75	psig
Stack Temp	64.8	67.8	F
Centerline vel.	1202	1202	afpm
Ambient pressure	29.85	29.91	inHg
Ambient humidity	54%	51%	RH
Ambient temp	64.4	67.1	F
Back-Gd aerosol	3,11,4,6,1	2,3,3,2,3	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	30	34	psig



Notes:

SS 8/2/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by:	Susan Sande
Signature/date	8/2/2013
	Signature on file with original

Technical Data Review performed by:	Carmen Arimescu
Signature/date	2/25/2014
	Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-12
Date	8/2/2013	Fan configuration	AC MAX
Tester	SS,SFS,EA	Fan Setting	40 Hz
Stack Dia.	11.922 in.	Stack Temp	76.15 deg F
Stack X-Area	111.6 in.2	Start/End Time	0920 / 1114
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

Order ——>	1st				2nd			
Traverse-->	Side				Bottom			
Trial ——>	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	particles/ft3				particles/ft3			
1 / 0.50	1247	1098	1102	**1149.0**	1204	1224	1267	**1231.7**
2 / 1.25	1487	1394	1503	**1461.3**	1407	1451	1532	**1463.3**
3 / 2.31	1538	1578	1580	**1565.3**	1528	1733	1738	**1666.3**
4 / 3.85	1690	1609	1631	**1643.3**	1885	1935	1913	**1911.0**
Center / 5.96	1770	1740	1785	**1765.0**	1994	1981	2068	**2014.3**
5 / 8.07	1694	1726	1665	**1695.0**	1994	1988	2060	**2014.0**
6 / 9.61	1409	1524	1524	**1485.7**	1777	1851	1850	**1826.0**
7 / 10.67	1405	1363	1270	**1346.0**	1402	1401	1346	**1383.0**
8 / 11.42	926	1024	1043	**997.7**	1151	1180	1132	**1154.3**
Averages ——>	**1462.9**	**1450.7**	**1455.9**	**1456.5**	**1593.6**	**1638.2**	**1656.2**	**1629.3**

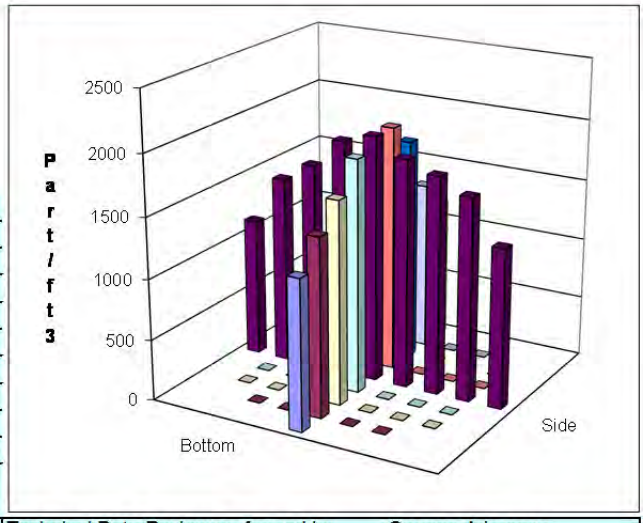
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1542.9		Mean	1566.0	1754.0	1660.0	1770.58
Min Point	997.7	-35.3%	Std. Dev.	146.1	256.6	223.1	208.59
Max Point	2014.3	30.6%	COV as %	9.3	14.6	13.4	11.78

Avg Conc 1500 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.5	2.5	psig
Stack Temp	73.2	79.1	F
Centerline vel.	2107	2144	afpm
Ambient pressure	29.91	29.94	inHg
Ambient humidity	40%	33%	RH
Ambient temp	74.3	79.7	F
Back-Gd aerosol	2,2,0,3,2	3,0,2,0,1	pt/ft3
No. Blk-Gd samples	5	5	
Compressor output	30	35	psig



Notes:

SS 8/2/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande

Signature/date 8/2/2013

Signature on file with original

Technical Data Review performed by: Carmen Arimescu

Signature/date 2/25/2014

Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-13
Date	8/2/2013	Fan configuration	A
Tester	TH, cb	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	76.8 deg F
Stack X-Area	111.6 in.2	Start/End Time	13:45/15:45
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

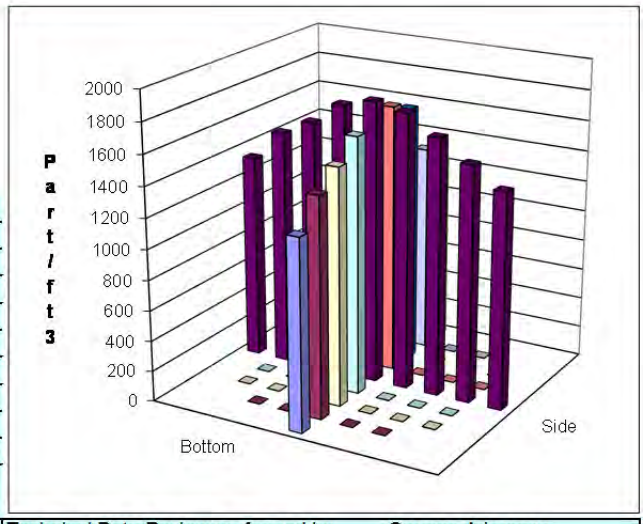
		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1266	1336	1417	**1339.7**	1293	1319	1124	**1245.3**
2	1.25	1396	1489	1507	**1464.0**	1488	1505	1308	**1433.7**
3	2.31	1601	1649	1522	**1590.7**	1566	1547	1524	**1545.7**
4	3.85	1705	1749	1670	**1708.0**	1722	1715	1590	**1675.7**
Center	5.96	1741	1806	1689	**1745.3**	1897	1894	1722	**1837.7**
5	8.07	1630	1715	1743	**1696.0**	1745	1836	1675	**1752.0**
6	9.61	1541	1518	1619	**1559.3**	1765	1736	1552	**1684.3**
7	10.67	1434	1442	1515	**1463.7**	1382	1430	1267	**1359.7**
8	11.42	1229	1368	1229	**1275.3**	1253	1275	1185	**1237.7**
Averages ———>		**1504.8**	**1563.6**	**1545.7**	**1538.0**	**1567.9**	**1584.1**	**1438.6**	**1530.2**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1534.1		Mean	1603.9	1612.7	1608.3	1650.69
Min Point	1237.7	-19.3%	Std. Dev.	116.0	173.1	141.6	149.21
Max Point	1837.7	19.8%	COV as %	7.2	10.7	8.8	9.04

Avg Conc 1502 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.0	2.0	psig
Stack Temp	80.9	72.7	F
Centerline vel side #7	1883	1862	afpm
Ambient pressure	29.94	29.97	inHg
Ambient humidity	34%	41%	RH
Ambient temp	77.0	77.9	F
Back-Gd aerosol	9,12,6,7,5	5,2,3,3,1	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	30	34	psig



Notes:

cb 8/2/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyne Burns
Signature/date 8/2/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-14
Date	8/5/2013	Fan configuration	A&C MIN
Tester	A,SS,YFS	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	78.9 deg F
Stack X-Area	111.6 in.2	Start/End Time	0620 /0820
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1452	1533	1490	**1491.7**	1378	1484	1440	**1434.0**
2	1.25	1506	1663	1712	**1627.0**	1463	1530	1604	**1532.3**
3	2.31	1571	1723	1836	**1710.0**	1636	1698	1720	**1684.7**
4	3.85	1771	1805	1777	**1784.3**	1795	1904	1858	**1852.3**
Center	5.96	1688	1832	2036	**1852.0**	1737	1875	1911	**1841.0**
5	8.07	1810	1883	1912	**1868.3**	1774	1833	1820	**1809.0**
6	9.61	1636	1746	1810	**1730.7**	1667	1739	1803	**1736.3**
7	10.67	1619	1713	1771	**1701.0**	1434	1507	1537	**1492.7**
8	11.42	1462	1571	1655	**1562.7**	1395	1382	1418	**1398.3**
Averages ———>		**1612.8**	**1718.8**	**1777.7**	**1703.1**	**1586.6**	**1661.3**	**1679.0**	**1642.3**

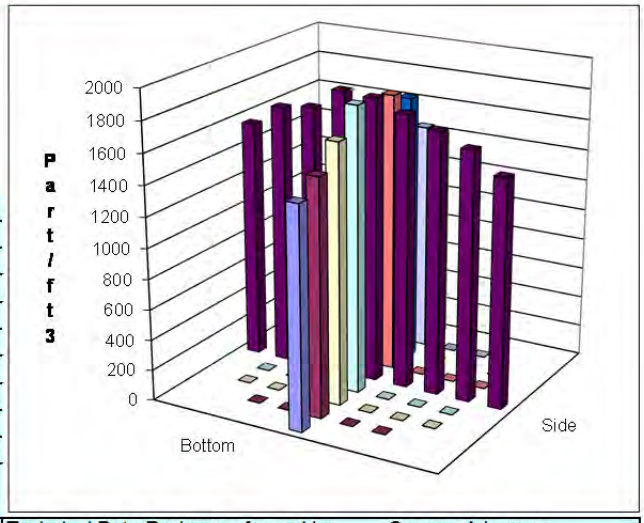
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1672.7		Mean	1753.3	1706.9	1730.1	1735.22
Min Point	1398.3	-16.4%	Std. Dev.	86.6	145.7	117.6	117.15
Max Point	1868.3	11.7%	COV as %	4.9	8.5	6.8	6.75

Avg Conc 1651 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.7	1.7	psig
Stack Temp	70.4	87.4	F
Centerline vel side #7	1295	1330	afpm
Ambient pressure	29.88	29.88	inHg
Ambient humidity	52%	34%	RH
Ambient temp	69.8	81.5	F
Back-Gd aerosol	5,2,6,0,3	5,2,4,0,5	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	30	32	psig



Notes:

ss 8/5/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/5/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-15
Date	8/5/2013	Fan configuration	A Norm
Tester	A,SS,YFS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	93.65 deg F
Stack X-Area	111.6 in.2	Start/End Time	0824 / 1023
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

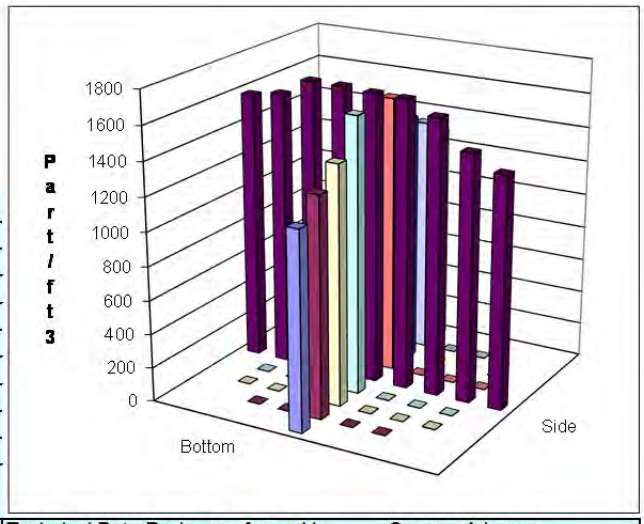
		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1064	1031	1097	1064.0	1136	1156	1205	1165.7
2	1.25	1098	1153	1150	1133.7	1302	1299	1277	1292.7
3	2.31	1194	1320	1277	1263.7	1359	1457	1413	1409.7
4	3.85	1303	1325	1336	1321.3	1654	1619	1604	1625.7
Center	5.96	1202	1361	1414	1325.7	1718	1725	1655	1699.3
5	8.07	1312	1398	1296	1335.3	1660	1604	1614	1626.0
6	9.61	1296	1357	1360	1337.7	1498	1413	1462	1457.7
7	10.67	1258	1262	1258	1259.3	1375	1417	1360	1384.0
8	11.42	1153	1283	1270	1235.3	1263	1284	1322	1289.7
Averages ———>		1208.9	1276.7	1273.1	1252.9	1440.6	1441.6	1434.7	1438.9

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1345.9		Mean	1282.4	1499.3	1390.8	1571.57
Min Point	1064.0	-20.9%	Std. Dev.	73.3	151.5	160.5	142.49
Max Point	1699.3	26.3%	COV as %	5.7	10.1	11.5	9.07

Avg Conc 1325 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.7	1.7	psig
Stack Temp	91.0	96.3	F
Centerline vel side #7	1835	1837	afpm
Ambient pressure	29.88	29.91	inHg
Ambient humidity	33%	30%	RH
Ambient temp	82.4	86.0	F
Back-Gd aerosol	7,15,15,14,9	10,4,4,5,6	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	22	28	psig



Notes:

ss 8/5/13 SS 8-5-13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/5/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-16
Date	8/5/2013	Fan configuration	A Norm
Tester	A,SS,YFS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	99.7 deg F
Stack X-Area	111.6 in.2	Start/End Time	1030 / 1215
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

Order —>	1st				2nd			
Traverse-->	Side				Bottom			
Trial —>	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	particles/ft3				particles/ft3			
1 / 0.50	1081	1036	1039	**1052.0**	1032	1095	1212	**1113.0**
2 / 1.25	1202	1209	1192	**1201.0**	1298	1324	1395	**1339.0**
3 / 2.31	1219	1119	1347	**1228.3**	1413	1450	1440	**1434.3**
4 / 3.85	1189	1285	1428	**1300.7**	1466	1658	1569	**1564.3**
Center / 5.96	1463	1377	1353	**1397.7**	1452	1628	1815	**1631.7**
5 / 8.07	1441	1364	1315	**1373.3**	1465	1558	1625	**1549.3**
6 / 9.61	1381	1284	1001	**1222.0**	1377	1522	1523	**1474.0**
7 / 10.67	1327	1349	1284	**1320.0**	1295	1402	1315	**1337.3**
8 / 11.42	1198	1253	1232	**1227.7**	1256	1368	1309	**1311.0**
Averages ———>	**1277.9**	**1252.9**	**1243.4**	**1258.1**	**1339.3**	**1445.0**	**1467.0**	**1417.1**

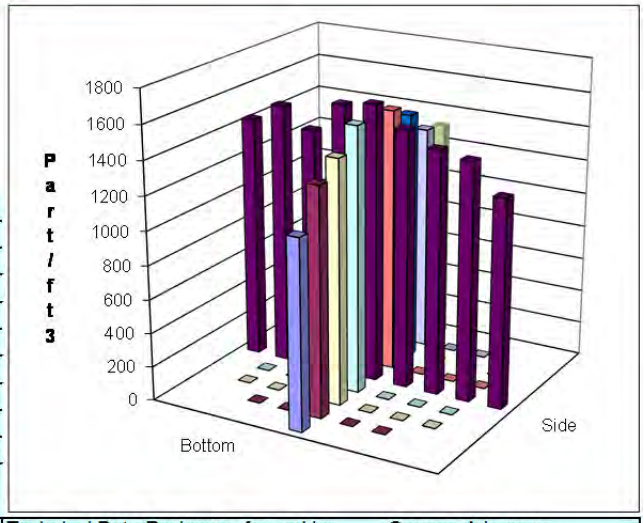
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1337.6		Mean	1291.9	1475.7	1383.8	1491.93
Min Point	1052.0	-21.4%	Std. Dev.	77.3	113.4	133.4	99.89
Max Point	1631.7	22.0%	COV as %	6.0	7.7	9.6	6.70

Avg Conc 1315 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.7	1.7	psig
Stack Temp	96.3	103.1	F
Centerline vel side #7	1837	1930	afpm
Ambient pressure	29.91	29.91	inHg
Ambient humidity	30%	28%	RH
Ambient temp	86.0	89.6	F
Back-Gd aerosol	3,5,3,3,18	0,1,4,2,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	28	26	psig



Notes:

ss 8/5/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/5/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-17
Date	8/5/2013	Fan configuration	A Norm
Tester	cb, TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	109.25 deg F
Stack X-Area	111.6 in.2	Start/End Time	13:25/ 14:30
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

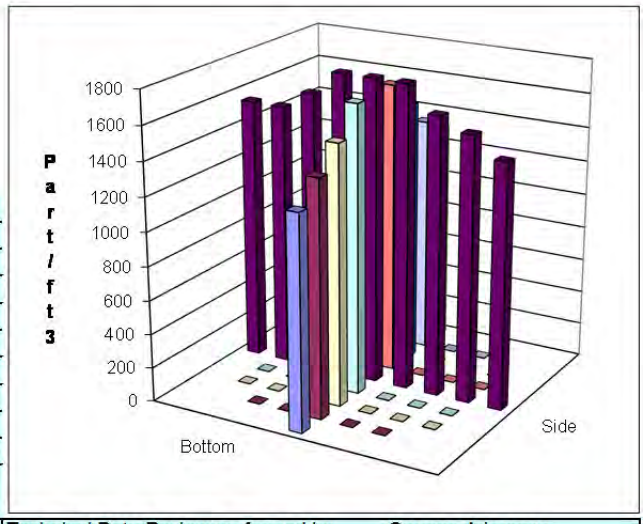
		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1179	1205	1224	**1202.7**	1307	1161	1298	**1255.3**
2	1.25	1290	1402	1215	**1302.3**	1392	1376	1390	**1386.0**
3	2.31	1363	1334	1402	**1366.3**	1502	1516	1552	**1523.3**
4	3.85	1521	1469	1488	**1492.7**	1690	1672	1714	**1692.0**
Center	5.96	1501	1428	1556	**1495.0**	1740	1785	1829	**1784.7**
5	8.07	1562	1452	1471	**1495.0**	1743	1609	1753	**1701.7**
6	9.61	1460	1328	1343	**1377.0**	1487	1509	1617	**1537.7**
7	10.67	1397	1234	1240	**1290.3**	1422	1257	1491	**1390.0**
8	11.42	1284	1232	1366	**1294.0**	1381	1220	1307	**1302.7**
Averages ———>		**1395.2**	**1342.7**	**1367.2**	**1368.4**	**1518.2**	**1456.1**	**1550.1**	**1508.1**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1438.3		Mean	1402.7	1573.6	1488.1	1624.03
Min Point	1202.7	-16.4%	Std. Dev.	91.1	156.9	151.9	139.85
Max Point	1784.7	24.1%	COV as %	6.5	10.0	10.2	8.61

