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Assessment of the HV-C2 Stack Sampling Probe Location

J. A. Glissmeyer
J. G. Droppo

August 2007

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Assessment of the HV-C2 STACK Sampling Probe Location

J. A. Glissmeyer

J. G. Droppo

August 2007

Test Plan: TP-RPP-WTP-441

Test Plan ICN: ICN-TP-RPP-WTP-441.1

Statement of Work: N13.1-1999 Stack Monitor Scale Model Testing and
Qualification, Feb. 5, 2007, Rev. 0

Pacific Northwest National Laboratory
Richland, Washington 99352

Completeness of Testing

This report describes the results of work and testing specified by test plan TP-RPP-WTP-441, Rev. 0, and ICN-TP-RPP-WTP-441.1. The work and any associated testing followed the quality assurance requirements outlined in the test specification/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:



Gordon H. Beeman, Manager
RPP-WTP Support Program



Date

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Acronyms

AD	aerodynamic diameter
BNI	Bechtel National, Inc.
COV	coefficient of variance
EPA	U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air (filter)
OPC	optical particle counter
Q/D	ratio of flowrate (Q) to stack diameter (D)

Testing Summary

Tests were performed to evaluate the location of the air-sampling probe in the proposed design for the Waste Treatment Plant's HV-C2 air exhaust stack. The evaluation criteria come from ANSI/HPS N13.1-1999, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities." Pacific Northwest National Laboratory conducted the tests on a 3.67:1 scale model of the stack. Limited confirmatory tests on the actual stack will need to be conducted during cold startup of the High Level Waste Treatment Facility. The tests documented here assessed the capability of the air-monitoring probe to extract a sample representative of the effluent stream in accordance with criteria in ANSI/HPS N13.1. The test parameters covered the expected range of system flowrates with both one and two operating fans.

The current stack design calls for the sampling probe to be located about 10 diameters downstream of the junction of the duct from Fan A with the stack. In accordance with the statement of work and the test plan, the test measurements were made at that location and also at one point upstream and another downstream. An adjustment was made for the distance between a typical sampling probe inlet and the centerline of its mounting flange. Thus, the test measurements were made at three positions designated as Test Port 1, 2, and 3, respectively.

The designed HV-C2 exhaust system includes dampers on the fan discharges. Custom-scale model dampers were fabricated to simulate the same number and configuration of damper blades shown in the design documents received from BNI. A subset of the test runs was run without the dampers to determine whether the dampers should be included in future tests on scale models.

The testing addressed the following criteria from ANSI/HPS N13.1-1999:

1. Angular Flow—The purpose is to determine whether the velocity vector is aligned with the sampling nozzle. The average yaw angle relative to the nozzle axis should not be more than 20°. The measured average values ranged from 3.73 to 6.15 degrees, regardless of the test port and presence of the dampers. These same types of flow angle measurements will have to be made on the constructed stack during cold startup to show that the mean flow angle is <20°. There is no criterion for agreement with the scale-model flow-angle results.
2. 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, the 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. The acceptance criterion is that the COV of the air velocity must be ≤20% across the center two-thirds of the area of the stack. The maximum result was 12.8% COV, indicating that this criterion is met regardless of test port, fan configuration, and damper presence. The values declined with increasing distance from the duct junction. To confirm the validity of these scale-model tests, air-velocity uniformity measurements will have to be made on the constructed stack during cold startup to check for agreement with the velocity-uniformity results presented here for the same relative probe location. The agreement must be within 5% COV.

3. Uniform Concentration of Tracer Gases—A uniform contaminant concentration in the sampling plane enables the extraction of samples that represent the true concentration. This was first tested using a tracer gas to represent gaseous effluents. The fan is a good mixer, so injecting the tracer downstream of the fans provides worst-case results. The two acceptance criteria are that 1) the COV of the measured tracer-gas concentration is $\leq 20\%$ across the center two-thirds of the sampling plane and 2) at no point in the sampling plane does the concentration vary from the mean by $>30\%$. With the dampers installed on the scale model, the results met the criteria at Test Ports 2 and 3. The maximum values observed were 10% COV and 28.3% maximum deviation, both at Test Port 2. At Test Port 3, the maxima were 3.9% COV and 9.1% maximum deviation. Without the dampers, the results were only acceptable at Test Port 3.
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 acceptance criterion is that the COV of particle concentration is $\leq 20\%$ across the center two-thirds of the sampling plane. The data were normalized to account for drift in the particle generator. With the dampers installed on the scale model, the results met the criterion at Test Ports 2 and 3. The maximum values observed were 13.75% COV and 9.72% COV at Test Port 2 and Test Port 3, respectively. Without the dampers, the results were still acceptable at both Test Ports 2 and 3.

Based on these tests, the location of the air-sampling probe in the current HV-C2 stack design (with dampers), namely 10 duct diameters downstream of the duct junction, meets the requirements of the ANSI/HPS N13.1-1999 standard. There was one gas tracer test that was borderline acceptable at 28.3% maximum deviation compared to the 30% criterion.

Acknowledgments

The author would like to express his appreciation to James G. Droppo, Mikhail S. Pekour, and Brad G. Fritz of Pacific Northwest National Laboratory for performing most of the testing required for the work described in this report. Wayne Cosby formatted and edited the report.

1.0 Introduction: Qualification of HV-C2 Air Monitoring Location

This report documents a series of tests conducted to assess how the proposed air-monitoring system for the HV-C2 Stack will meet the applicable regulatory criteria regarding the placement of the air-sampling probe. Pacific Northwest National Laboratory conducted the tests on a scale model of the stack as it is currently designed. The objective was to determine the suitability of the probe location before the stack design is finalized. The standard governing the performance of the tests, test methods, and acceptance criteria is ANSI/HPS N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*.

2.0 Qualification Criteria

The qualification criteria for the location of an air-monitoring probe, which are given in ANSI/HPS N13.1-1999, address four main characteristics.

1. **Angular Flow**—Sampling nozzles are usually aligned with the axis of the stack. If the air transits the stack in a cyclonic fashion, the air-velocity vector approaching the nozzle could be misaligned with the sampling nozzles enough to impair the extraction of particles. Consequently, the flow angle is measured in the stack at the location of the sampling nozzle. The average flow angle must not deviate from the axis of the sampling nozzle by more than 20 degrees.
2. **Uniform Air Velocity**—The gas momentum across the stack cross section where the sample is extracted should be well mixed or uniform. Consequently, the velocity is measured at several points in the stack at the location of the sampling nozzle. The uniformity is expressed as the variability of the measurements about the mean. This is expressed using the coefficient of variance (COV), which is the standard deviation divided by the mean and expressed as a percentage—the lower the COV value, the more uniform the velocity. The acceptance criterion is that the COV of the air velocity must be $\leq 20\%$ across the center two-thirds of the area of the stack.
3. **Uniform Concentration of Tracer Gases**—A uniform contaminant concentration at the probe location enables the extraction of samples that represent the true concentration. This 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 two acceptance criteria are that 1) the COV of the measured tracer gas concentration is $\leq 20\%$ across the center two-thirds of the sampling plane and 2) at no point in the sampling plane does the concentration vary from the mean by $>30\%$.
4. **Uniform Concentration of Tracer Particles**—Uniformity in contaminant concentration at the sampling probe is further demonstrated using tracer particles large enough to exhibit inertial effects. Particles of 10- μm aerodynamic diameter (AD) are used by default unless it is known that larger particles are expected in the actual airstream. The acceptance criterion is that the COV of particle concentration is $\leq 20\%$ across the center two-thirds of the sampling plane.

The tests to assess compliance with Criteria 1 to 4 can be performed on the actual stack or with a scale model. The ANSI/HPS N13.1-1999 standard sets acceptance 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 model's mean air velocity times the hydraulic diameter will be within a factor of six of the actual stack.
- The Reynolds number for the prototype and model stacks must $>10,000$.

The scale model results are considered valid if:

- The velocity profile in the actual stack meets the uniformity criterion.
- The velocity uniformity COV for the actual and model stacks agree within 5% COV.

This validation step will be performed during cold-startup testing on the constructed stack. If the scale-model results are not validated on the constructed stack, the qualification testing is then performed on the constructed stack.

3.0 Scale-Model Configuration

This section describes the configuration for the scale model and the flows in the scale model.

3.1 Physical Arrangement

ANSI N13.1 requires that the model be geometrically similar to the actual stack. Figure 3.1 shows the layout of the test system with the scale-model HV-C2 exhauster and heaters and filters on the inlet air. Also shown are the tracer injection ports A and B and the pairs of Test Ports 1, 2, and 3. Figure 3.2 is a picture of the assembled model taken before conducting tests. The picture shows the model with caps on the air intakes and on the exhaust opening. During tests, these caps were removed, and pre-filters were placed on the air intakes.

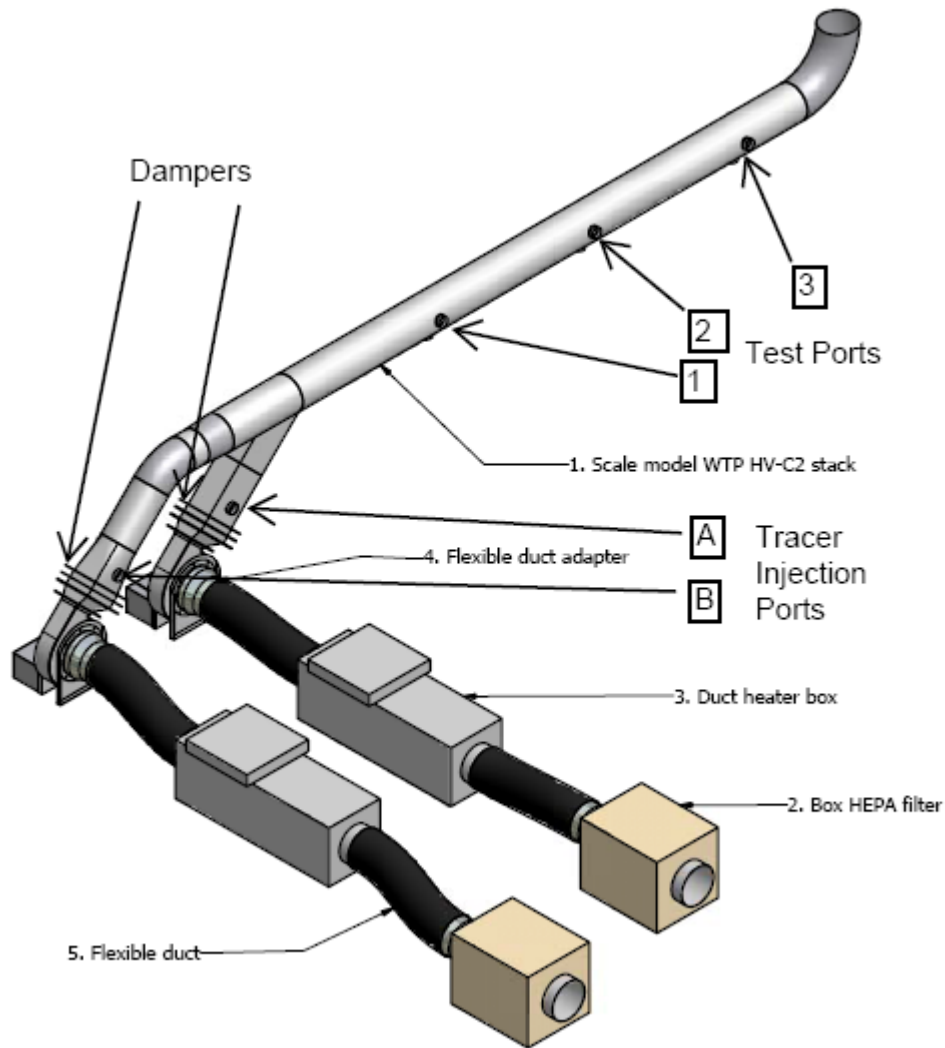


Figure 3.1. Layout of HV-C2 Test System

At each fan outlet is a control damper and a backdraft damper. Scale-model dampers and blank duct sections were interchanged to test the effect of the dampers on the test results.

The ratio of prototype dimensions to scale-model dimensions was determined by the ratio of the designed stack diameter (44 in.) to the scale-model stack diameter (12 in.), or $44/12 = 3.667$. Appendix A details the assumptions and calculations that were the basis of the scale-model dimensions. These were approved by Bechtel National, Inc. (BNI) staff. Appendix A also includes the referenced BNI design documents used for the scale-model parameters.



Figure 3.2. Assembled HV-C2 Scale Model

Table 3.1 lists the key dimensions along the run of the duct for HV-C2. Deviations in key length dimensions of the scale model arising from scaling and fabrication errors were acceptable. Test Ports 1 and 3 were simply located five duct diameters (5 D) in both directions from the planned sampling probe.

Table 3.1. Key Dimensions of Actual and Scale-Model Stacks

Key Dimensions	Current HV-C2 Design	Scale Model, As-Built
Junction of Fan A outlet and stack to 90° bend	Not given	201.25 in. (16.77 D)
Test Port 3 to start of 90° bend	Not given	27 in. (2.25 D)
Expansion of duct from Fan B to junction of Fan A outlet and stack	99 in. (2.25 D)	28.5 in. (2.38 D)
Junction of Fan A outlet and stack to Test Port 1	N.A.	53.5 in. (4.45 D)
Junction of Fan A outlet and stack to sampling probe and Test Port 2	418 in. (9.5 D)	113.75 in. (9.47 D)
Junction of Fan A outlet and stack to Test Port 3	N.A.	174.25 in. (14.52 D)

3.2 Scale-Model Flows

The test parameters should bracket the range of expected design flowrates and the two main flow conditions—one and two operating fans. The normal flowrate with two fans operating should be about 40,000 cfm.^(a) For the maximum flowrate, we assumed that the new system with clean ventilation filters may operate at 15% above normal, or 46,000 cfm. Garcia and Love^(b) predicted that with one fan operating, the system operating pressure will decrease. Thus, the one fan will actually provide more than half the normal flowrate (actually about 70% of normal). For the purposes of these tests, it was assumed that the scaled version of 20,000 and 46,000 cfm adequately bracketed the range of conditions.

The ANSI/HPS N13.1-1999 standard requires that the scale model's product of mean velocity \times hydraulic diameter 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 flowrate to stack diameter (Q/D) 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 $>10,000$.

Table 3.2 summarizes the prototype and scale-model flow parameters that satisfy the scaling requirements where the scale-model stack has a 12-in. diameter. The flowrate and velocity values for the scale model were treated as minimum target values.

Table 3.2. Summary of Flow Parameters

	Air Flow cfm		Air Velocity fpm		Reynolds Number	
	Actual Stack	Scale Model Min.	Actual Stack	Scale Model Min.	Actual Stack	Scale Model Min.
Two fans—max. flow	46,000	2,091	4,356	2,662	1.7E+06	2.8E+05
Two fans—normal flow	40,000	1,818	3,788	2,315	1.4E+06	2.4E+05
Single fan—minimum flow	20,000	909	1,894	1,158	7.2E+05	1.2E+05

The air temperature in the operating stack did not need to be simulated because it has a negligible effect on the turbulence produced by the geometry of the system. However, the air temperatures in the model were maintained above 55°F during the particle uniformity test so that the optical particle counters would provide reliable data.

(a) G. M. Gaulden. Exhaust Stack Design Standardization Data. RPP WTP Memorandum, March 23, 2005, CCN: 116112.

(b) G. Garcia, and B. Love. C2 Exhaust Fan Redundancy Criteria. RPP WTP Memorandum, August 3, 2002, CCN: 038045.

4.0 Test Methods

This section describes the flow-angle and velocity uniformity tests, the flow-controls calibration, and the gas-tracer and particle-tracer uniformity tests. The test quality assurance measures taken are also summarized. The detailed procedures are given in the appendices.

4.1 Flow-Controls Calibration

The first test performed with the scale model was to obtain an approximate calibration of the fan flow controls. Each fan has its own speed control, which is a variable frequency drive with settings from 0 to 60 Hz. The first step was to measure the flowrate of each fan separately with the speed control set at 30 Hz. Then a point with approximately average velocity is identified. A calibrated air-velocity meter is used to take readings at that point while the speed settings are varied from 5 to 60 Hz. Procedure EMS-JAG-03, "Test to Calibrate Ventilation Flow Controller," was used for this preliminary test. The results provide the approximate settings to achieve the flowrate desired for the balance of the tests. The data sheets are given in Appendix B.

4.2 Flow-Angle Test

The air-velocity vector approaching the sample nozzle should be aligned with the axis of the nozzle, within an acceptable angle, so sample-extraction performance is not degraded. The test method is based on 40 CFR 60, Appendix A, Method 1, Section 2.4, "Verification of the Absence of Cyclonic Flow."

The term "flow angle" is the angle between the air-velocity vector and the axis of the sampling nozzle. The flow angle was measured at a grid of points in a cross section of the stack at the scaled elevation of the actual sampling probe. The grid was an array of points in an x-pattern in the cross section of the duct. One line of points was aligned in the same direction as the proposed sampling probe. The other line was perpendicular to that. The number and distance between measurement points was based on the U.S. Environmental Protection Agency (EPA) procedure 40 CFR 60, Appendix A, Method 1.

Measurements were made using a type-S pitot tube attached by flexible tubes to a slant-tube manometer, and an angle-indicating device was attached to the pitot tube as shown in Figure 4.1. Figure 4.2 shows the angle-indicating device and S-type pitot mounted on a test port. Procedure EMS-JAG-05, "Test to Determine Flow Angle at the Elevation of a Sampler Probe," provides the general procedure to determine the mean flow angle. The data sheets are provided in Appendix C.

4.3 Velocity Uniformity Test

The uniformity of air velocity where the air sample is being extracted verifies that the air momentum in the stack is well mixed. To determine uniformity, air velocity was measured at the same grid of points used for the angular flow test. The method used was based on 40 CFR 60, Appendix A, Method 2.

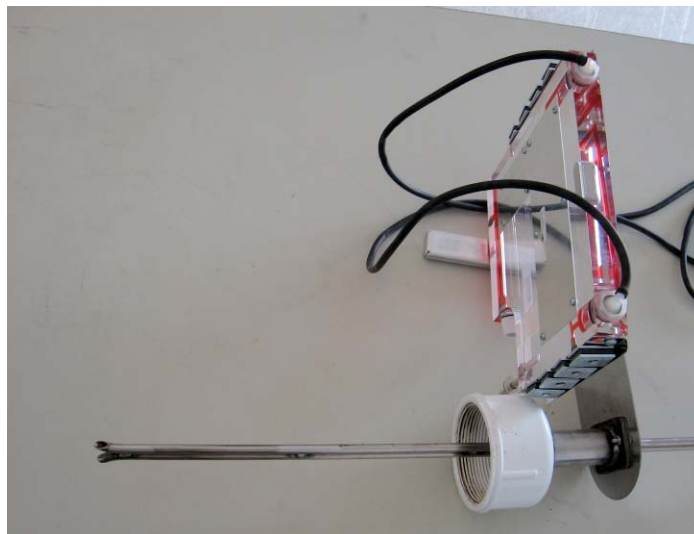


Figure 4.1. Flow-Angle Measurement Apparatus

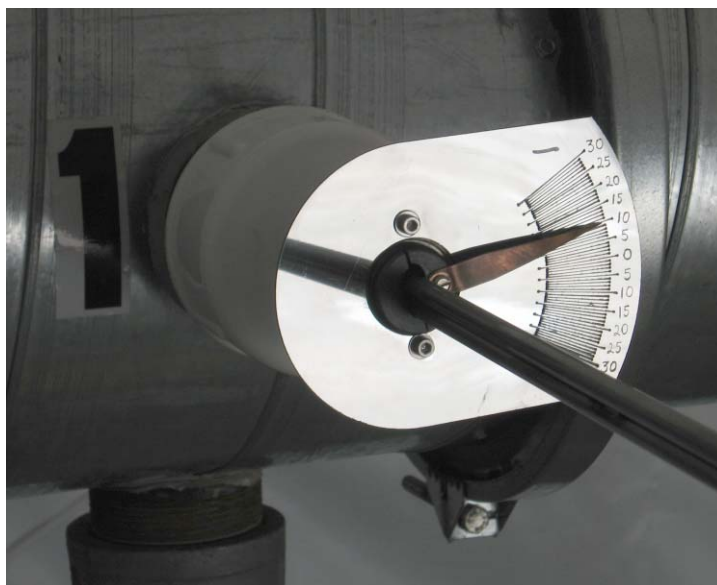


Figure 4.2. View of Type-S Pitot Tube Inserted into Model Stack

The air velocity was measured three times at each grid point, and each measurement was recorded. The measurements at each grid point were averaged to determine the average velocity at each grid point. The average values for each grid point in the center two-thirds of the stack were used to calculate the overall mean and standard deviation of velocity for the sampling location. The COV (also called the percent relative standard deviation) was calculated as 100 times the standard deviation divided by the mean. This value should be less than or equal to 20%.

The equipment used included a standard pitot tube (Prandtl type) and a calibrated electronic manometer and air-velocity meter. Figure 4.3 shows the setup. Procedure EMS-JAG-04, "Test to Determine

Uniformity of Gas Velocity at the Elevation of a Sampler Probe,” was used for this test. The data sheets are provided in Appendix D.



Figure 4.3. Electronic Manometer and Pitot Tube

4.4 Gas-Tracer Uniformity Test

The gaseous-contaminant-concentration uniformity was demonstrated using sulfur hexafluoride as a tracer gas. The tracer gas was injected into the air downstream of a fan through one of the injection ports shown in Figure 3.1 and Figure 3.2. A probe was used to inject the tracer along the centerline of the duct and at four points near the corners of the duct. One injection point at a time was tested.

For each injection position, the tracer concentration was measured at the sampling location using the same measurement grid as used for the other tests. The tracer concentration was measured three times at each grid point, and each measurement was recorded. The measurements at each grid point were averaged to determine the average concentration at each grid point. The values for each grid point in the center two-thirds of the stack were used to calculate the mean and standard deviation of concentration for the sampling location. The percent COV was calculated as 100 times the standard deviation divided by the mean. This value should be less than or equal to 20%. The average concentration values for all grid points were also compared to the mean to determine if the concentration at any point deviates from the mean by more than 30%.

The tracer-gas concentration was measured with an Innova AirTech Instruments A/S (Ballerup, Denmark) Model 1302 photoacoustic gas analyzer. The analyzer response was checked with calibration standards before and during the test series to verify that the instrument responds adequately to changes in concentration. If the indicated concentration was within 20% of the standard, the response was acceptable. A maximum bias of 4.8% was observed in these check readings. The effects of this bias on the COV were analyzed and found to be negligible.

Figure 4.4 shows the tracer-gas sampling probe. Figure 4.5 shows the gas analyzer and Figure 4.6 the assembled sampling equipment. Procedure EMS-JAG-01, “Test to Determine Uniformity of a Tracer Gas at a Sampler Probe,” was used for this test. The data sheets are given in Appendix E.



Figure 4.4. Tracer-Gas Sampling Assembly



Figure 4.5. Tracer-Gas Analyzer



Figure 4.6. Tracer-Gas Test Setup

4.5 Particle-Tracer Uniformity Test

The test for uniformity of tracer particles is similar to the test for uniformity of tracer gases. The general approach is to inject a polydisperse aerosol into the test stack downstream of a fan. The concentration of the particles is then measured at the sampling grid points with a calibrated optical particle counter (OPC, Met-One Model A2408, Grants Pass, Oregon). A simple probe was used to extract the sample and deliver it to the OPC. Figure 4.7 shows the sampling probe and OPC located at a test port.

The tracer aerosol was vacuum pump oil (Fisherbrand 19™). It is drawn into a compressed-air-driven spray nozzle and is housed in the chamber shown in Figure 4.8. The chamber provides a means for injecting the particles into the airflow through a probe.

The tracer injection ports were the same as for the gaseous tracer; however, only the centerline injection point was used as required in the standard. The layout of measurement points was the same as for all of the other tests.

The OPCs sort the number of particles into six size channels. Each concentration reading was the count of particles in the 9- to 11- μm channel. The readings were recorded on a data sheet. Three readings were taken at each point and averaged. The COV of the average concentration readings at all points was calculated, and the result was compared to the acceptance criterion for uniformity. The particle mixing

was acceptable if the COV of the tracer particles of 10- μm AD was less than or equal to 20% across the center two-thirds of the sampling plane.

Procedure EMS-JAG-02, “Test to Determine Uniformity of a Tracer Aerosol at a Sampler Probe,” was used for this test. Appendix F contains the data sheets obtained.



Figure 4.7. Particle Counter Connected to Probe



Figure 4.8. Particle Tracer Generator Apparatus (HVC2 not shown)

4.6 Quality Assurance Requirements

4.6.1 Application of RPP-WTP Quality Assurance Requirements

Pacific Northwest National Laboratory (PNNL) is operated by Battelle for the U.S. Department of Energy. Its Pacific Northwest Division (PNWD) has a Quality Assurance Program that is based upon the requirements as defined in the United States Department of Energy (DOE) Order 414.1C, Quality Assurance, and 10 CFR 830, Energy/Nuclear Safety Management, Subpart A—Quality Assurance Requirements. PNWD chose to implement the requirements of DOE Order 414.1C and 10 CFR 830, Subpart A by integrating them into the laboratory’s management systems and daily operating processes. The procedures necessary to implement the requirements are documented through the laboratory’s Standards-Based Management System (SBMS).

PNNL implements the RPP-WTP quality requirements by performing work in accordance with the *River Protection Project-Waste Treatment Plant Support Program (RPP-WTP) Quality Assurance Plan* (RPP-WTP-QA-001, QAP). Work was performed to the quality requirements of NQA-1-1989, Part I, Basic and Supplementary Requirements, NQA-2a-1990, Part 2.7, and DOE/RW-0333P, Rev 13, *Quality Assurance Requirements and Descriptions (QARD)*. These quality requirements are implemented through the *River Protection Project-Waste Treatment Plant Support Program (RPP-WTP) Quality Assurance Manual* (RPP-WTP-QA-003, QAM).

4.6.2 Conduct of Experimental and Analytical Work

Experiments that are not method-specific shall be performed in accordance with RPP-WTP’s procedures QA-RPP-WTP-1101 “Scientific Investigations” and QA-RPP-WTP-1201 “Calibration Control System,” making sure that sufficient data are taken with properly calibrated measuring and test equipment to obtain quality results. The instrumentation used for each test was recorded on each data sheet.

4.6.3 Internal Data Verification and Validation

RPP-WTP addresses internal verification and validation activities by conducting an independent technical review of the final data report in accordance with RPP-WTP’s procedure QA-RPP-WTP-604. This review verifies that the reported results are traceable, inferences and conclusions are soundly based, and the reported work satisfies the Test Plan objectives. This review procedure is part of PNNL’s *RPP-WTP Quality Assurance Manual*.

5.0 Test Runs

A number of factors were considered in defining the appropriate set of test runs. In terms of defining the most limiting conditions, it is presumed that the least mixing would occur for tracer injected after Fan A and measured at Test Port 1. Better mixing should be observed at the test ports more distant from the fans.

The current facility design shows that the planned air monitoring probe position will correspond to Test Port 2. The statement of work indicates that the qualification tests will be conducted in detail for the planned probe location, with less detailed testing at up to two other locations that cover the likely alternate positions. The tests should also be conducted at flow rates bracketing the range of expected flow. The different fan operating configurations should be addressed in the tests. And finally, the presence of dampers just upstream of the tracer injection ports was also addressed in this test plan because it is the first instance where the presence of dampers could be a factor.

To completely qualify a monitoring location for one set of operating conditions, the gas tracer test requires five runs (one for each injection area) and one run of each of the other tests. To qualify alternate test-port locations more distant from the fans or flow disturbance, only one of the set of gas tracer tests may be needed. Often the tests are more detailed for injection-port/test-port combinations in closest proximity to each other, with fewer test runs for injection-port/test-port combinations with a greater distance between them. Some repeat runs were added to the test matrix to obtain an indication of repeatability. Table 5.1 lists the number of test runs by operating configuration, injection and test-port combination, and test type.

The tests listed in the first three rows provided an approximate calibration of the fan-control settings. The tests in the next two rows allowed exploring the effect caused by the absence or presence of dampers just upstream of the injection ports. Test Port 1 and Injection Port A were used mostly because any damper effect would be most easily observed there. The series started with a group of tests with no dampers installed, and both series covered the major flow configurations. The rest of the tests were conducted with the dampers installed. Repeat tests were added to determine the repeatability of results.

The matrix of tests with dampers underwent some modifications based on results of initial tests without dampers to optimize the utility of the results.

Table 5.1. Test Runs Performed for HV-C2 Configurations

Combination of Injection/Test Port	Target Scaled Stack Flowrate, cfm	Number of Test Runs				
		Flow Angle	Velocity	Gas Tracer	Particle Tracer	
N.A.	Both fans	-	1	-	-	
N.A.	Fan A	-	1	-	-	
N.A.	Fan B	-	1	-	-	
A/1	909, Fan A only, no dampers	1	2	5	1	
B/1	909, Fan B only, no dampers	0	2	0	0	
A/1	2091, both fans, no dampers	6	6	12	5	
A/2		0	0	1	0	
A/3		0	0	1	0	
B/1		0	-	1	0	
A/1	Fan A only, dampers partly closed	1	1	5	1	
B/1	2091, both fans, dampers partly closed	0	0	1	0	
B/2		0	0	1	0	
B/3		0	0	1	0	
A/1	2091 from both fans, dampers full open	1	1	5	1	
A/2		1	1	5	1	
A/3		1	1	5	1	
B/1		0	-	1	1	
B/2		0	-	1	1	
B/3		0	-	1	1	
A/1	909 Fan A only, dampers full open	1	1	1	1	
A/2		1	1	1	1	
A/3		1	1	1	1	
B/1	909 Fan B only, dampers full open	1	1	1	1	
B/2		1	1	1	1	
B/3		1	1	1	1	
Total		17	6	52	19	111

6.0 Test Results

The results will be presented in three sections as follows: (6.1) for fan-control correlation, (6.2) for tests without dampers installed, and (6.3) for tests with dampers installed.

6.1 Fan-Control Correlation

All of the measurements made for this test were done using Test Port 1. Flowrates were measured with the speed controls set at 30 Hz (half speed). The dampers were not installed. The flowrates were measured using the same procedure as for the velocity uniformity test. Table 6.1 lists the results, and the data sheets are in Appendix B. The first run was made with no prefilter on the high-efficiency particulate air (HEPA) filter inlets. Prefilters were used on the other three runs.

Table 6.1. Flowrates Measured at Test Port 1 During Control Correlation

Operating Fans	Run No.	Flowrate cfm	% COV with Center-Point
A&B-half speed, no prefilters	VT-1	2029	5.2
A&B-half speed, prefilters	VT-2	1673	6.5
A- half speed, prefilters	VT-3	920	11.8
B half speed, prefilters	VT-4	913	6.3

The measurement points were identified that best represented the average velocity. At those points, we measured velocity as a function of control setting, and the datasheets are given in Appendix B. Table 6.2 lists the control settings that would provide the minimum test flowrates. It was decided that for all of the remaining tests, the speed settings would be 40 Hz for two fans and 35 Hz for a single fan.

Table 6.2. Interpolated Fan-Control Settings

Operating Fans	Target Flow, cfm	Interpolated Control Setting for Target, Hz	Run No.
A & B	2091	37.4	VF-1
A	909	31.1	VF-2
B	909	30.5	VF-3
A	909	32.0	VF-4
B	909	30.4	VF-5

6.2 Tests Without Dampers Installed

6.2.1 Flow-Angle Test

Table 6.3 lists the results for the flow-angle tests performed on the scale model without the dampers installed. Tests were done for all fan combinations at Test Port 1. Tests with both fans were repeated five times. Run FA-8 was also done with both fans operating, but with a contoured filler plug installed in

the test port in an attempt to eliminate the possible effect of an eddy, caused by the empty space in the test port, on the readings nearest the test port. Figure 6.1 shows a chart of typical results from these tests. Appendix C provides the data sheets.