Avg Conc 1413 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.7	1.7	psig
Stack Temp	107.9	110.6	F
Centerline vel side #7	2009	1810	afpm
Ambient pressure	29.91	29.53	inHg
Ambient humidity	27%	21%	RH
Ambient temp	91.4	95	F
Back-Gd aerosol	4,3,0,6,6	0,5,3,0,1	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	14	24	psig



Notes:

cb 8/5/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/5/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-18
Date	8/6/2013	Fan configuration	AB MIN
Tester	SS,SFS,EA	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	81.4 deg F
Stack X-Area	111.6 in.2	Start/End Time	0635 / 0920
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1478	1462	1601	**1513.7**	1293	1409	1377	**1359.7**
2	1.25	1640	1590	1728	**1652.7**	1352	1536	1480	**1456.0**
3	2.31	1652	1762	1855	**1756.3**	1462	1490	1588	**1513.3**
4	3.85	1758	1680	1895	**1777.7**	1565	1547	1673	**1595.0**
Center	5.96	1770	1810	1859	**1813.0**	1628	1685	1702	**1671.7**
5	8.07	1777	1783	1750	**1770.0**	1608	1652	1641	**1633.7**
6	9.61	1679	1718	1699	**1698.7**	1529	1600	1557	**1562.0**
7	10.67	1681	1621	1712	**1671.3**	1504	1538	1564	**1535.3**
8	11.42	1527	1662	1651	**1613.3**	1377	1446	1510	**1444.3**
Averages ———>		**1662.4**	**1676.4**	**1750.0**	**1696.3**	**1479.8**	**1544.8**	**1565.8**	**1530.1**

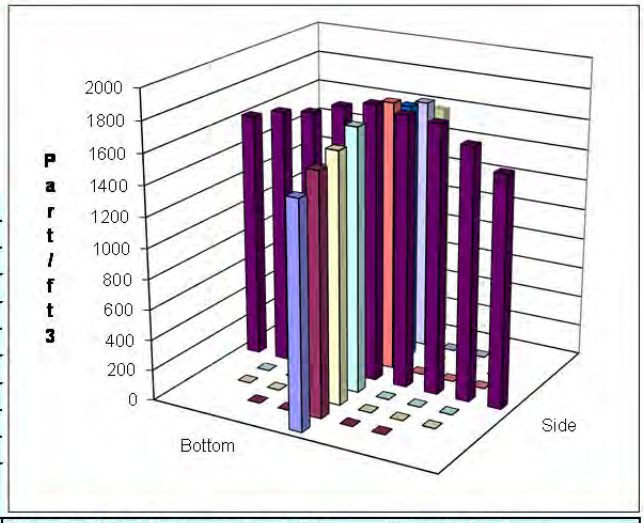
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1613.2		Mean	1734.2	1566.7	1650.5	1716.71
Min Point	1359.7	-15.7%	Std. Dev.	60.2	73.5	108.3	70.25
Max Point	1813.0	12.4%	COV as %	3.5	4.7	**6.6**	**4.09**

Avg Conc 1597 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	72.5	90.3	F
Centerline vel bot#3	1303	1250	afpm
Ambient pressure	29.5	29.56	inHg
Ambient humidity	51%	31%	RH
Ambient temp	70.7	84.2	F
Back-Gd aerosol	4,3,3,5, 4	3, 7,710,	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	28	28	psig



Notes: Between bottom and side traversees the data probe syringe cracked. It was replaced.

SS 8/6/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/6/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-19
Date	8/6/2013	Fan configuration	AB MIN
Tester	SS,SFS	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	96.8 deg F
Stack X-Area	111.6 in.2	Start/End Time	0924 /1100
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

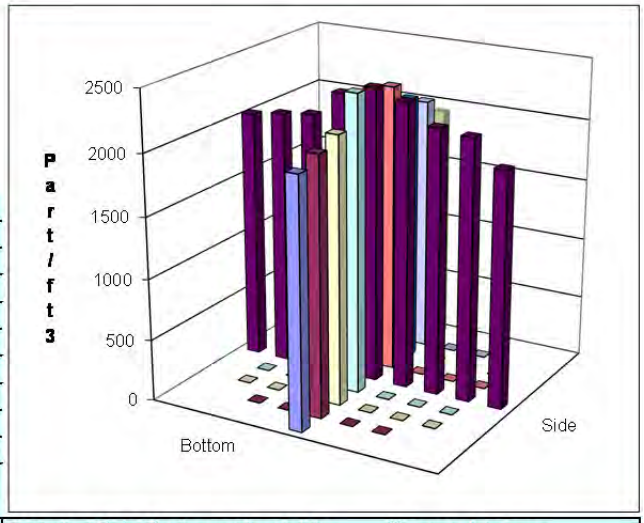
Order —>	1st				2nd			
Traverse-->	Side				Bottom			
Trial —>	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	particles/ft3				particles/ft3			
1 / 0.50	1687	1735	1774	1732.0	2045	1978	2047	2023.3
2 / 1.25	1809	1958	1987	1918.0	2075	2067	2151	2097.7
3 / 2.31	1919	1917	2000	1945.3	2155	2183	2178	2172.0
4 / 3.85	1952	2028	2292	2090.7	2378	2376	2509	2421.0
Center / 5.96	2186	2141	2147	2158.0	2349	2452	2390	2397.0
5 / 8.07	2109	2071	2076	2085.3	2295	2375	2352	2340.7
6 / 9.61	1824	1887	1983	1898.0	2144	2194	2192	2176.7
7 / 10.67	1825	1864	1913	1867.3	2071	2079	2116	2088.7
8 / 11.42	1913	1737	1846	1832.0	1957	1972	1884	1937.7
Averages ———>	1913.8	1926.4	2002.0	1947.4	2163.2	2186.2	2202.1	2183.9

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	2065.6		Mean	1994.7	2242.0	2118.3	2228.76
Min Point	1732.0	-16.2%	Std. Dev.	114.0	141.0	177.9	129.48
Max Point	2421.0	17.2%	COV as %	5.7	6.3	8.4	5.81

Avg Conc 2039 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	90.3	103.3	F
Centerline vel bot#3	1250	1243	afpm
Ambient pressure	29.56	29.56	inHg
Ambient humidity	31%	23%	RH
Ambient temp	84.2	91.4	F
Back-Gd aerosol	9,7,9,8,24,11	2,9,2,4,7,	pt/ft3
No. Bk-Gd samples	6	5	
Compressor output	28	24	psig



Notes:

SS 8/6/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/6/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-20
Date	8/6/2013	Fan configuration	AB MIN
Tester	SFS, CB	Fan Setting	A:25/B:35 Hz
Stack Dia.	11.922 in.	Stack Temp	106.25 deg F
Stack X-Area	111.6 in.2	Start/End Time	11:20/13:10
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

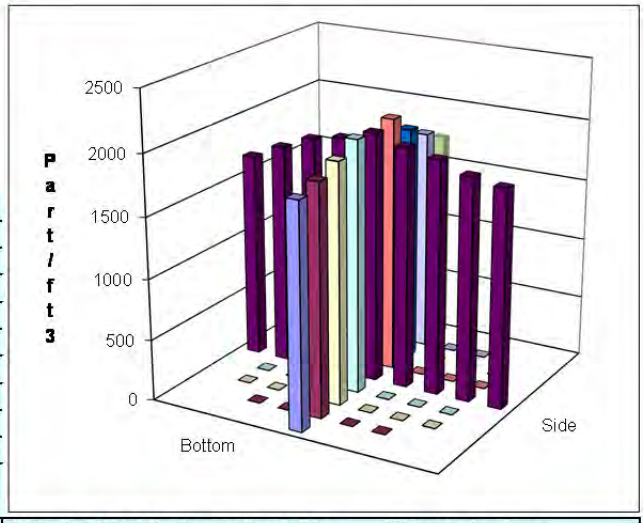
		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	651	particles/ft3				particles/ft3			
1	0.50	1629	1688	1667	**1661.3**	1823	1821	1846	**1830.0**
2	1.25	1651	1773	1686	**1703.3**	1841	1955	1871	**1889.0**
3	2.31	1806	1775	1776	**1785.7**	2002	1961	1940	**1967.7**
4	3.85	1835	1894	1779	**1836.0**	2130	2055	2009	**2064.7**
Center	5.96	1902	1908	1898	**1902.7**	2070	2073	1981	**2041.3**
5	8.07	1826	1893	1759	**1826.0**	2046	2131	2075	**2084.0**
6	9.61	1828	1745	1769	**1780.7**	1953	1923	1909	**1928.3**
7	10.67	1664	1692	1682	**1679.3**	1846	1820	1794	**1820.0**
8	11.42	1582	1584	1540	**1568.7**	1726	1735	1706	**1722.3**
Averages ———>		**1747.0**	**1772.4**	**1728.4**	**1749.3**	**1937.4**	**1941.6**	**1903.4**	**1927.5**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1838.4		Mean	1787.7	1970.7	1879.2	1944.33
Min Point	1568.7	-14.7%	Std. Dev.	77.4	98.2	127.4	91.55
Max Point	2084.0	13.4%	COV as %	4.3	5.0	6.8	4.71

Avg Conc 1822 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.3	1.3	psig
Stack Temp	105.5	107	F
Centerline vel bot#3	1277	1278	afpm
Ambient pressure	29.56	29.53	inHg
Ambient humidity	20%	18%	RH
Ambient temp	94.1	97.7	F
Back-Gd aerosol	2,6,4,7,1	4,3,5,4,4	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	14	20	psig



Notes:

8/6/13
cb

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/6/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-21
Date	8/6/2013	Fan configuration	AB MIN
Tester	CB,TH	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	111.35 deg F
Stack X-Area	111.6 in.2	Start/End Time	1335/1615
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

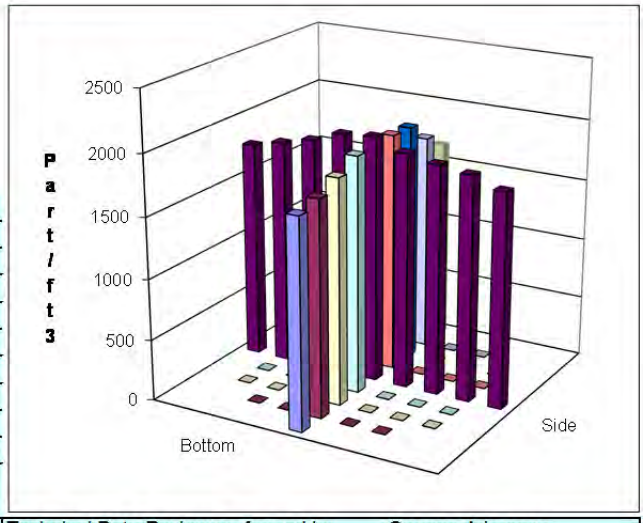
Order —>		1st				2nd			
Traverse-->		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	651	particles/ft3				particles/ft3			
1	0.50	1623	1836	1695	**1718.0**	1710	1719	1702	**1710.3**
2	1.25	1847	1774	1778	**1799.7**	1705	1716	1853	**1758.0**
3	2.31	1838	1815	1854	**1835.7**	1900	1742	1880	**1840.7**
4	3.85	1830	1973	1837	**1880.0**	1895	1926	1986	**1935.7**
Center	5.96	1953	2011	1939	**1967.7**	2063	1971	1997	**2010.3**
5	8.07	1982	1959	1904	**1948.3**	2027	1857	1975	**1953.0**
6	9.61	1797	1927	1856	**1860.0**	2041	1872	1921	**1944.7**
7	10.67	1841	1788	1769	**1799.3**	1977	1652	1725	**1784.7**
8	11.42	1793	1741	1690	**1741.3**	1743	1565	1669	**1659.0**
Averages ———>		**1833.8**	**1869.3**	**1813.6**	**1838.9**	**1895.7**	**1780.0**	**1856.4**	**1844.0**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1841.5		Mean	1870.1	1889.6	1879.8	1900.11
Min Point	1659.0	-9.9%	Std. Dev.	67.1	95.3	79.8	80.48
Max Point	2010.3	9.2%	COV as %	3.6	5.0	4.2	4.24

Avg Conc 1823 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.3	1.3	psig
Stack Temp	110.6	112.1	F
Centerline vel bot#3	1289	1267	afpm
Ambient pressure	29.53	29.47	inHg
Ambient humidity	18%	17%	RH
Ambient temp	95.9	98.6	F
Back-Gd aerosol	5,4,1,6,0	1, 2, 1, 5,4	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	16	20	psig



Notes:

Two data sheets used, Bottom was restarted after the particle counter sample tube was noticed as being Insufficiently inserted into the sampling tube.

8/6/2013

cb

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns

Signature/date 8/6/2013

Signature on file with original

Technical Data Review performed by: Carmen Arimescu

Signature/date 2/25/2014

Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-22
Date	8/6/2013	Fan configuration	AB MIN
Tester	CB,TH	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	110.9 deg F
Stack X-Area	111.6 in.2	Start/End Time	4:15/17:50
Test Port	1	Center 2/3 from	1.00 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

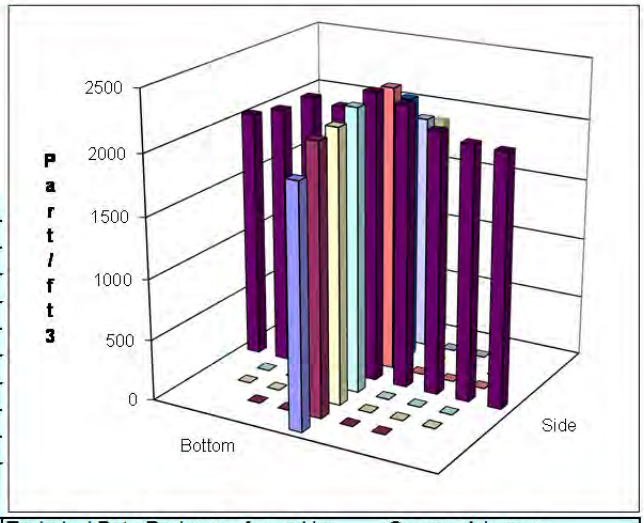
Order —>		2nd				1st			
Traverse-->		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	651	particles/ft3				particles/ft3			
1	0.50	2021	1930	2078	**2009.7**	1851	2108	1961	**1973.3**
2	1.25	2146	1863	2067	**2025.3**	2171	2270	2148	**2196.3**
3	2.31	2290	1965	1989	**2081.3**	2217	2277	2192	**2228.7**
4	3.85	2371	2222	2141	**2244.7**	2363	2253	2318	**2311.3**
Center	5.96	2308	2300	2304	**2304.0**	2323	2402	2369	**2364.7**
5	8.07	2088	2199	2165	**2150.7**	2323	2405	2273	**2333.7**
6	9.61	2220	2195	2144	**2186.3**	2327	2110	2098	**2178.3**
7	10.67	1978	2037	2146	**2053.7**	2001	1903	1936	**1946.7**
8	11.42	1937	2102	1894	**1977.7**	1870	1859	1860	**1863.0**
Averages ———>		**2151.0**	**2090.3**	**2103.1**	**2114.8**	**2160.7**	**2176.3**	**2128.3**	**2155.1**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	2135.0		Mean	2149.4	2222.8	2186.1	2214.42
Min Point	1863.0	-12.7%	Std. Dev.	102.9	141.0	124.5	119.98
Max Point	2364.7	10.8%	COV as %	4.8	6.3	5.7	5.42

Avg Conc 2110 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.3	1.3	psig
Stack Temp	112.1	109.7	F
Centerline vel bot#3	1267	1241	afpm
Ambient pressure	29.47	29.47	inHg
Ambient humidity	17%	16%	RH
Ambient temp	98.6	97.7	F
Back-Gd aerosol	1, 2, 1, 5,4	2,0, 2,1, 3	pt/ft3
No. Blk-Gd samples	5	5	
Compressor output	20	20	psig



Notes:

8/6/13
cb

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/6/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-23
Date	8/7/2013	Fan configuration	AB MIN
Tester	SFS,SS	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	77.55 deg F
Stack X-Area	111.6 in.2	Start/End Time	0625 / 0825
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	651	particles/ft3				particles/ft3			
1	0.50	1231	1380	1378	**1329.7**	1265	1299	1336	**1300.0**
2	1.25	1424	1472	1501	**1465.7**	1261	1411	1421	**1364.3**
3	2.31	1457	1522	1638	**1539.0**	1356	1449	1527	**1444.0**
4	3.85	1484	1637	1566	**1562.3**	1425	1512	1584	**1507.0**
Center	5.96	1536	1515	1668	**1573.0**	1522	1543	1610	**1558.3**
5	8.07	1492	1581	1619	**1564.0**	1500	1551	1552	**1534.3**
6	9.61	1546	1470	1554	**1523.3**	1413	1508	1550	**1490.3**
7	10.67	1427	1494	1573	**1498.0**	1253	1306	1421	**1326.7**
8	11.42	1359	1336	1494	**1396.3**	1244	1243	1265	**1250.7**
Averages ———>		**1439.6**	**1489.7**	**1554.6**	**1494.6**	**1359.9**	**1424.7**	**1474.0**	**1419.5**

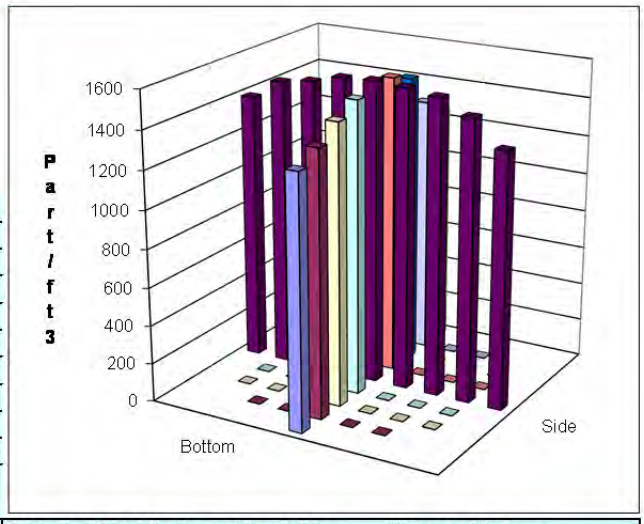
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1457.1		Mean	1532.2	1460.7	1496.5	1503.33
Min Point	1250.7	-14.2%	Std. Dev.	39.4	87.1	74.8	71.97
Max Point	1573.0	8.0%	COV as %	2.6	6.0	**5.0**	**4.79**

Avg Conc 1443 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	1.6	1.6	psig
Stack Temp	70.2	84.9	F
Centerline vel bot#3	1325	1254	afpm
Ambient pressure	29.5	29.53	inHg
Ambient humidity	50%	32%	RH
Ambient temp	67.1	78.8	F
Back-Gd aerosol	1,1,1,4,0	3,2,7,3,3	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	28	30	psig



Notes:

SS

8/7/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/7/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-24
Date	8/7/2013	Fan configuration	AB Max
Tester	SFS,SS	Fan Setting	45 Hz
Stack Dia.	11.922 in.	Stack Temp	94.2 deg F
Stack X-Area	111.6 in.2	Start/End Time	08:55/10:37
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

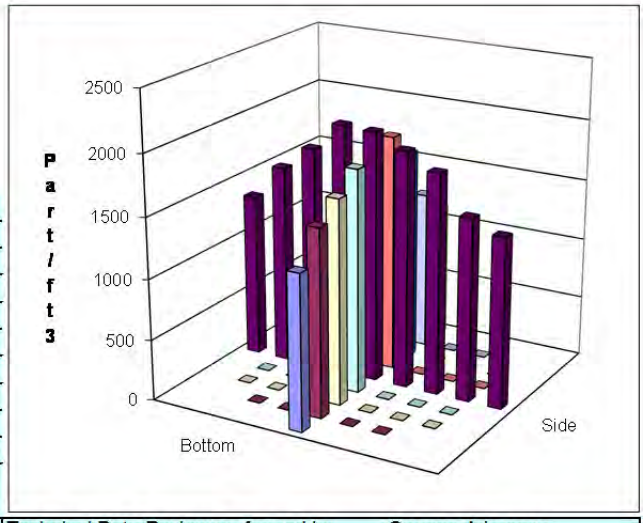
Order —>		1st				2nd			
Traverse-->		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	651	particles/ft3				particles/ft3			
1	0.50	1049	1238	1081	1122.7	1250	1319	1246	1271.7
2	1.25	1128	1172	1312	1204.0	1450	1683	1471	1534.7
3	2.31	1369	1441	1545	1451.7	1663	1673	1699	1678.3
4	3.85	1579	1582	1505	1555.3	1861	1846	1789	1832.0
Center	5.96	1583	1673	1672	1642.7	2039	2091	2017	2049.0
5	8.07	1589	1643	1734	1655.3	1931	1896	1991	1939.3
6	9.61	1424	1430	1548	1467.3	1785	1709	1702	1732.0
7	10.67	1273	1231	1421	1308.3	1305	1269	1341	1305.0
8	11.42	989	1122	1124	1078.3	1186	1063	1104	1117.7
Averages ———>		1331.4	1392.4	1438.0	1387.3	1607.8	1616.6	1595.6	1606.6

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1497.0		Mean	1469.2	1724.3	1596.8	1778.50
Min Point	1078.3	-28.0%	Std. Dev.	167.7	250.7	243.9	228.83
Max Point	2049.0	36.9%	COV as %	11.4	14.5	15.3	12.87

Avg Conc 1453 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.3	2.3	psig
Stack Temp	88.10	100.3	F
Centerline vel bot#3	2458	2571	afpm
Ambient pressure	29.53	29.56	inHg
Ambient humidity	27%	20%	RH
Ambient temp	84.2	91.4	F
Back-Gd aerosol	7,0,1,2,3	3,2,3,1,0	pt/ft3
No. Blk-Gd samples	5	5	
Compressor output	23	23	psig



Notes:

SS
8/7/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/7/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-25
Date	8/7/2013	Fan configuration	AB Norm
Tester	SFS,SS	Fan Setting	38 Hz
Stack Dia.	11.922 in.	Stack Temp	103.6 deg F
Stack X-Area	111.6 in.2	Start/End Time	10:44/12:20
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

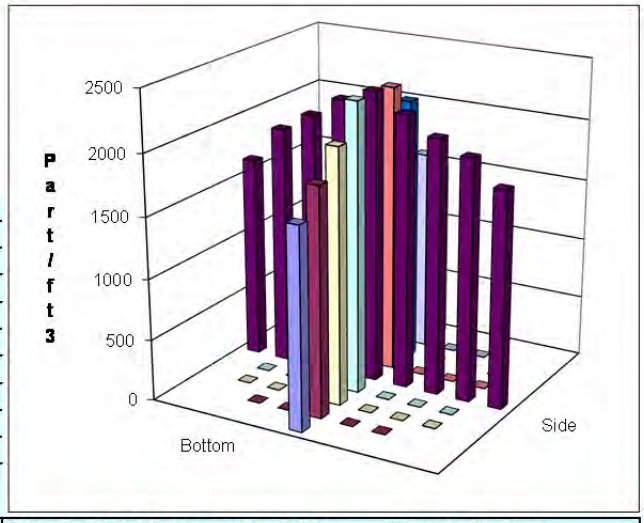
		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	651	particles/ft3				particles/ft3			
1	0.50	1677	1703	1606	**1662.0**	1493	1714	1717	**1641.3**
2	1.25	1813	1905	1837	**1851.7**	1762	1876	1945	**1861.0**
3	2.31	1953	2014	1894	**1953.7**	2057	2112	2077	**2082.0**
4	3.85	1964	2166	2141	**2090.3**	2348	2344	2394	**2362.0**
Center	5.96	2191	2273	2207	**2223.7**	2312	2434	2362	**2369.3**
5	8.07	2052	2151	2174	**2125.7**	2237	2381	2393	**2337.0**
6	9.61	1963	1962	1992	**1972.3**	2116	2224	2142	**2160.7**
7	10.67	1764	1881	1840	**1828.3**	1624	1682	1638	**1648.0**
8	11.42	1544	1525	1583	**1550.7**	1437	1526	1500	**1487.7**
Averages ———>		**1880.1**	**1953.3**	**1919.3**	**1917.6**	**1931.8**	**2032.6**	**2018.7**	**1994.3**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1956.0		Mean	2006.5	2117.1	2061.8	2127.55
Min Point	1487.7	-23.9%	Std. Dev.	146.1	277.1	220.4	216.20
Max Point	2369.3	21.1%	COV as %	7.3	13.1	**10.7**	**10.16**

Avg Conc 1913 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.1	2.1	psig
Stack Temp	100	107.2	F
Centerline vel bot#3	2115	2090	afpm
Ambient pressure	29.56	29.53	inHg
Ambient humidity	18%	18%	RH
Ambient temp	96.8	95	F
Back-Gd aerosol	1,0,0,0,4	0,0,1,1,2	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	14	24	psig



Notes: Ref OPC Flow adjusted to 1.01 between Bottom 1 and 2 traverses

SS 8/7/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/7/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-26
Date	8/7/2013	Fan configuration	AB Norm
Tester	cb,TH	Fan Setting	38 Hz
Stack Dia.	11.922 in.	Stack Temp	109.15 deg F
Stack X-Area	111.6 in.2	Start/End Time	13:40/15:25
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

		1st				2nd			
Traverse-->		Side				Bottom			
Trial -->		1	2	3	Mean	1	2	3	Mean
Point	651	particles/ft3				particles/ft3			
1	0.50	1776	1766	1934	**1825.3**	1900	1785	1905	**1863.3**
2	1.25	1980	2034	2095	**2036.3**	1980	2050	2099	**2043.0**
3	2.31	2118	2156	2239	**2171.0**	2223	2220	2287	**2243.3**
4	3.85	2331	2366	2427	**2374.7**	2527	2490	2486	**2501.0**
Center	5.96	2456	2493	2592	**2513.7**	2600	2681	2703	**2661.3**
5	8.07	2304	2429	2557	**2430.0**	2533	2634	2573	**2580.0**
6	9.61	2078	2196	2344	**2206.0**	2456	2332	2516	**2434.7**
7	10.67	1951	2044	2102	**2032.3**	1809	1993	1926	**1909.3**
8	11.42	1812	2028	1775	**1871.7**	1760	1717	1704	**1727.0**
Averages ———>		**2089.6**	**2168.0**	**2229.4**	**2162.3**	**2198.7**	**2211.3**	**2244.3**	**2218.1**

All	pt/ft3	Dev. from mean
Mean	2190.2	
Min Point	1727.0	-21.1%
Max Point	2661.3	21.5%

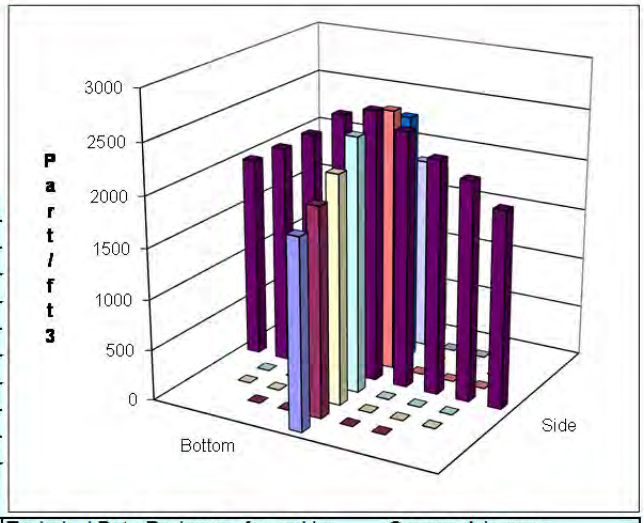
Center 2/3	Side	Bottom	All	Normlzd
Mean	2252.0	2339.0	2295.5	2361.62
Std. Dev.	190.9	282.5	236.0	237.14
COV as %	8.5	12.1	10.3	10.04

Avg Conc 2141 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.1	2.1	psig
Stack Temp	109.2	109.1	F
Centerline vel bot#3	1901	2005	afpm
Ambient pressure	29.5	29.47	inHg
Ambient humidity	18%	18%	RH
Ambient temp	96.8	96.8	F
Back-Gd aerosol	1,3,3,1,1	1,1,3,1,4	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	18	14	psig



Notes:

cb
8/7/13

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/7/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-27
Date	8/7/2013	Fan configuration	AB Norm
Tester	cb,TH	Fan Setting	38 Hz
Stack Dia.	11.922 in.	Stack Temp	108 deg F
Stack X-Area	111.6 in.2	Start/End Time	15:30/16:50
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

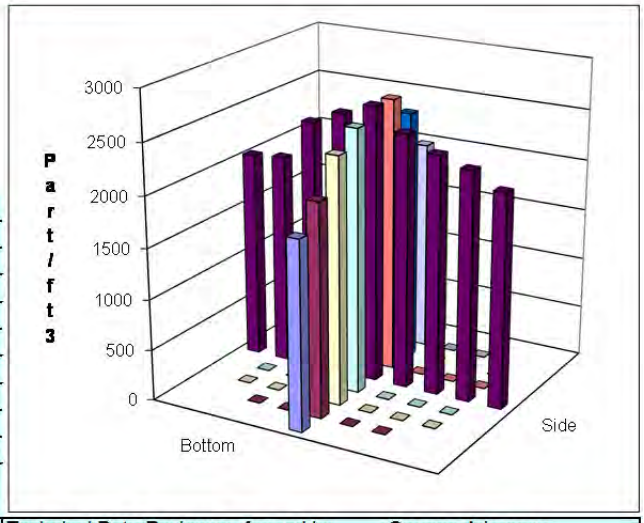
Order —>		2nd				1st				
Traverse-->		Side				Bottom				
Trial —>		1	2	3	Mean	1	2	3	Mean	
Point	651	particles/ft3				particles/ft3				
1	0.50	1934	2062	2165	2053.7	1694	1918	1910	1840.7	
2	1.25	2203	2229	2180	2204.0	2027	2058	2163	2082.7	
3	2.31	2286	2298	2294	2292.7	2361	2394	2490	2415.0	
4	3.85	2395	2442	2475	2437.3	2566	2564	2615	2581.7	
Center	5.96	2629	2628	2678	2645.0	2674	2807	2634	2705.0	
5	8.07	2579	2503	2510	2530.7	2687	2713	2667	2689.0	
6	9.61	2384	2339	2483	2402.0	2480	2473	2465	2472.7	
7	10.67	1940	1943	2160	2014.3	2083	2076	2061	2073.3	
8	11.42	1939	1937	2088	1988.0	1779	1674	1825	1759.3	
Averages ———>		2254.3	2264.6	2337.0	2285.3	2261.2	2297.4	2314.4	2291.0	

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	2288.2		Mean	2360.9	2431.3	2396.1	2422.87
Min Point	1759.3	-23.1%	Std. Dev.	210.7	263.2	232.0	231.26
Max Point	2705.0	18.2%	COV as %	8.9	10.8	9.7	9.54

Avg Conc 2240 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.1	2.1	psig
Stack Temp	109.1	106.9	F
Centerline vel bot#3	2005	1883	afpm
Ambient pressure	29.47	29.47	inHg
Ambient humidity	17%	16%	RH
Ambient temp	97.7	104	F
Back-Gd aerosol	1,1,3,1,4	1,3,0,2,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	14	20	psig



Notes:

cb
8/7/13

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/7/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-28
Date	8/8/2013	Fan configuration	AB Max
Tester	SS,SFS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	80.25 deg F
Stack X-Area	111.6 in.2	Start/End Time	06:30/9:00
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

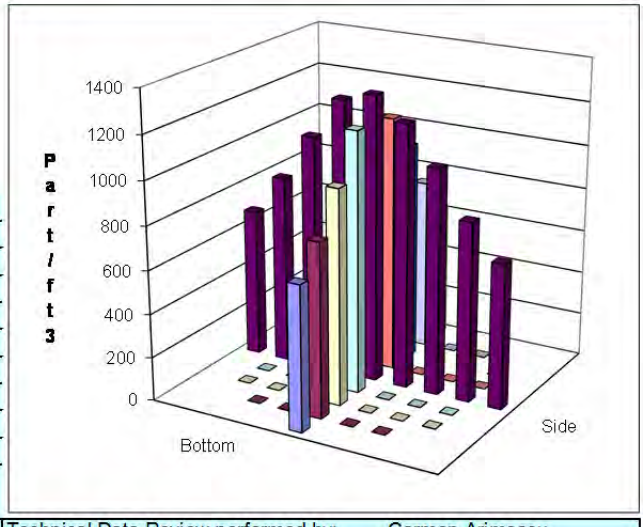
		Side				Bottom			
Traverse–>									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	693	625	675	664.3	674	638	675	662.3
2	1.25	812	811	845	822.7	765	785	842	797.3
3	2.31	999	1044	1059	1034.0	960	988	1005	984.3
4	3.85	1130	1228	1257	1205.0	1170	1192	1217	1193.0
Center	5.96	1261	1309	1354	1308.0	1303	1315	1309	1309.0
5	8.07	1209	1260	1330	1266.3	1157	1170	1176	1167.7
6	9.61	1059	1050	1124	1077.7	944	1016	1045	1001.7
7	10.67	846	851	892	863.0	795	763	802	786.7
8	11.42	675	729	642	682.0	587	667	600	618.0
Averages ———>		964.9	989.7	1019.8	991.4				946.7

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	969.1		Mean	1082.4	1034.2	1058.3	1058.72
Min Point	618.0	-36.2%	Std. Dev.	190.5	199.8	189.2	189.31
Max Point	1309.0	35.1%	COV as %	17.6	19.3	17.9	17.88

Avg Conc 927 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	3.2	3,2	psig
Stack Temp	70.3	90.2	F
Centerline vel.	2867	3375	afpm
Ambient pressure	29.50	29.53	inHg
Ambient humidity	58%	31%	RH
Ambient temp	67.1	83.3	F
Back-Gd aerosol	4,3,4,7,4	1,3,1,4,1	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	25	28	psig



Notes:

ss 8/8/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by:	Susan Sande
Signature/date	8/8/2013
	Signature on file with original

Technical Data Review performed by:	Carmen Arimescu
Signature/date	3/21/2014
Signature on file with original TI-WTPSP 123	

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3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-29
Date	8/8/2013	Fan configuration	BC Max
Tester	SS,SFS,EA	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	95.25 deg F
Stack X-Area	111.6 in.2	Start/End Time	09:48/11:30
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

Order —>	1st				2nd			
Traverse-->	Side				Bottom			
Trial —>	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	particles/ft3				particles/ft3			
1 / 0.50	681	625	536	**614.0**	622	645	786	**684.3**
2 / 1.25	861	802	787	**816.7**	865	928	981	**924.7**
3 / 2.31	952	957	939	**949.3**	1097	1172	1154	**1141.0**
4 / 3.85	1182	1157	1183	**1174.0**	1241	1397	1462	**1366.7**
Center / 5.96	1275	1255	1235	**1255.0**	1395	1536	1605	**1512.0**
5 / 8.07	1234	1292	1136	**1220.7**	1263	1362	1466	**1363.7**
6 / 9.61	1015	991	1065	**1023.7**	991	1056	1123	**1056.7**
7 / 10.67	817	785	806	**802.7**	824	842	890	**852.0**
8 / 11.42	636	545	674	**618.3**	493	586	541	**540.0**
Averages ———>	**961.4**	**934.3**	**929.0**	**941.6**	**976.8**	**1058.2**	**1112.0**	**1049.0**

All	pt/ft3	Dev. from mean
Mean	995.3	
Min Point	540.0	-45.7%
Max Point	1512.0	51.9%

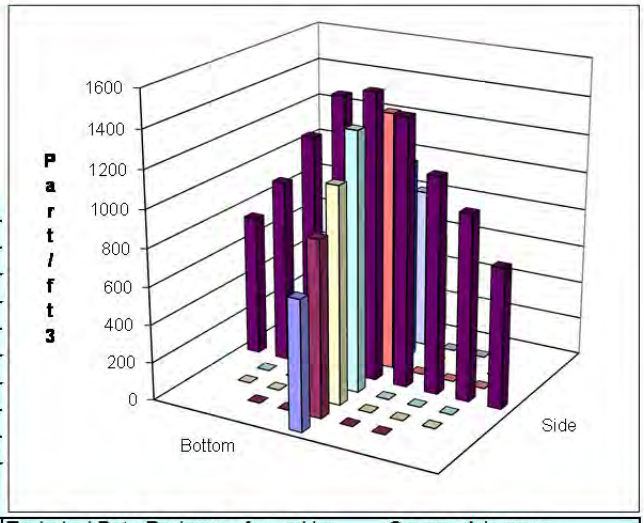
Center 2/3	Side	Bottom	All	Normlzd
Mean	1034.6	1173.8	1104.2	1210.12
Std. Dev.	187.7	247.7	223.1	230.92
COV as %	18.1	21.1	20.2	19.08