Table 6.3. Flow-Angle Tests on Scale Model Without Dampers

Test Port	Fans	Run	Average Absolute Angle (degrees)
1	A & B	FA-1	4.59
1	A & B	FA-2	5.02
1	A & B	FA-3	4.96
1	A & B	FA-4	4.30
1	A & B	FA-7	4.44
1	A & B	FA-8	3.75
1	A	FA-6	3.43
1	B	FA-5	5.46

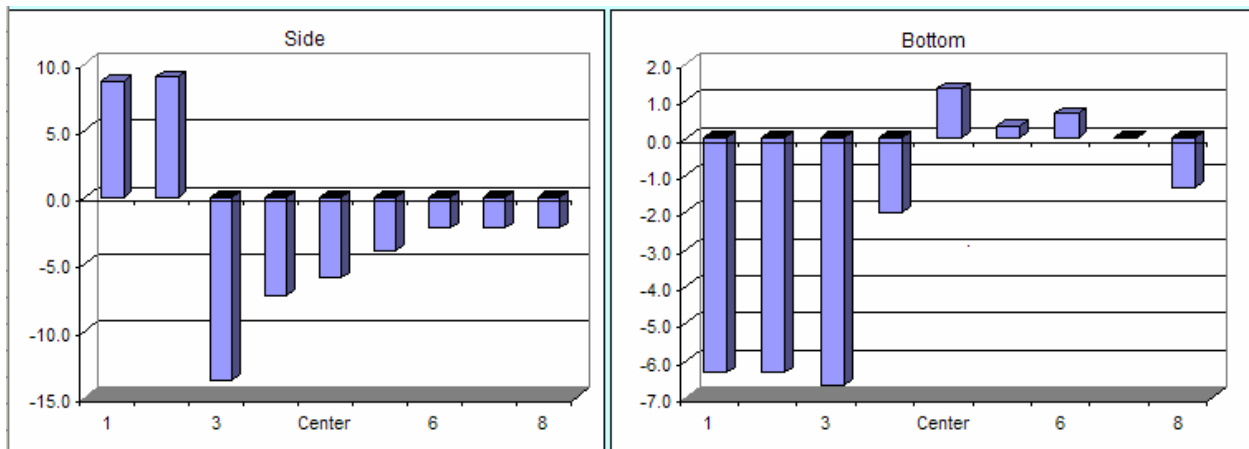


Figure 6.1. Plot of Scale-Model Flow-Angle Results, which are shown in degrees, with Both Fans Operating (Run FA-1)

6.2.2 Velocity Uniformity Test

6.2.2.1 Scale-Model Tests

Test runs were performed on the scale model using an 8-point traverse grid with the addition of a centerpoint. Generally, the addition of the centerpoint has little impact on the COV results and provides information on whether something interesting happens at the center. Appendix D provides the detailed results for each test. Table 6.4 summarizes the results for the various fan combinations.

Table 6.4. Velocity Uniformity Tests on Scale Model at Test Port 1 Without Dampers

Test Port	Operating Fans	Run No.	Flowrate cfm	% COV	Meets COV Criterion
1	A & B	VT-1	2029	5.2	Yes
1	A & B	VT-2	1673	6.5	Yes
1	A & B	VT-5	2265	5.5	Yes
1	A & B	VT-6	2244	5.8	Yes
1	A & B	VT-7	2307	5.6	Yes
1	A & B	VT-8	2282	7.0	Yes
1	A	VT-3	920	11.8	Yes
1	A	VT-9	1076	10.3	Yes
1	B	VT-4	913	6.3	Yes
1	B	VT-10	1049	5.9	Yes

For the 8-point traverse grid, the center two-thirds area excludes the measurement points nearest the wall. The % COV was calculated for the center two-thirds area, including centerpoint measurements. Runs VT-1 through VT-4 were originally done as part of the controls calibration, and the control setting was 30 Hz. The other tests were done at 40 Hz for two fans and 35 Hz for single fans. Also, Run VT-1 was done without prefilters at the HEPA filter inlets and hence the somewhat higher flowrate. These slight variations in flowrate did not appear to have any impact on these results. With Fan A operated singly, the resulting COV was a little higher than that for the other fan configurations. The uniformity criterion was met in these tests. Figure 6.2 shows a plot of the velocity profile at Test Port 1 with Fans A and B operating.

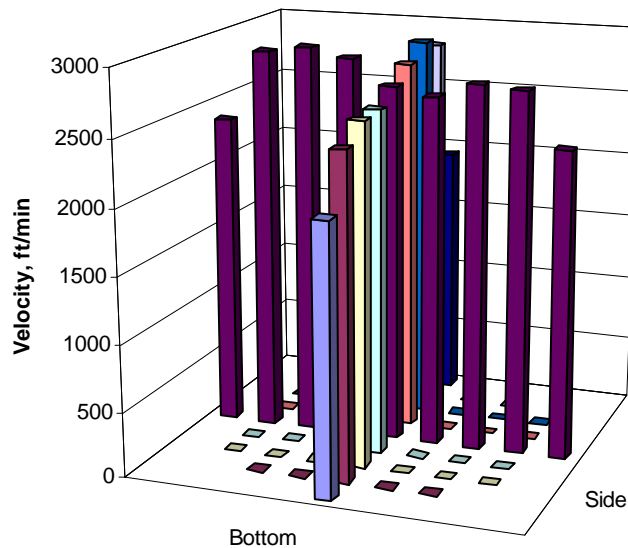


Figure 6.2. Scale-Model Velocity Profile with Fans A & B Operating (Run VT-1)

6.2.3 Gas-Tracer Uniformity Test

Twenty-one gas-tracer uniformity tests were performed on the scale model with no dampers installed. The gas-tracer injection ports are shown in Figure 3.1 and Figure 3.2. For a given test, the injection probe is positioned to inject the gas in one location within 25% of a hydraulic diameter from each of the corners of the rectangular cross section or at the center.

Appendix E provides the detailed data and results for each run, and the results are summarized in Table 6.5. The % COV was calculated for the measured gas concentration at the points in the center two-thirds area of the stack. The percent deviation from the mean concentration was also calculated for any point in the measurement grid. Figure 6.3 shows a sample plot of results from a gas-tracer test.

Table 6.5. Summarized Results of Gas-Tracer Uniformity Tests Without Dampers

Injection Port		Operating Fans	Port	Run No.	Center ² / ₃ % COV	% Deviation from Mean
B	Center	A & B	1	GT-21	24.7	43.3
A	Center	A & B	1	GT-1	33.7	65.6
A	Center	A & B	1	GT-8	9.3	27.8
A	Center	A & B	1	GT-12	35.2	62.5
A	Far Left	A & B	1	GT-5	29.8	60.8
A	Far Left	A & B	1	GT-7	32.1	65.4
A	Far Right	A & B	1	GT-4	37.5	60.7
A	Far Right	A & B	1	GT-6	34.4	59.5
A	Far Right	A & B	1	GT-10	37.6	59.6
A	Far Right	A & B	1	GT-11	35.1	60.3
A	Far Right	A & B	2	GT-19	14.6	34.8
A	Far Right	A & B	3	GT-20	10.5	22.1
A	Near Left	A & B	1	GT-2	30.3	84.6
A	Near Left	A & B	1	GT-9	36.8	78.0
A	Near Right	A & B	1	GT-3	33.8	59.5
A	Far Left	A	1	GT-16	9.1	15.6
A	Far Right	A	1	GT-17	2.9	6.4
A	Near Left	A	1	GT-15	5.8	11.0
A	Near Right	A	1	GT-14	2.6	5.6
A	Center	A	1	GT-13	2.9	4.3
B	Center	B	1	GT-18	2.9	6.0

With two streams coming together in this configuration, and with only one of the streams carrying the tracer, they did not mix together well until Test Port 3 was reached. With the flow only coming from one fan, the mixing of the tracer with the stream had occurred by the time Test Port 1 was reached.

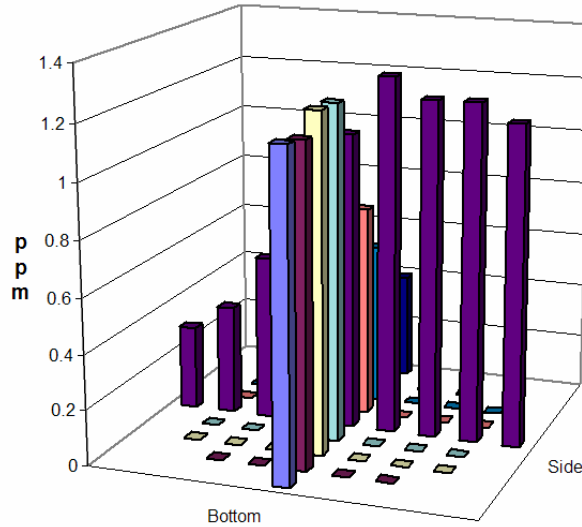


Figure 6.3. Plot of Gas-Tracer Results for Injection in Center at Port A with both Fans Operating (Run GT-1)

6.2.4 Particle-Tracer Uniformity Test Without Dampers

Nine runs of the particle-tracer uniformity test were performed before the dampers were installed. The tracer aerosol was injected along the duct centerlines downstream of the fans with the various combinations of operating fans. Table 6.6 summarizes the results for each test run. The % COV was calculated for the 9- to 11- μm -diameter particle concentration at the measurement points in the center two-thirds area of the stack.

During some runs, the output of the aerosol generator varied with time and could affect the test results. The concentration readings were normalized to equalize the centerpoint values and to remove that effect. Table 6.6 shows the COV values both with and without normalization. Cases where the time variation occurred are apparent when the COV values are compared. Where the temporal variation did not occur, both the normalized and un-normalized COVs were consistent.

With both fans operating, the particle tracer mixing was not satisfactory at Test Port 1, but was satisfactory at the other test ports. With only one fan operating, mixing was adequate even at Test Port 1.

Figure 6.4 shows the bar-chart particle concentration measurements for Run PT-1. The poor mixing is illustrated in the strong concentration gradient.

Table 6.6. Particle-Tracer Uniformity Tests Without Dampers

Tracer Injection Port	Operating Fans	Test Port	Run No.	Normalized % COV	Un-normalized % COV
A	A & B	1	PT-1	32.20	42.03
A	A & B	1	PT-2	35.50	51.56
A	A & B	1	PT-3	31.61	42.64
A	A & B	1	PT-4	35.21	55.07
A	A & B	1	PT-7	33.44	33.48
A	A & B	2	PT-8	18.15	18.34
A	A & B	3	PT-9	14.35	17.55
A	A	1	PT-5	9.81	27.05
B	B	1	PT-6	4.30	13.30

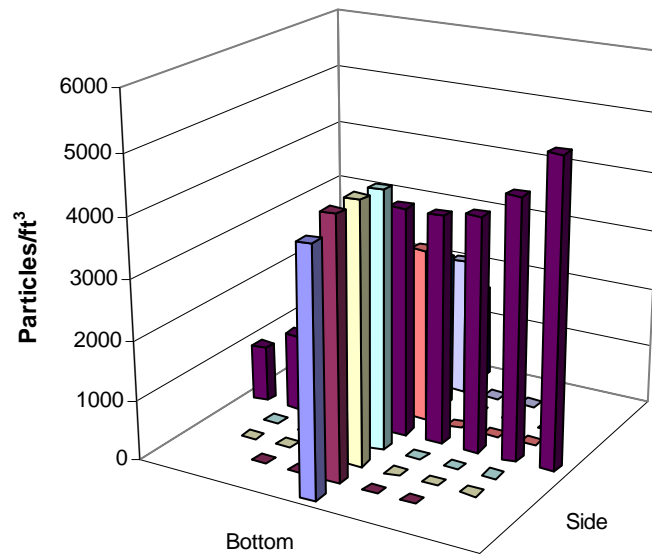


Figure 6.4. Plot of Particle-Tracer Concentration for Run PT-1

6.3 Tests with Dampers Installed

6.3.1 Flow-Angle Test

Table 6.7 lists the results for the flow-angle tests performed with the dampers installed. Except for Run FA-9, the contoured filler plug was used in all of these test runs. Figure 6.5 shows a chart of typical small-angle results from the scale model. Appendix C provides the data sheets.

Table 6.7. Flow-Angle Results on Scale Model with Dampers Installed

Run	Fans	Test Port	Control Damper Angle	Backdraft Damper Angle	Average Absolute Angle (degrees)
FA-9	A	1	45	45	4.13
FA-10	A	1	90	70	3.44
FA-12	A	1	90	70	4.30
FA-13	B	1	90	70	6.15
FA-11	A & B	1	90	70	4.31
FA-15	A	2	90	70	2.56
FA-16	B	2	90	70	5.04
FA-14	A & B	2	90	70	3.98
FA-18	A	3	90	70	3.69
FA-17	B	3	90	70	4.54
FA-19	A & B	3	90	70	4.78

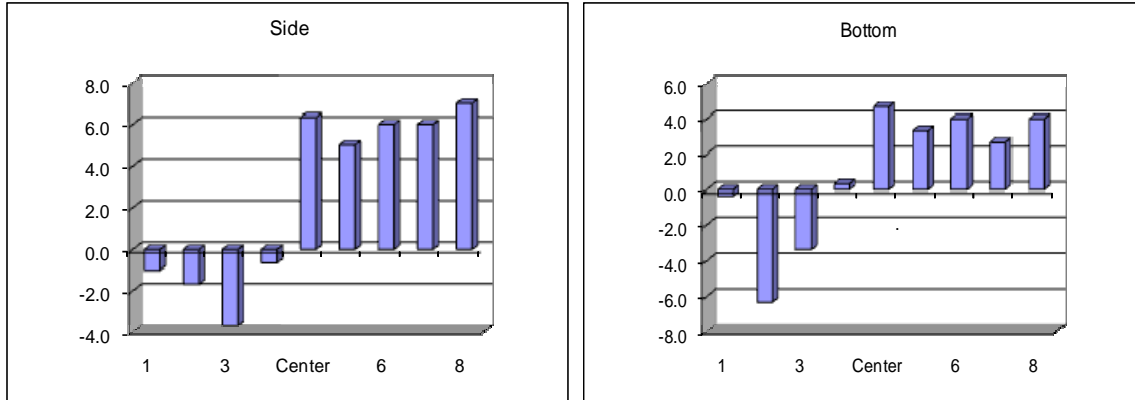


Figure 6.5. Plot of Flow-Angle Results, which are shown in degrees, with both Fans Operating (Run FA-14)

6.3.2 Velocity Uniformity Test

Fourteen velocity uniformity test runs were performed on the scale model with the dampers installed. Appendix D provides the detailed results for each test. Table 6.8 summarizes the results for the various fan combinations. The velocity uniformity criterion was met in all cases.

Table 6.8. Velocity Uniformity Tests on Scale Model at Air-Sampling-Probe Location

Test Port	Operating Fans	Run No.	Control Damper Setting (degrees)	Back Flow Damper Setting (degrees)	Flowrate cfm	% COV
1	A	VT-11	45	45	907	12.8
1	A & B	VT-12	90	70	2128	7.8
2	A & B	VT-13	90	70	2094	6.1
3	A & B	VT-14	90	70	2117	4.4
1	A	VT-15	90	70	974	3.7
2	A	VT-16	90	70	973	3.6
3	A	VT-17	90	70	1002	3.4
3	B	VT-18	90	70	959	6.0
2	B	VT-19	90	70	977	6.0
1	B	VT-20	90	70	959	6.2
3	A & B	VT-21	90	70	2136	5.1
3	A & B	VT-22	90	70	2180	4.5
2	A & B	VT-23	90	70	2132	5.1
2	A & B	VT-24	90	70	2126	4.4

With the dampers partly closed, the velocity uniformity result was definitely “less uniform” than the others, but within the criterion anyway. Figure 6.6 shows the plot of the velocity profile with the largest % COV (VT-11) at Test Port 1, with Fan A operating and the dampers set at 45 degrees.

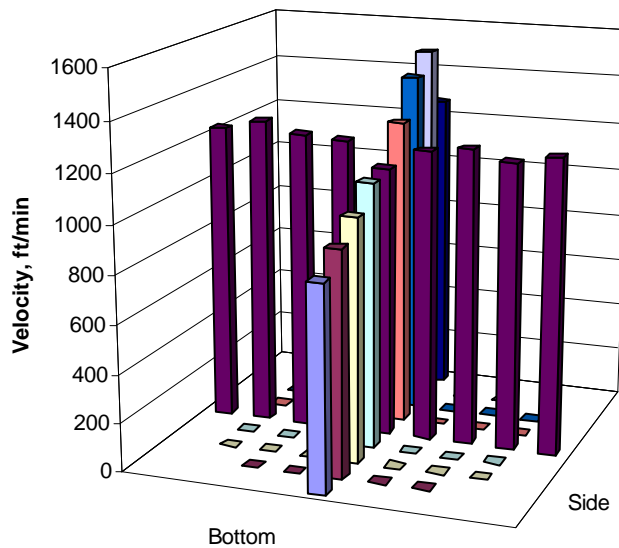


Figure 6.6. Scale-Model Velocity Profile with Fan A Operating and Dampers Set at 45 Degrees (Run VT-11)

6.3.3 Gas-Tracer Uniformity Test

Thirty-three gas-tracer uniformity tests were performed on the scale model with the dampers installed. Table 6.9 summarizes these results for each run. The % COV was calculated for the measured gas concentration at the points in the center two-thirds area of the stack. The percent deviation from the mean concentration was also calculated for any point in the measurement grid.

Table 6.9. Summarized Results of Gas-Tracer Uniformity Tests with Dampers

Injection Port		Operating Fans	Test Port	Run No.	Control Damper Setting (degrees)	Back Flow Damper Setting (degrees)	Center $\frac{2}{3}$ % COV	% Deviation from Mean
A	Center	A	1	GT-40	45.0	70.0	1.4	3.5
B	Center	A & B	1	GT-50	45.0	45.0	2.7	5.1
B	Center	A & B	2	GT-49	45.0	45.0	1.7	4.4
B	Center	A & B	3	GT-48	45.0	45.0	1.3	2.6
A	Far Left	A	1	GT-42	45.0	45.0	3.2	5.2
A	Far Right	A	1	GT-41	45.0	45.0	7.6	10.9
A	Near Left	A	1	GT-43	45.0	45.0	2.3	6.0
A	Near Right	A	1	GT-44	45.0	45.0	6.3	11.1
A	Center	A	1	GT-39	90.0	70.0	3.6	13.0
A	Center	A	2	GT-38	90.0	70.0	1.3	2.6
A	Center	A	3	GT-37	90.0	70.0	2.3	5.3
A	Center	A & B	1	GT-26	90.0	70.0	10.6	18.7
A	Center	A & B	2	GT-27	90.0	70.0	7.2	13.8
A	Center	A & B	3	GT-34	90.0	70.0	3.2	7.9
B	Center	B	1	GT-45	90.0	70.0	2.5	6.9
B	Center	B	2	GT-46	90.0	70.0	1.1	1.9
B	Center	B	3	GT-47	90.0	70.0	1.7	2.9
B	Center	A & B	1	GT-53	90.0	70.0	14.7	34.7
B	Center	A & B	2	GT-52	90.0	70.0	6.3	12.3
B	Center	A & B	3	GT-54	90.0	70.0	3.9	9.1
A	Far Left	A & B	1	GT-24	90.0	70.0	9.7	19.4
A	Far Left	A & B	2	GT-28	90.0	70.0	5.2	9.8
A	Far Left	A & B	2	GT-31	90.0	70.0	4.5	13.1
A	Far Left	A & B	3	GT-32	90.0	70.0	3.2	6.6
A	Far Right	A & B	1	GT-25	90.0	70.0	22.9	57.4
A	Far Right	A & B	2	GT-29	90.0	70.0	10.0	28.3
A	Far Right	A & B	3	GT-33	90.0	70.0	2.8	5.8
A	Near Left	A & B	1	GT-23	90.0	70.0	5.5	12.7
A	Near Left	A & B	2	GT-51	90.0	70.0	2.0	4.5
A	Near Left	A & B	3	GT-36	90.0	70.0	2.9	5.5
A	Near Right	A & B	1	GT-22	90.0	70.0	16.3	37.0
A	Near Right	A & B	2	GT-30	90.0	70.0	5.7	9.6
A	Near Right	A & B	3	GT-35	90.0	70.0	3.5	7.9

The dampers were partly closed for the first eight runs listed in Table 6.9. Both gas-mixing acceptance criteria were met for all test ports and for the fan configurations that were tested with the dampers partly closed to their 45° positions.

The remaining 25 runs are listed in order of the injection position, fan configuration, and test port. Both acceptance criteria were met in all but three instances (GT-22, 25, and 53), and those were where Test Port 1 was used.

Figure 6.7 shows a sample plot of results from a gas-tracer test.

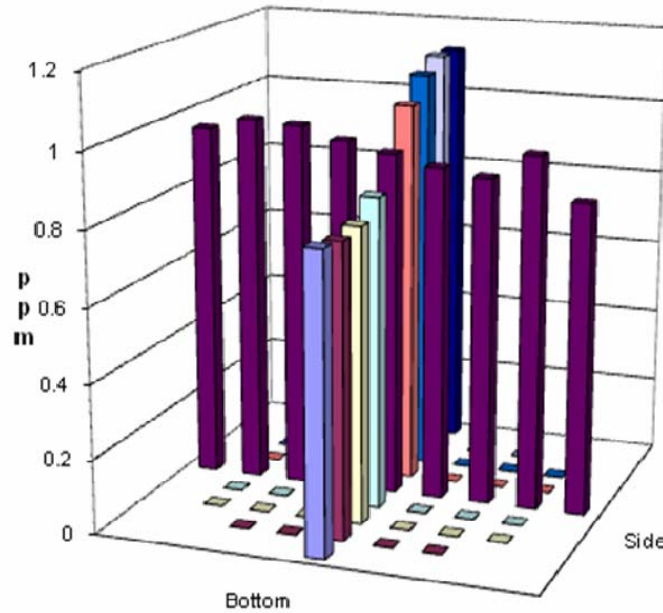


Figure 6.7. Plot of Gas-Tracer Results for Injection in Center at Port A with Fans A & B Operating (Run GT-26)

6.3.4 Particle-Tracer Uniformity Tests With Dampers

Thirteen particle-tracer uniformity tests were performed with the dampers installed. The tracer aerosol was injected along the duct centerlines downstream of the fans with the various combinations of operating fans. Table 6.10 summarizes the results for each run. The % COV was calculated for the 9- to 11- μm -diameter particle concentration at the measurement points in the center two-thirds area of the stack. Both the normalized and un-normalized % COV results are shown.

With both fans operating, the dampers fully open, and with normalizing the measurements for time, satisfactory mixing occurred at Test Ports 2 and 3. With only one operating fan, the mixing was satisfactory for all three test ports.

Figure 6.8 shows the bar chart of normalized particle-concentration measurements for Run PT-22. The acceptance criterion was met in that the COV of the measured tracer particles was 13.5% across the center two-thirds of the sampling plane.

Table 6.10. Particle-Tracer Uniformity Tests with Dampers

Injection Port	Operating Fans	Test Port	Run No.	Control Damper Setting (degrees)	Back Flow Damper Setting (degrees)	Normalized % COV	Un-normalized % COV
A	A & B	1	PT-11	90	70	31.03	33.36
A	A & B	1	PT-22	90	70	13.48	20.22
A	A & B	2	PT-12	90	70	13.75	17.60
A	A & B	2	PT-21	90	70	7.41	32.36
A	A & B	3	PT-13	90	70	9.72	14.78
A	A & B	3	PT-20	90	70	8.12	10.88
A	A	1	PT-10	45	45	3.47	10.71
A	A	1	PT-16	90	70	14.44	20.33
A	A	2	PT-15	90	70	2.46	4.79
A	A	3	PT-14	90	70	3.73	12.27
B	B	1	PT-17	90	70	2.03	6.82
B	B	2	PT-18	90	70	3.02	9.00
B	B	3	PT-19	90	70	3.61	5.42

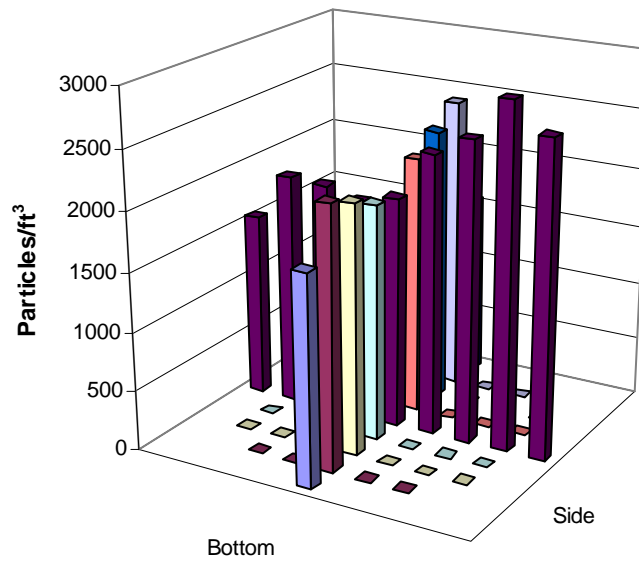


Figure 6.8. Plot of Particle-Tracer Concentration for Run PT-22

7.0 Discussion of Results

The following scatter charts reveal trends in the results obtained at the three test ports. They are based on the results in Table 6.1 to Table 6.10.

Even though fewer tests were performed without the dampers installed, the scatter charts also provide some indication of the effect of the dampers on the results. This may provide some guidance for designing the tests to be performed for the other WTP stacks.

Figure 7.1 provides a scatter plot of the flow-angle tests. In all cases, the angles are small and have about the same magnitude with and without the dampers. The tests with dampers show a slight tendency for the flow angles to be lower at Test Ports 2 and 3 compared to Test Port 1. The absence of the dampers seemed to have no effect on the flow angles measured at Test Port 1.

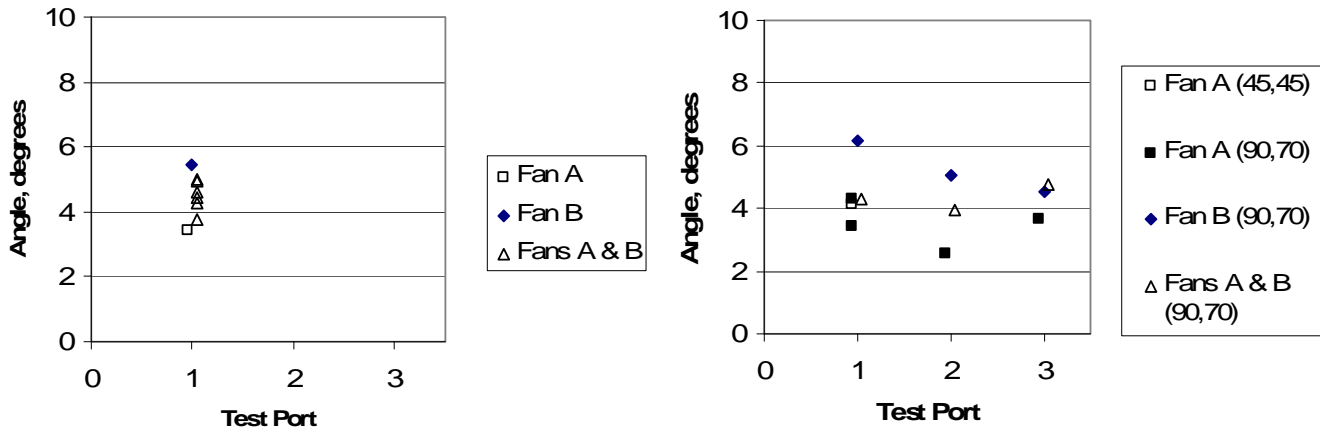


Figure 7.1. Flow-Angle Test Results Comparison (figure on left without dampers and figure on right with dampers)

With the dampers present, the scatter plots of the velocity uniformity results in Figure 7.2 show a slight improvement for test ports downstream of Test Port 1. At Test Port 1, the absence of the dampers seemed to have no effect on the results.

Figure 7.3 shows scatter plots of the gas-mixing % COV results for each test port with and without the dampers installed. With both fans operating, which is the normal operating mode, note the trend toward greater uniformity with greater distance down the stack in the direction away from the fans. It can also be observed that the uniformity is somewhat more improved with the dampers installed than when they are absent. Similar trends do not appear when a single fan is operating. This is because the airstream with the tracer does not have to mix with another airstream without a tracer. The single 45-degree bend following either fan seems to be sufficient for mixing the tracer. In any case, the % COV values meet the criterion of <20% at Test Ports 2 and 3.

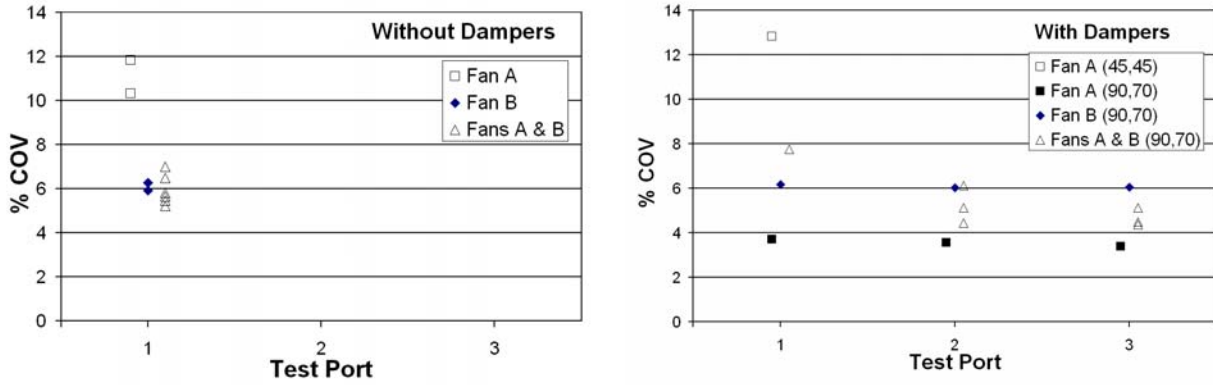


Figure 7.2. Velocity Uniformity Results (figure on left without dampers and figure on right with dampers)

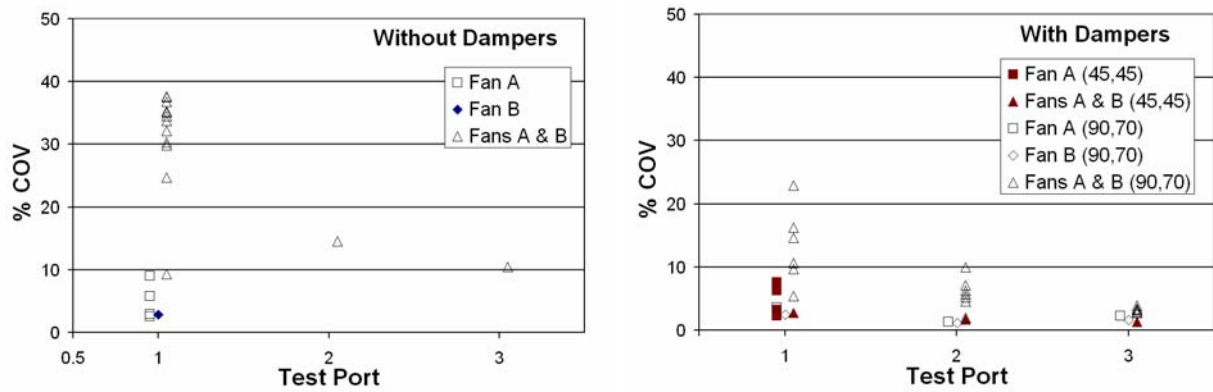


Figure 7.3. Gas Mixing % COV Scatter Plot with and Without Dampers Installed

Figure 7.4 shows the scatter plots of the percent deviation from the mean of the gas-mixing tests with and without the dampers present. Similar to the % COV results, and with both fans operating, there is a trend toward greater uniformity (less deviation) with distance down the stack in the direction away from the fans. It can also be observed that the deviation is somewhat more reduced with the dampers installed than when they are absent. With the dampers installed, the percent-deviation criterion is satisfied at both Test Port 2 and 3. Without the dampers, the criterion was only satisfied at Test Port 3. The same trends are not observable with only one fan operating, and for that operating mode, the criterion was met at all three test ports.