Avg Conc 947 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	3.2	3.2	psig
Stack Temp	86.7	103.8	F
Centerline vel.	3653	3508	afpm
Ambient pressure	29.53	29.56	inHg
Ambient humidity	28%	19%	RH
Ambient temp	84.2	91.4	F
Back-Gd aerosol	8,4,8,4,2	1,4,2,3,3	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	22	20	psig



Notes:

ss 8/8/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/8/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-30
Date	8/8/2013	Fan configuration	BC
Tester	cb,TH	Fan Setting	41 Hz
Stack Dia.	11.922 in.	Stack Temp	107.05 deg F
Stack X-Area	111.6 in.2	Start/End Time	12:30/14:20
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

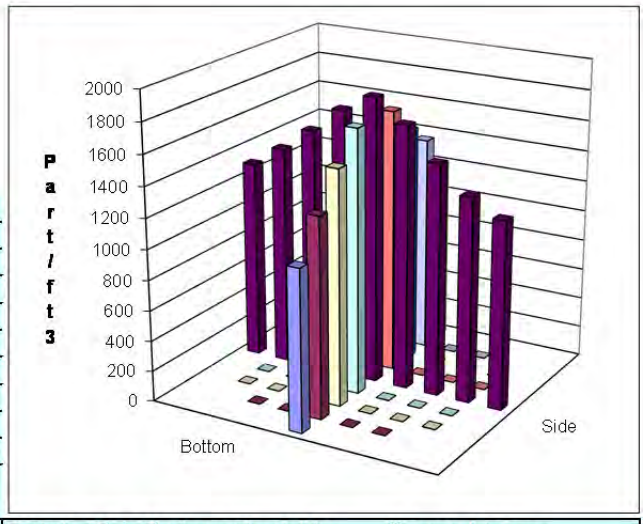
		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1126	1206	1284	**1205.3**	1018	1054	1093	**1055.0**
2	1.25	1269	1227	1433	**1309.7**	1303	1289	1326	**1306.0**
3	2.31	1347	1486	1612	**1481.7**	1514	1537	1557	**1536.0**
4	3.85	1648	1765	1642	**1685.0**	1680	1733	1772	**1728.3**
Center	5.96	1810	1791	1874	**1825.0**	1824	1815	1955	**1864.7**
5	8.07	1693	1762	1693	**1716.0**	1691	1711	1769	**1723.7**
6	9.61	1581	1675	1407	**1554.3**	1560	1522	1557	**1546.3**
7	10.67	1480	1400	1338	**1406.0**	1411	1426	1428	**1421.7**
8	11.42	1313	1233	1281	**1275.7**	1163	1192	1267	**1207.3**
Averages ———>		**1474.1**	**1505.0**	**1507.1**	**1495.4**	**1462.7**	**1475.4**	**1524.9**	**1487.7**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1491.5		Mean	1568.2	1589.5	1578.9	1595.92
Min Point	1055.0	-29.3%	Std. Dev.	183.6	194.2	181.9	183.55
Max Point	1864.7	25.0%	COV as %	11.7	12.2	11.5	11.50

Avg Conc 1447 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.2	2.2	psig
Stack Temp	105.3	108.8	F
Centerline vel.	2118	2407	afpm
Ambient pressure	29.53	29.50	inHg
Ambient humidity	18%	18%	RH
Ambient temp	95.0	95.0	F
Back-Gd aerosol	3,1,3,0,0	1,1,1,2,1	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	14	12	psig



Notes:

cb 8/8/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/8/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-31
Date	8/9/2013	Fan configuration	BC
Tester	YFS, SS	Fan Setting	55 Hz
Stack Dia.	11.922 in.	Stack Temp	77.95 deg F
Stack X-Area	111.6 in.2	Start/End Time	0638 /0848
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

Order —>	2nd				1st			
Traverse-->	792				Bottom			
Trial —>	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	112				particles/ft3			
1 0.50	516	619	631	588.7	689	620	658	655.7
2 1.25	771	795	793	786.3	828	722	828	792.7
3 2.31	912	907	814	877.7	1112	998	956	1022.0
4 3.85	984	974	1021	993.0	1284	1181	1183	1216.0
Center 5.96	1099	1139	1204	1147.3	1289	1304	1334	1309.0
5 8.07	920	1045	1178	1047.7	1237	1144	1185	1188.7
6 9.61	862	685	848	798.3	970	943	999	970.7
7 10.67	644	753	729	708.7	792	760	799	783.7
8 11.42	433	489	509	477.0	524	468	445	479.0
Averages ———>	793.4	822.9	858.6	825.0	969.4	904.4	931.9	935.3

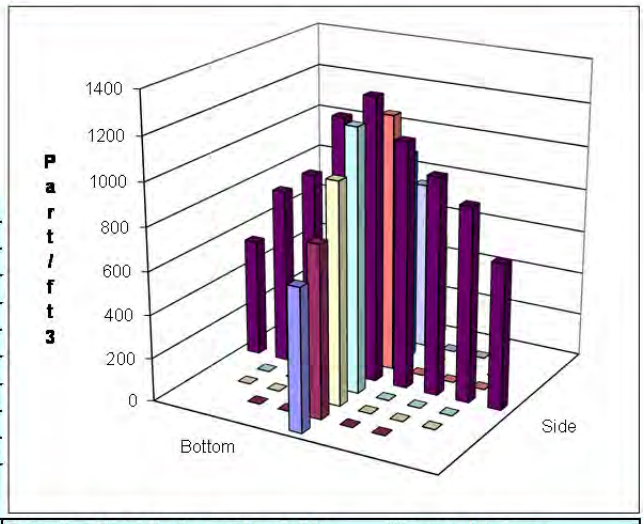
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	880.1		Mean	908.4	1040.4	974.4	1038.41
Min Point	477.0	-45.8%	Std. Dev.	158.9	207.1	190.1	187.02
Max Point	1309.0	48.7%	COV as %	17.5	19.9	19.5	18.01

Avg Conc 837 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	3.2	3.3	psig
Stack Temp	73.2	82.7	F
Centerline vel.	2955	2961	afpm
Ambient pressure	29.47	29.47	inHg
Ambient humidity	52%	37%	RH
Ambient temp	72.5	79.7	F
Back-Gd aerosol	0,1,2,3,3	1,1,2,0,4	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	25	26	psig



Notes:

SS 8/9/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/9/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-32
Date	8/9/2013	Fan configuration	BC
Tester	YFS,SS	Fan Setting	41 Hz
Stack Dia.	11.922 in.	Stack Temp	92.1 deg F
Stack X-Area	111.6 in.2	Start/End Time	0850 /
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5

		Order —>	1st				2nd			
		Traverse-->	Side				Bottom			
		Trial —>	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.		particles/ft3				particles/ft3			
1	0.50		729	905	869	**834.3**	1020	1070	964	**1018.0**
2	1.25		863	1011	874	**916.0**	1125	1175	1177	**1159.0**
3	2.31		1062	1071	1086	**1073.0**	1370	1386	1358	**1371.3**
4	3.85		1167	1179	1214	**1186.7**	1499	1512	1556	**1522.3**
Center	5.96		1113	1243	1357	**1237.7**	1644	1658	1637	**1646.3**
5	8.07		1145	1209	1316	**1223.3**	1574	1588	1632	**1598.0**
6	9.61		1129	987	1176	**1097.3**	1485	1472	1484	**1480.3**
7	10.67		1045	1024	1028	**1032.3**	1089	1027	1157	**1091.0**
8	11.42		798	839	828	**821.7**	911	858	889	**886.0**
Averages ———>			**1005.7**	**1052.0**	**1083.1**	**1046.9**	**1301.9**	**1305.1**	**1317.1**	**1308.0**

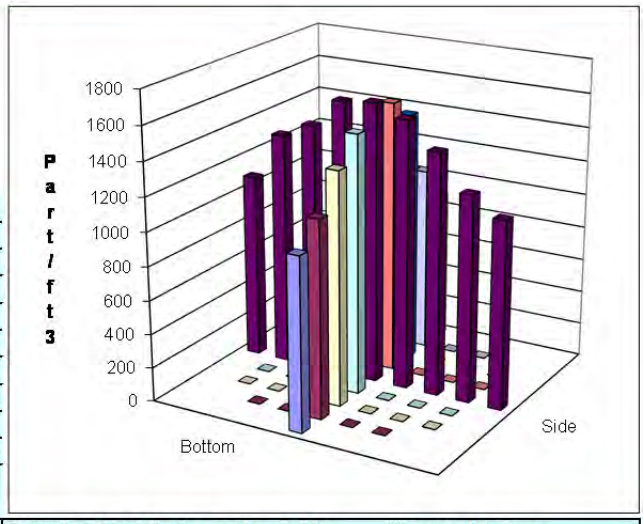
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1177.5		Mean	1109.5	1409.8	1259.6	1442.79
Min Point	821.7	-30.2%	Std. Dev.	115.6	214.1	227.2	182.34
Max Point	1646.3	39.8%	COV as %	10.4	15.2	**18.0**	**12.64**

Avg Conc 1144 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.2	2.2	psig
Stack Temp	81.5	102.7	F
Centerline vel.	2231	1983	afpm
Ambient pressure	29.83	30.86	inHg
Ambient humidity	36%	26%	RH
Ambient temp	80.6	91.4	F
Back-Gd aerosol	2,15,19,11,9	0,1,1,1,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	22	22	psig



Notes:

SS 8/9/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/9/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-33
Date	8/9/2013	Fan configuration	BC
Tester	YFS,cb,EA	Fan Setting	50 Hz
Stack Dia.	11.922 in.	Stack Temp	107.85 deg F
Stack X-Area	111.6 in.2	Start/End Time	12:15/14:10
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	851	832	927	**870.0**	909	931	834	**891.3**
2	1.25	1085	1012	1073	**1056.7**	1165	1132	1022	**1106.3**
3	2.31	1218	1301	1216	**1245.0**	1384	1353	1279	**1338.7**
4	3.85	1383	1438	1405	**1408.7**	1552	1650	1573	**1591.7**
Center	5.96	1461	1449	1543	**1484.3**	1733	1760	1728	**1740.3**
5	8.07	1419	1270	1304	**1331.0**	1515	1527	1538	**1526.7**
6	9.61	1224	1155	1249	**1209.3**	1389	1434	1386	**1403.0**
7	10.67	1107	1099	992	**1066.0**	962	940	977	**959.7**
8	11.42	874	837	765	**825.3**	731	711	726	**722.7**
Averages ———>		**1180.2**	**1154.8**	**1163.8**	**1166.3**	**1260.0**	**1270.9**	**1229.2**	**1253.4**

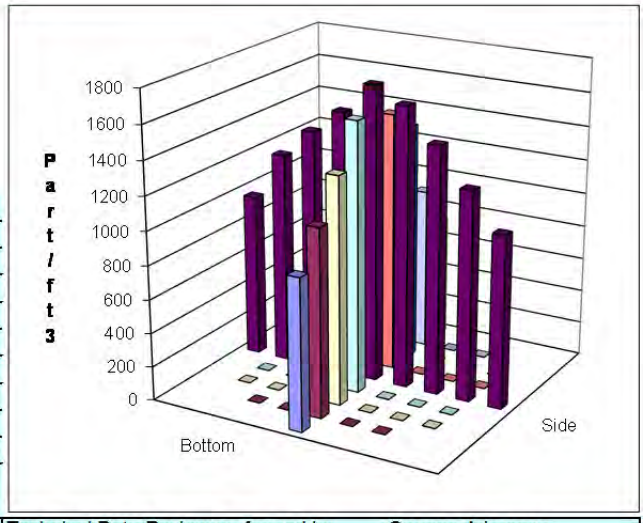
All	pt/ft3	Dev. from mean	***Center 2/3***	Side	Bottom	All	Normlzd
Mean	1209.8		Mean	1257.3	1380.9	1319.1	1427.52
Min Point	722.7	-40.3%	Std. Dev.	162.9	273.8	225.8	231.92
Max Point	1740.3	43.9%	COV as %	13.0	19.8	17.1	16.25

Avg Conc 1160 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.5	2.5	psig
Stack Temp	105.6	110.1	F
Centerline vel.	2921	2795	afpm
Ambient pressure	30.86	30.83	inHg
Ambient humidity	26%	21%	RH
Ambient temp	90.5	94.1	F
Back-Gd aerosol	0,4,1,1,2	3,2,1,1,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	10	16	psig



Notes:

bottom cap left off during run #1 Side. Data looks ok
But ref data slightly lower.
cb 8/9/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/9/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-34
Date	8/9/2013	Fan configuration	BC
Tester	cb,EA	Fan Setting	45 Hz
Stack Dia.	11.922 in.	Stack Temp	109.45 deg F
Stack X-Area	111.6 in.2	Start/End Time	14:30/16:05
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-5
Order —>	2nd		1st

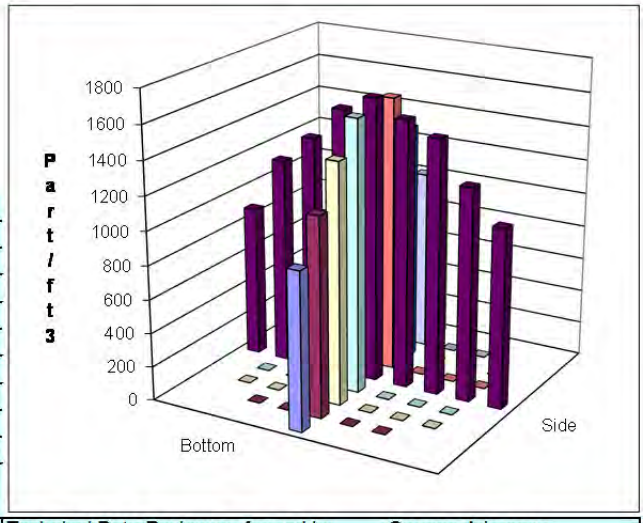
		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1015	970	1192	**1059.0**	835	841	1035	**903.7**
2	1.25	1152	1247	1367	**1255.3**	1053	1113	1253	**1139.7**
3	2.31	1413	1606	1471	**1496.7**	1267	1396	1472	**1378.3**
4	3.85	1538	1557	1625	**1573.3**	1395	1647	1641	**1561.0**
Center	5.96	1700	1570	1734	**1668.0**	1486	1637	1744	**1622.3**
5	8.07	1528	1557	1644	**1576.3**	1398	1610	1724	**1577.3**
6	9.61	1396	1359	1384	**1379.7**	1182	1458	1436	**1358.7**
7	10.67	1254	1205	1192	**1217.0**	892	1119	1099	**1036.7**
8	11.42	908	919	852	**893.0**	722	851	875	**816.0**
Averages ———>		**1322.7**	**1332.2**	**1384.6**	**1346.5**	**1136.7**	**1296.9**	**1364.3**	**1266.0**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1306.2		Mean	1452.3	1382.0	1417.2	1436.62
Min Point	816.0	-37.5%	Std. Dev.	172.2	226.0	196.5	197.18
Max Point	1668.0	27.7%	COV as %	11.9	16.4	13.9	13.72

Avg Conc 1264 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529009	1/14/2014

	Start	Finish	
Generator Inlet Press	2.2	2.3	psig
Stack Temp	108.5	110.4	F
Centerline vel.	2502	2558	afpm
Ambient pressure	30.83	30.77	inHg
Ambient humidity	19%	18%	RH
Ambient temp	97.7	99.5	F
Back-Gd aerosol	1,1,1,2,1	1,1,3,1,6	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	24	22	psig



Notes:
checked generator inlet after side run#3 #1
value had increased to 2.3.
cb 8/9/13

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/9/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-35
Date	8/28/2013	Fan configuration	AB MAX
Tester	SFS,SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	74.9 deg F
Stack X-Area	111.6 in.2	Start/End Time	0630 / 0930
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	2nd		1st

		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1764	1481	1638	**1627.7**	1526	1661	1676	**1621.0**
2	1.25	1940	2073	2213	**2075.3**	1853	1994	1873	**1906.7**
3	2.31	2208	2346	2451	**2335.0**	2189	2251	2281	**2240.3**
4	3.85	2462	2515	2681	**2552.7**	2440	2577	2650	**2555.7**
Center	5.96	2449	2496	2851	**2598.7**	2577	2813	2842	**2744.0**
5	8.07	2122	2463	2388	**2324.3**	2321	2621	2580	**2507.3**
6	9.61	1946	2224	2364	**2178.0**	1943	2273	2253	**2156.3**
7	10.67	1858	1847	1961	**1888.7**	1630	1974	2017	**1873.7**
8	11.42	1559	1587	1622	**1589.3**	1572	1666	1596	**1611.3**
Averages ———>		**2034.2**	**2114.7**	**2241.0**	**2130.0**	**2005.7**	**2203.3**	**2196.4**	**2135.1**

All	pt/ft3	Dev. from mean
Mean	2132.6	
Min Point	1589.3	-25.5%
Max Point	2744.0	28.7%

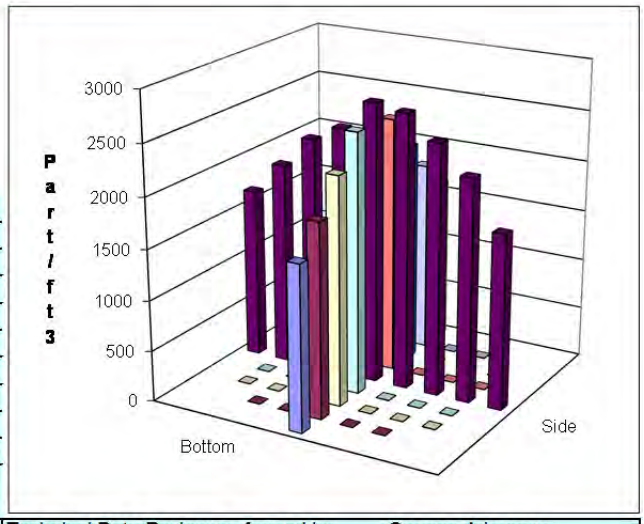
Center 2/3	Side	Bottom	All	Normlzd
Mean	2279.0	2283.4	2281.2	2344.92
Std. Dev.	253.7	332.7	284.3	297.15
COV as %	11.1	14.6	12.5	12.67

Avg Conc 2065 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	3.2	3.2	psig
Stack Temp	66.5	83.3	F
Centerline vel.	3018	3139	afpm
Ambient pressure	30.77	30.74	inHg
Ambient humidity	69%	42%	RH
Ambient temp	64.4	76.1	F
Back-Gd aerosol	2,1,1,0,2	1,1,0,2,1	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	25	32	psig



Notes: Redo of PT-28.