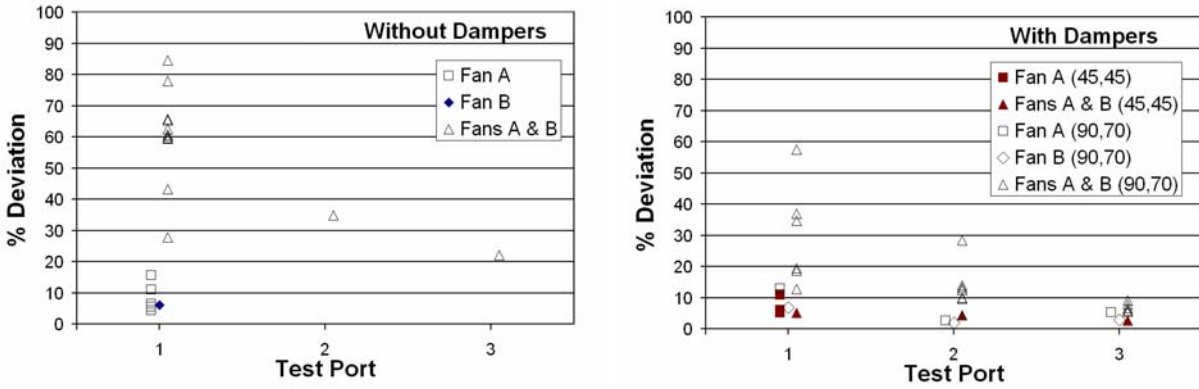


Figure 7.4. Gas Mixing % Deviation Scatter Plot with and Without Dampers Installed

Figure 7.5 shows the scatter plots of the % COV results of the particle mixing tests with and without the dampers present. Similar to the % COV results for the gas-tracer mixing, and with both fans operating, there is a trend toward greater uniformity (lower %COV) with distance down the stack in the direction away from the fans. It can also be observed that the % COV is somewhat more reduced with the dampers installed than when they are absent. The percent-deviation criterion is satisfied at both Test Port 2 and 3. The same trends are not observable with only one fan operating, and for that operating mode, the criterion was met at all three test ports.

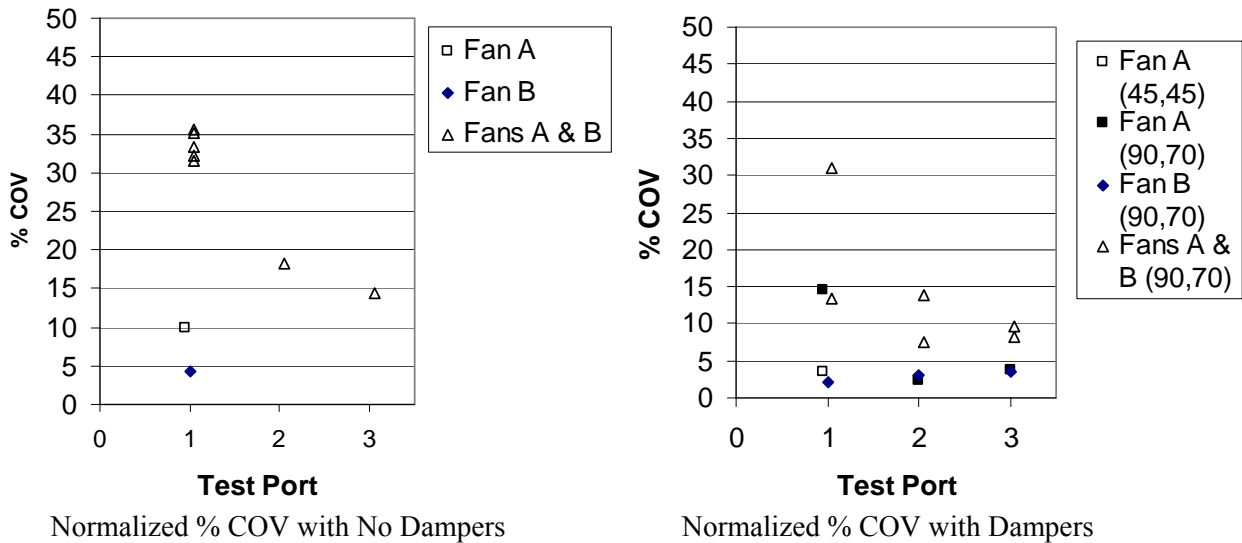


Figure 7.5. Particle Mixing % COV Scatter Plot with and Without Dampers Installed

8.0 Conclusions

Tests were performed to assess the suitability of the location of the air-sampling probe on the HV-C2 stack according to the criteria of ANSI N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*. A scale model of the stack was used for the tests. For each type of test, the following conclusions were reached.

1. Angular Flow—The purpose is to determine whether the velocity vector is aligned with the sampling nozzle. The average yaw angle relative to the nozzle axis should not be more than 20°. The measured average values ranged from 3.73 to 6.15 degrees, regardless of the test port and presence of the dampers. These same types of flow-angle measurements will have to be made on the constructed stack during cold startup to show that the mean flow angle is <20°. There is no criterion for agreement with the scale-model flow-angle results.
2. Uniform Air Velocity—The acceptance criterion is that the COV of the air velocity must be $\leq 20\%$ across the center two-thirds of the area of the stack. The maximum result was 12.8% COV, indicating that this criterion is met regardless of test port, fan configuration, and damper presence. The values declined with increasing distance from the duct junction. To confirm the validity of these scale-model tests, air-velocity uniformity measurements will have to be made on the constructed stack during cold startup to check for agreement with the velocity-uniformity results presented here for the same relative probe location. The agreement must be within 5% COV.
3. Uniform Concentration of Tracer Gases—The two acceptance criteria are that 1) the COV of the measured tracer-gas concentration is $\leq 20\%$ across the center two-thirds of the sampling plane and 2) at no point in the sampling plane does the concentration vary from the mean by $>30\%$. With the dampers installed on the scale model, the results met the criteria at Test Ports 2 and 3. The maximum values observed were 10% COV and 28.3% maximum deviation, both at Test Port 2. At Test Port 3, the maxima were 3.9% COV and 9.1% maximum deviation. Without the dampers, the results were only acceptable at Test Port 3.
5. Uniform Concentration of Tracer Particles—The acceptance criterion is that the COV of particle concentration is $\leq 20\%$ across the center two-thirds of the sampling plane. The data were normalized to account for drift in the particle generator. With the dampers installed on the scale model, the results met the criterion at Test Ports 2 and 3. The maximum values observed were 13.75% COV and 9.72% COV at Test Port 2 and Test Port 3, respectively. Without the dampers, the results were still acceptable at both Test Ports 2 and 3.
6. The potential sampling-probe location represented by Test Port 1 did not satisfy all of the test criteria and would be unsuitable as a sampling probe location during normal operation. If only a single fan is operated at a time, then the Test Port 1 location would be satisfactory; however, that is not currently considered as a normal operating condition.

9.0 References

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

40 CFR 60, Appendix A, Method 2, as amended. U.S. Environmental Protection Agency, *Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate*. U.S. Code of Federal Regulations.

American National Standards Institute (ANSI). 1999. *Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and Ducts of Nuclear Facilities*. ANSI/HPS N13.1 – 1999, American National Standards Institute, New York.

Appendix A

Dimensional Calculations for Scale Model WTP HV-C2 Stack

Appendix A: Dimensional Calculations for Scale Model WTP HV-C2 Stack

John Glissmeyer
Revision 0
February 7, 2006

PURPOSE

The purpose of this calculation is to provide key dimensions for a scale model of the WTP HV-C2 air exhaust stack. Additional calculations will provide lower limit operating flowrates for the scale model.

REFERENCES

1. **Attachment A** -- The configuration of the scale model will mimic that of the attachments to this memorandum (CCN 111186) from BNI (Aaron Childers) to John Glissmeyer (January 19, 2005). The rendered model views and instrumentation diagrams are omitted here.
2. **Attachment B** -- Email from Dan Cragin (BNI) to John Glissmeyer (Battelle) of November 8, 2005, which refers to CCN 116112 containing the most current duct and flow parameters.
3. **Attachment C** -- BNI memorandum from Gerald M. Gaulden (BNI) to Jennifer Su-Coker (BNI), Exhaust Stack Design Standardization Data, CCN 116112, March 23, 2005. Herein, the operating parameters for the HV-C2 stack are enumerated: nominal stack height 71-ft, stack diameter 44-in, nominal airflow 40,000-cfm, discharge velocity 3500-fpm, normal exhaust temperature 80°F, discharge pressure 0.76-in. WG, and normal relative humidity 10 – 100%. It was assumed that these parameters superseded those in the earlier CCN 111186.
4. *Sampling and Monitoring Releases of Airborne Radioactive Substances From the Stacks and ducts of Nuclear Facilities*. ANSI/HPS N13.1-1999. American National Standards Institute and the Health Physics Society, McLean, VA. Clause 5.2.2.2 of this standard provides guidance on the scaling parameters.
5. **Attachment D** – General arrangement of fan outlet and dampers as provided by Intermech (March 19, 2005), the ductwork subcontractor to BNI.
6. **Attachment E** – Catalog cut of Ruskin Control Damper. BNI will use the opposed blade style. Note that the frame is 8-in. deep.
7. **Attachment F** – Catalog cut of Ruskin Backdraft Damper. Note that the frame is 8-in. deep.

ASSUMPTIONS

1. The diameter of the actual stack will be 44 inches according to Reference 3, not 60 inches as shown in Attachment A. For the given flowrate, this gets the discharge air velocity up

into the range where BNI wishes to standardize, i.e., >3500 ft/min. With the 60 inch duct, the velocity was only about 2000 ft/min.

2. The dimensions of ducts feeding the stack will be unchanged from Attachment A.
3. The minimum distance from the last duct junction to the sampling probe location is assumed to remain at 9.5 diameters. As the duct gets smaller, this relative distance becomes smaller too. The bulk of the qualification tests will be done at this relative distance. However, it is noted that BNI may keep the distance from the fans to the sampling probe and the 90° turn up to the vertical stack the same as in Attachment A for practical reasons. The qualification test results tend to improve at greater distances separating the last flow disturbance from the sampling location, so tests at 9.5 diameters will yield conservative results relative to those at longer distances. Some limited tests will be done at greater and lesser distances to verify that this is the case.
4. There are certain constraints on the scale model that must be satisfied. (These come from ANSI/HPS N13.1-1999.) A scale model used for qualifying the proposed sampling location must be geometrically similar (with proportional critical dimensions) to the actual stack. The sampling location of the model must be geometrically similar to the actual stack. The product of the mean air velocity times the hydraulic diameter of the actual stack must be within a factor of six of the scale model. The scale model hydraulic diameter must be at least 250 mm. Finally, the Reynolds number of the scale model and the actual stack must be greater than 10,000.
5. The size of the scaled stack diameter will be 12 inches.
6. The first item following the fan will be a rectangular cross section expansion from the fan outlet to the dampers, as shown in Attachment D.
7. The control damper will follow the expansion, see Attachment D.
8. The backdraft damper will follow the control damper, see Attachment D.

CALCULATIONS

1. The scaling factor for linear dimensions is
$$44 \text{ inches} / 12 \text{ inches} = 3.667$$
2. The key dimensions of the prototype stack were given in Reference 1. However, the minimum distance from the duct junction to the sampling probe port was 9.5 D (for diameters). Also, the minimum distance from the sampling probe port to the next flow disturbance was 5D. For the model, these distances become 9.5 x 12 and 5 x 12 inches, or **114** and **60** inches respectively.
3. Key dimensions are labeled in Attachment A with numeric labels. A spreadsheet (HVC2modelstacflo.xls, worksheet ScaledDims) was created to calculate the scaled down values for these key dimensions. The equation used was

$$(\text{prototype dimension}) / (\text{scaling factor}) = \text{scaled dimension}$$

In this case, the scaling factor is 3.667. The results are included in Table 1.

For example, the spacing from the discharge of Fan 4B to the start of the 44 inch diameter stack is given as 17-ft, 10-in. That is a total of

$$(17\text{-ft} \times 12\text{-in/ft}) + 10\text{-in} = 214 \text{ in.}$$

The scaled distance is

$$214\text{-in}/3.667 = 58.363\text{-in.}$$

The scaled results are shown in Table 1 in decimal feet, decimal inches, and fractional inches.

4. The last sheet of Attachment A shows the presence of two dampers, a control damper and an isolation damper. Neither of these was shown in the other diagrams. Information was obtained from the ductwork subcontractor (Intermech) showing the general configuration of the fan discharge and dampers, as shown in Attachment D. Attachments E and F show Ruskin catalog cuts of the model of control and backdraft dampers that will be used. Note that the depth of the dampers is 8 inches. This scales to a depth of

$$8/3.667 = 2.182 \text{ in}$$

as listed in Table 1. Ruskin builds dampers to custom heights and widths. Therefore, it was assumed that the dampers would be the same size as the rectangular cross sections that they will mate with. The prototype and scaled dimensions are listed in Table 1.

5. The dampers will occupy space in the segment labeled as Fan 4B segment 1 in Table 1 and Attachment A. The balance of the space in that segment will be occupied by the rectangular expansion from the stack discharge to the damper cross section. The overall length of the expansion is

$$7.636 - 2(2.182) = 3.272 \text{ in.}$$

	A	B	C	D	E	F	G	H	I	J
1	Table 1 HV-C2 PRELIMINARY MODEL DIMENSIONS									
2	2/7/2006 Rev 0.				Scaled					
3					Trial scaling, 1:x			Final ft	Final in.	Final in.
4	Section	Orientation	Prototype ft	Prototype in	1.83	2.45	3.67	3.67	3.67	3.67
5	Stack 1	H	17.833	214.0	9.727	7.279	4.864	4.864	58.363	58 6/16
6										
7	Stack 2	H	8.250	99.0	4.500	3.367	2.250	2.250	27.000	27
8	Stack 3	H min	34.833	418.0	19.000	14.218	9.500	9.500	114.000	114
9	Stack 4	H min	18.333	220.0	10.000	7.483	5.000	5.000	60.000	60
10	Stack 2 - 4	H min	61.417	737.0	33.500	25.068	16.750	16.750	200.999	201
11										
12	Stack dia.	H	3.667	44.0	2.000	1.497	1.000	1.000	12.000	12
13	Stack 3 to probe tip	H min	33.333	400.0	18.182	13.605	9.091	9.091	109.091	109 1/16
14										
15	Duct Width	45 deg	2.500	30.0	1.364	1.020	0.682	0.682	8.182	8 3/16
16	Duct Height	45 deg	3.667	44.0	2.000	1.497	1.000	1.000	12.000	12
17										
18	Fan 4B-1	45 deg	2.333	28.0	1.273	0.952	0.636	0.636	7.636	7 10/16
19	Fan 4B-2	45 deg	3.797	45.6	2.071	1.550	1.036	1.036	12.427	12 7/16
20	Fan 4B-3	45 deg	5.615	67.4	3.063	2.292	1.531	1.531	18.376	18 6/16
21	Fan 4B-4	H	1.745	20.9	0.952	0.712	0.476	0.476	5.711	5 11/16
22	Fan 4B-5	H	2.797	33.6	1.526	1.142	0.763	0.763	9.154	9 2/16
23	Fan 4B-6	H	2.276	27.3	1.241	0.929	0.621	0.621	7.449	7 7/16
24	Fan 4B-RndDuct	45 deg	3.333	40.0	1.818	1.361	0.909	0.909	10.909	10 15/16
25										
26	Fan 4A-1	45 deg	12.688	152.3	6.920	5.179	3.460	3.460	41.523	41 8/16
27										
28	Control Damper	Width	2.500	30.0	1.364	1.020	0.682	0.682	8.182	8 3/16
29		Height	3.667	44.0	2.000	1.497	1.000	1.000	12.000	12
30		Length	0.667	8.0	0.364	0.272	0.182	0.182	2.182	2 3/16
31										
32	Backdraft Damper	Width	2.500	30.0	1.364	1.020	0.682	0.682	8.182	8 3/16
33		Height	3.667	44.0	2.000	1.497	1.000	1.000	12.000	12
34		Length	0.667	8.0	0.364	0.272	0.182	0.182	2.182	2 3/16
35										
36	Math Checks	Check	1.000	12.0	0.545	0.408	0.273	0.273	3.273	3 4/16
37		Check	5.000	60.0	2.727	2.041	1.364	1.364	16.364	16 6/16

Table 1 HV-C2 PRI

38653										Scaled	
Section	Orientation	Prototype ft	Prototype in	Trial scaling, 1:1x	Final ft	Final in.	Final in.	Final in.	Final in.	Final in.	Final in.
Stack 1	H	17.83333	=12*C5	1.8333333 =5C5/FS4	3.66667 =5C5/GS4	=H4	=H4	=H4	=H4	=H5*12	
Stack 2	H	8.25	=12*C7	=5C7/FS4	=5C7/GS4	=H7*12	=H7*12	=H7*12	=H7*12	=H7*12	
Stack 3	H min	34.833333	=12*C8	=5C8/FS4	=5C8/GS4	=H8*12	=H8*12	=H8*12	=H8*12	=H8*12	
Stack 4	H min	18.33333	=12*C9	=5C9/FS4	=5C9/GS4	=H9*12	=H9*12	=H9*12	=H9*12	=H9*12	
Stack 2-4	H min	=SUM(C7:C9)	=12*C10	=5C10/FS4	=5C10/GS4	=H10*12	=H10*12	=H10*12	=H10*12	=H10*12	
Stack dia.	H	3.6667	=12*C12	=5C12/FS4	=5C12/GS4	=H12*12	=H12*12	=H12*12	=H12*12	=H12*12	
Stack 3 to probe tip	H min	=34.833333-1.5	=12*C13	=5C13/FS4	=5C13/GS4	=H13*12	=H13*12	=H13*12	=H13*12	=H13*12	
Duct Width	45 deg	2.5	=12*C15	=5C15/FS4	=5C15/GS4	=H15*12	=H15*12	=H15*12	=H15*12	=H15*12	
Duct Height	45 deg	3.666667	=12*C16	=5C16/FS4	=5C16/GS4	=H16*12	=H16*12	=H16*12	=H16*12	=H16*12	
Fan 4B-1	45 deg	2.33333	=12*C18	=5C18/FS4	=5C18/GS4	=H18*12	=H18*12	=H18*12	=H18*12	=H18*12	
Fan 4B-2	45 deg	3.797	=12*C19	=5C19/FS4	=5C19/GS4	=H19*12	=H19*12	=H19*12	=H19*12	=H19*12	
Fan 4B-3	45 deg	5.615	=12*C20	=5C20/FS4	=5C20/GS4	=H20*12	=H20*12	=H20*12	=H20*12	=H20*12	
Fan 4B-4	H	1.745	=12*C21	=5C21/FS4	=5C21/GS4	=H21*12	=H21*12	=H21*12	=H21*12	=H21*12	
Fan 4B-5	H	2.797	=12*C22	=5C22/FS4	=5C22/GS4	=H22*12	=H22*12	=H22*12	=H22*12	=H22*12	
Fan 4B-6	H	2.276	=12*C23	=5C23/FS4	=5C23/GS4	=H23*12	=H23*12	=H23*12	=H23*12	=H23*12	
Fan 4B-RndDuct	45 deg	3.33333	=12*C24	=5C24/FS4	=5C24/GS4	=H24*12	=H24*12	=H24*12	=H24*12	=H24*12	
Fan 4A-1	45 deg	12.6875	=12*C26	=5C26/FS4	=5C26/GS4	=H26*12	=H26*12	=H26*12	=H26*12	=H26*12	
Control Damper	Width	2.5	=12*C28	=5C28/FS4	=5C28/GS4	=H28*12	=H28*12	=H28*12	=H28*12	=H28*12	
	Height	3.666667	=12*C29	=5C29/FS4	=5C29/GS4	=H29*12	=H29*12	=H29*12	=H29*12	=H29*12	
	Length	0.666667	=12*C30	=5C30/FS4	=5C30/GS4	=H30*12	=H30*12	=H30*12	=H30*12	=H30*12	
Backdraft Damper	Width	2.5	=12*C32	=5C32/FS4	=5C32/GS4	=H32*12	=H32*12	=H32*12	=H32*12	=H32*12	
	Height	3.6667	=12*C33	=5C33/FS4	=5C33/GS4	=H33*12	=H33*12	=H33*12	=H33*12	=H33*12	
	Length	0.6667	=12*C34	=5C34/FS4	=5C34/GS4	=H34*12	=H34*12	=H34*12	=H34*12	=H34*12	
Math Checks	Check	1	=12*C36	=5C36/FS4	=5C36/GS4	=H36*12	=H36*12	=H36*12	=H36*12	=H36*12	
	Check	5	=12*C37	=5C37/FS4	=5C37/GS4	=H37*12	=H37*12	=H37*12	=H37*12	=H37*12	

ATTACHMENT A

**MEMORANDUM CCN 111186
January 19, 2005**

All drawings are best-available copy in Attachment A.

101967



Memorandum

To: John Glissmeyer
From: Aaron Childers
Ext: (509) 371-3352

Date: January 19, 2005
CCN: 101967
Subcontract 24590-101-TSA-W000-00004

Subject: **WTP/RPP STACK DISCHARGE SCALE MODEL SUPPORT FOR
SUBCONTRACT 24590-TSA-W000-00004, FLOW ELEMENT PROCESS
DATASHEETS FOR EACH FLUE EXHAUSTING FROM HLW, LAW, PTF,
AND LAB FACILITIES**

John,

Please use the attached documents listed below for simulating the process conditions for each exhaust flue located in the HLW, LAW, PTF, and LAB facilities. In the attached documents, you will find anticipated process data conditions at the location of each inserted flow element for all exhaust flues in the HLW, LAW, PTF, and LAB facilities.

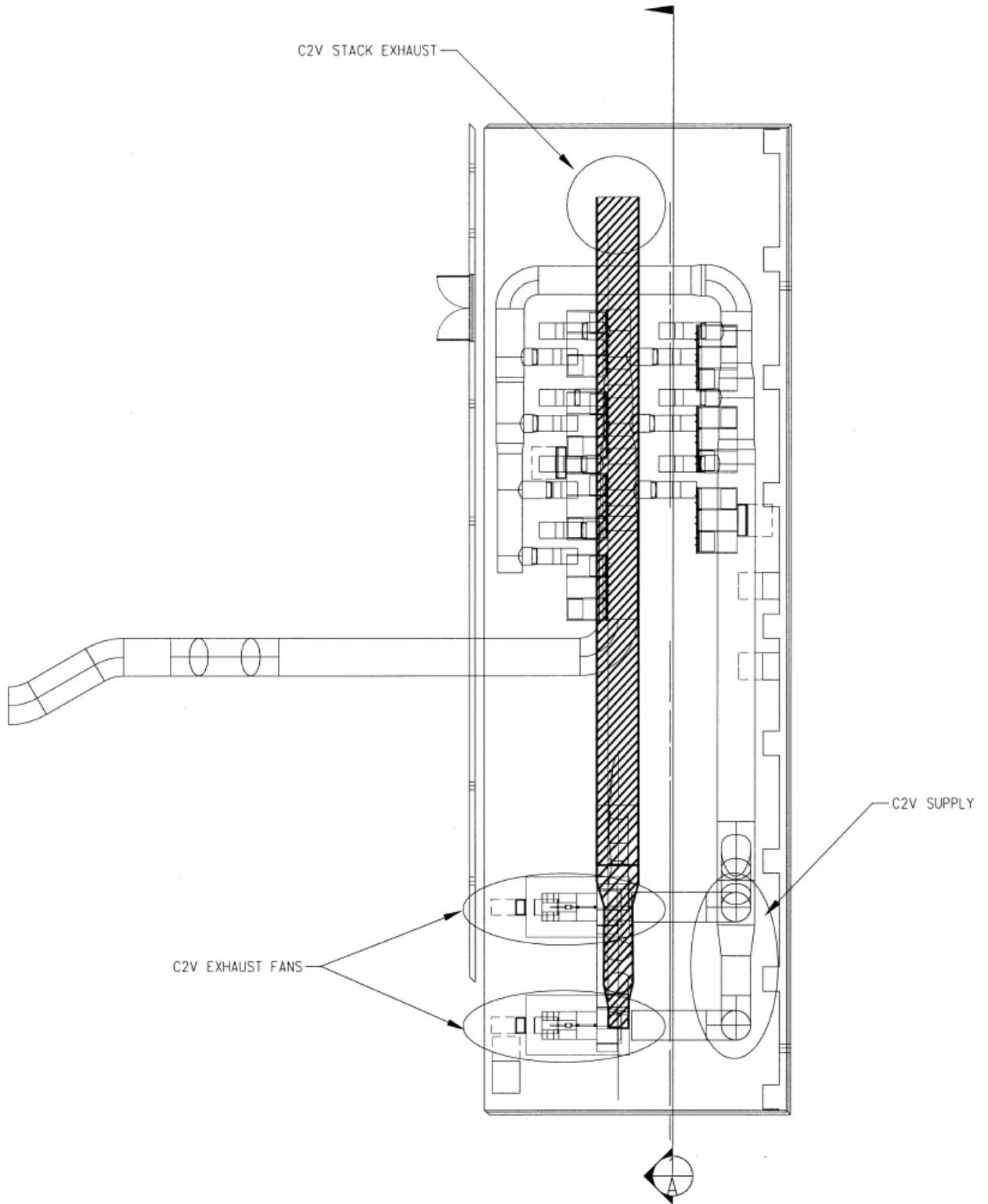
Regards,

A handwritten signature in cursive script that reads 'Aaron Childers'.

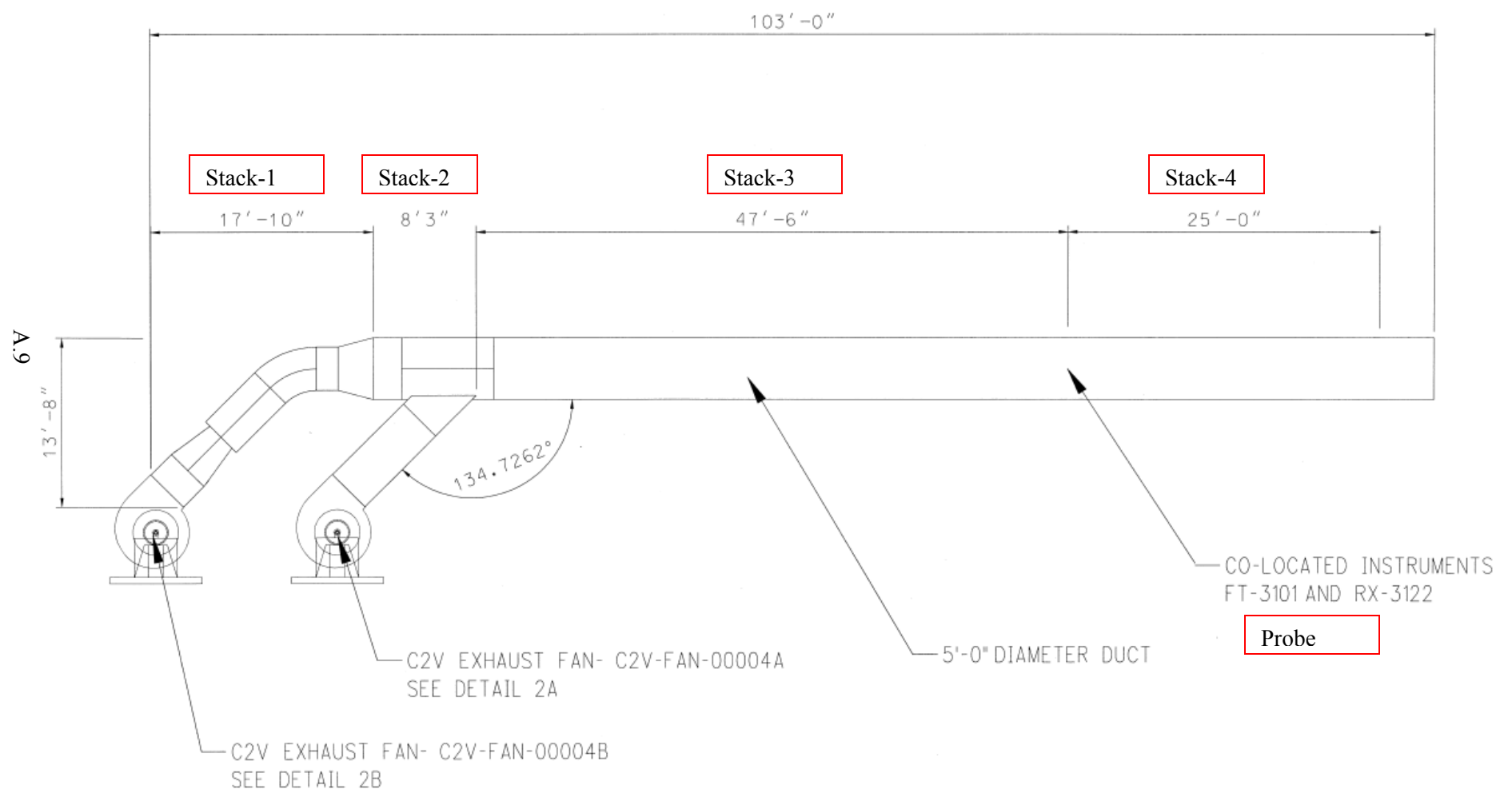
Aaron Childers
Controls and Instrument Engineer
High Level Waste Facility

Waste Treatment Project

- Attachments:
- 1) High Level Waste Facility; Flow Process Data Sheet; SDJ-FE-3101/PD Rev 0; Decemeber 14, 2004
 - 2) High Level Waste Facility; Flow Process Data Sheet; SDJ-FE-3104/PD Rev 0; Decemeber 14, 2004
 - 3) High Level Waste Facility; Flow Process Data Sheet; SDJ-FE-3108/PD Rev 0; Decemeber 14, 2004



Detail 1A

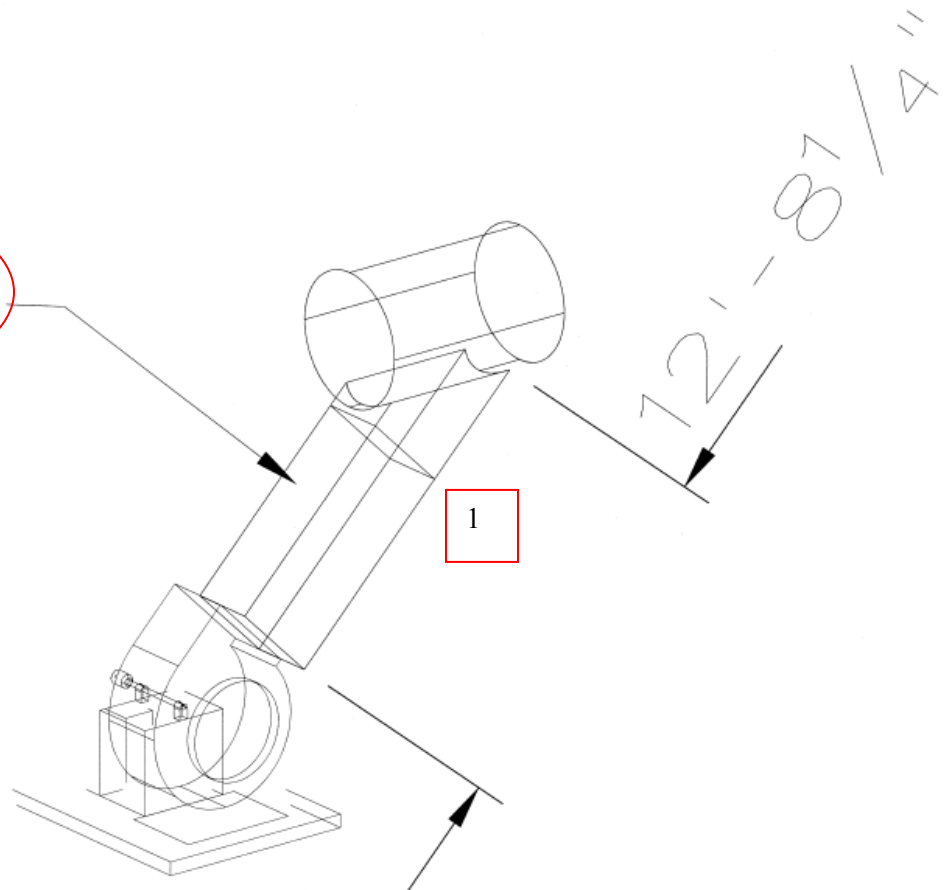


DETAIL 2A: C2V-FAN-00004A

Fan 4A dimensions

A.10

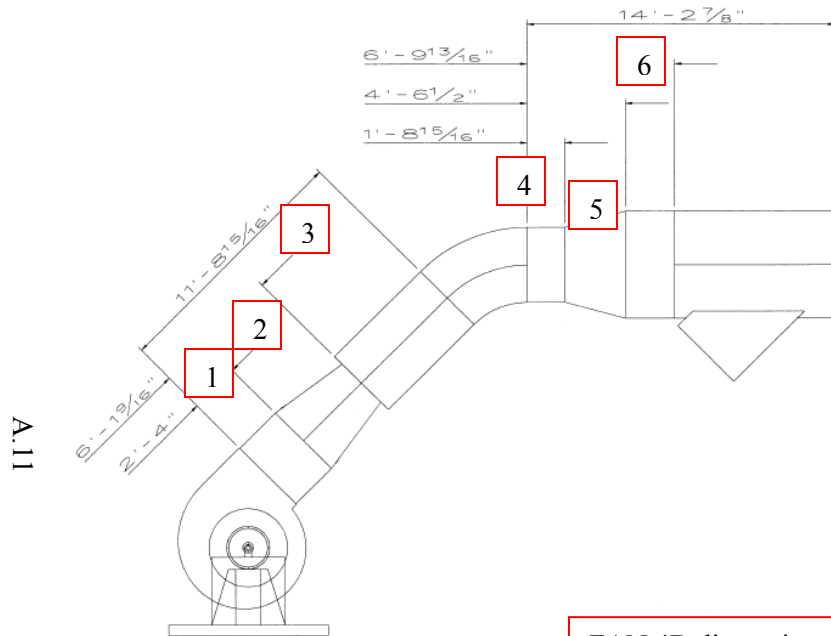
30" X 44" RECTANGULAR DUCT



NOTES:

- 1. Between C2V-FAN-00004A to the main C2V exhaust duct header an on/off isolation damper, back draft damper, and an averaging pitot tube is located in this duct run. Positioning and installation details of the above elements are unknown at this time.

DETAIL 2B: C2V-FAN-00004B

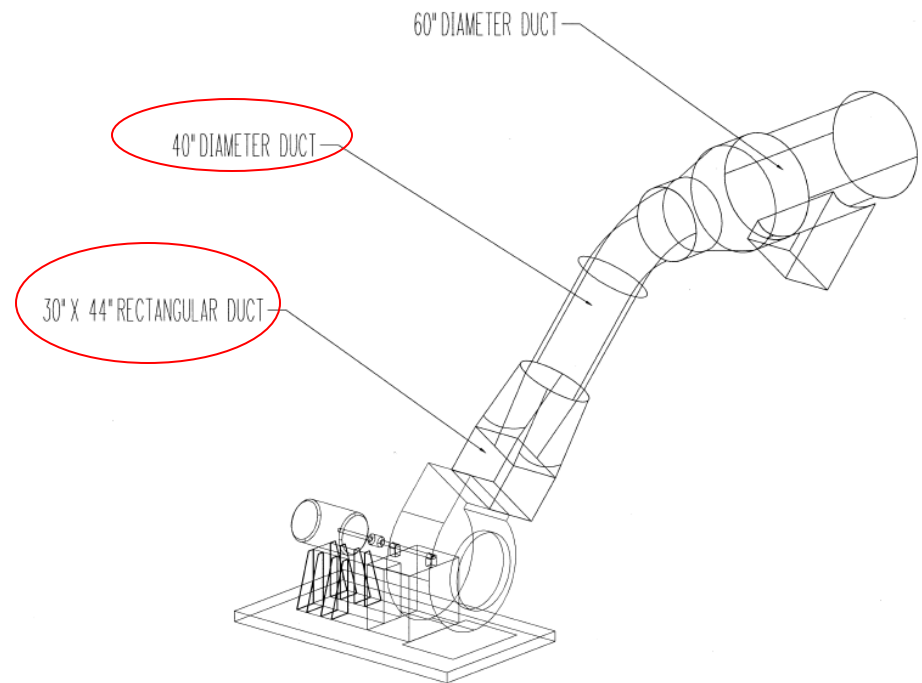


FAN 4B dimensions

NOTES:

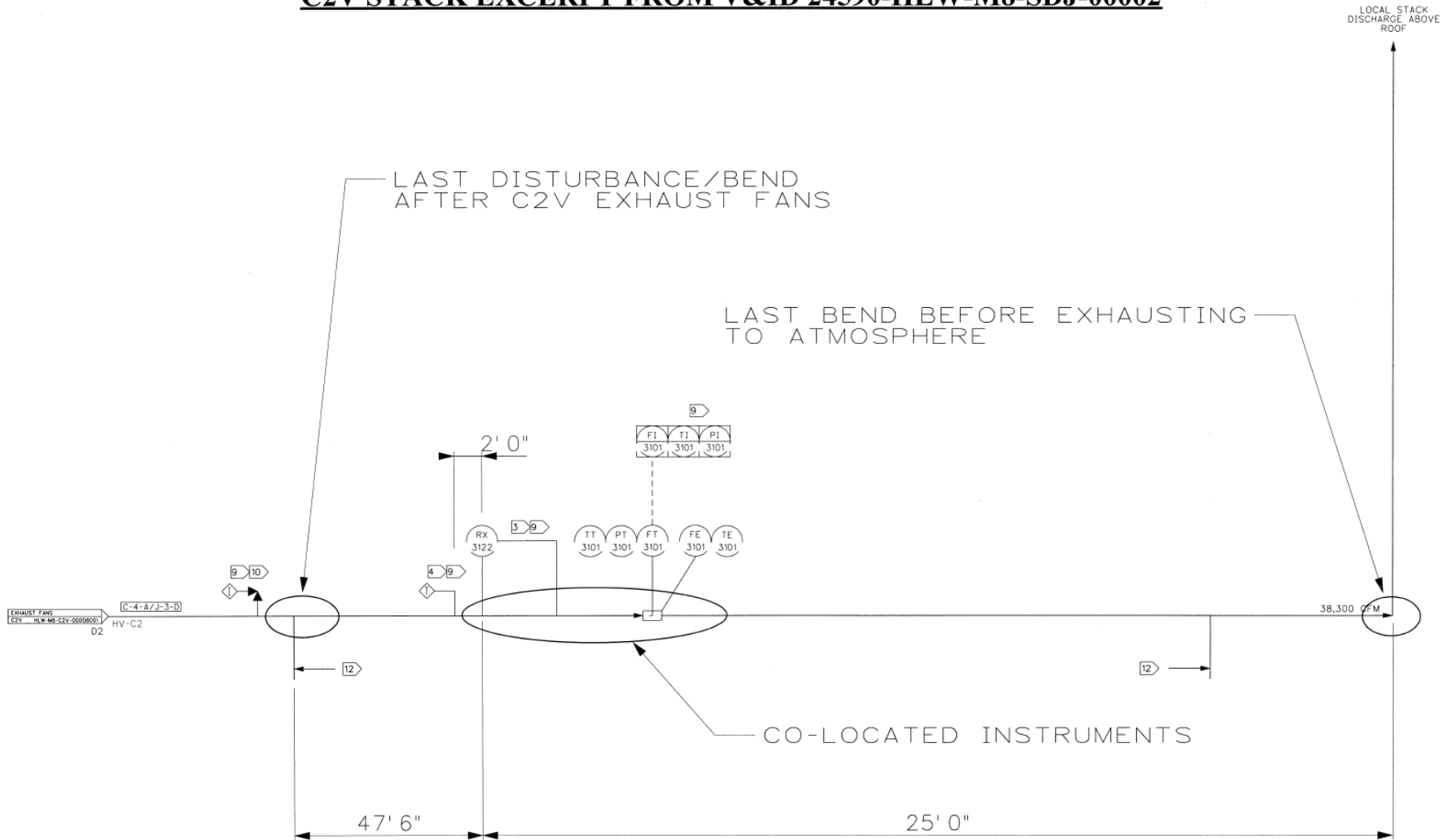
1. Between C2V-FAN-00004B to the main C2V exhaust duct header an on/off isolation damper, back draft damper, and an averaging pitot tube resides in this duct run. Positioning and installation details of the above elements are unknown at this time.

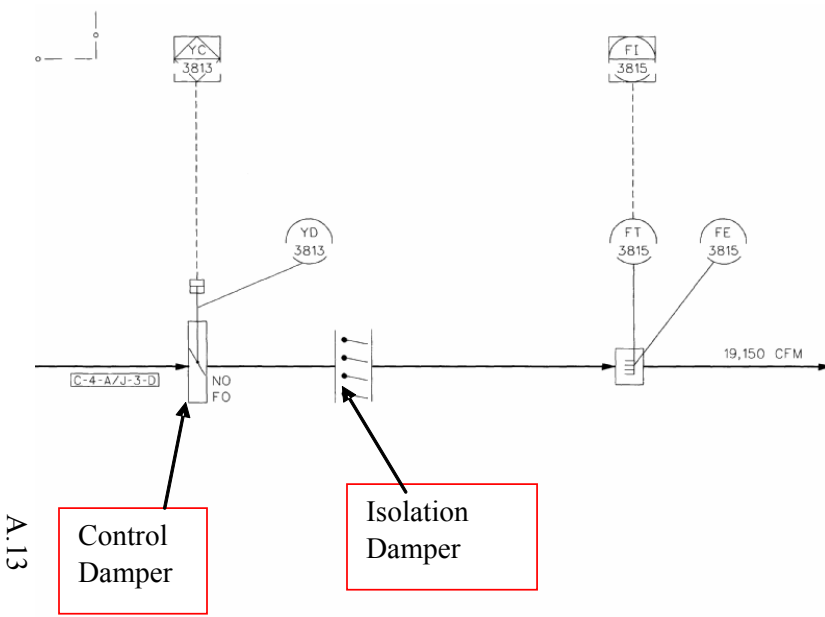
2. The HVAC duct coming off of the C2V-FAN-00004B is rectangular and transitions to a 40" round duct. The 40" round duct once again transitions into the 60" main C2V exhaust header.



C2V STACK EXCERPT FROM V&ID 24590-HLW-M8-SDJ-00002

A.12





A.13

Control Damper

Isolation Damper

DRAWING INDEX		
DWG NO	REV	TITLE
24590-HLW-M8-C2V-00008001	0	HLW VITRIFICATION BLDG. SYSTEM C2V PLANT RM V&ID EXHAUST FANS

REFERENCE DRAWINGS		
DWG NO	TITLE	
24590-WTP-M8-M80T-00001	HVAC V&ID SYMBOLS AND LEGENDS	
24590-WTP-M6-50-00001	P&ID SYMBOLS AND LEGEND SHEET 1 OF 6	
24590-WTP-M6-50-00002	P&ID SYMBOLS AND LEGEND SHEET 2 OF 6	
24590-WTP-M6-50-00003	P&ID SYMBOLS AND LEGEND SHEET 3 OF 6	
24590-WTP-M6-50-00004	P&ID SYMBOLS AND LEGEND SHEET 4 OF 6	
24590-WTP-M6-50-00005	P&ID SYMBOLS AND LEGEND SHEET 5 OF 6	
24590-WTP-M6-50-00006	P&ID SYMBOLS AND LEGEND SHEET 6 OF 6	
24590-HLW-M8-SDJ-00002	HLW VITRIFICATION BLDG. SYSTEM SDJ PLANT RM. V&ID EXHAUST STACK MONITORING SYSTEM	
24590-HLW-P1-P01T-00005	HLW VIT BLDG. GEN. ARRGT. PLAN AT EL 58'-0"	
24590-HLW-M8-C2V-00007001	HLW VITRIFICATION BLDG SYSTEM C2V PLANT RM V&ID EXHAUST FILTERS	

CM
QUALITY DESIGNATOR

REV	DESCRIPTION	ORG	CHKD	RW/D	APVD	DATE
0	ISSUED FOR CONSTRUCTION					3-19-04

ISSUED BY RPP-WTP-PDG CC 3/19/04 INT DATE ISSUE STAMP	PROJECT No. 24590 SITE HANFORD AREA 200E BUILDING No. 30	BY Matthew Mulla 3-19-2004	DATE 3-19-2004
ORIGINATOR	CHECKER Paul R. Brown 3-19-2004	APPROVER J. V. A.	REVIEWER Eric J. Gallo 3-19-04

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99352

CONTRACT No: DE-AC27-01RV14136
**HLW VITRIFICATION BUILDING
SYSTEM C2V
PLANT ROOM V&ID
EXHAUST FANS**

CONTENT APPLICABLE TO ALARA? YES NO
ADR NO. 24590-HLW-ADR-HV-02-003 REV: 0

SCALE: NONE	24590-HLW-M8-C2V-00008001	REV 0
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ATTACHMENT B
MEMORANDUM CCN 111186
January 19, 2005

John,

In response to the e-mail below, please use the attached (CCN 116112) as a reference for your modelling efforts on the HV-C2 stack. This CCN represents the latest direction on WTP stack designs and target discharge velocities. If you have any questions regarding the use of this CCN please feel free to call either Jerry Gaulden (371-3598) or me.

Dan Cragin P.E.
WTP HVAC
(509) 371-8458
djcragin@bechtel.com < <mailto:djcragin@bechtel.com> >

-----Original Message-----

From: Glissmeyer, John A [<mailto:ja.glissmeyer@pnl.gov>]
Sent: Thursday, November 03, 2005 5:25 PM
To: Weddle, Brian E; Garcia, Gerard
Cc: Icyan, Cesar
Subject: FW: Electronic Files- CCN 111186

Earlier this year, Aaron Childers submitted this package showing the conceptual design for the stack HV-C2. Shortly, we will be building a scale model of this stack to test the mixing at the proposed sampling location.

Brian - could you please check for design changes since January 2005 before I submit the scaled version of the design for fabrication?

I noticed that the airflow (38300) is considerably less than the value that was being used about a year ago and which appeared in my design review report (58000 cfm); however the stack diameter had not changed. This would result in a discharge velocity much less than the standard range that Gerard Garcia proposed. Maybe Gerard's proposed range did not apply to C2 systems?

I was wondering if you two could set me straight.

Thanks,

John Glissmeyer

ATTACHMENT C
MEMORANDUM CCN 116112
March 23, 2005

All drawings are best-available copy in Attachment C.



Memorandum

To: Jennifer Su-Coker - MS4-C1 Date: March 23, 2005
From: Gerald M. Gaulden, P.E. CCN: 116112
Ext: 371-3582
Fax: 371-3508

Subject: **VENTILATION EXHAUST STACK DESIGN DATA (AUGMENTED)**

Reference: CCN: 101188, Memorandum from G.M. Gaulden, "Exhaust Stack Design Standardization Data", March 4, 2005.
 CCN: 094165, Meeting Minutes from G. Garcia, HVAC/FP Engineering Discipline Manager, October 11, 2004

The purpose of this memorandum is to supercede CCN: 101188 to augment the ventilation exhaust stack design data. The table has been augmented to include total pressure at stack discharge and nominal relative humidity. This current ventilation exhaust stack design data is being provided to RPP-WTP Environmental and Nuclear Safety (E&NS) to support the Air Dispersion Model in the Environmental Risk Assessment for the Dangerous Waste Permit and the Radioactive Air Emissions Permit.

As engineering design on the RPP-WTP Project has progressed, the Central Engineering Groups have made a concerted effort with the Facility Design Teams to standardize the exhaust stack designs across all facilities. The most significant result of this effort has been the establishment of a nominal stack discharge velocity of 3,500 feet per minute (fpm) within a range of ± 500 fpm. This velocity will maintain adequate exhaust plume rise above the stack discharge, thereby ensuring proper dispersion of the exhaust stream.

The reader is advised that the design data contained herein reflects the current engineering design of the RPP-WTP Facility. In some cases, further design evolution may require revision of this data.

Gerald M. Gaulden, P.E.
Systems Lead
HVAC Central Engineering
GMG/gmg

VENTILATION EXHAUST STACK DESIGN DATA

Facility	Emission Unit	Nominal Stack Height (ft)	Stack Diameter (in)	Nominal Airflow (cfm)	Discharge Velocity (fpm)	Normal Exhaust Temp (F)	Discharge Pressure (in WG) *	Normal Relative Humidity
PTF	C2V	200	54	63,400	4,000	80	1.00	10-80%
	C3V	200	62	72,500	3,500	95	0.76	10% min
	C5V	200	62	70,500	3,400	113	0.72	5%
	PJV	Refer to CCN: 116807 for Process Exhaust Stack Design Data						
	PVV	Refer to CCN: 116807 for Process Exhaust Stack Design Data						
LAW	C2V	105	60	56,000	2,800	80	0.49	15%
	C3V	200	48	40,000	3,200	95	0.64	15%
	C5V	200	60	64,000	3,300	160	0.68	4%
	LVP	Refer to CCN: 116807 for Process Exhaust Stack Design Data						
HLW	C2V	71	44	40,000	3,500	80	0.76	10-100%
	C3V	200	50	47,500	3,500	95	0.76	10% min
	C5V	200	52	51,000	3,400	113	0.72	5%
	IHLW	200	24	10,500	3,300	113	0.68	10% min
	PJV	Refer to CCN: 116807 for Process Exhaust Stack Design Data						
	HOP A	Refer to CCN: 116807 for Process Exhaust Stack Design Data						
	HOP B	Refer to CCN: 116807 for Process Exhaust Stack Design Data						
LAB	C2V	118	48	42,000	3,300	80	0.68	10%
	C3V	118	60	69,000	3,500	95	0.76	30%
	C5V	118	28	14,500	3,400	95	0.72	10%

* Discharge Pressure is equal to Velocity Pressure since Static Pressure is negligible at point of discharge.



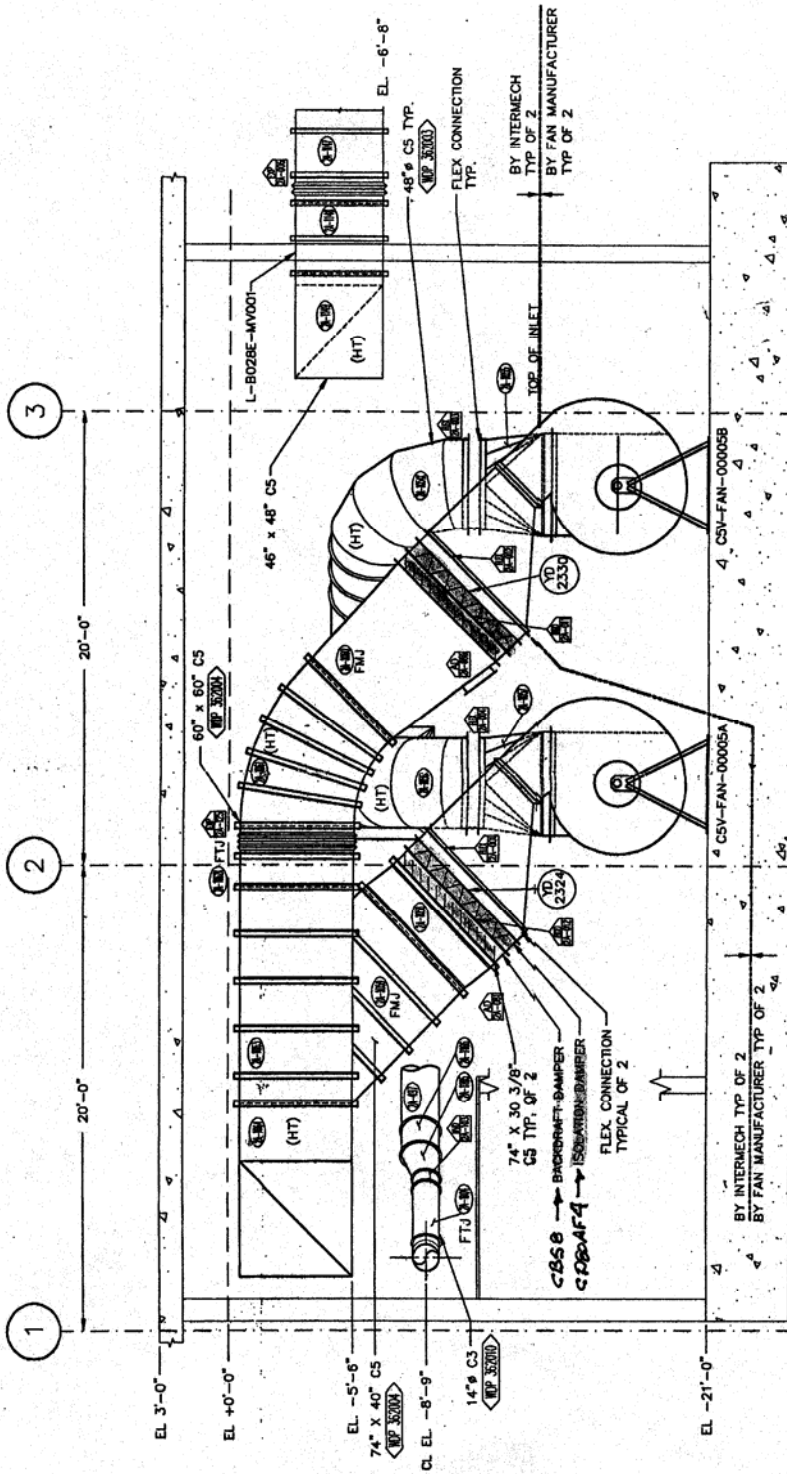
Distribution

<u>Addressee</u>	<u>MSIN</u>	<u>Addressee</u>	<u>MSIN</u>
Braccia, Mark	MS4-B2	Shea, Peter	MS8-A
Garcia, Gerard	MS4-E2	Solis, Leo	MS5-H
Icayan, Cesar	MS5-K1	Su-Coker, Jennifer	MS4-C1
Isern, Eric	MS5-H	Sweeney, Sean	MS12-2B
Lawrence, Will	MS12-2B	Thomas, John	MS8-A
Merzouk, Karl	MS12-2B	PDC	MS11-B

ATTACHMENT D
FAN and DAMPER ARRANGEMENT ASSUMED

The drawing is best-available copy in Attachment D.

**FOR
INFORMATION
ONLY**



3/9/85

ATTACHMENT E
CATALOG CUT OF RUSKIN CONTROL DAMPER

The drawing is best-available copy in Attachment E.

CD80AF3 and CD80AF4 INDUSTRIAL CONTROL DAMPER GALVANIZED STEEL

STANDARD CONSTRUCTION

FRAME
CD80AF3 - 8" x 2" x 12 gage (203 x 51 x 2.8) steel channel.
CD80AF4 - 8" x 2" x 10 gage (203 x 51 x 3.5) steel channel.

BLADE
CD80AF3 - 5 3/4" to 7 3/4" (146 to 197) wide, double skin airfoil type of 16 gage (1.6) steel for blade lengths to 48" (1219) and 14 gage (2) steel for 48" to 60" (1219 to 1524) blade lengths.
CD80AF4 - 5 3/4" to 7 3/4" (146 to 197) wide, double skin airfoil type of 12 gage (2.8) steel for blade lengths to 48" (1219) and 10 gage (3.5) steel for 48" to 60" (1219 to 1524) blade lengths.

LINKAGE
Side linkage out of airstream. 3/16" x 3/4" (4.8 x 19) plated steel tie bars. 3/8" (9.5) diameter stainless steel pivot pins with lock type retainers. 10 gage (3.5) galvanized steel clevis arms.

AXLES
CD80AF3 - 3/4" (19) diameter plated steel.
CD80AF4 - 3/4" (19) diameter plated steel for blade lengths up to 48" (1219), 1" (25.4) diameter plated steel for 48" to 60" (1219 to 1524) blade lengths.

BEARINGS
Stainless steel sleeve bolted to frame.

OPERATING LEVER
Hand Quadrant (HQ) for manual operation or Crank Lever (CL) for motor operation.

FINISH
Mill.

MAXIMUM TEMPERATURE
250°F (121°C) is standard. Damper can be supplied for temperatures between 250°F (121°C) and 400°F (204°C) by increasing clearance between blade ends and frame. Advise Ruskin of maximum operating temperature.

MINIMUM SIZE
Single blade, parallel action - 6" w x 6" h (152 x 152).
Two blade, parallel or opposed action - 6" w x 12" h (152 x 305).

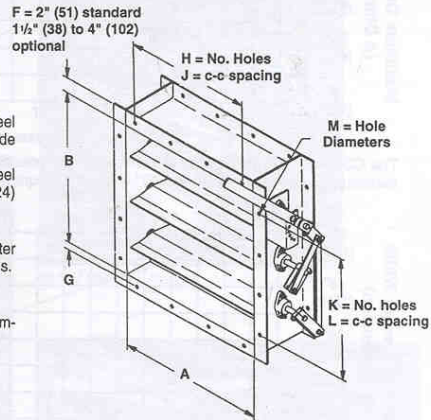
MAXIMUM SIZE
60" w x 96" h (1524 x 2438). Consult Ruskin for larger sizes.

VARIATIONS

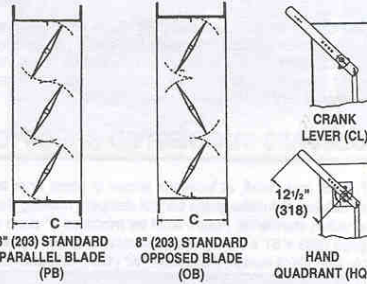
Additional variations to those listed in table are available. Consult Ruskin for pricing.

- Higher temperature construction
- Other materials/heavier construction
- Special finishes.

Dimensions in parenthesis () indicate millimeters



ILLUSTRATED WITH OPTIONAL BOLT HOLES IN FLANGES



FRAME	BLADES	AXLES	BEARINGS	LINKAGE	SEALS (OPT)	ACCESSORIES
12 GA (2.8) GALVANIZED STEEL	16 GA (1.6) to 48" (1219) 14 GA (2) to 60" (1524) GALV	3/4" (19) DIA. PLATED STEEL	SS SLEEVE IN CAST HSG BOLTED TO FRAME	SIDE LINKAGE (CONCEALED)	BLADE SEALS EPDM 250°F (121°C) MAX	HAND QUADRANT (HQ)
10 GA (3.5) GALVANIZED STEEL	12 GA (2.8) to 48" (1219) 10 GA (3.5) to 60" (1524) GALV	3/4" (19) DIA. PLATED STEEL to 48", 1" (25.4) DIA PLTD STL OVER 48" (1219) to 60" (1524)	BRGS BOLTED TO FRAME W/INTEGRAL SHAFT SEALS (OPT)		BLADE SEALS SILICONE 400°F (200°C) MAX	CRANK LEVER (CL)
12 GA (2.8) 304SS	16 GA (1.6) 304SS to 48" (1219) 14 GA (2) 304SS to 60" (1524)	1" (25.4) DIA PLTD STL (OPT)	OUTBOARD BRGS W/SHAFT SEALS (OPT)		SS JAMB SEALS	BOLT HOLES ONE FLANGE (OPT)
10 GA (3.5) 304SS	12 GA (2.8) 304SS to 48" (1219) 10 GA (3.5) 304SS to 60" (1524)	1" (25.4) DIA PLTD STL (OPT)				BOLT HOLES BOTH FLANGES (OPT)
12 GA (2.8) 316SS	16 GA (1.6) 316SS to 48" (1219) 14 GA (2) 316SS to 60" (1524)	3/4" (19) DIA. SS (Opt)				PNEUMATIC ACTUATOR (OPT)
10 GA (3.5) 316SS	12 GA (2.8) 316SS to 48" (1219) 10 GA (3.5) 316SS to 60" (1524)	1" (25.4) DIA. SS (Opt)				ELECTRIC ACTUATOR (OPT)

QTY.	MODEL	BLADE ACTION		DIMENSIONS											COMMENTS	TAG	
		PB	OB	A	B	C	F	G	H	J	K	L	M				

PROJECT	REPRESENTATIVE	CONTRACTOR
ARCH/ENGR.	LOCATION:	DATE

ATTACHMENT F
CATALOG CUT OF RUSKIN BACKDRAFT DAMPER

The drawing is best-available copy in Attachment F.

RUSKIN®

**FOR
INFORMATION
ONLY**

3900 Dr. Greaves Rd. • Kansas City, MO 64030 • (816) 761-7476 • FAX (816) 765-8955

CBS8 HEAVY DUTY COUNTERBALANCED BACKDRAFT DAMPER

STANDARD CONSTRUCTION

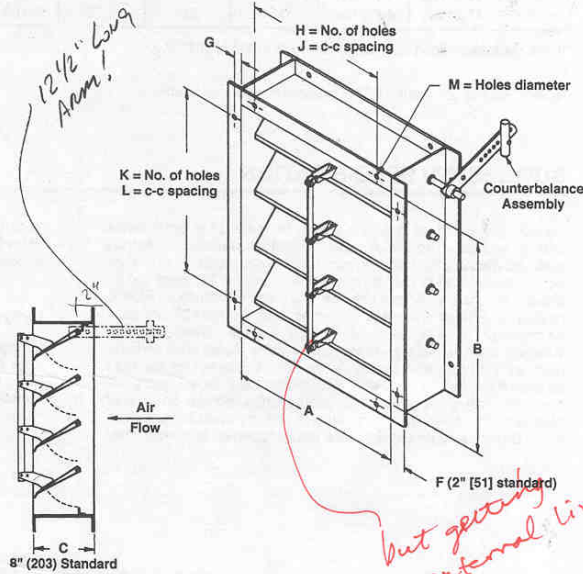
- FRAME**
8" x 2" x 10 gage (203 x 51 x 3.5) steel channel.
- BLADES**
Double-skin, airfoil type of 18 (1.3) gage steel with a 7" (178) maximum width.
- AXLES**
3/4" (19) diameter, plated steel.
- BEARINGS**
Ball bearings pressed to frame.
- LINKAGE**
3/16" thick x 3/4" (5 x 19) plated steel tie bar with 16 gage (1.6) linkage arms in airstream.
- FINISH**
Mill galvanized.
- MINIMUM SIZE**
6" w x 6"h (152 x 152).
- MAXIMUM SIZE**
60"w x 96"h (1524 x 2438).
- MAXIMUM TEMPERATURE**
250°F (121°C).