SS 8/28/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/28/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-36
Date	8/28/2013	Fan configuration	BC MAX
Tester	SFS,SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	96.8 deg F
Stack X-Area	111.6 in.2	Start/End Time	1040 / 1230
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I6
Order —>	2nd		1st

		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	816	950	856	874.0	868	889	869	875.3
2	1.25	978	1174	1049	1067.0	979	1055	969	1001.0
3	2.31	1089	1238	1215	1180.7	1042	1142	1172	1118.7
4	3.85	1217	1357	1279	1284.3	1212	1314	1262	1262.7
Center	5.96	1291	1328	1419	1346.0	1371	1398	1414	1394.3
5	8.07	1253	1255	1220	1242.7	1349	1315	1333	1332.3
6	9.61	1117	1017	1160	1098.0	1228	1162	1192	1194.0
7	10.67	940	953	1016	969.7	795	900	838	844.3
8	11.42	731	796	730	752.3	713	809	736	752.7
Averages ———>		1048.0	1118.7	1104.9	1090.5	1061.9	1109.3	1087.2	1086.1

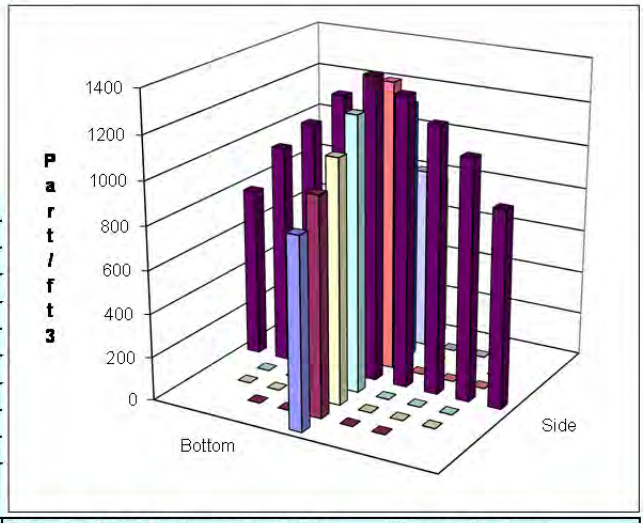
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1088.3		Mean	1169.8	1163.9	1166.8	1187.84
Min Point	752.3	-30.9%	Std. Dev.	132.5	192.7	158.9	162.65
Max Point	1394.3	28.1%	COV as %	11.3	16.6	13.6	13.69

Avg Conc 1053 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	2.3	2.3	psig
Stack Temp	94.2	99.4	F
Centerline vel.	3439	3571	afpm
Ambient pressure	30.74	30.74	inHg
Ambient humidity	30%	24%	RH
Ambient temp	85.1	89.6	F
Back-Gd aerosol	1,2,1,3,7	1,1,2,0,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	23	34	psig



Notes:

SS 8/28/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/28/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-37
Date	8/28/2013	Fan configuration	BC Max
Tester	EA, cb	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	104.9 deg F
Stack X-Area	111.6 in.2	Start/End Time	13:30/15:20
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-7
Order —>	1st		2nd

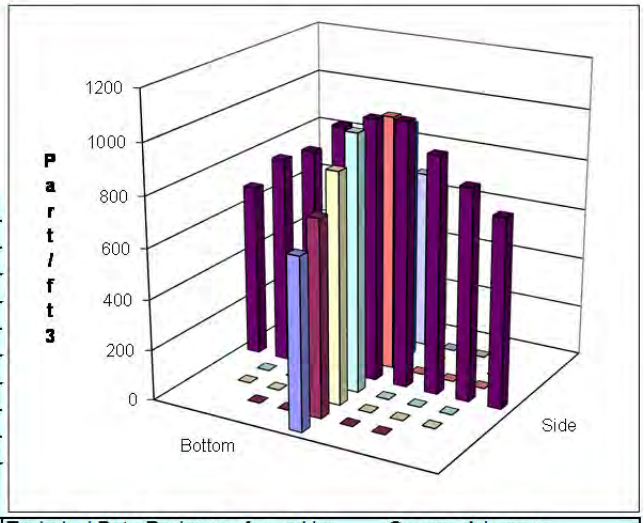
		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	727	686	645	686.0	645	672	704	673.7
2	1.25	826	777	703	768.7	779	802	735	772.0
3	2.31	869	846	864	859.7	897	936	890	907.7
4	3.85	947	981	946	958.0	1016	1031	999	1015.3
Center	5.96	917	946	984	949.0	1036	976	1089	1033.7
5	8.07	865	906	943	904.7	1030	976	1019	1008.3
6	9.61	792	796	808	798.7	911	953	972	945.3
7	10.67	756	756	740	750.7	702	722	714	712.7
8	11.42	610	649	622	627.0	637	636	597	623.3
Averages ———>		812.1	815.9	806.1	811.4	850.3	856.0	857.7	854.7

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	833.0		Mean	855.6	913.6	884.6	922.76
Min Point	623.3	-25.2%	Std. Dev.	85.1	126.0	107.6	106.67
Max Point	1033.7	24.1%	COV as %	9.9	13.8	12.2	11.56

Avg Conc 813 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	2.3	2.3	psig
Stack Temp	104.5	105.3	F
Centerline vel.	3476	3990	afpm
Ambient pressure	30.74	30.74	inHg
Ambient humidity	20%	21%	RH
Ambient temp	93.2	92.3	F
Back-Gd aerosol	1,2,0,0,0,	1,3,0,4,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	23	30	psig



Notes:

cb 8/28/2013

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by:	Carolyn Burns
Signature/date	8/28/2013
	Signature on file with original

Technical Data Review performed by:	Carmen Arimescu
Signature/date	2/25/2014
Signature on file with original TI-WTPSP 123	

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-38
Date	8/28/2013	Fan configuration	BC Max
Tester	EA, cb,JG	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	102.8 deg F
Stack X-Area	111.6 in.2	Start/End Time	15:30/17:20
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-8
Order —>	2nd		1st

Traverse-->		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	733	764	707	734.7	784	777	799	786.7
2	1.25	823	825	761	803.0	791	788	808	795.7
3	2.31	850	827	863	846.7	899	878	915	897.3
4	3.85	916	817	824	852.3	931	954	928	937.7
Center	5.96	920	849	866	878.3	941	989	989	973.0
5	8.07	846	828	867	847.0	933	960	941	944.7
6	9.61	822	830	822	824.7	950	943	874	922.3
7	10.67	767	768	795	776.7	733	799	782	771.3
8	11.42	698	712	708	706.0	744	734	731	736.3
Averages ———>		819.4	802.2	801.4	807.7	856.2	869.1	863.0	862.8

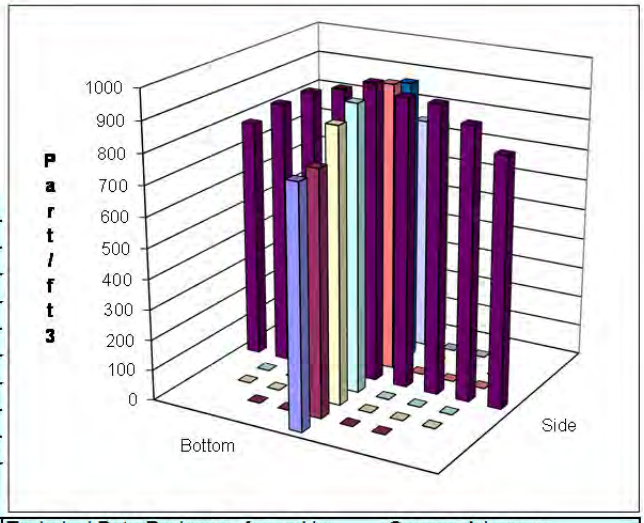
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	835.2		Mean	832.7	891.7	862.2	907.06
Min Point	706.0	-15.5%	Std. Dev.	34.0	77.7	65.3	60.79
Max Point	973.0	16.5%	COV as %	4.1	8.7	7.6	6.70

Avg Conc 824 pt/ft3

Instuments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	3.5	3.5	psig
Stack Temp	109.3	96.3	F
Centerline vel.	3564	3217	afpm
Ambient pressure	30.74	30.74	inHg
Ambient humidity	18%	24%	RH
Ambient temp	97.7	90.5	F
Back-Gd aerosol	5,2,1,1,3	3,3,0,3,4	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	30	22	psig



Notes:

CB 8/28/2013

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/28/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-39
Date	8/29/2013	Fan configuration	BC Max
Tester	SFS, SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	88.15 deg F
Stack X-Area	111.6 in.2	Start/End Time	0850 / 1040
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-9
Order —>	2nd		1st

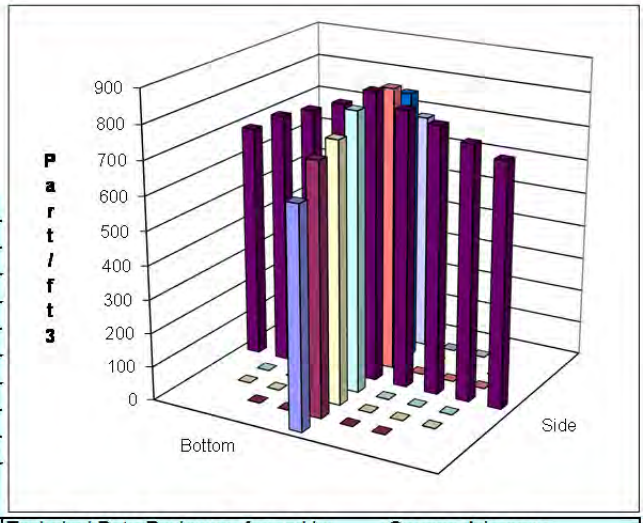
Traverse-->		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	678	698	779	718.3	629	654	635	639.3
2	1.25	724	743	780	749.0	691	724	766	727.0
3	2.31	775	783	799	785.7	713	755	802	756.7
4	3.85	776	818	850	814.7	757	859	817	811.0
Center	5.96	829	874	855	852.7	807	873	840	840.0
5	8.07	783	854	773	803.3	803	791	883	825.7
6	9.61	783	781	750	771.3	744	771	848	787.7
7	10.67	766	713	743	740.7	674	697	712	694.3
8	11.42	725	673	668	688.7	650	657	643	650.0
Averages ———>		759.9	770.8	777.4	769.4	718.7	753.4	771.8	748.0

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	758.7		Mean	788.2	777.5	782.8	788.70
Min Point	639.3	-15.7%	Std. Dev.	39.1	53.8	45.5	45.62
Max Point	852.7	12.4%	COV as %	5.0	6.9	5.8	5.78

Avg Conc 748 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	3.9	3.9	psig
Stack Temp	81.3	95	F
Centerline vel.	3557	3489	afpm
Ambient pressure	30.77	30.8	inHg
Ambient humidity	41%	28%	RH
Ambient temp	78.8	89.6	F
Back-Gd aerosol	5,0,2,1,1	2,1,0,2,3	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	24	30	psig



Notes: Ref probe was found to be off perpendicular
Corrected at run Bottom 3.

ss 8/29/13

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 8/29/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-40
Date	8/29/2013	Fan configuration	BC Max
Tester	SFS, EA, TH,cb	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	94.25 deg F
Stack X-Area	111.6 in.2	Start/End Time	1100 / 1242
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	1st		2nd

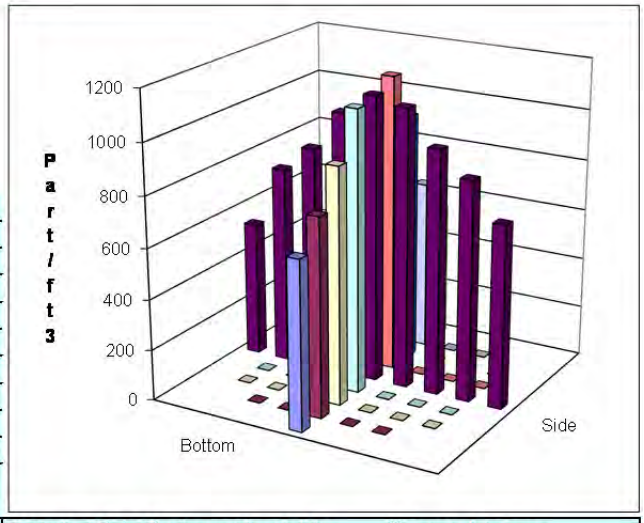
		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	690	617	648	651.7	625	617	745	662.3
2	1.25	785	784	784	784.3	738	801	794	777.7
3	2.31	883	874	851	869.3	948	892	941	927.0
4	3.85	982	1013	982	992.3	1094	1113	1108	1105.0
Center	5.96	1072	961	1019	1017.3	1109	1124	1131	1121.3
5	8.07	927	946	949	940.7	1106	1173	1211	1163.3
6	9.61	817	854	723	798.0	953	963	1018	978.0
7	10.67	726	717	673	705.3	669	692	648	669.7
8	11.42	499	472	478	483.0	536	498	560	531.3
Averages ———>		820.1	804.2	789.7	804.7	864.2	874.8	906.2	881.7

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	843.2		Mean	872.5	963.1	917.8	962.41
Min Point	483.0	-42.7%	Std. Dev.	116.4	185.9	156.2	153.43
Max Point	1163.3	38.0%	COV as %	13.3	19.3	17.0	15.94

Avg Conc 815 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	94	94.5	F
Centerline vel.	3442	3259	afpm
Ambient pressure	30.8	30.83	inHg
Ambient humidity	25%	23%	RH
Ambient temp	92.3	95	F
Back-Gd aerosol	2, 3, 0, 0, 3	0,2,1,1,1,	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	30	40	psig



Notes:

CB 08/29/2013

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/29/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-41
Date	8/29/2013	Fan configuration	BC Max
Tester	TH,cb	Fan Setting	55 Hz
Stack Dia.	11.922 in.	Stack Temp	100.55 deg F
Stack X-Area	111.6 in.2	Start/End Time	1300/1442
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	2nd		1st

		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	455	626	555	545.3	579	519	521	539.7
2	1.25	620	718	622	653.3	685	622	634	647.0
3	2.31	783	679	776	746.0	762	715	743	740.0
4	3.85	751	818	823	797.3	854	815	829	832.7
Center	5.96	784	809	834	809.0	853	928	879	886.7
5	8.07	728	738	829	765.0	838	870	873	860.3
6	9.61	720	717	732	723.0	762	761	727	750.0
7	10.67	598	630	661	629.7	552	503	522	525.7
8	11.42	503	567	556	542.0	489	437	498	474.7
Averages ———>		660.2	700.2	709.8	690.1	708.2	685.6	691.8	695.2

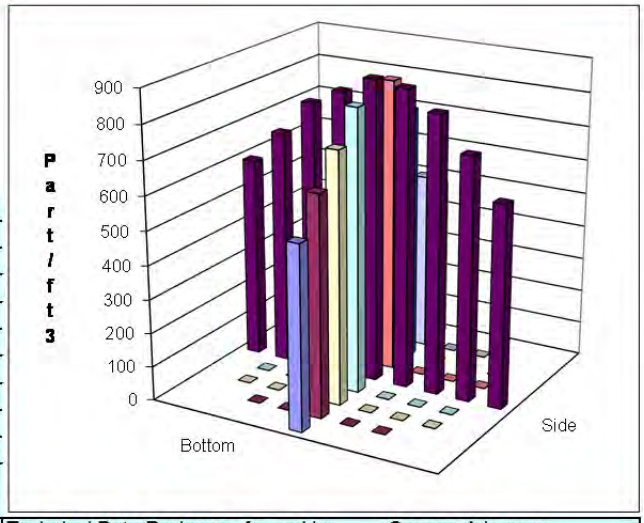
All	pt/ft3	Dev. from mean
Mean	692.6	
Min Point	474.7	-31.5%
Max Point	886.7	28.0%

Center 2/3	Side	Bottom	All	Normlzd
Mean	731.9	748.9	740.4	775.54
Std. Dev.	68.6	128.3	99.2	104.71
COV as %	9.4	17.1	13.4	13.50

Avg Conc 673 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	1.2	1.1	psig
Stack Temp	93.3	107.8	F
Centerline vel.	3006	2932	afpm
Ambient pressure	30.83	30.83	inHg
Ambient humidity	24%	20%	RH
Ambient temp	93.2	96.8	F
Back-Gd aerosol	0,1,3,0,0	0,1,2,0,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	26	20	psig



Notes:

Sun came out then behind the clouds throughout test
cover was missing on cap used for velocity check
for duration of test. Ref may be lower than actual due
to air flow out of duct.
CB 08/29/2013

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 8/29/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-42
Date	8/30/2013	Fan configuration	B&C Max
Tester	YFS, EA	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	96.85 deg F
Stack X-Area	111.6 in.2	Start/End Time	1100 / 1300
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	2nd		1st

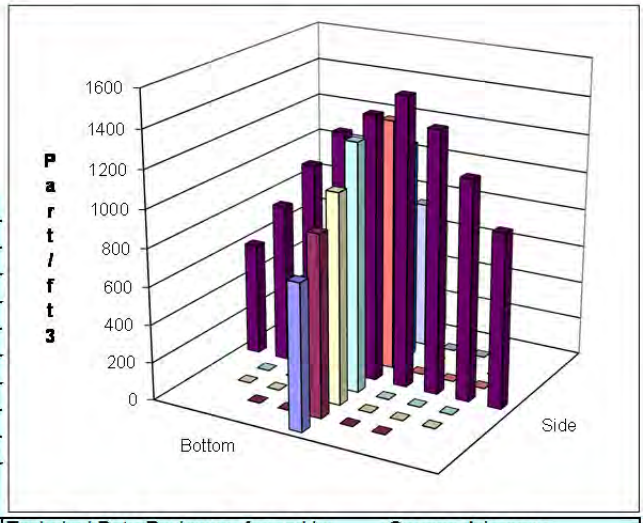
		Side				Bottom			
Traverse–>									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	661	694	438	597.7	705	777	819	767.0
2	1.25	891	868	505	754.7	898	972	987	952.3
3	2.31	1064	997	630	897.0	1098	1129	1090	1105.7
4	3.85	1233	1086	649	989.3	1249	1321	1354	1308.0
Center	5.96	1113	933	685	910.3	1352	1357	1481	1396.7
5	8.07	1065	755	686	835.3	1289	1344	1342	1325.0
6	9.61	896	632	594	707.3	1120	1120	1218	1152.7
7	10.67	695	499	446	546.7	761	742	847	783.3
8	11.42	449	334	381	388.0	571	621	650	614.0
Averages ———>		896.3	755.3	557.1	736.3	1004.8	1042.6	1087.6	1045.0

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	890.6		Mean	805.8	1146.2	976.0	1191.27
Min Point	388.0	-56.4%	Std. Dev.	149.0	220.5	252.8	220.82
Max Point	1396.7	56.8%	COV as %	18.5	19.2	25.9	18.54

Avg Conc 858 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	1.3	1.3	psig
Stack Temp	93.1	100.6	F
Centerline vel.	3462	3384	afpm
Ambient pressure	31.13	31.12	inHg
Ambient humidity	29%	26%	RH
Ambient temp	85.1	89.6	F
Back-Gd aerosol	3, 6, 0, 3, 2	2, 1, 2, 2, 3	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	12	28	psig



Notes: Velocity measured at Bottom 7.
During middle of 2nd side traverse
seems that particle generation lowered.
Plastic particle generator (old style).