VARIATIONS

Additional variations to those listed in table are available. Contact Ruskin for pricing.

- Heavier/Higher Temperature Construction
- Special Finishes
- Pressure Relief Applications

Dimensions shown in parentheses () indicate millimeters.



but getting external linkages

FRAME	BLADES	AXLES	BEARINGS	LINKAGE	SEALS (OPT)	ACCESSORIES (OPT)
10 GA (3.5) GALV STEEL CHANNEL	18 GA (1.3) GALV STEEL DOUBLE SKIN AIRFOIL	3/4" (19) DIA. PLATED STEEL	BALL BRGS PRESSED INTO FRAME	FACE LINKAGE IN AIR STREAM (EXPOSED)	BLADE SEALS EPDM 250°F (121°C) MAX	INTERNAL COUNTER WEIGHTS
10 GA (3.5) SS CHANNEL (OPT)	18 GA (1.3) 304 SS DOUBLE SKIN AIRFOIL	3/4" (19) DIA 304 SS (OPT)	SS SLEEVE PRESSED INTO FRAME (OPT)	SIDE LINKAGE OUT OF AIRSTREAM (OPT)	BLADE SEALS SILICONE 400°F (200°C) MAX	BOLT HOLES ONE FLANGE
10 GA (3.5) 316 SS CHANNEL (OPT)	18 GA (1.3) 316 SS DOUBLE SKIN AIRFOIL	3/4" (19) DIA. 316 SS (OPT)	RE-LUBE BALL BRG BOLTED TO FRAME (OPT)		SS JAMB SEALS	BOLT HOLES BOTH FLANGES
						1 1/2" (38) TO 4" (102) FLANGES

QTY.	DIMENSIONS											VARIATIONS
	A	B	C	F	G	H	J	K	L	M		
JOB						LOCATION						
CONTRACTOR												

Spec CBS8-1199/Replaces CBS8-293 ALL STATED SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION

Appendix B

Flow-Calibration Data Sheets

Appendix B: Flow-Calibration Data Sheets

VELOCITY vs. FREQUENCY DATA FORM

VELFR_Rev0

8/11/2006

Site	HV-C2 model	Run No.	VF-1
Date	10/27/2006	Stack Temp	68 deg F
Tester	BG Fritz	Stack RH%	52%
Stack Dia.	12 in.	Baro Press	1014.2 mbar
Stack X-Area	113.1 in ²	Fan Configuration	A&B ON with prefilters installed
Elevation	Port 1	Start/End Time	1100 -- 1130
El. above disturbance	53.5 inches	Reference point from velocity test VT	: Bottom #4
Velocity Readings, units =	fpm		

Hz	fpm			Mean	Target	Target	Estmtd
	1	2	3		cfm	fpm	
					--	--	--
					2091	2662	37.4
Hz	1	2	3	Mean	StDev	2 StDev	cfm
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	2079	2075	2074	2076.00	2.65	5.29	1630.49
35	2462	2485	2488	2478.33	14.22	28.45	1946.48
40	2862	2857	2881	2866.67	12.66	25.32	2251.47
45	3262	3266	3253	3260.33	6.66	13.32	2560.66
50	3631	3637	3657	3641.67	13.61	27.23	2860.16
55	4048	4023	4068	4046.33	22.55	45.09	3177.98
60	4407	4426	4414	4415.67	9.61	19.22	3468.06

Instuments Used:

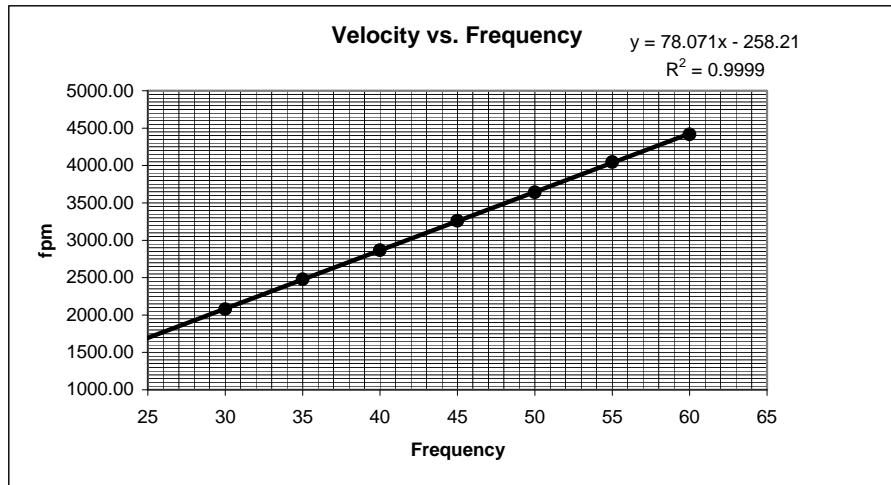
Solomat Zephyr SN 12951472

Stack pressure = 0.97 mbar Pbaro = 29.95 in Hg

Total Stack Press = 1015 mbar

Cal Exp. Date:

10/12/2007



Signature signifies compliance with Procedure EMS-JAG-3	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-464

Reference: CCP-WTPSP-177
 VELFR_Rev0.xls
 3 August 2006

(HVC2_VELFR_Rev0).xls
 VF1
 4/9/2007

VELOCITY vs. FREQUENCY DATA FORM

VELFR_Rev0

8/11/2006

Site	HV-C2 model	Run No.	VF-2
Date	10/27/2006	Stack Temp	71 deg F
Tester	BG Fritz	Stack RH%	50%
Stack Dia.	12 in.	Baro Press	1014 mbar
Stack X-Area	113.1 in2	Fan Configuration	Fan A on, prefilter installed, Fan B sealed closed
Elevation	Port 1	Start/End Time	1135 -- 1155
El. above disturbance	53.5 inches	Reference point from velocity test VT	: Bottom #4
Velocity Readings, units =	fpm		

Hz	fpm			Mean	Target	Target	Estmtd
	1	2	3		cfm	fpm	Hz
					--	--	--
					909	1158	31.1
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	1123	1109	1116	1116.00	7.00	14.00	876.50
35	1327	1277	1371	1325.00	47.03	94.06	1040.65
40	1528	1475	1536	1513.00	33.15	66.30	1188.31
45	1738	1748	1733	1739.67	7.64	15.28	1366.33
50	1929	1993	2022	1981.33	47.59	95.17	1556.14
55	2187	2161	2163	2170.33	14.47	28.94	1704.58
60	2340	2312	2422	2358.00	57.17	114.33	1851.97

Instruments Used:

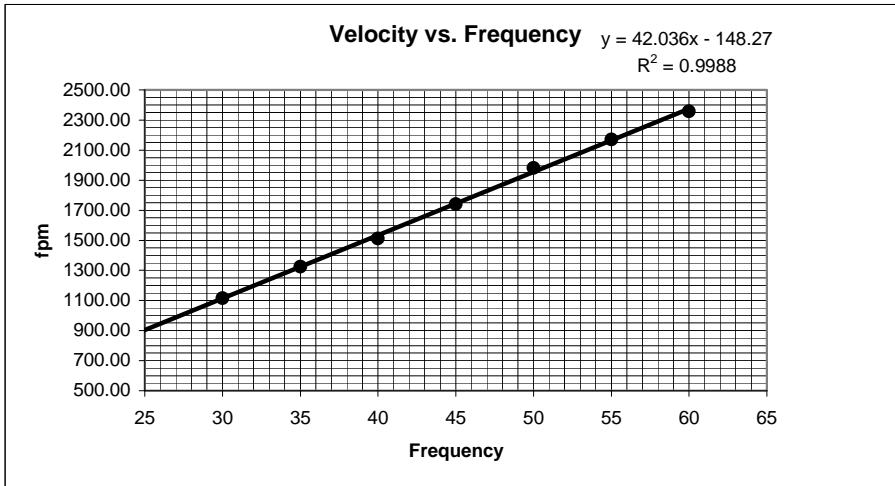
Solomat Zephyr SN 12951472

Stack static = 0.2 mbar

Total Stack Press = 1014 mbar

Cal Exp. Date:

10/12/2007



Signature signifies compliance with Procedure EMS-JAG-3	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-464

Reference: CCP-WTPSP-177
 VELFR_Rev0.xls
 3 August 2006

(HVC2_VELFR_Rev0).xls
 VF2
 4/9/2007

VELOCITY vs. FREQUENCY DATA FORM

VELFR_Rev0

8/11/2006

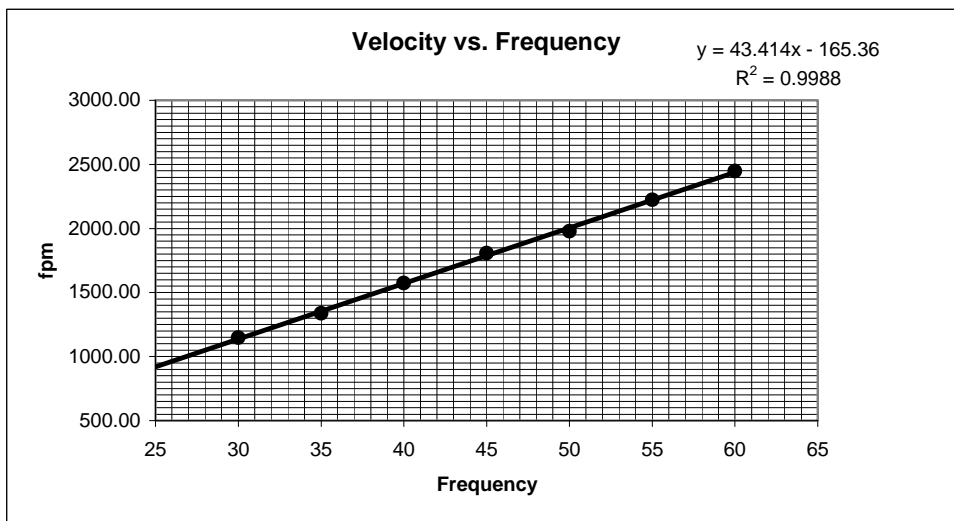
Site	HV-C2 model	Run No.	VF-3
Date	10/27/2006	Stack Temp	70 deg F
Tester	BG Fritz	Stack RH%	50%
Stack Dia.	12 in.	Baro Press	1014 mbar
Stack X-Area	113.1 in2	Fan Configuration	Fan B, prefilter on, Fan A sealed
Elevation	Port 1	Start/End Time	1300 -- 1325
El. above disturbance	53.5 inches	Reference point from velocity test VT	: Bottom #4
Velocity Readings, units	= fpm		

Hz	fpm				Target	Target	Estmtd
	1	2	3	Mean	cfm	fpm	Hz
					--	--	--
					909	1158	30.5
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	1153	1125	1168	1148.67	21.83	43.65	902.16
35	1332	1323	1358	1337.67	18.18	36.35	1050.60
40	1598	1528	1591	1572.33	38.55	77.11	1234.91
45	1849	1777	1799	1808.33	36.90	73.79	1420.26
50	1968	1964	2005	1979.00	22.61	45.21	1554.30
55	2212	2181	2277	2223.33	48.99	97.99	1746.20
60	2528	2398	2420	2448.67	69.58	139.16	1923.18

Instuments Used:

Cal Exp. Date:

Solomat Zephyr SN 12951472 10/12/2007
 For fun I looked at several averages at 45 Hz (30 - 35 points). Typical Std. Dev. for each average was 120 (i.e., 1777 +/- 1 S.D. = 1777 +/- 120).



Signature signifies compliance with Procedure EMS-JAG-3	Signature verifying data and calculations: Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-464
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VELOCITY vs. FREQUENCY DATA FORM

VELFR_Rev0

8/11/2006

Site	HV-C2 model	Run No.	VF-4
Date	11/6/2006	Stack Temp	72 deg F
Tester	JAG	Stack RH%	54%
Stack Dia.	12 in.	Baro Press	981 mbar
Stack X-Area	113.1 in2	Fan Configuration	Fan A, prefilter on, Fan B sealed
Elevation	Port 1	Start/End Time	1600 -- 1640
El. above disturbance	53.5 inches	Reference point from velocity test VT	: Side #4
Velocity Readings, units =	fpm		

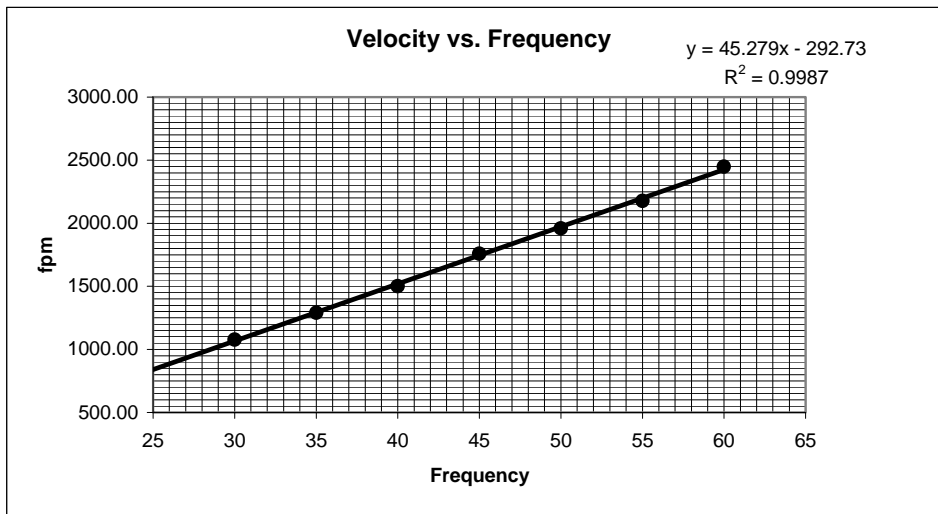
Hz	fpm				Target	Target	Estmtd
	1	2	3	Mean	cfm	fpm	Hz
					--	--	--
					909	1158	32.0
					StDev	2 StDev	cfm
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	1044	1082	1109	1078.33	32.65	65.31	846.92
35	1221	1302	1349	1290.67	64.75	129.50	1013.69
40	1491	1568	1444	1501.00	62.60	125.20	1178.88
45	1752	1797	1729	1759.33	34.59	69.18	1381.78
50	1956	1952	1973	1960.33	11.15	22.30	1539.64
55	2269	2157	2102	2176.00	85.11	170.21	1709.03
60	2464	2495	2385	2448.00	56.72	113.44	1922.65

Instruments Used:

Solomat Zephyr SN 12951472
 1600 HMS Station 11 54% RH and 28.97 in. mercury barometric pressure.

Cal Exp. Date:

10/12/2007



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Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-464

Reference: CCP-WTPSP-177
 VELFR_Rev0.xls
 3 August 2006

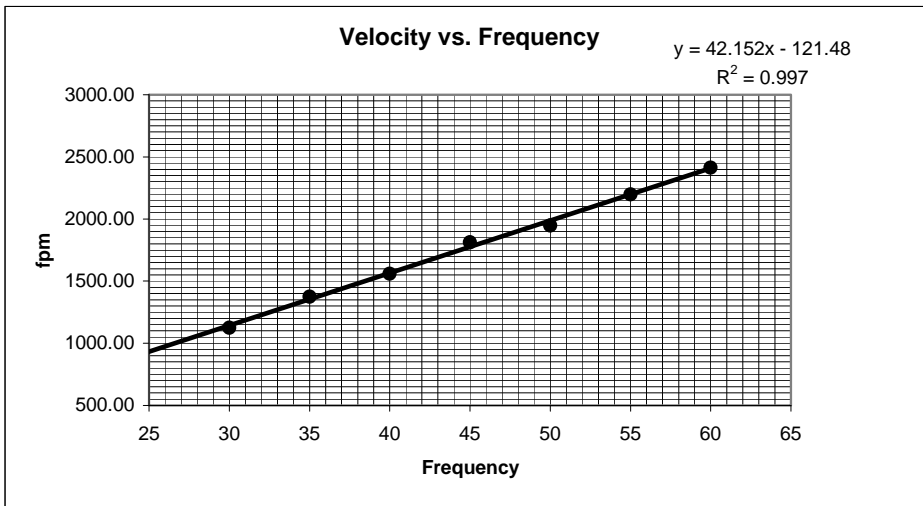
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 VF4
 4/9/2007

VELOCITY vs. FREQUENCY DATA FORM

VELFR_Rev0 8/11/2006
 Site **HV-C2 model** Run No. **VF-5**
 Date **11/6/2006** Stack Temp **73 deg F**
 Tester **JAG** Stack RH% **54%**
 Stack Dia. **12 in.** Baro Press **981 mbar**
 Stack X-Area **113.1 in2** Fan Configuration **Fan B, prefilter on, Fan A sealed**
 Elevation **Port 1** Start/End Time **1643 -- 1715**
 El. above disturbance **53.5 inches** Reference point from velocity test VT : **Side #4**
 Velocity Readings, units = **fpm**

Hz	fpm			Mean	Target	Target	Estmtd
	1	2	3		cfm	fpm	Hz
					--	--	--
					909	1158	30.4
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
15	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
30	1118	1124	1132	1124.67	7.02	14.05	883.31
35	1373	1416	1334	1374.33	41.02	82.03	1079.40
40	1601	1542	1532	1558.33	37.29	74.57	1223.91
45	1811	1774	1852	1812.33	39.02	78.03	1423.40
50	1941	1968	1933	1947.33	18.34	36.68	1529.43
55	2211	2185	2195	2197.00	13.11	26.23	1725.52
60	2433	2418	2390	2413.67	21.83	43.65	1895.69

Instruments Used: Solomat Zephyr SN 12951472 **Cal Exp. Date:** 10/12/2007



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Appendix C

Velocity Uniformity Data Sheets

Appendix C: Velocity Uniformity Data Sheets

VELOCITY TRAVERSE DATA FORM

Site HV-C2 Model	Run No. VT-1
Date 10/25/06	Fan Configuration A & B no prefilters
Testers JAG & JGD	Fan Setting 30 Hz
Stack Dia. 12 in.	Stack Temp 69.5 deg F
Stack X-Area 113.1 in.2	Start/End Time 1400 -- 1520
Elevation Port 1	Center 2/3 from 1.10 to: 10.90
Distance to disturbance 53.5 inches	Points in Center 2/3 2 to: 7
Velocity units ft/min	Data Files: NA

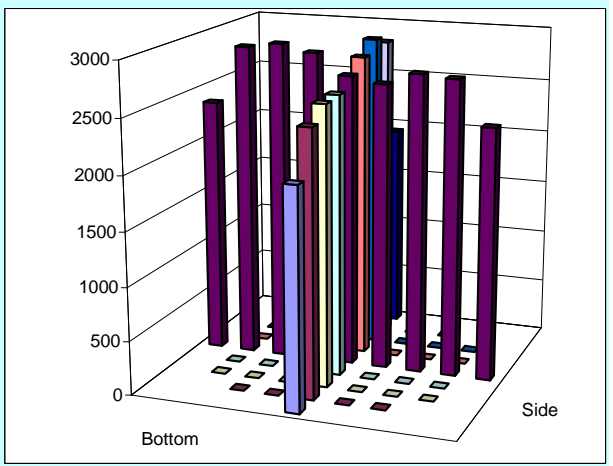
Order -->		1st							
Traverse-->		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	2355	2099	2374	2276.0	2040	2062	1995	2032.3
2	1.26	2696	2648	2673	2672.3	2481	2415	2459	2451.7
3	2.33	2687	2656	2744	2695.7	2527	2555	2678	2586.7
4	3.88	2527	2613	2617	2585.7	2569	2673	2574	2605.3
Center	6.00	2665	2621	2627	2637.7	2694	2744	2700	2712.7
5	8.12	2827	2803	2832	2820.7	2820	2835	2829	2828.0
6	9.67	2867	2897	2884	2882.7	2922	2988	2913	2941.0
7	10.74	2816	2831	2864	2837.0	2823	2861	2913	2865.7
8	11.50	2338	2356	2248	2314.0	2248	1704	1842	1931.3
Averages ----->		2642.0	2613.8	2651.4	2635.7	2569.3	2537.4	2544.8	2550.5

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2593.1		Mean	2733.1	2713.0	2723.0
Min Point	1931.3	-25.5%	Std. Dev.	113.1	175.3	142.1
Max Point	2941.0	13.4%	COV as %	4.1	6.5	5.2

Flow w/o C-Pt	2029 acfm	Instruments Used:	Cal Due
Vel Avg w/o C-Pt	2583 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	68	71	F
Equipment temp	74	71	F
Ambient temp	61	61	F
Stack static	0.412	0.503	mbars
Ambient pressure	1011.2	1010.8	mbars
Total Stack pressure	1011.6	1011.3	mbars
Ambient humidity	32%	31%	RH

	Time -->	1405	1520
Notes:	HMS Stn 11	in Hg	29.86 29.85
		F	61 61
		% RH	32 31



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Reference: CCP-WTPSP-179
VEL-dataRev0.xls
3 August 2006

(HVC2_VEL-dataRev0 (1)).xls/VT1
4/18/2007

VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-2
Date	10/25/06	Fan Configuration	A & B 3M Filtrete microallergen prefilters
Testers	JAG & JGD	Fan Setting	30 Hz
Stack Dia.	12 in.	Stack Temp	70.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1535 -- 1610
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order -->		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	1867	1962	1724	1851.0	1733	1601	1608	1647.3
2	1.26	2238	2242	2209	2229.7	1935	1980	1952	1955.7
3	2.33	2350	2327	2275	2317.3	2079	2091	2101	2090.3
4	3.88	2216	2256	2200	2224.0	2135	2056	2142	2111.0
Center	6.00	2294	2256	2267	2272.3	2279	2302	2249	2276.7
5	8.12	2376	2376	2334	2362.0	2407	2414	2393	2404.7
6	9.67	2367	2442	2421	2410.0	2469	2451	2470	2463.3
7	10.74	2434	2394	2390	2406.0	2410	2422	2430	2420.7
8	11.50	1497	1543	1761	1600.3	1769	1339	1678	1595.3
Averages ----->		2182.1	2199.8	2175.7	2185.9	2135.1	2072.9	2113.7	2107.2

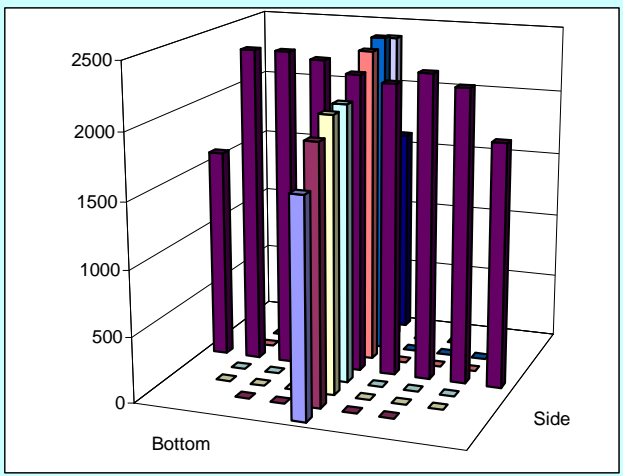
All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2146.5		Mean	2317.3	2246.0	2281.7
Min Point	1595.3	-25.7%	Std. Dev.	78.4	196.0	148.1
Max Point	2463.3	14.8%	COV as %	3.4	8.7	6.5

Flow w/o C-Pt 1673 acfm **Instruments Used:** Cal Due
 Vel Avg w/o C-Pt 2131 fpm Solomat Zephyr SN 12951472 10/12/07

	Start	Finish	
Stack temp	71	69	F
Equipment temp	71	66	F
Ambient temp	61	60	F
Stack static	0.503	0.327	mbars
Ambient pressure	1010.8	1010.8	mbars
Total Stack pressure	1011.3	1011.1	mbars
Ambient humidity	31%	31%	RH

Notes:

Time -->	1520	1610
HMS Stn 11 in Hg	29.85	29.85
F	61	60
% RH	31	31



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-3
Date	10/26/06	Fan Configuration	A 3M Filtrete microallergen prefilters
Testers	JAG & BGF & JGD	Fan Setting	30.08 Hz
Stack Dia.	12 in.	Stack Temp	68.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1410 -- 1510
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order -->		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	1062	914	1016	997.3	770	922	856	849.3
2	1.26	1257	1168	1232	1219.0	993	1046	1069	1036.0
3	2.33	1256	1299	1236	1263.7	1113	1094	1044	1083.7
4	3.88	1100	1177	1176	1151.0	1063	1034	1081	1059.3
Center	6.00	1093	1100	1084	1092.3	1096	1105	1117	1106.0
5	8.12	1210	1098	1140	1149.3	1226	1175	1206	1202.3
6	9.67	1229	1172	1248	1216.3	1392	1335	1451	1392.7
7	10.74	1279	1331	1287	1299.0	1547	1513	1606	1555.3
8	11.50	1390	1235	1306	1310.3	931	1029	920	960.0
Averages ----->		1208.4	1166.0	1191.7	1188.7	1125.7	1139.2	1150.0	1138.3

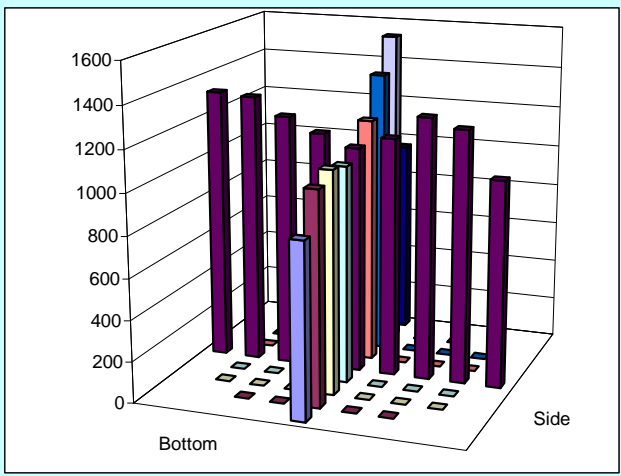
All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1163.5		Mean	1198.7	1205.0	1201.9
Min Point	849.3	-27.0%	Std. Dev.	71.9	196.7	142.4
Max Point	1555.3	33.7%	COV as %	6.0	16.3	11.8

Flow w/o C-Pt	920 acfm	Instruments Used:	Cal Due
Vel Avg w/o C-Pt	1172 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	69	68	F
Equipment temp	73	70	F
Ambient temp	68	68	F
Stack static	0.081	0.134	mbars
Ambient pressure	1013.5	1012.7	mbars
Total Stack pressure	1013.6	1012.8	mbars
Ambient humidity	41%	40%	RH

Notes:	HMS Stn 11	Time -->	1410	1510
		in Hg	29.93	29.9
		F	58	60
		% RH	41	40

Blocked Fan B inlet.
 Bottom # 8 hits something at top of duct. Probe tip hits lip created at duct seam.



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-4
Date	10/26/06	Fan Configuration	B 3M Filtrete microallergen prefilters
Testers	BGF & JGD	Fan Setting	30.08 Hz
Stack Dia.	12 in.	Stack Temp	69.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1530 -- 1555
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	82 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order -->		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	877	960	939	925.3	1039	946	920	968.3
2	1.26	1074	1051	1022	1049.0	1208	1132	1105	1148.3
3	2.33	1151	1147	1075	1124.3	1213	1194	1181	1196.0
4	3.88	1177	1206	1132	1171.7	1241	1215	1252	1236.0
Center	6.00	1207	1224	1216	1215.7	1250	1272	1276	1266.0
5	8.12	1340	1297	1318	1318.3	1287	1256	1301	1281.3
6	9.67	1308	1345	1311	1321.3	1284	1221	1256	1253.7
7	10.74	1245	1262	1280	1262.3	1193	1222	1207	1207.3
8	11.50	1219	1208	976	1134.3	912	1076	1000	996.0
Averages ----->		1177.6	1188.9	1141.0	1169.1	1180.8	1170.4	1166.4	1172.6

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1170.9		Mean	1209.0	1227.0	1218.0
Min Point	925.3	-21.0%	Std. Dev.	101.3	46.2	76.2
Max Point	1321.3	12.9%	COV as %	8.4	3.8	6.3

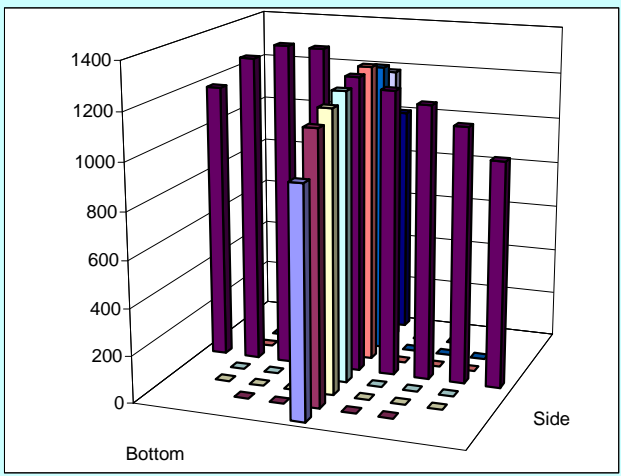
Flow w/o C-Pt: 913 acfm Instruments Used: Solomat Zephyr SN 12951472 Cal Due: 10/12/07
 Vel Avg w/o C-Pt: 1162 fpm

	Start	Finish	
Stack temp	68	70	F
Equipment temp	70	69	F
Ambient temp	70	69	F
Stack static	0.117	0.104	mbars
Ambient pressure	1012.7	1012.7	mbars
Total Stack pressure	1012.8	1012.8	mbars
Ambient humidity	40%	37%	RH

Notes: HMS Stn 11 Time --> 1530 1555

in Hg	29.9	29.9
F	58	61
% RH	40	37

Blocked Fan A inlet.