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by: Ernest Antonio
Signature/date 8/30/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-43
Date	9/5/2013	Fan configuration	BC Max
Tester	JAG, YFS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	91.95 deg F
Stack X-Area	111.6 in.2	Start/End Time	9:37
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	2nd		1st

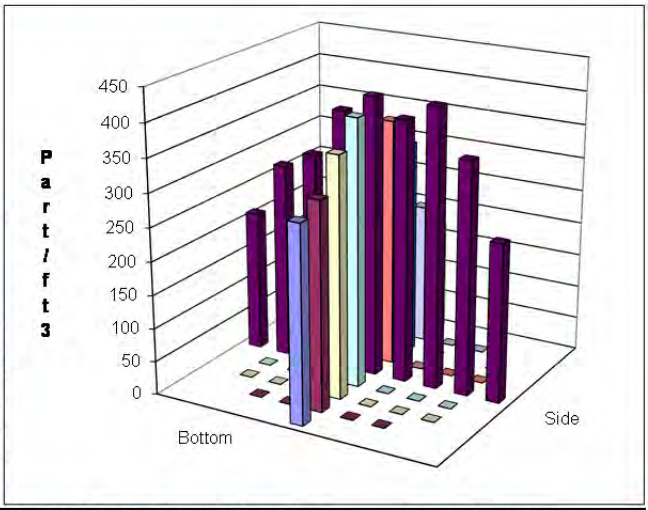
Traverse–>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	119	57	48	**74.7**	380	232	269	**293.7**
2	1.25	167	81	80	**109.3**	401	277	254	**310.7**
3	2.31	198	87	108	**131.0**	436	327	318	**360.3**
4	3.85	165	107	96	**122.7**	495	344	360	**399.7**
Center	5.96	178	115	100	**131.0**	502	364	386	**417.3**
5	8.07	156	94	117	**122.3**	458	328	323	**369.7**
6	9.61	126	85	88	**99.7**	393	291	280	**321.3**
7	10.67	117	91	68	**92.0**	246	207	181	**211.3**
8	11.42	90	59	50	**66.3**	182	175	148	**168.3**
Averages ———>		**146.2**	**86.2**	**83.9**	**105.4**	**388.1**	**282.8**	**279.9**	**316.9**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	211.2		Mean	115.4	341.5	228.5	354.60
Min Point	66.3	-68.6%	Std. Dev.	15.4	69.0	126.7	59.10
Max Point	417.3	97.6%	COV as %	13.3	20.2	55.5	16.67

Avg Conc 203 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	4.2	4.9	psig
Stack Temp	88.6	95.3	F
Centerline vel.	3796	3213	afpm
Ambient pressure	30.92	30.92	inHg
Ambient humidity	32%	31%	RH
Ambient temp	83.3	87.8	F
Back-Gd aerosol	0,1,1,0,0	3,1,0,1,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	33	29	psig



Notes:

1. Ref and Measure OPC in concentration mode. 2. After first traverse replaced A G Nozzle. 3. Plastic Aerosol Generator used.

JAG 9/5/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: J Glissmeyer
Signature/date 9/5/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-44
Date	9/9/2013	Fan configuration	BC Max
Tester	JG,cb	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	88.15 deg F
Stack X-Area	111.6 in.2	Start/End Time	9:15/11:10
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	2nd		1st

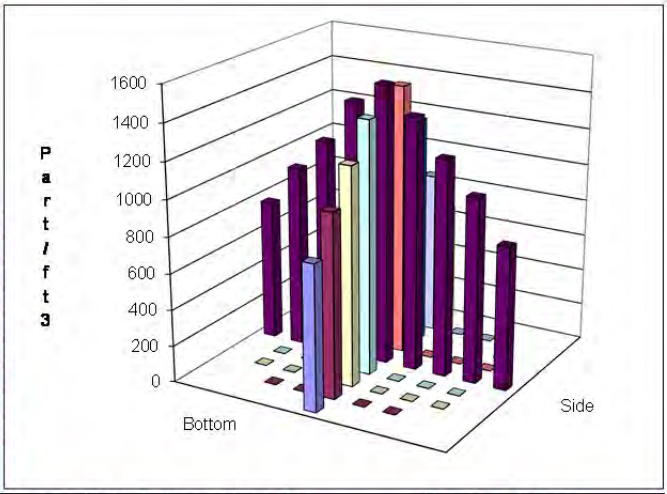
		Side				Bottom			
Traverse—>									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	783	772	806	787.0	725	683	632	680.0
2	1.25	927	1001	1121	1016.3	910	808	860	859.3
3	2.31	1138	1279	1149	1188.7	1148	949	968	1021.7
4	3.85	1379	1387	1383	1383.0	1300	1149	1108	1185.7
Center	5.96	1505	1518	1564	1529.0	1425	1217	1267	1303.0
5	8.07	1345	1458	1436	1413.0	1370	1212	1203	1261.7
6	9.61	1176	1178	1164	1172.7	1191	1001	1003	1065.0
7	10.67	889	1154	951	998.0	814	719	746	759.7
8	11.42	847	844	637	776.0	580	548	533	553.7
Averages ———>		1109.9	1176.8	1134.6	1140.4	1051.4	920.7	924.4	965.5

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1053.0		Mean	1243.0	1065.1	1154.0	1246.42
Min Point	553.7	-47.4%	Std. Dev.	204.0	203.0	216.2	213.09
Max Point	1529.0	45.2%	COV as %	16.4	19.1	18.7	17.10

Avg Conc 1008 pt/ft3

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	80.9	95.4	F
Centerline vel.	3450	3362	afpm
Ambient pressure	30.98	31.01	inHg
Ambient humidity	31%	28%	RH
Ambient temp	79.7	84.2	F
Back-Gd aerosol	1,1,5,2,1	0,3,0,0,0,	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	32	30	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014



Notes:
Added cap of the Port2 cover after the 3rd reading on run 1 side.

CB 09/09/2013

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by:	Carolyn Burns	Technical Data Review performed by:	Carmen Arimescu
Signature/date	9/9/2013	Signature/date	2/25/2014
	Signature on file with original	Signature on file with original TI-WTPSP 123	

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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-45
Date	9/9/2013	Fan configuration	BC Norm
Tester	JG,cb	Fan Setting	55 Hz
Stack Dia.	11.922 in.	Stack Temp	98.75 deg F
Stack X-Area	111.6 in.2	Start/End Time	11:30/13:15
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5

Order —>		1st				2nd				
Traverse—>		Side				Bottom				
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1143	1109	1115	1122.3	1079	1044	977	1033.3
2	1.25	1177	1390	1308	1291.7	1241	1199	1177	1205.7
3	2.31	1472	1635	1456	1521.0	1453	1460	1373	1428.7
4	3.85	1679	1642	1764	1695.0	1612	1686	1649	1649.0
Center	5.96	1710	1778	1866	1784.7	1883	1908	1760	1850.3
5	8.07	1792	1677	1739	1736.0	1796	1778	1717	1763.7
6	9.61	1614	1624	1420	1552.7	1631	1567	1425	1541.0
7	10.67	1422	1379	1257	1352.7	1199	1231	1176	1202.0
8	11.42	1138	1002	1152	1097.3	1208	938	952	1032.7
Averages —————>		1460.8	1470.7	1453.0	1461.5	1455.8	1423.4	1356.2	1411.8

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1436.6		Mean	1562.0	1520.0	1541.0	1569.74
Min Point	1032.7	-28.1%	Std. Dev.	189.8	256.2	217.7	225.46
Max Point	1850.3	28.8%	COV as %	12.2	16.9	14.1	14.36

Avg Conc 1389 pt/ft3

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	96.1	101.4	F
Centerline vel.	3088	3204	afpm
Ambient pressure	31.01	30.98	inHg
Ambient humidity	28%	21%	RH
Ambient temp	84.2	94.1	F
Back-Gd aerosol	0,3,0,0,0,	0,0,3,0,0,	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	26	40	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

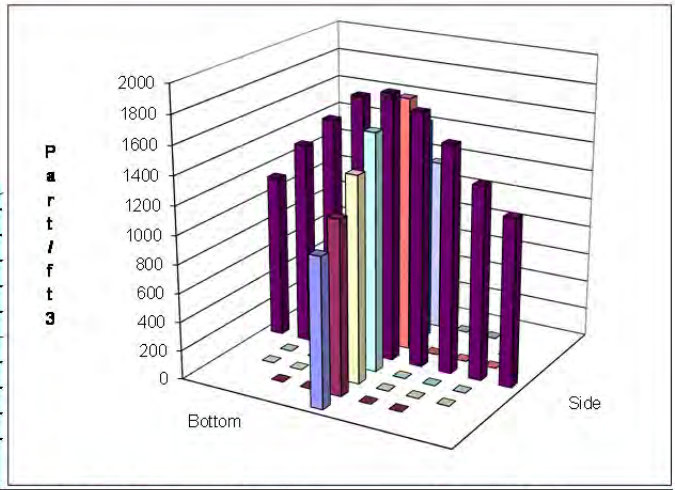
Notes:

CB 9/9/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe



Entries made by: Carolyn Burns
Signature/date 9/9/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-46
Date	9/10/2013	Fan configuration	BC Max
Tester	SS,cb	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	77.5 deg F
Stack X-Area	111.6 in.2	Start/End Time	7:20/9:30
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I5
Order —>	2nd		1st

		Side				Bottom			
Traverse–>									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	731	697	600	**676.0**	646	685	558	**629.7**
2	1.25	847	790	778	**805.0**	849	827	758	**811.3**
3	2.31	1004	892	911	**935.7**	1090	1047	889	**1008.7**
4	3.85	1029	905	1111	**1015.0**	1320	1180	1107	**1202.3**
Center	5.96	1041	1030	1108	**1059.7**	1511	1253	1179	**1314.3**
5	8.07	1092	1072	1186	**1116.7**	1422	1251	1035	**1236.0**
6	9.61	960	1003	951	**971.3**	1160	1028	956	**1048.0**
7	10.67	794	745	874	**804.3**	792	730	661	**727.7**
8	11.42	547	537	612	**565.3**	561	584	507	**550.7**
Averages ———>		**893.9**	**852.3**	**903.4**	**883.2**	**1039.0**	**953.9**	**850.0**	**947.6**

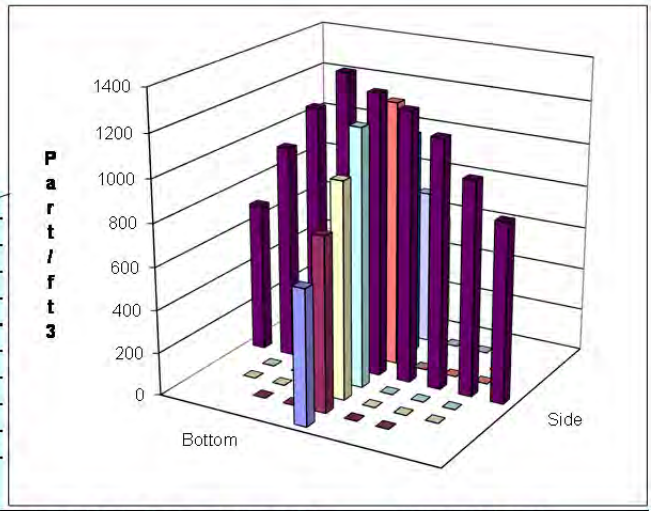
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	915.4		Mean	958.2	1049.8	1004.0	1119.15
Min Point	550.7	-39.8%	Std. Dev.	120.0	219.9	176.7	194.27
Max Point	1314.3	43.6%	COV as %	12.5	21.0	17.6	17.36

Avg Conc 881 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	1.8	1.8	psig
Stack Temp	69.5	85.5	F
Centerline vel b#7	4099	3479	afpm
Ambient pressure	30.95	30.98	inHg
Ambient humidity	55%	34%	RH
Ambient temp	63.5	77.9	F
Back-Gd aerosol	3,2,2,0,0	2,1,3,0,0,	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	42	40	psig



Notes:

CB 9/10/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 9/10/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-47
Date	9/10/2013	Fan configuration	BC Max
Tester	SS,TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	104.9 deg F
Stack X-Area	111.6 in.2	Start/End Time	1340 / 1523
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I9

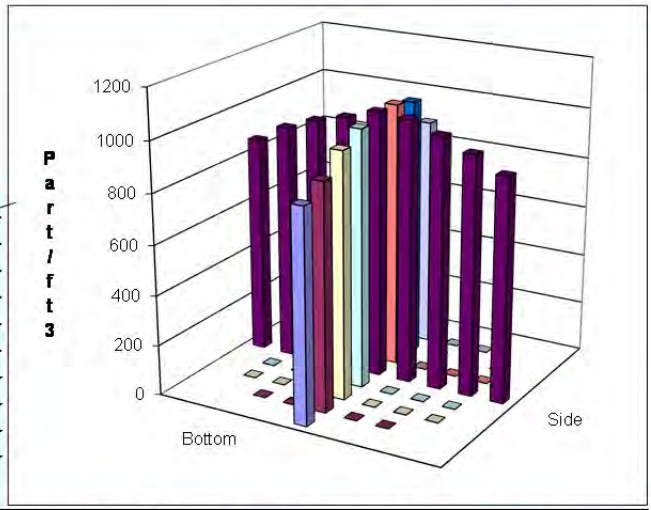
Order —>	1st				2nd			
Traverse—>	Side				Bottom			
Trial —>	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	particles/ft3				particles/ft3			
1 / 0.50	860	828	876	**854.7**	836	848	857	**847.0**
2 / 1.25	905	902	933	**913.3**	860	927	912	**899.7**
3 / 2.31	958	972	951	**960.3**	968	1003	962	**977.7**
4 / 3.85	960	1036	1009	**1001.7**	1019	986	1069	**1024.7**
Center / 5.96	984	1004	1045	**1011.0**	1018	1040	1105	**1054.3**
5 / 8.07	961	957	999	**972.3**	1036	1054	1061	**1050.3**
6 / 9.61	929	955	941	**941.7**	1016	1010	1061	**1029.0**
7 / 10.67	907	886	898	**897.0**	910	870	961	**913.7**
8 / 11.42	846	794	853	**831.0**	814	805	863	**827.3**
Averages ———>	**923.3**	**926.0**	**945.0**	**931.4**	**941.9**	**949.2**	**983.4**	**958.2**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	944.8		Mean	956.8	992.8	974.8	995.27
Min Point	827.3	-12.4%	Std. Dev.	42.6	64.0	55.5	53.01
Max Point	1054.3	11.6%	COV as %	4.5	6.4	5.7	5.33

Avg Conc 934 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	3.6	3.6	psig
Stack Temp	104.4	105.4	F
Centerline vel b#7	3297	3323	afpm
Ambient pressure	30.95	30.95	inHg
Ambient humidity	21%	17%	RH
Ambient temp	95	101.3	F
Back-Gd aerosol	11,2,0,1,2	5,8,5,4,3	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	24	42	psig



Notes:

SS 9/10/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 9/10/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-48
Date	9/13/2013	Fan configuration	BC Max
Tester	SS, EA	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	96.1 deg F
Stack X-Area	111.6 in.2	Start/End Time	0900 / 1050
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I7
Order —>	2nd		1st

Traverse—>		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	707	717	779	734.3	587	542	617	582.0
2	1.25	764	854	892	836.7	712	625	709	682.0
3	2.31	864	932	905	900.3	780	823	794	799.0
4	3.85	920	1021	929	956.7	818	835	912	855.0
Center	5.96	994	990	943	975.7	863	876	939	892.7
5	8.07	902	976	891	923.0	924	888	894	902.0
6	9.61	830	820	796	815.3	809	853	814	825.3
7	10.67	719	801	806	775.3	634	611	649	631.3
8	11.42	641	659	625	641.7	547	499	593	546.3
Averages —>		815.7	863.3	840.7	839.9	741.6	728.0	769.0	746.2

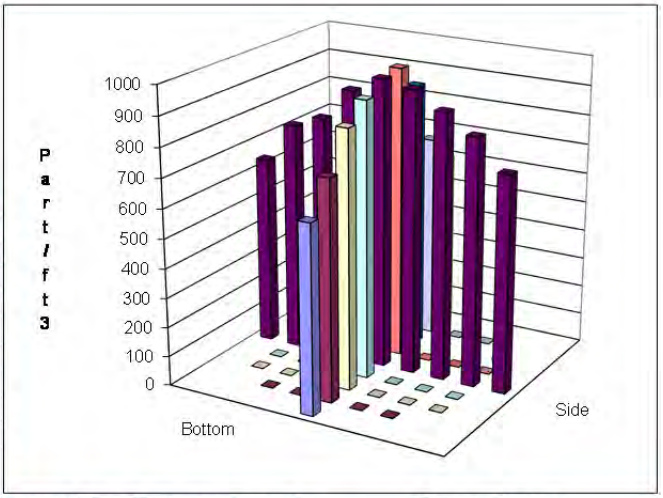
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	793.0		Mean	883.3	798.2	840.7	877.85
Min Point	546.3	-31.1%	Std. Dev.	75.5	104.1	97.9	92.95
Max Point	975.7	23.0%	COV as %	8.6	13.0	11.6	10.59

Avg Conc 775 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	2.3	2.2	psig
Stack Temp	90.2	102	F
Centerline vel b#7	3923	3447	afpm
Ambient pressure	30.83	30.83	inHg
Ambient humidity	40%	27%	RH
Ambient temp	77	88.7	F
Back-Gd aerosol	3,3,1,2,2	0,1,4,1,1	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	38	44	psig



Notes: Velocity checked at bottom 7 port 2.

SS
9/13/13

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	9/10/2013	Signature/date	2/25/2014
	Signature on file with original	Signature on file with original TI-WTPSP 123	

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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-49
Date	9/13/2013	Fan configuration	BC min
Tester	SS, EA	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	110.2 deg F
Stack X-Area	111.6 in.2	Start/End Time	1320 / 1510
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I7
Order ---->	1st		2nd

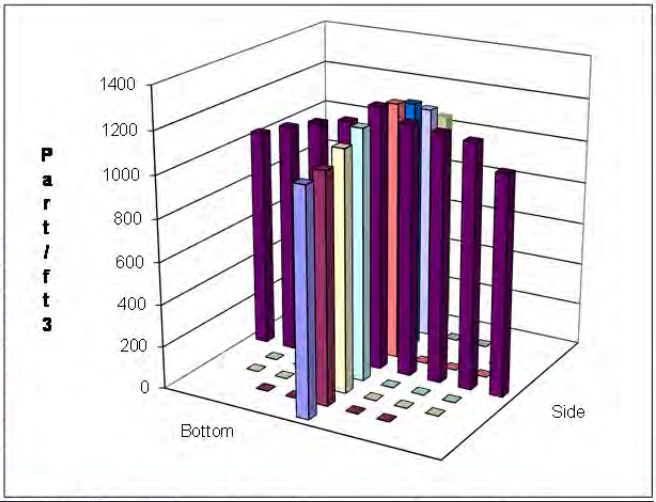
Traverse-->		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	977	929	1003	**969.7**	1139	994	1059	**1064.0**
2	1.25	1090	1055	1090	**1078.3**	1072	1024	1150	**1082.0**
3	2.31	1124	1107	1051	**1094.0**	1152	1112	1146	**1136.7**
4	3.85	1135	1104	1093	**1110.7**	1183	1215	1163	**1187.0**
Center	5.96	1152	1167	1173	**1164.0**	1193	1299	1243	**1245.0**
5	8.07	1122	1050	1067	**1079.7**	1230	1228	1200	**1219.3**
6	9.61	1025	1098	1034	**1052.3**	1133	1201	1211	**1181.7**
7	10.67	1038	950	1051	**1013.0**	1053	1156	1140	**1116.3**
8	11.42	942	968	984	**964.7**	1042	1084	1007	**1044.3**
Averages ---->		**1067.2**	**1047.6**	**1060.7**	**1058.5**	**1133.0**	**1145.9**	**1146.6**	**1141.8**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1100.1		Mean	1084.6	1166.9	1125.7	1163.45
Min Point	964.7	-12.3%	Std. Dev.	47.1	58.0	66.3	52.28
Max Point	1245.0	13.2%	COV as %	4.3	5.0	5.9	4.49

Avg Conc 1087 pt/ft3

	Start	Finish	
Generator Inlet Press	0.6	0.6	psig
Stack Temp	109	111.4	F
Centerline vel.	1274	1243	afpm
Ambient pressure	30.86	30.83	inHg
Ambient humidity	20%	19%	RH
Ambient temp	95.9	97.7	F
Back-Gd aerosol	3,6,5,6,6	7,7,4,13.8	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	60	38	psig

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014



Notes:

SS
9/13/13

Oil Used: Edwards 19
Ref. Probe Location: Ref port downstream Port 2.
Probe Type / Configuration: L-Shaped probe

Entries made by:	Susan Sande	Technical Data Review performed by:	Carmen Arimescu
Signature/date	9/13/2013	Signature/date	2/25/2014
	Signature on file with original	Signature on file with original TI-WTPSP 123	

Rev. 0

3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-50
Date	9/16/2013	Fan configuration	BC max
Tester	cb, TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	84.9 deg F
Stack X-Area	111.6 in.2	Start/End Time	17:00 / 18:30
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I7
Order —>	2nd		1st

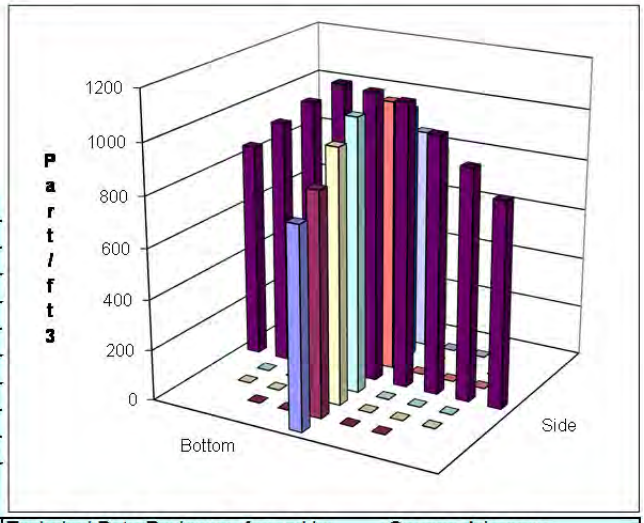
		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	770	700	748	739.3	815	754	802	790.3
2	1.25	839	831	826	832.0	933	813	880	875.3
3	2.31	955	903	913	923.7	991	952	1049	997.3
4	3.85	1023	1005	1026	1018.0	1093	981	1149	1074.3
Center	5.96	1085	1003	1018	1035.3	1162	1028	1210	1133.3
5	8.07	1058	1088	996	1047.3	1091	936	1173	1066.7
6	9.61	963	1039	897	966.3	1038	926	1052	1005.3
7	10.67	954	809	863	875.3	856	846	944	882.0
8	11.42	827	756	737	773.3	806	666	844	772.0
Averages ———>		941.6	903.8	891.6	912.3	976.1	878.0	1011.4	955.2

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	933.7		Mean	956.9	1004.9	980.9	1026.17
Min Point	739.3	-20.8%	Std. Dev.	83.2	97.5	90.6	93.29
Max Point	1133.3	21.4%	COV as %	8.7	9.7	9.2	9.09

Avg Conc 915 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	2.8	2.8	psig
Stack Temp	90.7	79.1	F
Centerline vel.	3327	3236	afpm
Ambient pressure	30.89	30.83	inHg
Ambient humidity	28%	31%	RH
Ambient temp	82.4	75.2	F
Back-Gd aerosol	2,4,4,1,4	0,3,0,1,3	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	38	50	psig



Notes:

wind Max during testing in the 17 m/h

cb

9/16/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns

Signature/date 9/13/2013

Signature on file with original

Technical Data Review performed by: Carmen Arimescu

Signature/date 2/25/2014

Signature on file with original TI-WTPSP 123

Rev. 0

3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-51
Date	9/17/2013	Fan configuration	BC min
Tester	SS, SFS	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	80.5 deg F
Stack X-Area	111.6 in.2	Start/End Time	0915 / 1130
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I7
Order —>	2nd		1st

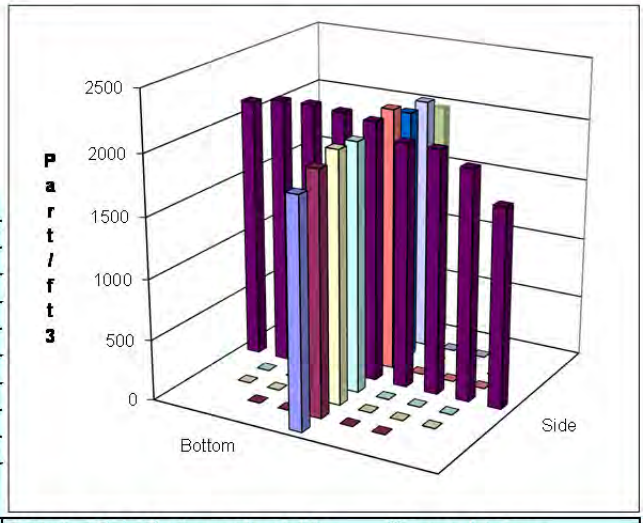
		Side				Bottom			
Traverse--> / Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1132	1778	2002	**1637.3**	1598	1616	1619	**1611.0**
2	1.25	1673	1924	2077	**1891.3**	1647	1687	1802	**1712.0**
3	2.31	1871	1877	2241	**1996.3**	1787	1712	1823	**1774.0**
4	3.85	1676	2067	2270	**2004.3**	1711	1763	1819	**1764.3**
Center	5.96	1741	2244	2413	**2132.7**	1801	1771	1938	**1836.7**
5	8.07	1946	2118	2438	**2167.3**	1772	1912	1901	**1861.7**
6	9.61	2009	2058	2499	**2188.7**	1765	1778	1795	**1779.3**
7	10.67	2025	2134	2384	**2181.0**	1724	1748	1923	**1798.3**
8	11.42	1937	2094	2378	**2136.3**	1679	1640	1768	**1695.7**
Averages ———>		**1778.9**	**2032.7**	**2300.2**	**2037.3**	**1720.4**	**1736.3**	**1820.9**	**1759.2**

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1898.2		Mean	2080.2	1789.5	1934.9	2079.05
Min Point	1611.0	-15.1%	Std. Dev.	116.0	49.1	173.5	87.83
Max Point	2188.7	15.3%	COV as %	5.6	2.7	9.0	4.22

Avg Conc 1887 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	1.2	1.2	psig
Stack Temp	82.2	78.8	F
Centerline vel.	1212	1257	afpm
Ambient pressure	30.8	30.8	inHg
Ambient humidity	36%	33%	RH
Ambient temp	72.5	77	F
Back-Gd aerosol	2,2,1,2,6	2,3,2,2,1	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	36	44	psig



Notes:

ss

9/17/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande

Signature/date 9/17/2013

Signature on file with original

Technical Data Review performed by: Carmen Arimescu

Signature/date 2/25/2014

Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-52
Date	9/17/2013	Fan configuration	AC MAX
Tester	SFS, TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	78.35 deg F
Stack X-Area	111.6 in.2	Start/End Time	12:35 14:12
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I7
Order —>	1st		2nd

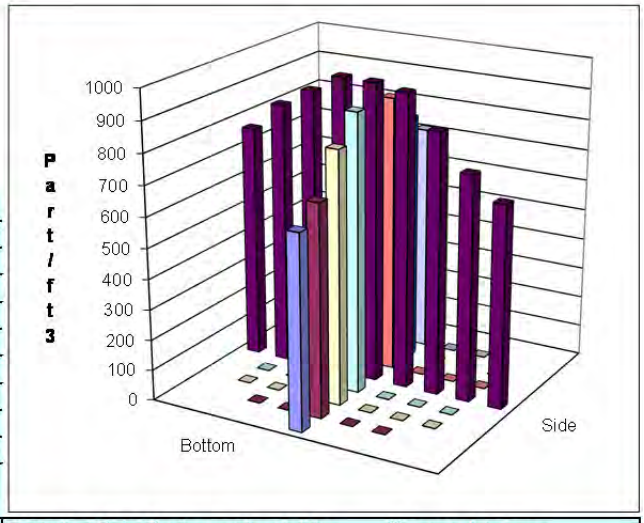
		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	463	766	762	663.7	641	648	566	618.3
2	1.25	795	717	702	738.0	729	686	609	674.7
3	2.31	878	806	877	853.7	842	855	716	804.3
4	3.85	1027	919	930	958.7	909	928	830	889.0
Center	5.96	1008	990	926	974.7	1014	945	895	951.3
5	8.07	1005	957	969	977.0	954	864	819	879.0
6	9.61	933	880	945	919.3	859	755	758	790.7
7	10.67	845	900	832	859.0	782	732	661	725.0
8	11.42	798	721	778	765.7	594	657	585	612.0
Averages ———>		861.3	850.7	857.9	856.6	813.8	785.6	715.4	771.6

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	814.1		Mean	897.2	816.3	856.7	866.75
Min Point	612.0	-24.8%	Std. Dev.	86.9	97.2	98.0	95.18
Max Point	977.0	20.0%	COV as %	9.7	11.9	11.4	10.98

Avg Conc 796 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	2.9	2.9	psig
Stack Temp	79.1	77.6	F
Centerline vel.	3365	3384	afpm
Ambient pressure	30.8	30.8	inHg
Ambient humidity	31%	38%	RH
Ambient temp	77.9	73.4	F
Back-Gd aerosol	0,1,1,0,1	1,1,0,0,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	40	48	psig



Notes:

SS 9/17/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Tristan Hay
Signature/date 9/17/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-53
Date	9/18/2013	Fan configuration	AC MIN
Tester	SFS,SS	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	64.75 deg F
Stack X-Area	111.6 in.2	Start/End Time	0730 / 0920
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I7
Order —>	2nd		1st

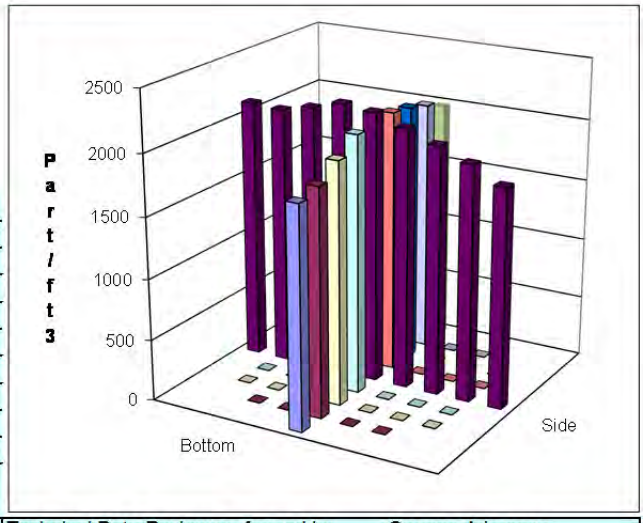
		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1726	1793	1855	1791.3	1196	1466	1597	1419.7
2	1.25	1766	1999	2007	1924.0	1338	1440	1596	1458.0
3	2.31	1838	2043	2193	2024.7	1309	1565	1786	1553.3
4	3.85	1975	2168	2206	2116.3	1445	1646	1872	1654.3
Center	5.96	2006	2269	2337	2204.0	1522	1746	1935	1734.3
5	8.07	2078	2287	2335	2233.3	1445	1754	1840	1679.7
6	9.61	2006	2198	2289	2164.3	1466	1728	1778	1657.3
7	10.67	1973	2110	2240	2107.7	1300	1682	1877	1619.7
8	11.42	2069	2130	2177	2125.3	1322	1700	1659	1560.3
Averages ———>		1937.4	2110.8	2182.1	2076.8	1371.4	1636.3	1771.1	1593.0

All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1834.9		Mean	2110.6	1622.4	1866.5	2086.17
Min Point	1419.7	-22.6%	Std. Dev.	107.2	91.2	270.8	110.17
Max Point	2233.3	21.7%	COV as %	5.1	5.6	14.5	5.28

Avg Conc 1818 pt/ft3

Instruments Used:		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	56.6	72.9	F
Centerline vel.	1261	1241	afpm
Ambient pressure	30.92	30.95	inHg
Ambient humidity	50%	35%	RH
Ambient temp	55.4	66.2	F
Back-Gd aerosol	3,1,1,3,3	3,4,5,8,6	pt/ft3
No. Blk-Gd samples	5	5	
Compressor output	41	47	psig



Notes:

SS 9/18/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande

Signature/date 9/18/2013

Signature on file with original

Technical Data Review performed by: Carmen Arimescu

Signature/date 2/25/2014

Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-54
Date	9/18/2013	Fan configuration	AC MIN
Tester	SFS,SS	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	77.7 deg F
Stack X-Area	111.6 in.2	Start/End Time	0930 /1110
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I7
Order —>	2nd		1st

		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	2413	2557	2511	**2493.7**	2362	2527	2672	**2520.3**
2	1.25	2544	2735	2602	**2627.0**	2571	2754	2752	**2692.3**
3	2.31	2598	2671	2728	**2665.7**	2845	2868	2851	**2854.7**
4	3.85	2794	2837	2908	**2846.3**	2919	2914	2925	**2919.3**
Center	5.96	2949	2561	2749	**2753.0**	2993	2946	2934	**2957.7**
5	8.07	2950	2731	2618	**2766.3**	2949	2947	3006	**2967.3**
6	9.61	2787	2787	2911	**2828.3**	2870	2926	2882	**2892.7**
7	10.67	2721	2659	2787	**2722.3**	2636	2765	2600	**2667.0**
8	11.42	2615	2608	2585	**2602.7**	2457	2517	2572	**2515.3**
Averages ———>		**2707.9**	**2682.9**	**2711.0**	**2700.6**	**2733.6**	**2796.0**	**2799.3**	**2776.3**

All	pt/ft3	Dev. from mean
Mean	2738.4	
Min Point	2493.7	-8.9%
Max Point	2967.3	8.4%