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-5
Date	11/7/06	Fan Configuration	A & B 3M Filtrete microallergen prefilters
Testers	JAG & JGD	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	73.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1445 -- 1530
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

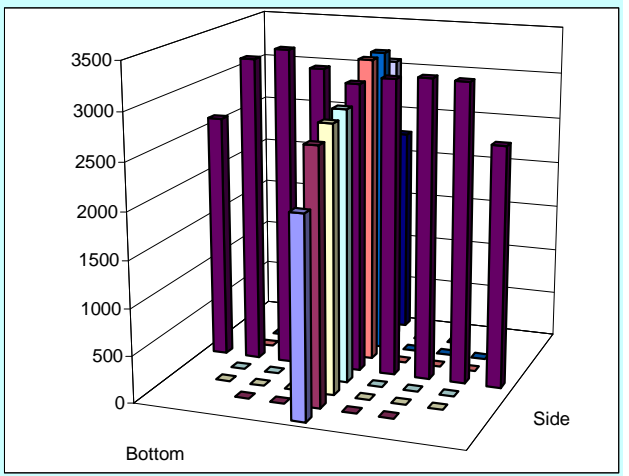
Order -->		1st				2nd			
Trial ---->		Side				Bottom			
CorrectLabel	Depth, in.	1	2	3	Mean	1	2	3	Mean
		Velocity				Velocity			
1	0.50	2695	2136	2546	2459.0	2110	1937	2328	2125.0
2	1.26	3024	3078	3066	3056.0	2693	2736	2680	2703.0
3	2.33	3030	3032	3139	3067.0	2808	2850	2860	2839.3
4	3.88	3097	2991	3024	3037.3	2917	2936	2861	2904.7
Center	6.00	2896	2966	3027	2963.0	3169	3082	3030	3093.7
5	8.12	3065	3128	3071	3088.0	3256	3296	3282	3278.0
6	9.67	3259	3252	3260	3257.0	3300	3312	3262	3291.3
7	10.74	3190	3178	3058	3142.0	3125	3200	3074	3133.0
8	11.50	2480	2450	2597	2509.0	2443	2103	2194	2246.7
Averages ----->		2970.7	2912.3	2976.4	2953.1	2869.0	2828.0	2841.2	2846.1

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2899.6		Mean	3087.2	3034.7	3061.0
Min Point	2125.0	-26.7%	Std. Dev.	92.3	224.8	167.3
Max Point	3291.3	13.5%	COV as %	3.0	7.4	5.5

Flow w/o C-Pt	2265 acfm	Instruments Used:	Solomat Zephyr SN 12951472	Cal Due	10/12/07
Vel Avg w/o C-Pt	2884 fpm				

	Start	Finish	
Stack temp	73	73	F
Equipment temp	70	71	F
Ambient temp	67	69	F
Stack static	0.500	--	mbars
Ambient pressure	985.4	--	mbars
Total Stack pressure	985.9	--	mbars
Ambient humidity	64%	--	RH

Notes:	HMS Stn 11	Time -->	1445	1530
		in Hg	29.1	29.13
		F	67	69
		% RH	64	57



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-6
Date	11/7/06	Fan Configuration	A & B 3M Filtrete microallergen prefilters
Testers	JAG & JGD	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	73.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1535 -- 1605
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA
Order -->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	2628	1520	2654	2267.3	1973	2186	1796	1985.0
2	1.26	2989	3005	3034	3009.3	2672	2663	2639	2658.0
3	2.33	3078	3092	3113	3094.3	2821	2824	2875	2840.0
4	3.88	2993	3014	3110	3039.0	2917	2899	2909	2908.3
Center	6.00	2973	3029	3023	3008.3	3104	3093	3134	3110.3
5	8.12	3176	3188	3215	3193.0	3255	3229	3256	3246.7
6	9.67	3280	3279	3241	3266.7	3262	3262	3322	3282.0
7	10.74	3132	3144	3154	3143.3	3219	3185	3206	3203.3
8	11.50	2728	2424	2395	2515.7	2468	1218	2480	2055.3
Averages ----->		2997.4	2855.0	2993.2	2948.6	2854.6	2728.8	2846.3	2809.9

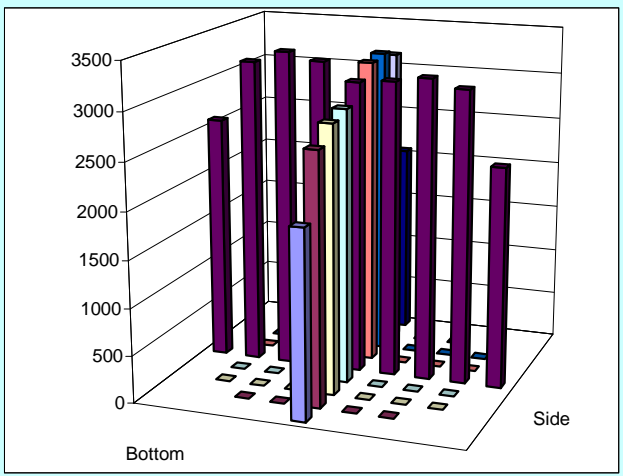
All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2879.2		Mean	3107.7	3035.5	3071.6
Min Point	1985.0	-31.1%	Std. Dev.	98.5	236.7	178.1
Max Point	3282.0	14.0%	COV as %	3.2	7.8	5.8

Flow w/o C-Pt 2244 acfm **Instruments Used:** Cal Due
 Vel Avg w/o C-Pt 2857 fpm Solomat Zephyr SN 12951472 10/12/07

	Start	Finish	
Stack temp	73	74	F
Equipment temp	71	71	F
Ambient temp	69	69	F
Stack static	0.500	--	mbars
Ambient pressure	986.5	--	mbars
Total Stack pressure	987.0	--	mbars
Ambient humidity	57%	--	RH

Notes:

	Time -->	1530	1605
HMS Stn 11	in Hg	29.13	29.17
	F	69	69
	% RH	57	52



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-7
Date	11/7/06	Fan Configuration	A & B 3M Filtrete microallergen prefilters
Testers	JAG & JGD	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	72.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1610 -- 1640
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA
Order -->	1st		2nd

CorrectLabel	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		Velocity				Velocity			
1	0.50	2661	2645	2827	2711.0	2294	1940	1841	2025.0
2	1.26	3078	3062	3110	3083.3	2723	2671	2779	2724.3
3	2.33	3096	3094	3100	3096.7	2822	2965	2879	2888.7
4	3.88	3096	3060	3021	3059.0	2881	2983	2917	2927.0
Center	6.00	2995	3054	2960	3003.0	3154	3206	3201	3187.0
5	8.12	3144	3203	3198	3181.7	3320	3295	3330	3315.0
6	9.67	3265	3254	3283	3267.3	3339	3347	3355	3347.0
7	10.74	3118	3144	3152	3138.0	3234	3225	3277	3245.3
8	11.50	2736	2349	2393	2492.7	2446	2309	2709	2488.0
Averages ----->		3021.0	2985.0	3004.9	3003.6	2912.6	2882.3	2920.9	2905.3

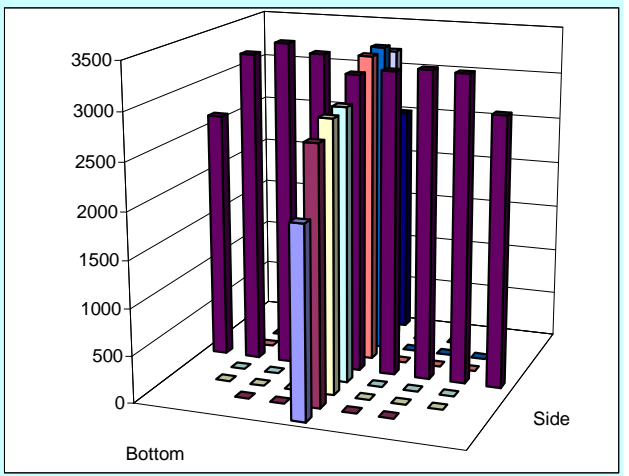
All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2954.4		Mean	3118.4	3090.6	3104.5
Min Point	2025.0	-31.5%	Std. Dev.	86.7	241.9	175.2
Max Point	3347.0	13.3%	COV as %	2.8	7.8	5.6

Flow w/o C-Pt 2307 acfm **Instruments Used:** Cal Due
 Vel Avg w/o C-Pt 2937 fpm Solomat Zephyr SN 12951472 10/12/07

	Start	Finish	
Stack temp	74	70	F
Equipment temp	71	70	F
Ambient temp	69	62	F
Stack static	0.500	--	mbars
Ambient pressure	987.8	--	mbars
Total Stack pressure	988.3	--	mbars
Ambient humidity	52%	--	RH

Notes:

	Time -->	1605	1640
HMS Stn 11	in Hg	29.17	29.21
	F	69	62
	% RH	52	51



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-8
Date	11/9/06	Fan Configuration	A & B 3M Filtrete microallergen prefilters
Testers	JAG	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	63.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1500 -- 1552
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

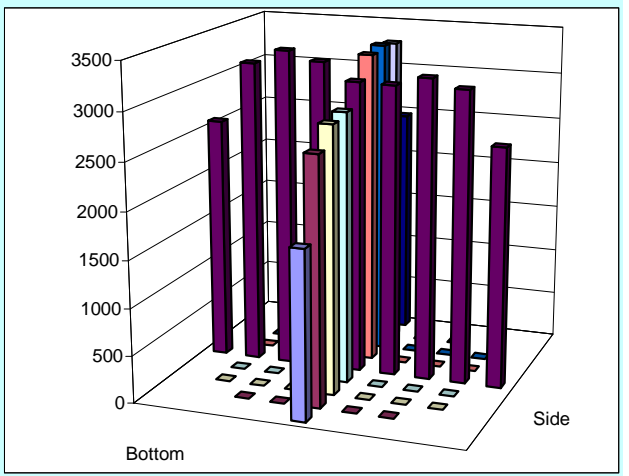
Order -->		1st				2nd			
Trial ---->		Side				Bottom			
CorrectLabel	Depth, in.	1	2	3	Mean	1	2	3	Mean
		Velocity				Velocity			
1	0.50	1899	2827	2751	2492.3	1882	1632	1812	1775.3
2	1.26	3005	3052	3060	3039.0	2662	2553	2634	2616.3
3	2.33	3127	3144	3112	3127.7	2831	2845	2820	2832.0
4	3.88	3009	2999	3090	3032.7	2896	2852	2881	2876.3
Center	6.00	3049	2991	3085	3041.7	3124	3128	3089	3113.7
5	8.12	3202	3246	3217	3221.7	3352	3330	3303	3328.3
6	9.67	3336	3302	3302	3313.3	3366	3353	3385	3368.0
7	10.74	3183	3121	3178	3160.7	3347	3355	3294	3332.0
8	11.50	2778	2321	2487	2528.7	2275	2439	2649	2454.3
Averages ----->		2954.2	3000.3	3031.3	2995.3	2859.4	2831.9	2874.1	2855.1

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2925.2		Mean	3133.8	3066.7	3100.2
Min Point	1775.3	-39.3%	Std. Dev.	106.8	296.1	216.6
Max Point	3368.0	15.1%	COV as %	3.4	9.7	7.0

Flow w/o C-Pt	2282 acfm	Instruments Used:	Solomat Zephyr SN 12951472	Cal Due	10/12/07
Vel Avg w/o C-Pt	2906 fpm				

	Start	Finish	
Stack temp	65	61	F
Equipment temp	68	67	F
Ambient temp	54	55	F
Stack static	0.53	0.54	mbars
Ambient pressure	1003.05	1003.73	mbars
Total Stack pressure	1003.60	1004.27	mbars
Ambient humidity	44%	36%	RH

Notes:	HMS Stn 11	Time -->	1500	1552
		in Hg	29.62	29.64
		F	54	55
		% RH	44	36



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-9
Date	11/9/06	Fan Configuration	A 3M Filtrete microallergen prefilters
Testers	JAG	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	60.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1600 -- 1632
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA
Order -->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	1334	1310	1296	1313.3	904	872	832	869.3
2	1.26	1458	1507	1448	1471.0	1235	1184	1257	1225.3
3	2.33	1445	1501	1450	1465.3	1225	1268	1289	1260.7
4	3.88	1299	1309	1272	1293.3	1292	1268	1196	1252.0
Center	6.00	1335	1260	1283	1292.7	1274	1290	1330	1298.0
5	8.12	1348	1364	1346	1352.7	1418	1358	1325	1367.0
6	9.67	1488	1425	1415	1442.7	1599	1610	1558	1589.0
7	10.74	1477	1507	1511	1498.3	1738	1712	1723	1724.3
8	11.50	1433	1361	1301	1365.0	1427	1401	1482	1436.7
Averages ----->		1401.9	1393.8	1369.1	1388.3	1345.8	1329.2	1332.4	1335.8

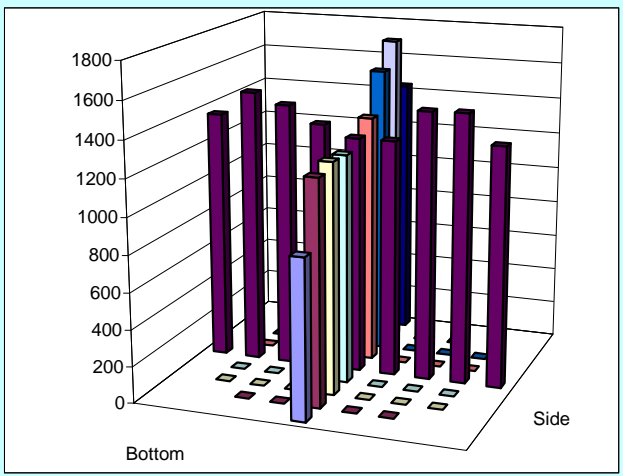
All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1362.0		Mean	1402.3	1388.0	1395.2
Min Point	869.3	-36.2%	Std. Dev.	87.5	192.9	144.1
Max Point	1724.3	26.6%	COV as %	6.2	13.9	10.3

Flow w/o C-Pt 1076 acfm **Instruments Used:** Cal Due
 Vel Avg w/o C-Pt 1370 fpm Solomat Zephyr SN 12951472 10/12/07

	Start	Finish	
Stack temp	61	60	F
Equipment temp	67	62	F
Ambient temp	55	50	F
Stack static	0.08	0.13	mbars
Ambient pressure	1003.73	1004.40	mbars
Total Stack pressure	1003.81	1004.52	mbars
Ambient humidity	36%	43%	RH

Notes:

	Time -->	1552	1638
HMS Stn 11	in Hg	29.64	29.66
	F	55	50
	% RH	36	43



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-10
Date	11/13/06	Fan Configuration	B 3M Filtrete microallergen prefilters
Testers	JAG	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	60.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1430 -- 1515
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	82 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

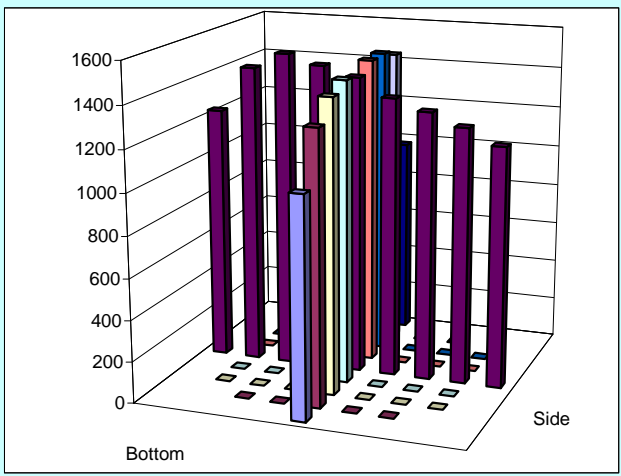
Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	1177	1149	1181	1169.0	1042	1077	1020	1046.3
2	1.26	1255	1207	1271	1244.3	1310	1286	1307	1301.0
3	2.33	1335	1275	1304	1304.7	1406	1398	1405	1403.0
4	3.88	1363	1349	1360	1357.3	1451	1398	1495	1448.0
Center	6.00	1462	1461	1409	1444.0	1461	1426	1399	1428.7
5	8.12	1491	1475	1502	1489.3	1493	1446	1498	1479.0
6	9.67	1535	1553	1515	1534.3	1484	1468	1499	1483.7
7	10.74	1467	1473	1431	1457.0	1423	1474	1455	1450.7
8	11.50	1140	1309	1260	1236.3	1003	814	1067	961.3
Averages ----->		1358.3	1361.2	1359.2	1359.6	1341.4	1309.7	1349.4	1333.5

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1346.6		Mean	1404.4	1427.7	1416.1
Min Point	961.3	-28.6%	Std. Dev.	105.1	62.4	83.9
Max Point	1534.3	13.9%	COV as %	7.5	4.4	5.9

Flow w/o C-Pt	1049 acfm	Instruments Used:	Solomat Zephyr SN 12951472	Cal Due	10/12/07
Vel Avg w/o C-Pt	1335 fpm				

	Start	Finish	
Stack temp	62	58	F
Equipment temp	72	68	F
Ambient temp	57	55	F
Stack static	0.14	--	mbars
Ambient pressure	986.32	--	mbars
Total Stack pressure	986.46	--	mbars
Ambient humidity	39%	--	RH

Notes:	HMS Stn 11	Time -->	1416	1530
		in Hg	29.126	29.097
		F	57	55
		% RH	39	46



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-11
Date	1/5/07	Fan Configuration	A with 3M Filterete microallergen prefilter
Testers	JGD	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	61.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	0945 -- 1115
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order -->		1st				2nd			
Trial ---->		Side				Bottom			
CorrectLabel	Depth, in.	1	2	3	Mean	1	2	3	Mean
		Velocity				Velocity			
1	0.50	1124	1214	1315	1217.7	850	662	833	781.7
2	1.26	1146	1180	1223	1183.0	913	836	834	861.0
3	2.33	1169	1265	1240	1224.7	922	969	923	938.0
4	3.88	1216	1100	1294	1203.3	1059	974	1041	1024.7
Center	6.00	1107	1074	1181	1120.7	1038	1085	1007	1043.3
5	8.12	1124	1275	1261	1220.0	1176	1157	1213	1182.0
6	9.67	1348	1151	1200	1233.0	1293	1333	1362	1329.3
7	10.74	1328	1269	1226	1274.3	1332	1314	1559	1401.7
8	11.50	1256	1172	1280	1236.0	981	1188	1355	1174.7
Averages ----->		1202.0	1188.9	1246.7	1212.5	1062.7	1057.6	1125.2	1081.8

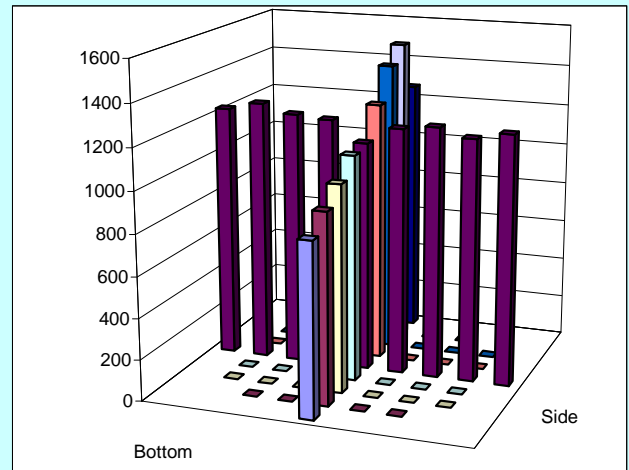
All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1147.2		Mean	1208.4	1111.4	1159.9
Min Point	781.7	-31.9%	Std. Dev.	47.8	200.7	148.9
Max Point	1401.7	22.2%	COV as %	4.0	18.1	12.8

Flow w/o C-Pt	907 acfm	Instuments Used:	Cal Due
Vel Avg w/o C-Pt	1155 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	62	60	F
Equipment temp	58.6	59.7	F
Ambient temp	37	42	F
Stack static	0.03	--	mbars
Ambient pressure	1014.90	--	mbars
Total Stack pressure	1014.90	--	mbars
Ambient humidity	65%	--	RH

Time --> 9:45
Notes: HMS Stn 11 in Hg 29.97
 F 37
 % RH 65

Backflow damper at 45 deg
 Control flow damper at 45 deg
 (unreadable: changed batteries for start & bottom)



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-12
Date	1/5/07	Fan Configuration	A & B with 3M Filterete microallergen prefilter
Testers	JGD & MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	62.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1315 -- 1430
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA
Order -->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	2733	2660	2374	2589.0	1915	2241	2155	2103.7
2	1.26	2888	2875	2794	2852.3	2406	2495	2367	2422.7
3	2.33	2939	2975	3027	2980.3	2692	2599	2531	2607.3
4	3.88	2728	2799	2871	2799.3	2653	2650	2643	2648.7
Center	6.00	2624	2622	2725	2657.0	2743	2722	2702	2722.3
5	8.12	2723	2718	2840	2760.3	3006	2977	2919	2967.3
6	9.67	2935	3085	3075	3031.7	3219	3211	3113	3181.0
7	10.74	3027	3081	3081	3063.0	3147	3076	3110	3111.0
8	11.50	2681	2762	2913	2785.3	1804	1178	1370	1450.7
Averages ----->		2808.7	2841.9	2855.6	2835.4	2620.6	2572.1	2545.6	2579.4

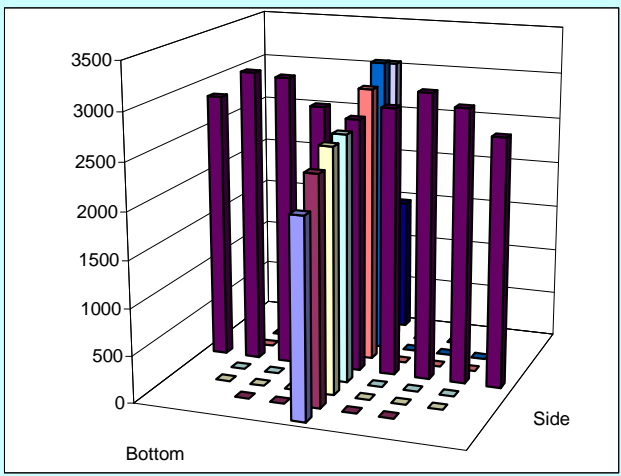
All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2707.4		Mean	2877.7	2808.6	2843.2
Min Point	1450.7	-46.4%	Std. Dev.	151.6	282.2	220.6
Max Point	3181.0	17.5%	COV as %	5.3	10.0	7.8

Flow w/o C-Pt	2128 acfm	Instruments Used:	Cal Due
Vel Avg w/o C-Pt	2710 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	62 (58-65)	62	F
Equipment temp	57	60.6	F
Ambient temp	64 (41)	61	F
Stack static	0.40	--	mbars
Ambient pressure	1012.00	--	mbars
Total Stack pressure	1012.00	--	mbars
Ambient humidity	56 (25)%	--	RH

Time --> 13:15
Notes: HMS Stn 11 in Hg 29.88
 F 41
 % RH 56

Control dampers: Full Open
 Backflow: 70 deg.



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-13
Date	1/5/07	Fan Configuration	A & B with 3M Filterete microallergen prefilter:
Testers	JGD & MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	61.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1430 -- 1510
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	113.75 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA
Order -->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	2282	2538	2190	2336.7	2308	2240	2163	2237.0
2	1.26	2586	2663	2516	2588.3	2337	2331	2370	2346.0
3	2.33	2793	2785	2757	2778.3	2501	2496	2437	2478.0
4	3.88	2832	2881	2871	2861.3	2693	2654	2616	2654.3
Center	6.00	2806	2827	2819	2817.3	2772	2827	2805	2801.3
5	8.12	2871	2900	2852	2874.3	2863	2857	2866	2862.0
6	9.67	2899	2819	2915	2877.7	2913	2884	2871	2889.3
7	10.74	2819	2871	2836	2842.0	2792	2775	2830	2799.0
8	11.50	2762	2739	2633	2711.3	2547	2540	2460	2515.7
Averages ----->		2738.9	2780.3	2709.9	2743.0	2636.2	2622.7	2602.0	2620.3

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2681.7		Mean	2805.6	2690.0	2747.8
Min Point	2237.0	-16.6%	Std. Dev.	102.0	207.4	168.1
Max Point	2889.3	7.7%	COV as %	3.6	7.7	6.1

Flow w/o C-Pt	2094 acfm	Instruments Used:	Cal Due
Vel Avg w/o C-Pt	2666 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	62	61	F
Equipment temp	60.6	63.3	F
Ambient temp	60	60	F
Stack static	0.14	--	mbars
Ambient pressure	1012.00	--	mbars
Total Stack pressure	1012.00	--	mbars
Ambient humidity	26%	--	RH

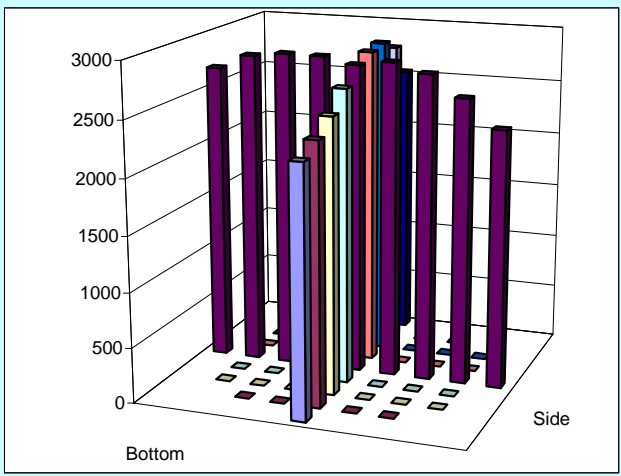
Time --> 14:30

Notes: HMS Stn 11 in Hg 29.82

F	41
% RH	55

Control dampers: full open

Backflow: 70 deg.



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-14
Date	1/5/07	Fan Configuration	A & B with 3M Filterete microallergen prefilter
Testers	JGD & MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	61.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1510 -- 1540
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	174.25 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
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	2364	2482	2270	2372.0	2356	2298	2321	2325.0
2	1.26	2697	2685	2665	2682.3	2620	2480	2537	2545.7
3	2.33	2893	2850	2813	2852.0	2641	2624	2644	2636.3
4	3.88	2909	2878	2922	2903.0	2809	2798	2798	2801.7
Center	6.00	2893	2848	2857	2866.0	2856	2883	2864	2867.7
5	8.12	2874	2835	2917	2875.3	2996	2967	2946	2969.7
6	9.67	2800	2847	2900	2849.0	2932	2964	2986	2960.7
7	10.74	2735	2704	2772	2737.0	2763	2767	2742	2757.3
8	11.50	2530	2526	2422	2492.7	2502	2310	2316	2376.0
Averages ----->		2743.9	2739.4	2726.4	2736.6	2719.4	2676.8	2683.8	2693.3

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2715.0		Mean	2823.5	2791.3	2807.4
Min Point	2325.0	-14.4%	Std. Dev.	81.3	159.1	122.6
Max Point	2969.7	9.4%	COV as %	2.9	5.7	4.4

Flow w/o C-Pt	2117 acfm	Instruments Used:	Cal Due
Vel Avg w/o C-Pt	2696 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	61	62	F
Equipment temp	63.3	64.7	F
Ambient temp	60	62	F
Stack static	0.30	--	mbars
Ambient pressure	1012.00	--	mbars
Total Stack pressure	1012.00	--	mbars
Ambient humidity	28%	--	RH

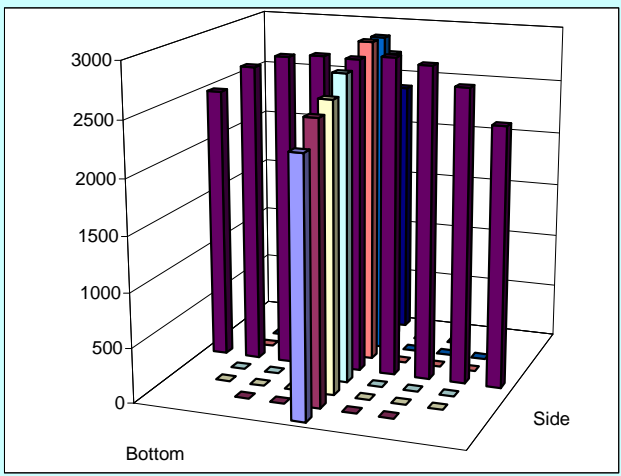
Time --> 14:30

Notes: HMS Stn 11 in Hg 29.82

F	41
% RH	55

Control damper: full open

Backflow: 70 deg.



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-15
Date	1/5/07	Fan Configuration	A with 3M Filterete microallergen prefilter
Testers	JGD & MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	61.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1545 -- 1620
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA
Order -->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	1098	1049	1082	1076.3	1107	1184	1206	1165.7
2	1.26	1194	1186	1170	1183.3	1298	1284	1241	1274.3
3	2.33	1284	1346	1295	1308.3	1330	1285	1341	1318.7
4	3.88	1304	1316	1344	1321.3	1332	1335	1343	1336.7
Center	6.00	1330	1358	1356	1348.0	1325	1334	1339	1332.7
5	8.12	1320	1358	1325	1334.3	1315	1325	1321	1320.3
6	9.67	1297	1308	1298	1301.0	1236	1278	1233	1249.0
7	10.74	1272	1261	1254	1262.3	1202	1208	1278	1229.3
8	11.50	1167	1173	1220	1186.7	1028	957	956	980.3
Averages ----->		1251.8	1261.7	1260.4	1258.0	1241.4	1243.3	1250.9	1245.2

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1251.6		Mean	1294.1	1294.4	1294.3
Min Point	980.3	-21.7%	Std. Dev.	56.0	43.2	48.0
Max Point	1348.0	7.7%	COV as %	4.3	3.3	3.7

Flow w/o C-Pt	974 acfm	Instruments Used:	Solomat Zephyr SN 12951472	Cal Due	10/12/07
Vel Avg w/o C-Pt	1241 fpm				

	Start	Finish	
Stack temp	61	62	F
Equipment temp	64.7	65.6	F
Ambient temp	60	63	F
Stack static	0.06	--	mbars
Ambient pressure	1012.00	--	mbars
Total Stack pressure	1012.00	--	mbars
Ambient humidity	26%	--	RH

Time --> 15:45

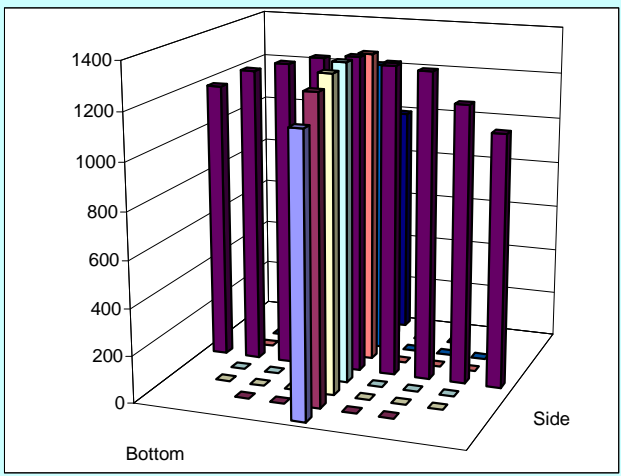
Notes: HMS Stn 11 in Hg 29.8

F 43

% RH 51

Control dampers: full open

Backflow: 70 deg.