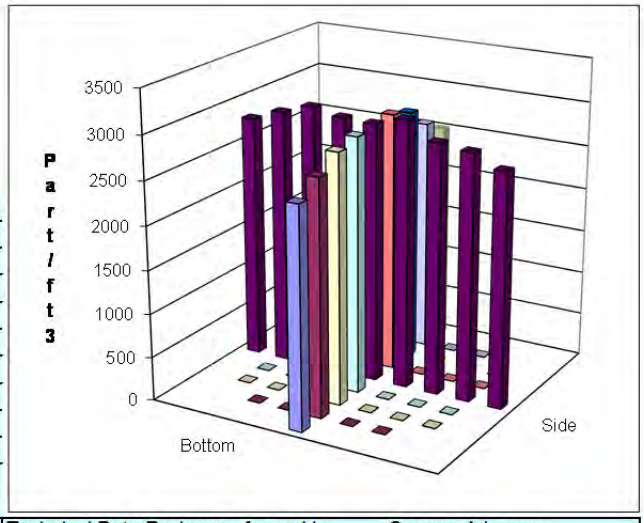
Center 2/3	Side	Bottom	All	Normlzd
Mean	2744.1	2850.1	2797.1	2899.15
Std. Dev.	80.1	122.7	113.7	113.80
COV as %	2.9	4.3	4.1	3.93

Avg Conc 2724 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	72.9	82.5	F
Centerline vel.	1261	1328	afpm
Ambient pressure	30.95	31.01	inHg
Ambient humidity	35%	24%	RH
Ambient temp	66.2	75.2	F
Back-Gd aerosol	4,4,3,0,2	0,3,3,1,3	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	47	44	psig



Notes:

SS 9/18/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande

Signature/date 9/18/2013

Signature on file with original

Technical Data Review performed by: Carmen Arimescu

Signature/date 2/25/2014

Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-55
Date	9/18/2013	Fan configuration	AC MAX
Tester	SFS,SS	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	82.85 deg F
Stack X-Area	111.6 in.2	Start/End Time	1120 / 1312
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I7

Order —>		1st				2nd				
Traverse-->		Side				Bottom				
Trial —>		1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	particles/ft3				particles/ft3				
1	0.50	840	908	852	**866.7**	692	797	838	**775.7**	
2	1.25	978	967	895	**946.7**	645	859	966	**823.3**	
3	2.31	974	1116	1091	**1060.3**	1040	965	1051	**1018.7**	
4	3.85	1138	1157	1176	**1157.0**	1123	1112	1141	**1125.3**	
Center	5.96	1241	1220	1183	**1214.7**	1151	1243	1200	**1198.0**	
5	8.07	1119	962	1097	**1059.3**	1140	1185	1202	**1175.7**	
6	9.61	1068	1017	1061	**1048.7**	1089	1159	1109	**1119.0**	
7	10.67	948	948	962	**952.7**	902	896	957	**918.3**	
8	11.42	867	833	891	**863.7**	714	729	746	**729.7**	
Averages ———>		**1019.2**	**1014.2**	**1023.1**	**1018.9**	**944.0**	**993.9**	**1023.3**	**987.1**	

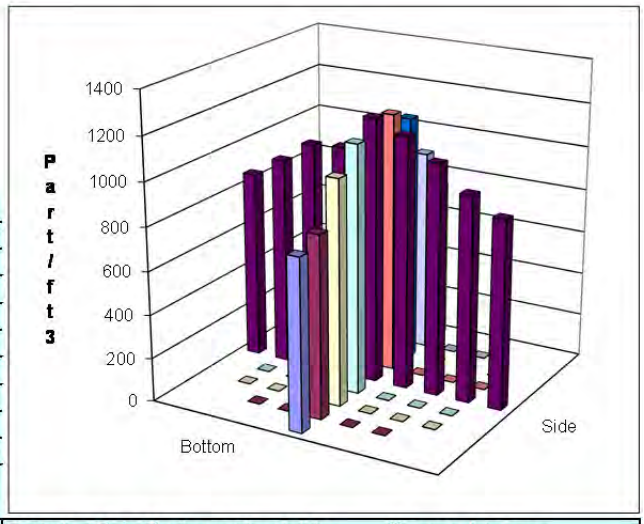
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1003.0		Mean	1062.8	1054.0	1058.4	1065.74
Min Point	729.7	-27.2%	Std. Dev.	98.1	140.1	116.3	117.31
Max Point	1214.7	21.1%	COV as %	9.2	13.3	**11.0**	**11.01**

Avg Conc 978 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific		12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	2.9	2.9	psig
Stack Temp	80.6	85.1	F
Centerline vel.	3684	3353	afpm
Ambient pressure	31.01	30.98	inHg
Ambient humidity	24%	19%	RH
Ambient temp	78.8	88.7	F
Back-Gd aerosol	0,1,0,1,2	0,0,0,0,0	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	38	42	psig



Notes:

SS 9/18/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 9/18/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-56
Date	9/18/2013	Fan configuration	AB
Tester	sfs, th	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	87.25 deg F
Stack X-Area	111.6 in.2	Start/End Time	1418 / 1611
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-7
Order —>	2nd		1st

		Side				Bottom			
Traverse-->									
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1261	1281	1298	**1280.0**	1082	1073	1192	**1115.7**
2	1.25	1372	1228	1385	**1328.3**	1347	1303	1312	**1320.7**
3	2.31	1431	1337	1485	**1417.7**	1531	1482	1482	**1498.3**
4	3.85	1583	1556	1593	**1577.3**	1650	1570	1639	**1619.7**
Center	5.96	1617	1614	1702	**1644.3**	1756	1720	1740	**1738.7**
5	8.07	1658	1715	1583	**1652.0**	1770	1687	1684	**1713.7**
6	9.61	1509	1390	1532	**1477.0**	1632	1561	1587	**1593.3**
7	10.67	1388	1470	1415	**1424.3**	1207	1343	1332	**1294.0**
8	11.42	1272	1294	1309	**1291.7**	1136	1093	1180	**1136.3**
Averages ———>		**1454.6**	**1431.7**	**1478.0**	**1454.7**	**1456.8**	**1425.8**	**1460.9**	**1447.8**

All	pt/ft3	Dev. from mean
Mean	1451.3	
Min Point	1115.7	-23.1%
Max Point	1738.7	19.8%

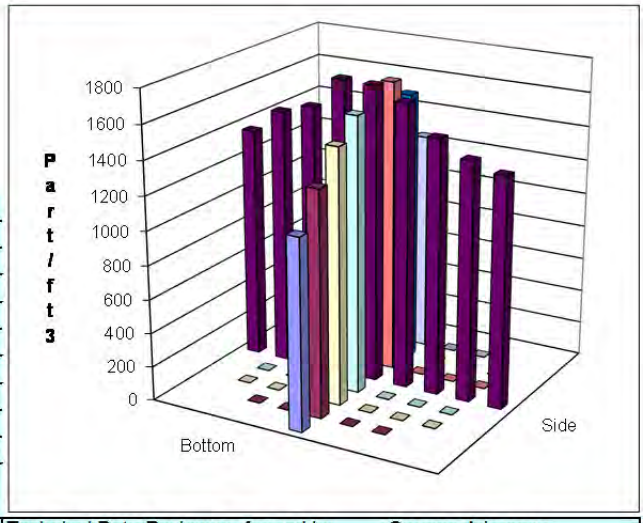
Center 2/3	Side	Bottom	All	Normlzd
Mean	1503.0	1539.8	1521.4	1564.49
Std. Dev.	124.1	177.6	148.4	152.16
COV as %	8.3	11.5	9.8	9.73

Avg Conc 1421 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	2.8	2.8	psig
Stack Temp	86.7	87.8	F
Centerline vel.	3031	2966	afpm
Ambient pressure	30.98	31.01	inHg
Ambient humidity	21%	21%	RH
Ambient temp	82.4	83.3	F
Back-Gd aerosol	3,6,1,5,5	2,0,2,1,2	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	32	48	psig



Notes:

SFS 9/18/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Sandra Snyder
Signature/date 9/18/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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3 Aug. 2006

PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-57
Date	9/19/2013	Fan configuration	AB
Tester	sfs, ss	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	61.65 deg F
Stack X-Area	111.6 in.2	Start/End Time	0730 /0940
Test Port	1	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	426.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-7
Order —>	2nd		1st

		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1747	1866	1983	**1865.3**	1747	1934	1479	**1720.0**
2	1.25	1920	1926	2026	**1957.3**	1773	1979	1550	**1767.3**
3	2.31	2005	1926	2038	**1989.7**	1878	1978	1671	**1842.3**
4	3.85	2028	2057	2180	**2088.3**	1945	2128	1768	**1947.0**
Center	5.96	2034	2199	2160	**2131.0**	2109	2138	1740	**1995.7**
5	8.07	2042	2116	2051	**2069.7**	1958	2234	1876	**2022.7**
6	9.61	2061	2024	1976	**2020.3**	1908	2180	1789	**1959.0**
7	10.67	2018	2052	1967	**2012.3**	1881	2071	1713	**1888.3**
8	11.42	1961	2003	2003	**1989.0**	1720	1930	1631	**1760.3**
Averages ———>		**1979.6**	**2018.8**	**2042.7**	**2013.7**	**1879.9**	**2063.6**	**1690.8**	**1878.1**

All	pt/ft3	Dev. from mean
Mean	1945.9	
Min Point	1720.0	-11.6%
Max Point	2131.0	9.5%

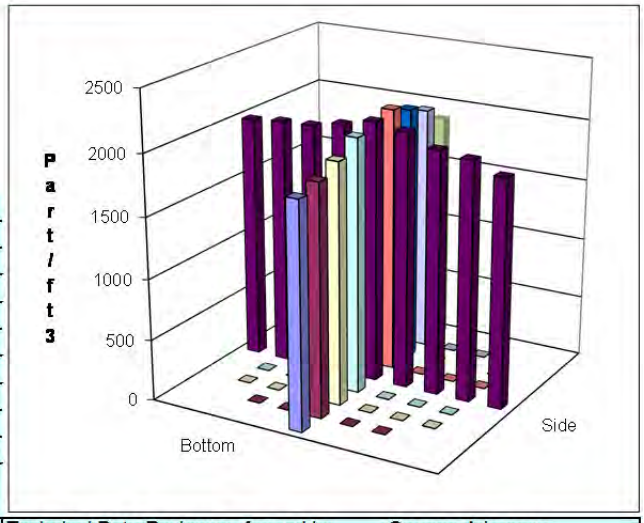
Center 2/3	Side	Bottom	All	Normlzd
Mean	2038.4	1917.5	1977.9	2042.94
Std. Dev.	60.6	90.2	96.9	77.43
COV as %	3.0	4.7	4.9	3.79

Avg Conc 1931 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	1.5	1.5	psig
Stack Temp	50.5	72.8	F
Centerline vel.	1169	1163	afpm
Ambient pressure	31.07	31.07	inHg
Ambient humidity	72%	47%	RH
Ambient temp	47.3	60.8	F
Back-Gd aerosol	1,2,1,2,3	1,9,2,5,0,	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	40	44	psig



Notes: Reran BTM 1& 2 due to low particle count.

SS 9/19/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 9/19/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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PARTICLE TRACER TRAVERSE DATA FORM

Site	LV-S3 Scale Model	Run No.	PT-58
Date	9/19/2013	Fan configuration	AB
Tester	sfs, ss	Fan Setting	25 Hz
Stack Dia.	11.922 in.	Stack Temp	77.75 deg F
Stack X-Area	111.6 in.2	Start/End Time	0944 / 1130
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-7
Order —>	2nd		1st

		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1504	1491	1600	**1531.7**	1480	1714	1688	**1627.3**
2	1.25	1487	1383	1610	**1493.3**	1677	1740	1745	**1720.7**
3	2.31	1560	1599	1565	**1574.7**	1743	1822	1747	**1770.7**
4	3.85	1559	1619	1655	**1611.0**	1854	1843	1818	**1838.3**
Center	5.96	1656	1718	1744	**1706.0**	1911	1916	1881	**1902.7**
5	8.07	1581	1631	1737	**1649.7**	1865	1879	1840	**1861.3**
6	9.61	1665	1669	1571	**1635.0**	1820	1759	1784	**1787.7**
7	10.67	1645	1689	1830	**1721.3**	1780	1758	1758	**1765.3**
8	11.42	1441	1600	1650	**1563.7**	1665	1622	1772	**1686.3**
Averages ———>		**1566.4**	**1599.9**	**1662.4**	**1609.6**	**1755.0**	**1783.7**	**1781.4**	**1773.4**

All	pt/ft3	Dev. from mean
Mean	1691.5	
Min Point	1493.3	-11.7%
Max Point	1902.7	12.5%

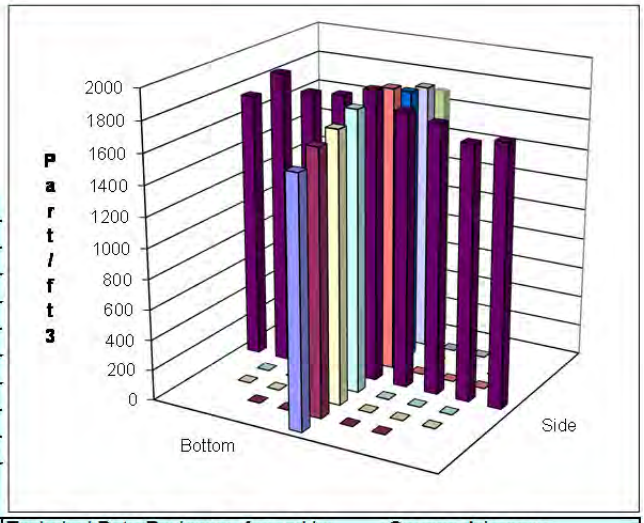
Center 2/3	Side	Bottom	All	Normlzd
Mean	1627.3	1806.7	1717.0	1810.77
Std. Dev.	78.1	63.2	115.4	73.22
COV as %	4.8	3.5	**6.7**	**4.04**

Avg Conc 1677 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	1.3	1.2	psig
Stack Temp	72.8	82.7	F
Centerline vel.	1163	1224	afpm
Ambient pressure	31.07	31.1	inHg
Ambient humidity	47%	31%	RH
Ambient temp	62.6	74.3	F
Back-Gd aerosol	0,2,2,0,2	0,6,2,1,2	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	34	40	psig



Notes:

SS 9/19/13

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Susan Sande
Signature/date 9/19/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	LV-S3 Scale Model	Run No.	PT-59
Date	9/19/2013	Fan configuration	AB
Tester	cb, TH	Fan Setting	60 Hz
Stack Dia.	11.922 in.	Stack Temp	85.75 deg F
Stack X-Area	111.6 in.2	Start/End Time	11:55/ 13:45
Test Port	2	Center 2/3 from	1.09 to: 10.83
Distance to disturbance	510.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	I-7
Order —>	1st		2nd

		Side				Bottom			
Trial —>		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	533	816	856	**735.0**	898	941	873	**904.0**
2	1.25	761	889	870	**840.0**	1028	1069	1077	**1058.0**
3	2.31	913	999	924	**945.3**	1104	1193	1183	**1160.0**
4	3.85	1094	1096	1060	**1083.3**	1262	1325	1302	**1296.3**
Center	5.96	1077	1093	1166	**1112.0**	1321	1413	1477	**1403.7**
5	8.07	1065	1097	1116	**1092.7**	1365	1455	1402	**1407.3**
6	9.61	1010	1065	1030	**1035.0**	1256	1227	1240	**1241.0**
7	10.67	963	1004	994	**987.0**	1087	1185	1126	**1132.7**
8	11.42	948	860	874	**894.0**	1009	1023	994	**1008.7**
Averages ———>		**929.3**	**991.0**	**987.8**	**969.4**	**1147.8**	**1203.4**	**1186.0**	**1179.1**

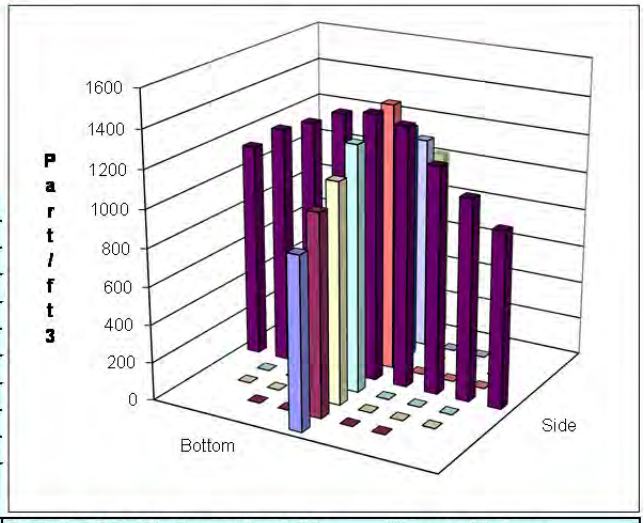
All	pt/ft3	Dev. from mean	*Center 2/3*	Side	Bottom	All	Normlzd
Mean	1074.2		Mean	1013.6	1242.7	1128.2	1261.10
Min Point	735.0	-31.6%	Std. Dev.	97.3	134.8	163.9	125.31
Max Point	1407.3	31.0%	COV as %	9.6	10.8	14.5	9.94

Avg Conc 1051 pt/ft3

Instruments Used:

		Cal. Due
TSI VelciCalc	T95351203001	12/10/2013
Fisher Scientific	90936818	12/11/2013
Met One OPC (Ref)	96258675	FIO
Met One OPC	1011529010	8/7/2014

	Start	Finish	
Generator Inlet Press	2.8	2.8	psig
Stack Temp	82.1	89.4	F
Centerline vel.	3028	3009	afpm
Ambient pressure	31.1	31.1	inHg
Ambient humidity	27%	24%	RH
Ambient temp	75.2	79.7	F
Back-Gd aerosol	3.0.1.1.1	2.1.0,1,2	pt/ft3
No. Bk-Gd samples	5	5	
Compressor output	24	36	psig



Notes:

CB 09/19/2013

Oil Used: Edwards 19

Ref. Probe Location: Ref port downstream Port 2.

Probe Type / Configuration: L-Shaped probe

Entries made by: Carolyn Burns
Signature/date 9/19/2013
Signature on file with original

Technical Data Review performed by: Carmen Arimescu
Signature/date 2/25/2014
Signature on file with original TI-WTPSP 123

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