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 Signature/Date _____ Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-462

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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-16
Date	1/5/07	Fan Configuration	A with 3M Filterete microallergen prefilter
Testers	JGD & MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	62.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1620 -- 1645
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	113.75 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA
Order -->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	1018	1059	1138	1071.7	1080	1182	1110	1124.0
2	1.26	1127	1220	1226	1191.0	1176	1258	1238	1224.0
3	2.33	1328	1310	1312	1316.7	1279	1247	1214	1246.7
4	3.88	1338	1368	1299	1335.0	1292	1309	1276	1292.3
Center	6.00	1326	1324	1284	1311.3	1339	1299	1353	1330.3
5	8.12	1289	1301	1270	1286.7	1334	1294	1285	1304.3
6	9.67	1256	1259	1225	1246.7	1272	1302	1310	1294.7
7	10.74	1220	1194	1245	1219.7	1308	1312	1316	1312.0
8	11.50	1130	1194	1169	1164.3	1116	1262	1192	1190.0
Averages ----->		1225.8	1247.7	1240.9	1238.1	1244.0	1273.9	1254.9	1257.6

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1247.9		Mean	1272.4	1286.3	1279.4
Min Point	1071.7	-14.1%	Std. Dev.	54.3	37.6	45.4
Max Point	1335.0	7.0%	COV as %	4.3	2.9	3.6

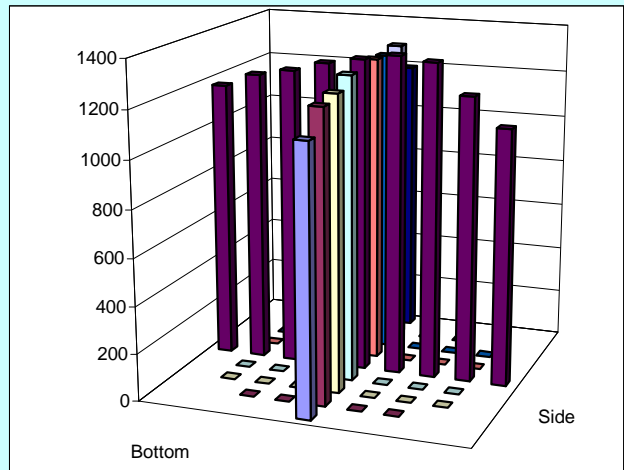
Flow w/o C-Pt	973 acfm	Instruments Used:	Cal Due
Vel Avg w/o C-Pt	1239 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	62	62	F
Equipment temp	65.6	66.7	F
Ambient temp	63	61	F
Stack static	0.09	--	mbars
Ambient pressure	1012.00	--	mbars
Total Stack pressure	1012.00	--	mbars
Ambient humidity	25%	--	RH

Time --> 15:43

Notes: HMS Stn 11 in Hg 29.8

F	43
% RH	51



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Reference: CCP-WTPSP-179
 VEL-dataRev0.xls
 3 August 2006

(HVC2_VEL-dataRev0 (1)).xls/VT16
 4/18/2007

VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-17
Date	1/8/07	Fan Configuration	A with 3M Filterete microallergen prefilter
Testers	JGD & MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	63.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1115 -- 1145
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	174.25 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA
Order -->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	1124	1126	1058	1102.7	1149	1242	1105	1165.3
2	1.26	1235	1221	1294	1250.0	1293	1237	1228	1252.7
3	2.33	1287	1293	1258	1279.3	1360	1338	1348	1348.7
4	3.88	1390	1346	1363	1366.3	1381	1376	1366	1374.3
Center	6.00	1319	1368	1370	1352.3	1368	1368	1374	1370.0
5	8.12	1326	1363	1322	1337.0	1385	1336	1358	1359.7
6	9.67	1306	1337	1345	1329.3	1319	1300	1352	1323.7
7	10.74	1290	1278	1305	1291.0	1243	1309	1255	1269.0
8	11.50	1242	1210	1157	1203.0	1170	1161	1143	1158.0
Averages ----->		1279.9	1282.4	1274.7	1279.0	1296.4	1296.3	1281.0	1291.3

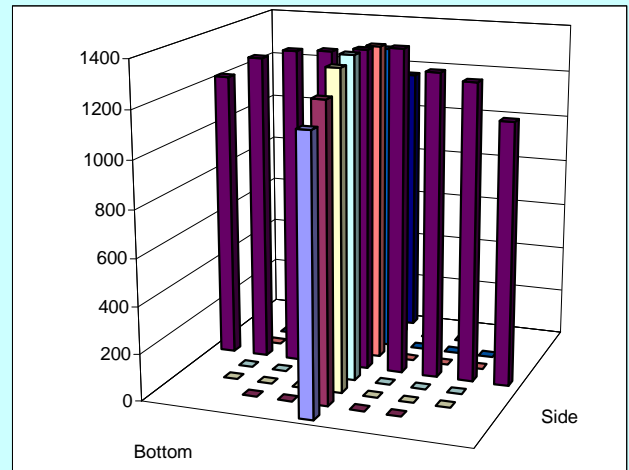
All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1285.1		Mean	1315.0	1328.3	1321.7
Min Point	1102.7	-14.2%	Std. Dev.	42.4	49.2	44.7
Max Point	1374.3	6.9%	COV as %	3.2	3.7	3.4

Flow w/o C-Pt	1002 acfm	Instruments Used:	Cal Due
Vel Avg w/o C-Pt	1276 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	64	62	F
Equipment temp	66.5	69.2	F
Ambient temp	67	64	F
Stack static	0.04	--	mbars
Ambient pressure	1022.00	--	mbars
Total Stack pressure	1022.00	--	mbars
Ambient humidity	31%	--	RH

Notes:	HMS Stn 11	in Hg	Time --> 11:15	11:45
			30.19	30.18
		F	48	49
		% RH	57	58

Control dampers: full open
 Backflow: 70 deg.



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-18
Date	1/8/07	Fan Configuration	B with 3M Filterete microallergen prefilter
Testers	JGD & MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	62.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1145 -- 1220
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	202.75 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order -->		1st				2nd			
Trial ---->		Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	1055	1002	1017	1024.7	1103	1107	1083	1097.7
2	1.26	1149	1196	1149	1164.7	1243	1191	1214	1216.0
3	2.33	1303	1308	1282	1297.7	1236	1270	1278	1261.3
4	3.88	1353	1376	1365	1364.7	1394	1372	1360	1375.3
Center	6.00	1375	1370	1375	1373.3	1387	1390	1388	1388.3
5	8.12	1350	1329	1336	1338.3	1353	1348	1305	1335.3
6	9.67	1362	1303	1267	1310.7	1303	1286	1269	1286.0
7	10.74	1178	1189	1178	1181.7	1159	1185	1210	1184.7
8	11.50	1074	1077	1101	1084.0	991	1073	954	1006.0
Averages ----->		1244.3	1238.9	1230.0	1237.7	1241.0	1246.9	1229.0	1239.0

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1238.4		Mean	1290.1	1292.4	1291.3
Min Point	1006.0	-18.8%	Std. Dev.	84.4	77.9	78.0
Max Point	1388.3	12.1%	COV as %	6.5	6.0	6.0

Flow w/o C-Pt	959 acfm	Instruments Used:	Solomat Zephyr SN 12951472	Cal Due	10/12/07
Vel Avg w/o C-Pt	1221 fpm				

	Start	Finish	
Stack temp	62	62	F
Equipment temp	69.2	72.1	F
Ambient temp	64	65	F
Stack static	0.07	--	mbars
Ambient pressure	1022.00	--	mbars
Total Stack pressure	1022.00	--	mbars
Ambient humidity	33%	--	RH

Time --> 11:45

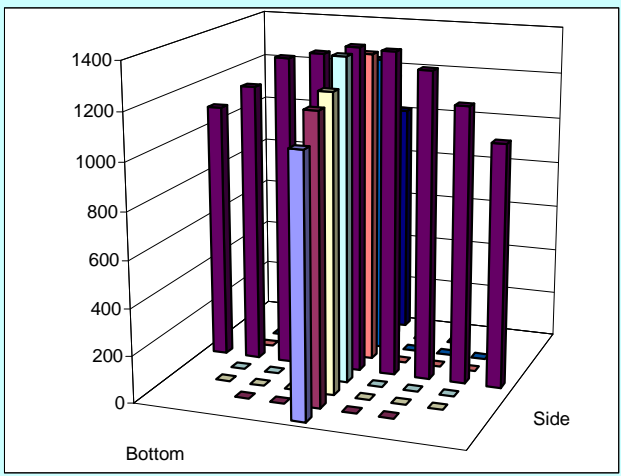
Notes: HMS Stn 11 in Hg 30.18

F 49

% RH 53

Control dampers: full open

Backflow: 70 deg.



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-19
Date	1/8/07	Fan Configuration	B with 3M Filterete microallergen prefilter
Testers	JGD & MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	62.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1220 -- 1250
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	142.25 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order -->		2nd				1nd			
Trial ---->		Side				Bottom			
CorrectLabel	Depth, in.	1	2	3	Mean	1	2	3	Mean
		Velocity				Velocity			
1	0.50	1026	920	1050	998.7	1028	1105	1088	1073.7
2	1.26	1127	1111	1112	1116.7	1174	1195	1212	1193.7
3	2.33	1224	1237	1268	1243.0	1300	1283	1264	1282.3
4	3.88	1321	1301	1305	1309.0	1403	1352	1371	1375.3
Center	6.00	1379	1345	1373	1365.7	1381	1338	1362	1360.3
5	8.12	1360	1364	1377	1367.0	1413	1362	1379	1384.7
6	9.67	1337	1350	1340	1342.3	1323	1344	1349	1338.7
7	10.74	1240	1261	1278	1259.7	1249	1250	1296	1265.0
8	11.50	1155	1244	1148	1182.3	1195	1168	1140	1167.7
Averages ----->		1241.0	1237.0	1250.1	1242.7	1274.0	1266.3	1273.4	1271.3

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1257.0		Mean	1286.2	1314.3	1300.2
Min Point	998.7	-20.6%	Std. Dev.	89.3	70.0	78.4
Max Point	1384.7	10.2%	COV as %	6.9	5.3	6.0

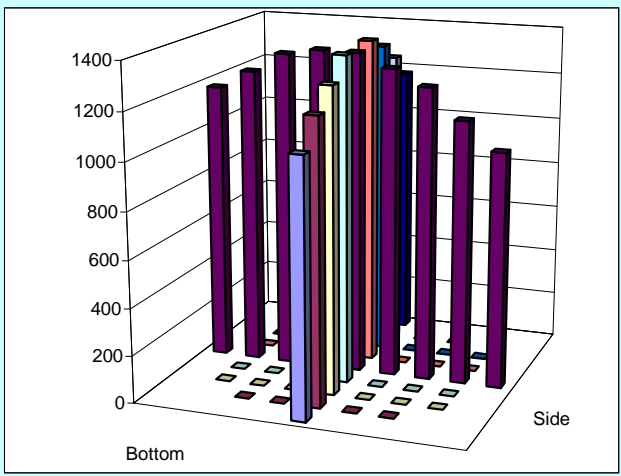
Flow w/o C-Pt	977 acfm	Instruments Used:	Solomat Zephyr SN 12951472	Cal Due	10/12/07
Vel Avg w/o C-Pt	1244 fpm				

	Start	Finish	
Stack temp	62	62	F
Equipment temp	72.1	76.6	F
Ambient temp	65	67	F
Stack static	0.39	--	mbars
Ambient pressure	1022.00	--	mbars
Total Stack pressure	1022.40	--	mbars
Ambient humidity	31%	--	RH

Notes:	HMS Stn 11	in Hg	Time -->	11:45	12:50
			F	49	50
		% RH		53	45

Control dampers: full open

Backflow: 70 deg.



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 Signature/Date _____ Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-462

Signature verifying data and calculations: _____

VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-20
Date	1/8/07	Fan Configuration	B with 3M Filterete microallergen prefilter
Testers	JGD & MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	62.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1250 -- 1330
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	82 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

Order -->		1st				2nd			
Trial ---->		Side				Bottom			
CorrectLabel	Depth, in.	1	2	3	Mean	1	2	3	Mean
		Velocity				Velocity			
1	0.50	762	794	1010	855.3	1008	1041	1046	1031.7
2	1.26	1200	1210	1158	1189.3	1167	1118	1209	1164.7
3	2.33	1237	1244	1223	1234.7	1265	1236	1218	1239.7
4	3.88	1265	1231	1285	1260.3	1296	1306	1316	1306.0
Center	6.00	1314	1342	1303	1319.7	1323	1335	1355	1337.7
5	8.12	1387	1375	1302	1354.7	1431	1413	1425	1423.0
6	9.67	1322	1381	1372	1358.3	1399	1423	1470	1430.7
7	10.74	1308	1289	1276	1291.0	1293	1395	1402	1363.3
8	11.50	994	1164	1054	1070.7	863	1294	753	970.0
Averages ----->		1198.8	1225.6	1220.3	1214.9	1227.2	1284.6	1243.8	1251.9

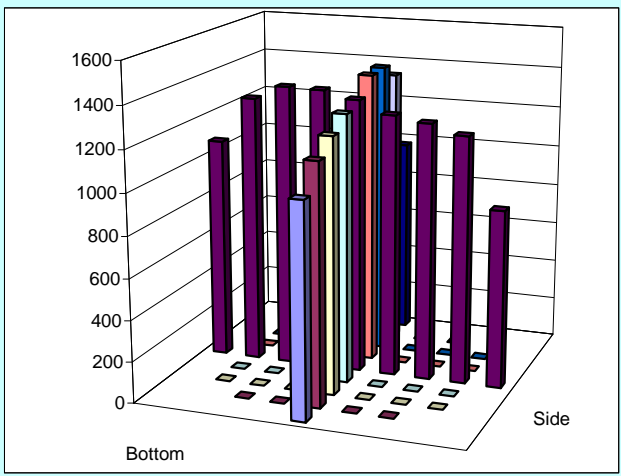
All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1233.4		Mean	1286.9	1323.6	1305.2
Min Point	855.3	-30.7%	Std. Dev.	62.9	96.4	80.5
Max Point	1430.7	16.0%	COV as %	4.9	7.3	6.2

Flow w/o C-Pt	959 acfm	Instruments Used:	Solomat Zephyr SN 12951472	Cal Due	10/12/07
Vel Avg w/o C-Pt	1221 fpm				

	Start	Finish	
Stack temp	62	62	F
Equipment temp	76.6	77.5	F
Ambient temp	67	67	F
Stack static	0.09	--	mbars
Ambient pressure	1022.00	--	mbars
Total Stack pressure	1022.00	--	mbars
Ambient humidity	29%	--	RH

Time --> 12:50
Notes: HMS Stn 11 in Hg 30.14
 F 50
 % RH 49

Control dampers: full open
 Backflow: 70 deg.



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 Signature verifying data and calculations:

VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-21
Date	2/5/07	Fan Configuration	A & B with 3M Filterete microallergen prefilter
Testers	BGF	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	60.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	0940 -- 1015
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	174.25 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

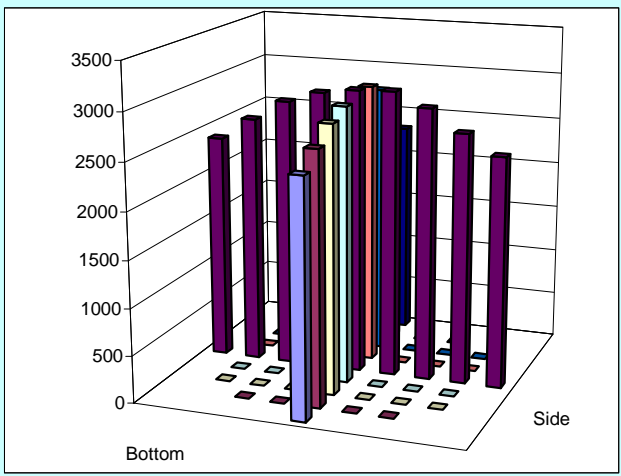
Order -->		1st				2nd			
Trial ---->		Side				Bottom			
CorrectLabel	Depth, in.	1	2	3	Mean	1	2	3	Mean
		Velocity				Velocity			
1	0.50	2474	2388	2422	2428.0	2490	2496	2499	2495.0
2	1.26	2680	2595	2625	2633.3	2628	2674	2700	2667.3
3	2.33	2807	2849	2934	2863.3	2780	2849	2878	2835.7
4	3.88	3021	3017	2991	3009.7	2905	2947	2950	2934.0
Center	6.00	3006	2987	2992	2995.0	3013	3108	2956	3025.7
5	8.12	2967	2966	2902	2945.0	2960	3024	2995	2993.0
6	9.67	2831	2816	2835	2827.3	2883	2883	2899	2888.3
7	10.74	2647	2591	2602	2613.3	2671	2688	2724	2694.3
8	11.50	2354	2372	2418	2381.3	2372	2315	2241	2309.3
Averages ----->		2754.1	2731.2	2746.8	2744.0	2744.7	2776.0	2760.2	2760.3

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2752.2		Mean	2841.0	2862.6	2851.8
Min Point	2309.3	-16.1%	Std. Dev.	162.6	139.4	145.9
Max Point	3025.7	9.9%	COV as %	5.7	4.9	5.1

Flow w/o C-Pt	2136 acfm	Instruments Used:	Cal Due
Vel Avg w/o C-Pt	2720 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	61	60	F
Equipment temp	52	67	F
Ambient temp	52	57	F
Stack static	1.80	--	mbars
Ambient pressure	1009.00	--	mbars
Total Stack pressure	1011.00	--	mbars
Ambient humidity	50%	--	RH

Notes:



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-22
Date	2/5/07	Fan Configuration	A & B with 3M Filterete microallergen prefilter
Testers	BGF & MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	63.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1020 -- 1045
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	174.25 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA
Order -->	2nd		1st

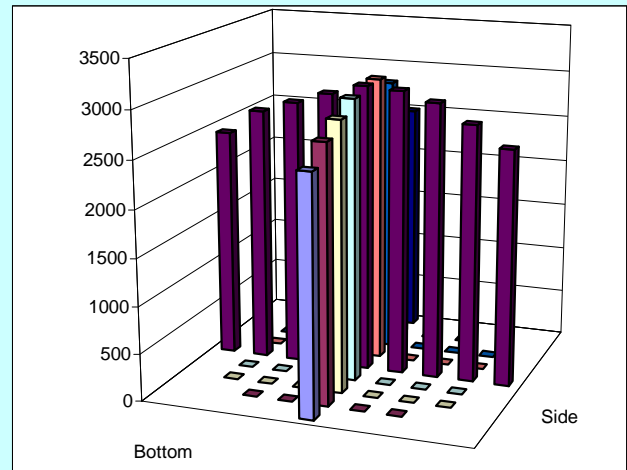
		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	2477	2559	2490	2508.7	2509	2512	2502	2507.7
2	1.26	2734	2720	2740	2731.3	2710	2695	2724	2709.7
3	2.33	2949	2880	2953	2927.3	2884	2832	2837	2851.0
4	3.88	3039	3021	3017	3025.7	2995	2980	2988	2987.7
Center	6.00	3042	3077	3035	3051.3	3045	3044	3045	3044.7
5	8.12	2946	2890	2993	2943.0	3061	3055	3023	3046.3
6	9.67	2791	2838	2845	2824.7	2915	2953	2944	2937.3
7	10.74	2733	2700	2684	2705.7	2749	2847	2715	2770.3
8	11.50	2469	2440	2422	2443.7	2352	2547	2549	2482.7
Averages ----->		2797.8	2791.7	2797.7	2795.7	2802.2	2829.4	2814.1	2815.3

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2805.5		Mean	2887.0	2906.7	2896.9
Min Point	2443.7	-12.9%	Std. Dev.	136.6	133.3	130.1
Max Point	3051.3	8.8%	COV as %	4.7	4.6	4.5

Flow w/o C-Pt	2180 acfm	Instuments Used:	Cal Due
Vel Avg w/o C-Pt	2775 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	60	66	F
Equipment temp	52	69	F
Ambient temp	52	60	F
Stack static	1.80	--	mbars
Ambient pressure	1009.00	--	mbars
Total Stack pressure	1011.00	--	mbars
Ambient humidity	46%	--	RH

Notes:



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VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-23
Date	2/5/07	Fan Configuration	A & B with 3M Filterete microallergen prefilter:
Testers	MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	63.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1055 -- 1140
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	113.75 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA

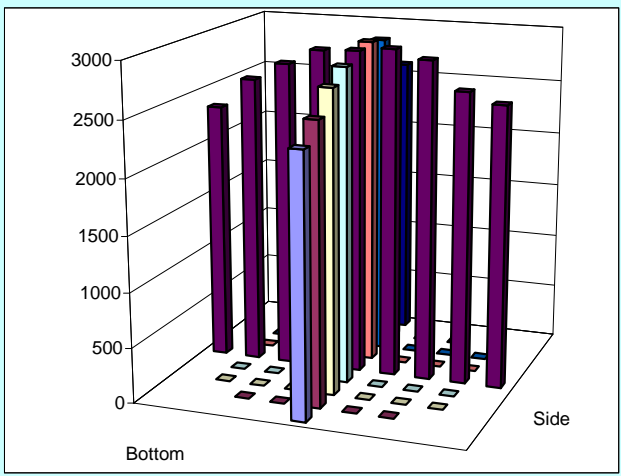
Order -->		1st				2nd			
Traverse-->		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	2496	2565	2600	2553.7	2390	2303	2335	2342.7
2	1.26	2541	2673	2726	2646.7	2517	2526	2515	2519.3
3	2.33	2937	2917	2847	2900.3	2687	2756	2734	2725.7
4	3.88	3004	2959	2970	2977.7	2867	2860	2809	2845.3
Center	6.00	2938	2922	2969	2943.0	2929	2946	2914	2929.7
5	8.12	2943	2951	2895	2929.7	2955	2926	2988	2956.3
6	9.67	2737	2794	2836	2789.0	2915	2922	2931	2922.7
7	10.74	2595	2588	2697	2626.7	2801	2762	2734	2765.7
8	11.50	2350	2307	2396	2351.0	2616	2603	2551	2590.0
Averages ----->		2726.8	2741.8	2770.7	2746.4	2741.9	2733.8	2723.4	2733.0

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2739.7		Mean	2830.4	2809.2	2819.8
Min Point	2342.7	-14.5%	Std. Dev.	145.0	154.5	144.4
Max Point	2977.7	8.7%	COV as %	5.1	5.5	5.1

Flow w/o C-Pt	2132 acfm	Instuments Used:	Cal Due
Vel Avg w/o C-Pt	2715 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	64	63	F
Equipment temp	69	70	F
Ambient temp	60	61	F
Stack static	0.30	--	mbars
Ambient pressure	1009.00	--	mbars
Total Stack pressure	1009.00	--	mbars
Ambient humidity	44%	--	RH

Notes:



Signature signifies compliance with Procedure EMS-JAG-4	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-462

VELOCITY TRAVERSE DATA FORM

Site	HV-C2 Model	Run No.	VT-24
Date	2/5/07	Fan Configuration	A & B with 3M Filterete microallergen prefilter
Testers	MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	63.0 deg F
Stack X-Area	113.1 in.2	Start/End Time	1145 -- 1220
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	113.75 inches	Points in Center 2/3	2 to: 7
Velocity units	ft/min	Data Files:	NA
Order -->	2nd		1st

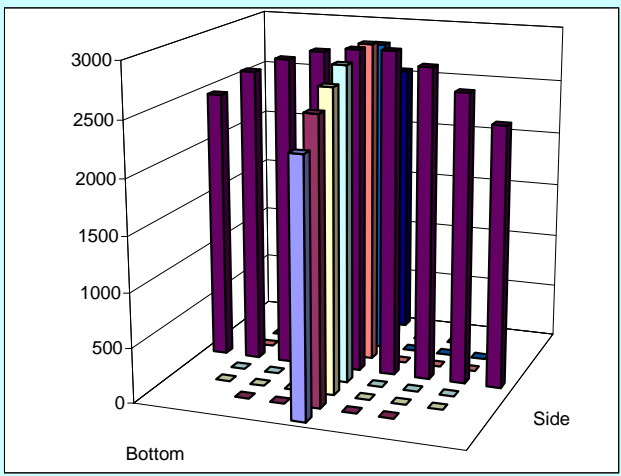
		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
CorrectLabel	Depth, in.	Velocity				Velocity			
1	0.50	2444	2264	2399	2369.0	2355	2224	2366	2315.0
2	1.26	2670	2590	2625	2628.3	2538	2462	2741	2580.3
3	2.33	2809	2803	2875	2829.0	2644	2709	2876	2743.0
4	3.88	2947	2968	2933	2949.3	2835	2843	2941	2873.0
Center	6.00	2913	2978	2937	2942.7	2939	2960	2965	2954.7
5	8.12	2883	2921	2913	2905.7	2964	2949	2939	2950.7
6	9.67	2848	2825	2776	2816.3	2884	2893	2903	2893.3
7	10.74	2664	2699	2697	2686.7	2754	2782	2763	2766.3
8	11.50	2440	2433	2498	2457.0	2522	2570	2522	2538.0
Averages ----->		2735.3	2720.1	2739.2	2731.6	2715.0	2710.2	2779.6	2734.9

All	ft/min	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2733.2		Mean	2822.6	2823.0	2822.8
Min Point	2315.0	-15.3%	Std. Dev.	125.0	135.1	125.0
Max Point	2954.7	8.1%	COV as %	4.4	4.8	4.4

Flow w/o C-Pt	2126 acfm	Instruments Used:	Cal Due
Vel Avg w/o C-Pt	2706 fpm	Solomat Zephyr SN 12951472	10/12/07

	Start	Finish	
Stack temp	63	63	F
Equipment temp	70	70	F
Ambient temp	60	62	F
Stack static	0.30	--	mbars
Ambient pressure	1008.00	--	mbars
Total Stack pressure	1008.00	--	mbars
Ambient humidity	44%	--	RH

Notes:



Signature signifies compliance with Procedure EMS-JAG-4	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-462

Appendix D

Flow-Angle Data Sheets

Appendix D: Flow-Angle Data Sheets

FLOW ANGLE DATA FORM

Site HV-C2 scale model Date <u>11/16/2006</u> Tester <u>JAG & JGD</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 1</u> ft Distance to disturbance <u>53.5</u> in Start/End Time <u>1330 -- 1432</u>	Run No. FA-1 Fan Setting <u>40 Hz</u> Fan configuration A & B w/ 3M Filtrete prefilters Approx. air vel. <u>3530</u> fpm at point >> CENTER Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>57</u>
--	---

Order										
Traverse-->		Side				Bottom				
Trial ---->		1	2	3	Avg.	1	2	3	Avg.	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.	
1	0.50	8	11	7	8.7	-7	-6	-6	-6.3	
2	1.26	8	10	9	9.0	-8	-5	-6	-6.3	
3	2.33	-14	-12	-15	-13.7	-7	-6	-7	-6.7	
4	3.88	-6	-8	-8	-7.3	-4	1	-3	-2.0	
Center	6.00	-5	-5	-8	-6.0	0	2	2	1.3	
5	8.12	-4	-3	-5	-4.0	2	0	-1	0.3	
6	9.67	-1	-3	-3	-2.3	1	0	1	0.7	
7	10.74	-2	-2	-3	-2.3	1	-1	0	0.0	
8	11.50	-2	-2	-3	-2.3	0	-2	-2	-1.3	
Mean of absolute values		5.6	6.2	6.8		3.3	2.6	3.1		
w/o points by wall:		5.7	6.1	7.3		3.3	2.1	2.9		

	all	4.6
	w/o wall pts	4.6

Instuments Used:

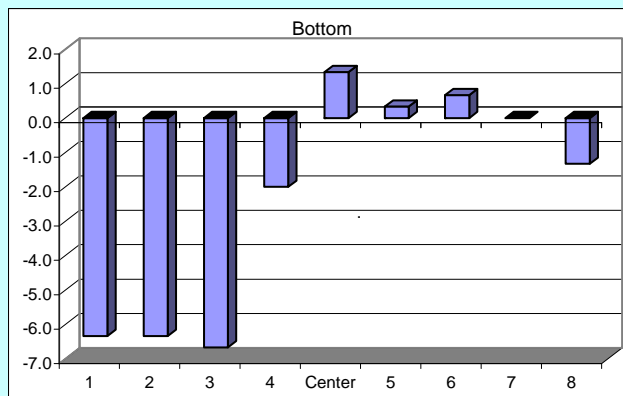
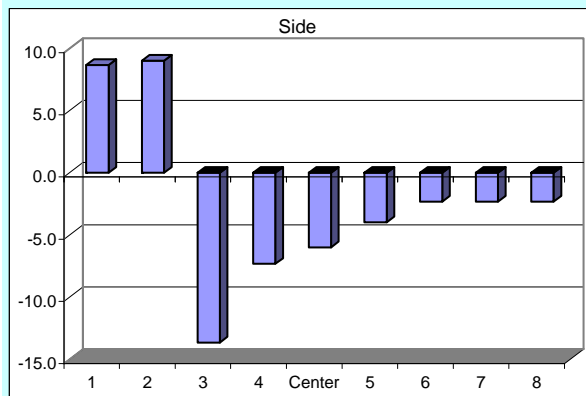
S-type pitot	<u>Pitot 2</u>	Cal. Due
Velocity sensor	<u>TSI 8360 SN 209060</u>	Cert of conformance
Angle indicator	<u>Shop built</u>	<u>11/1/2007</u>
Manometer	<u>Man - 3</u>	<u>N.A.</u>
		<u>10/12/2007</u>

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:

On side, # 8 hits the wall, so we backed off about 1/4-inch.



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA1
 4/18/2007

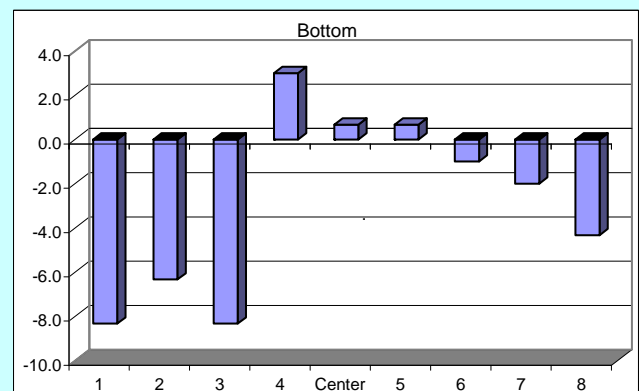
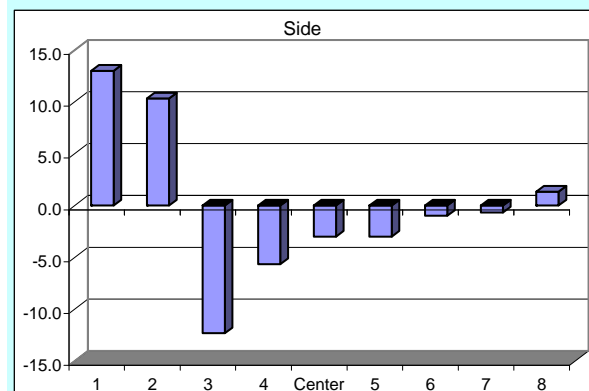
FLOW ANGLE DATA FORM

Site HV-C2 scale model Date <u>11/16/2006</u> Tester <u>JAG & JGD</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 1</u> ft Distance to disturbance <u>53.5</u> in Start/End Time <u>1440 -- 1548</u>	Run No. <u>FA-2</u> Fan Setting <u>40 Hz</u> Fan configuration <u>A & B</u> w/ 3M Filtrete prefilters Approx. air vel. <u>3190 & 3160</u> fpm at point >> Side & Bottom centers Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>56</u>
--	---

Order Trial ---->	Point	Depth, in.	1st				2nd			
			Side				Bottom			
			1	2	3	Avg.	1	2	3	Avg.
	1	0.50	13	13	13	13.0	-8	-8	-9	-8.3
	2	1.26	10	10	11	10.3	1	-8	-12	-6.3
	3	2.33	-12	-12	-13	-12.3	-7	-7	-11	-8.3
	4	3.88	-6	-5	-6	-5.7	2	4	3	3.0
	Center	6.00	-2	-3	-4	-3.0	3	-2	1	0.7
	5	8.12	-4	-2	-3	-3.0	3	-2	1	0.7
	6	9.67	0	-1	-2	-1.0	2	-3	-2	-1.0
	7	10.74	-1	0	-1	-0.7	1	-3	-4	-2.0
	8	11.50	4	0	0	1.3	-3	-5	-5	-4.3
Mean of absolute values			5.8	5.1	5.9		3.3	4.7	5.3	
w/o points by wall:			5.0	4.7	5.7		2.7	4.1	4.9	

Instruments Used:	Cal. Due	all 5.0
S-type pitot	Pitot 2	w/o wall pts 4.5
Velocity sensor	TSI 8360 SN 209060	
Angle indicator	Shop built	
Manometer	Man - 3	
		Cert of conformance 11/1/2007 N.A. 10/12/2007

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).



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

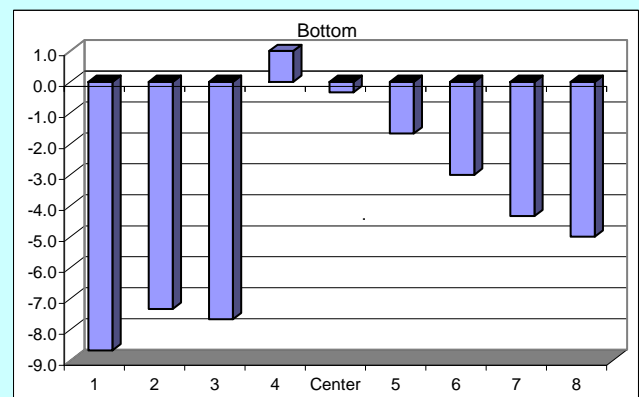
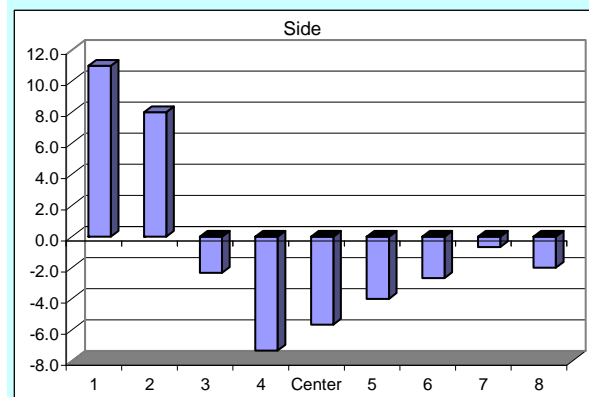
FLOW ANGLE DATA FORM

Site HV-C2 scale model Date <u>11/16/2006</u> Tester <u>JAG & JGD</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 1</u> ft Distance to disturbance <u>53.5</u> in Start/End Time <u>1548 -- 1620</u>	Run No. <u>FA-3</u> Fan Setting <u>40 Hz</u> Fan configuration <u>A & B</u> w/ 3M Filtrete prefilters Approx. air vel. <u>3240</u> fpm at point >> Bottom center Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>55</u>
--	--

Order	2nd				1st				
Traverse-->	Side				Bottom				
Trial ---->	1	2	3	Avg.	1	2	3	Avg.	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	11	11	11	11.0	-9	-7	-10	-8.7
2	1.26	8	8	8	8.0	-6	-8	-8	-7.3
3	2.33	6	1	-14	-2.3	-8	-7	-8	-7.7
4	3.88	-7	-7	-8	-7.3	3	-2	2	1.0
Center	6.00	-3	-7	-7	-5.7	1	-1	-1	-0.3
5	8.12	-3	-4	-5	-4.0	-1	-2	-2	-1.7
6	9.67	-3	-2	-3	-2.7	-3	-3	-3	-3.0
7	10.74	0	-1	-1	-0.7	-4	-5	-4	-4.3
8	11.50	0	-2	-4	-2.0	-5	-5	-5	-5.0
Mean of absolute values		4.6	4.8	6.8		4.4	4.4	4.8	
w/o points by wall:		4.3	4.3	6.6		3.7	4.0	4.0	

Instruments Used:	Cal. Due	all 5.0
S-type pitot	Pitot 2	w/o wall pts 4.5
Velocity sensor	TSI 8360 SN 209060	
Angle indicator	Shop built	
Manometer	Man - 3	
	Cert of conformance	
	11/1/2007	
	N.A.	
	10/12/2007	

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).



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA3
 4/18/2007

FLOW ANGLE DATA FORM

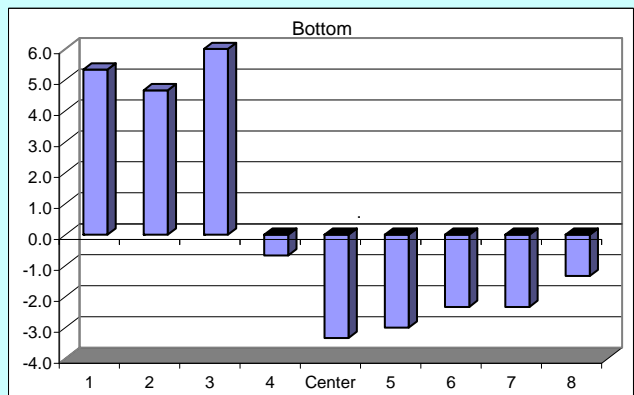
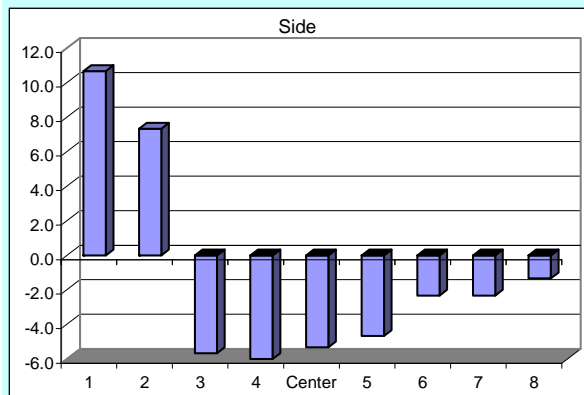
Site HV-C2 scale model Date <u>11/17/2006</u> Tester <u>BGF & JGD</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 1</u> ft Distance to disturbance <u>53.5</u> in Start/End Time <u>0915 -- 1010</u>	Run No. <u>FA-4</u> Fan Setting <u>40 Hz</u> Fan configuration <u>A & B</u> w/ 3M Filtrete prefilters Approx. air vel. <u>3590</u> fpm at point >> Bottom center Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>46</u>
--	--

Order		Side				Bottom			
Trial ---->		1	2	3	Avg.	1	2	3	Avg.
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	11	10	11	10.7	5	5	6	5.3
2	1.26	9	8	5	7.3	9	3	2	4.7
3	2.33	4	-13	-8	-5.7	14	4	0	6.0
4	3.88	-7	-7	-4	-6.0	-1	0	-1	-0.7
Center	6.00	-5	-6	-5	-5.3	-3	-4	-3	-3.3
5	8.12	-6	-4	-4	-4.7	-4	-3	-2	-3.0
6	9.67	-4	-1	-2	-2.3	-2	-3	-2	-2.3
7	10.74	-3	-1	-3	-2.3	-2	-3	-2	-2.3
8	11.50	-1	-2	-1	-1.3	0	-2	-2	-1.3
Mean of absolute values		5.6	5.8	4.8		4.4	3.0	2.2	
w/o points by wall:		5.4	5.7	4.4		5.0	2.9	1.7	

Instruments Used:	Cal. Due	all 4.3
S-type pitot	Pitot 2	w/o wall pts 4.2
Velocity sensor	TSI 8360 SN 209060	
Angle indicator	Shop built	
Manometer	Man - 3	
	Cert of conformance	
	11/1/2007	
	N.A.	
	10/12/2007	

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:
 On side # 8 hits the wall, so we backed off about 1/4-inch.
 Heaters turned on initially, but turned off because of poor control.
 Order not recorded, bottom likely the first



Signature signifies compliance with Procedure EMS-JAG-05

Signature verifying data and calculations:

Signature/date Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA4
 4/18/2007

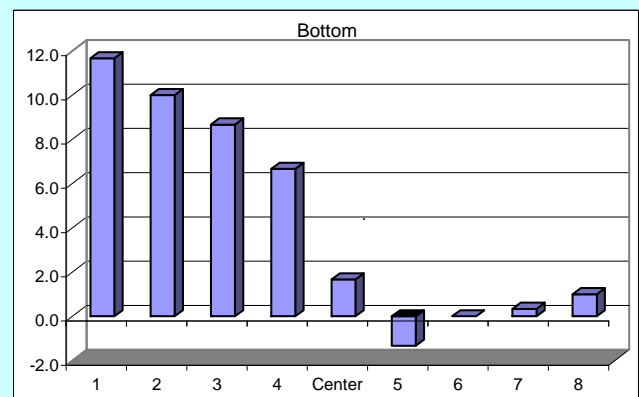
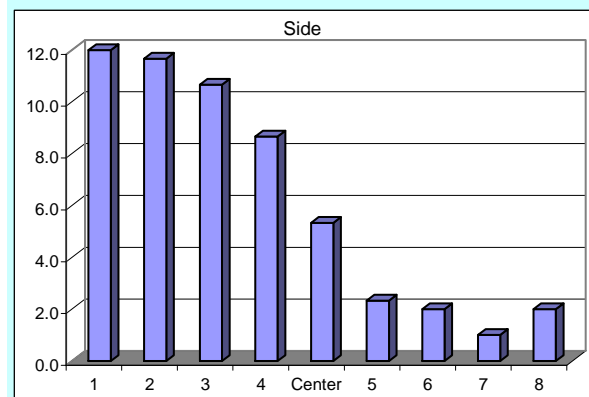
FLOW ANGLE DATA FORM

Site HV-C2 scale model Date <u>11/17/2006</u> Tester <u>BGF & JGD</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 1</u> ft Distance to disturbance <u>53.5</u> in Start/End Time <u>1015 -- 1035</u>	Run No. <u>FA-5</u> Fan Setting <u>35</u> Fan configuration <u>B</u> w/ 3M Filtrete prefilters Approx. air vel. <u>1590</u> fpm at point >> Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>45</u>
--	---

Order	2nd				1st				
	Point	Depth, in.	Side			Bottom			
			1	2	3	1	2	3	Avg.
1	0.50	9	13	14	12.0	14	11	10	11.7
2	1.26	11	11	13	11.7	11	9	10	10.0
3	2.33	11	10	11	10.7	9	8	9	8.7
4	3.88	8	10	8	8.7	7	7	6	6.7
Center	6.00	5	6	5	5.3	2	2	1	1.7
5	8.12	2	2	3	2.3	-3	-1	0	-1.3
6	9.67	1	2	3	2.0	0	-1	1	0.0
7	10.74	0	1	2	1.0	0	0	1	0.3
8	11.50	1	3	2	2.0	-1	0	4	1.0
Mean of absolute values		5.3	6.4	6.8		5.2	4.3	4.7	
w/o points by wall:		5.4	6.0	6.4		4.6	4.0	4.0	

Instruments Used:	Cal. Due	all 5.5
S-type pitot	Pitot 2	w/o wall pts 5.1
Velocity sensor	TSI 8360 SN 209060	
Angle indicator	Shop built	
Manometer	Man - 3	
	Cert of conformance	
	11/1/2007	
	N.A.	
	10/12/2007	

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).



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA5
 4/18/2007

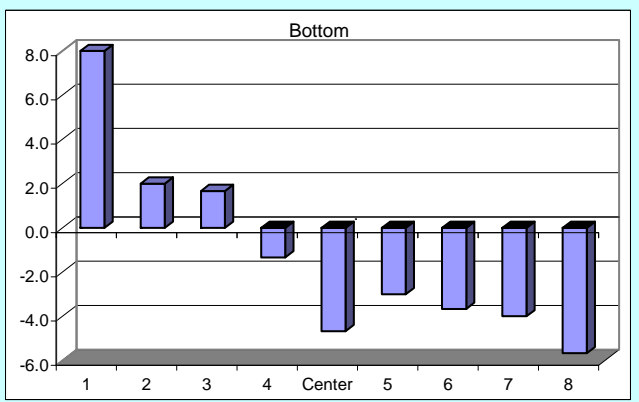
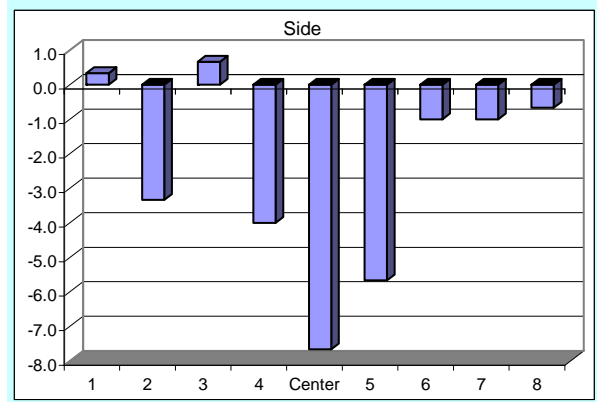
FLOW ANGLE DATA FORM

Site <u>HV-C2 scale model</u> Date <u>11/17/2006</u> Tester <u>BGF & JGD</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 1</u> ft Distance to disturbance <u>53.5</u> in Start/End Time <u>1040 -- 1110</u>	Run No. <u>FA-6</u> Fan Setting <u>35</u> Fan configuration <u>A</u> w/ 3M Filtrete prefilters Approx. air vel. <u>1480</u> fpm at point >> Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>52</u>
--	---

Order	1st				2nd				
Traverse-->	Side				Bottom				
Trial ---->	1	2	3	Avg.	1	2	3	Avg.	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	1	-2	2	0.3	12	5	7	8.0
2	1.26	-4	-3	-3	-3.3	3	4	-1	2.0
3	2.33	0	1	1	0.7	5	1	-1	1.7
4	3.88	-3	-5	-4	-4.0	1	-3	-2	-1.3
Center	6.00	-6	-8	-9	-7.7	-7	-5	-2	-4.7
5	8.12	-6	-5	-6	-5.7	-4	-2	-3	-3.0
6	9.67	0	-1	-2	-1.0	-3	-4	-4	-3.7
7	10.74	-1	-1	-1	-1.0	-4	-4	-4	-4.0
8	11.50	-1	-1	0	-0.7	-6	-5	-6	-5.7
Mean of absolute values		2.4	3.0	3.1		5.0	3.7	3.3	
w/o points by wall:		2.9	3.4	3.7		3.9	3.3	2.4	

Instruments Used:		Cal. Due	all 3.4
S-type pitot	Pitot 2	Cert of conformance	w/o wall pts 3.3
Velocity sensor	TSI 8360 SN 209060	11/1/2007	
Angle indicator	Shop built	N.A.	
Manometer	Man - 3	10/12/2007	

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).



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Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

FLOW ANGLE DATA FORM

Site HV-C2 scale model	Run No. FA-7 (repeat of FA-4)
Date 11/22/2006	Fan Setting 40
Tester BGF	Fan configuration A&B w/ 3M Filtrete prefilters
Stack Dia. 12 in	Approx. air vel. 3350 fpm at point >> Bottom center
Stack X-Area 113.1 in ²	Units degrees (clockwise > pos. nos.)
Elevation Port 1 ft	
Distance to disturbance 53.5 in	Stack Temp 55
Start/End Time 1315 -- 1345	

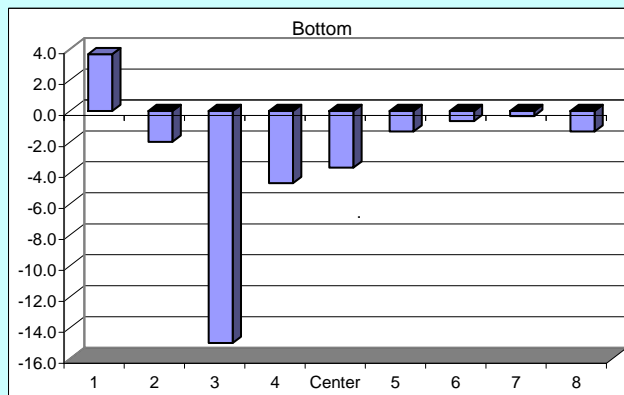
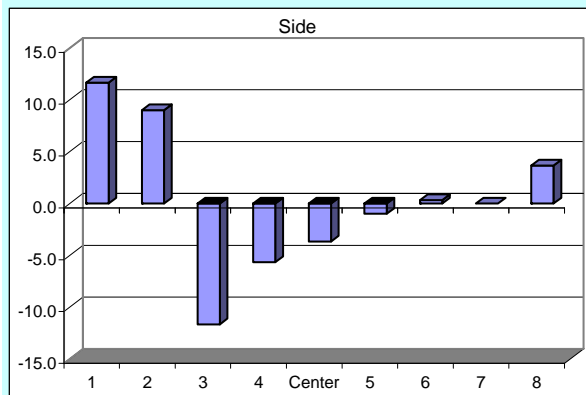
Order	Trial ---->	2nd					1st				
		Side					Bottom				
Point	Depth, in.	1	2	3	Avg.	1	2	3	Avg.		
1	0.50	10	13	12	11.7	3	5	3	3.7		
2	1.26	12	11	4	9.0	-3	-3	0	-2.0		
3	2.33	-10	-13	-12	-11.7	-14	-15	-16	-15.0		
4	3.88	-6	-5	-6	-5.7	-5	-5	-4	-4.7		
Center	6.00	-3	-4	-4	-3.7	-5	-3	-3	-3.7		
5	8.12	0	-1	-2	-1.0	-2	-1	-1	-1.3		
6	9.67	0	1	0	0.3	0	-1	-1	-0.7		
7	10.74	0	-1	1	0.0	0	0	-1	-0.3		
8	11.50	3	4	4	3.7	-2	-1	-1	-1.3		
Mean of absolute values		4.9	5.9	5.0		3.8	3.8	3.3			
w/o points by wall:		4.4	5.1	4.1		4.1	4.0	3.7			
									all 4.4		
									w/o wall pts 4.3		

Instruments Used:

S-type pitot	Pitot 2	Cal. Due	
Velocity sensor	TSI 8360 SN 209060	Cert of conformance	11/1/2007
Angle indicator	Shop built		N.A.
Manometer	Man-2		10/13/2007

Notes: Repeated location 4-side, 1st traverse, since it looked out of place.
 Got a different angle. Lots of turbulence noticed around Side Locations 3, 4, and center.

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).



Signature signifies compliance with Procedure EMS-JAG-05
 Signature verifying data and calculations:
 Signature/date Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

FLOW ANGLE DATA FORM

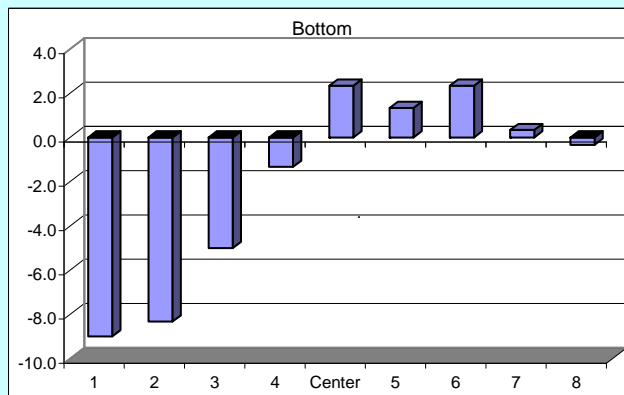
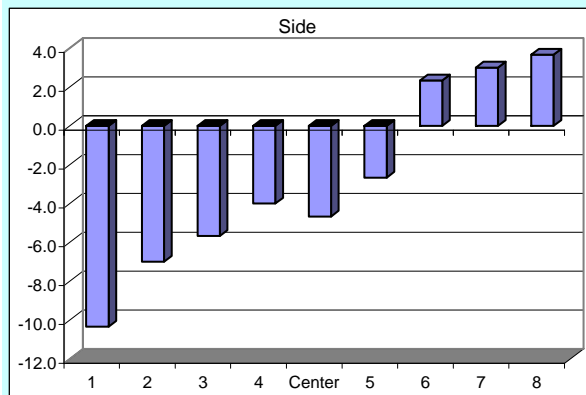
Site HV-C2 scale model Date <u>1/8/2007</u> Tester <u>JGD & MSP</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 1</u> ft Distance to disturbance <u>53.5</u> in Start/End Time <u>1530--1645</u>	Run No. <u>FA-9</u> Fan Setting <u>35 Hz</u> Fan configuration <u>A</u> w/ 3M Filtrete prefilters Approx. air vel. <u>1200</u> fpm at point >> Bottom center Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>62</u>
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Order	1st (2)					2nd (4)				
	Side					Bottom				
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.	
1	0.50	-11	-9	-11	-10.3	-7	-8	-12	-9.0	
2	1.26	-8	-7	-6	-7.0	-6	-12	-7	-8.3	
3	2.33	-6	-5	-6	-5.7	-6	-4	-5	-5.0	
4	3.88	-4	-5	-3	-4.0	-1	-1	-2	-1.3	
Center	6.00	-6	-4	-4	-4.7	2	3	2	2.3	
5	8.12	-3	-2	-3	-2.7	1	2	1	1.3	
6	9.67	2	3	2	2.3	1	3	3	2.3	
7	10.74	3	4	2	3.0	0	1	0	0.3	
8	11.50	3	4	4	3.7	-1	-1	1	-0.3	
Mean of absolute values		5.1	4.8	4.6		2.8	3.9	3.7		
w/o points by wall:		4.6	4.3	3.7		2.4	3.7	2.9		

Instruments Used: S-type pitot <u>Pitot 2</u> Velocity sensor <u>TSI 8360 SN 209060</u> Angle indicator <u>Shop built</u> Manometer <u>Man-3</u>	Cal. Due <u>Cert of conformance</u> <u>11/1/2007</u> N.A. <u>10/12/2007</u>	all 4.1 w/o wall pts 3.6
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Notes:
 Without plug in port
 FA-9 & FA-10 run together

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).



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA9
 4/18/2007

FLOW ANGLE DATA FORM

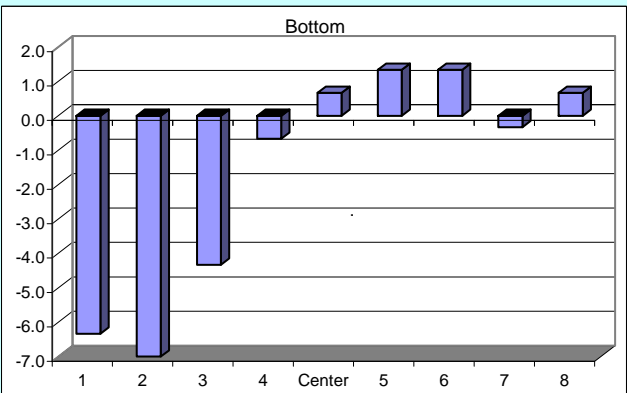
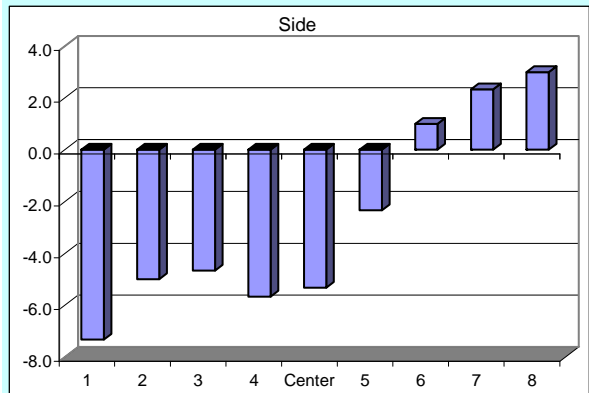
Site HV-C2 scale model Date <u>1/8/2007</u> Tester <u>JGD & MSP</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 1</u> ft Distance to disturbance <u>53.5</u> in Start/End Time <u>1530--1645</u>	Run No. FA-10 Fan Setting 35 Hz Fan configuration A w/ 3M Filtrete prefilters Approx. air vel. <u>1200</u> fpm at point >> Bottom center Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>62</u>
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Order	1st (1)					2nd (3)				
	Side					Bottom				
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.	
1	0.50	-7	-6	-9	-7.3	-6	-6	-7	-6.3	
2	1.26	-5	-4	-6	-5.0	-8	-7	-6	-7.0	
3	2.33	-5	-5	-4	-4.7	-5	-7	-1	-4.3	
4	3.88	-6	-6	-5	-5.7	-2	2	-2	-0.7	
Center	6.00	-7	-6	-3	-5.3	1	0	1	0.7	
5	8.12	-3	-2	-2	-2.3	1	1	2	1.3	
6	9.67	1	-1	3	1.0	2	1	1	1.3	
7	10.74	2	2	3	2.3	-1	0	0	-0.3	
8	11.50	2	2	5	3.0	-1	1	2	0.7	
Mean of absolute values		4.2	3.8	4.4		3.0	2.8	2.4		
w/o points by wall:		4.1	3.7	3.7		2.9	2.6	1.9		
									all 3.4	
									w/o wall pts 3.1	

Instruments Used:		Cal. Due	
S-type pitot	Pitot 2	Cert of conformance	
Velocity sensor	TSI 8360 SN 209060	11/1/2007	
Angle indicator	Shop built	N.A.	
Manometer	Man-3	10/12/2007	

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:
 With plug in port
 FA-9 & FA-10 run together
 () -> order of transects



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA10
 4/18/2007

FLOW ANGLE DATA FORM

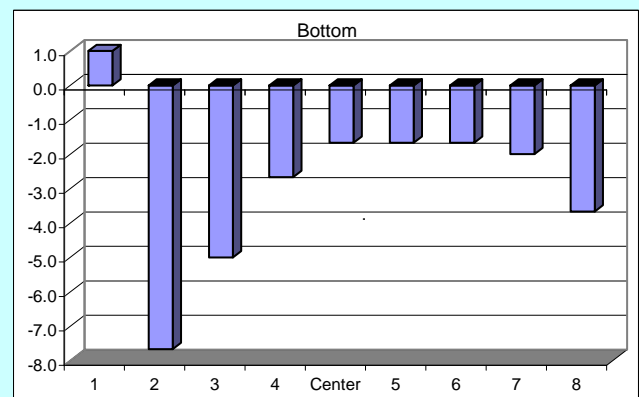
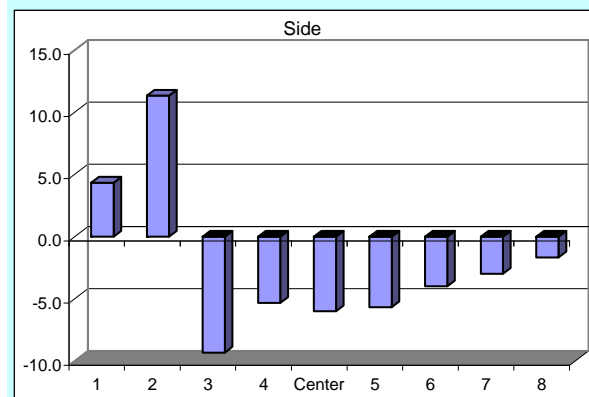
Site <u>HV-C2 scale model</u> Date <u>1/9/2007</u> Tester <u>JGD & MSP</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 1</u> ft Distance to disturbance <u>53.5</u> in Start/End Time <u>1000--1050</u>	Run No. <u>FA-11</u> Fan Setting <u>40 Hz</u> Fan configuration <u>A & B</u> w/ 3M Filtrete prefilters Approx. air vel. <u>2730</u> fpm at point >> Bottom center Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>65</u>
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Order	1st					2nd				
	Side					Bottom				
	1	2	3	Avg.		1	2	3	Avg.	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.	
1	0.50	7	3	3	4.3	3	0	0	1.0	
2	1.26	15	8	11	11.3	-6	-9	-8	-7.7	
3	2.33	-10	-7	-11	-9.3	-3	-5	-7	-5.0	
4	3.88	-5	-6	-5	-5.3	-2	-4	-2	-2.7	
Center	6.00	-6	-6	-6	-6.0	-1	-2	-2	-1.7	
5	8.12	-6	-6	-5	-5.7	-1	-2	-2	-1.7	
6	9.67	-3	-5	-4	-4.0	-1	-1	-3	-1.7	
7	10.74	-3	-3	-3	-3.0	-2	-2	-2	-2.0	
8	11.50	-1	-1	-3	-1.7	-3	-4	-4	-3.7	
Mean of absolute values		6.2	5.0	5.7		2.4	3.2	3.3		
w/o points by wall:		6.9	5.9	6.4		2.3	3.6	3.7		

Instruments Used:	Cal. Due	all 4.3
S-type pitot	Pitot 2	w/o wall pts 4.8
Velocity sensor	TSI 8360 SN 209060	
Angle indicator	Shop built	
Manometer	Man-3	

Notes:
 With plug in port
 70 deg. & full open dampers

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).



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA11
 4/18/2007

FLOW ANGLE DATA FORM

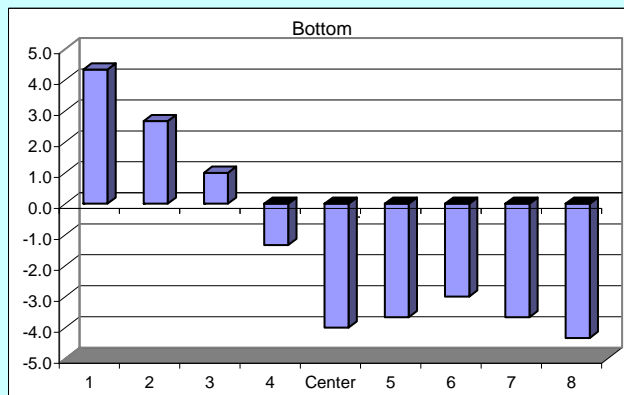
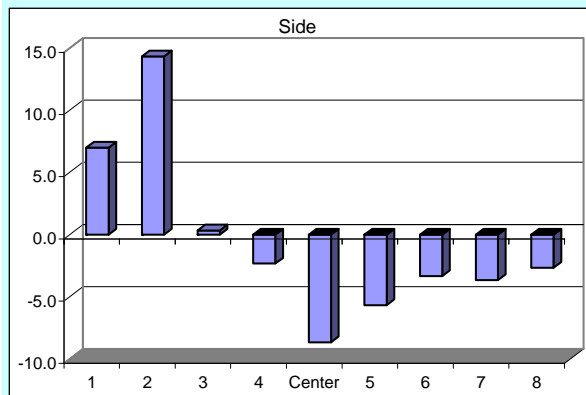
Site <u>HV-C2 scale model</u> Date <u>2/7/2007</u> Tester <u>JGD & MSP</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 1</u> ft Distance to disturbance <u>53.5</u> in Start/End Time <u>1300 -- 1342</u>	Run No. <u>FA-12</u> Fan Setting <u>35 Hz</u> Fan configuration <u>A</u> w/ 3M Filtrete prefilters Approx. air vel. <u>1330</u> fpm at point >> Side #2 Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>65</u>
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Order	1st					2nd				
	Side					Bottom				
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.	
1	0.50	7	8	6	7.0	2	5	6	4.3	
2	1.26	16	14	13	14.3	3	3	2	2.7	
3	2.33	0	1	0	0.3	0	0	3	1.0	
4	3.88	-2	-3	-2	-2.3	-4	-2	2	-1.3	
Center	6.00	-9	-8	-9	-8.7	-6	-3	-3	-4.0	
5	8.12	-6	-5	-6	-5.7	-4	-3	-4	-3.7	
6	9.67	-3	-3	-4	-3.3	-3	-3	-3	-3.0	
7	10.74	-3	-4	-4	-3.7	-4	-3	-4	-3.7	
8	11.50	-2	-3	-3	-2.7	-5	-3	-5	-4.3	
Mean of absolute values		5.3	5.4	5.2		3.4	2.8	3.6		
w/o points by wall:		5.6	5.4	5.4		3.4	2.4	3.0		

Instruments Used:	Cal. Due	all 4.3
S-type pitot	Pitot 2	w/o wall pts 4.2
Velocity sensor	TSI 8360 SN 209060	
Angle indicator	Shop built	
Manometer	Man-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:
 70 deg. & full open dampers
 With plug in port
 Rerun - Found procedure fault in the first run



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA12
 4/18/2007

FLOW ANGLE DATA FORM

Site HV-C2 scale model	Run No. FA-13
Date <u>1/9/2007</u>	Fan Setting 35 Hz
Tester <u>JGD & MSP</u>	Fan configuration B w/ 3M Filtrete prefilters
Stack Dia. <u>12</u> in	Approx. air vel. <u>1360</u> fpm at point >> Bottom center
Stack X-Area <u>113.1</u> in ²	Units <u>degrees (clockwise > pos. nos.)</u>
Elevation <u>Port 1</u> ft	Stack Temp <u>62</u>
Distance to disturbance <u>82</u> in	
Start/End Time <u>1215--1315</u>	

Order	2nd					1st				
	Side					Bottom				
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.	
1	0.50	-2	6	-1	1.0	7	6	7	6.7	
2	1.26	-16	-14	-16	-15.3	-2	3	6	2.3	
3	2.33	-10	-13	-13	-12.0	-6	1	2	-1.0	
4	3.88	-10	-9	-10	-9.7	-4	-4	-6	-4.7	
Center	6.00	-5	-10	-6	-7.0	2	-2	-5	-1.7	
5	8.12	-5	-10	-5	-6.7	-3	-4	-4	-3.7	
6	9.67	-4	-7	-5	-5.3	-5	-4	-4	-4.3	
7	10.74	-5	-7	-9	-7.0	-3	-5	-4	-4.0	
8	11.50	-5	-7	-9	-7.0	-5	-4	-5	-4.7	
Mean of absolute values		6.9	9.2	8.2		4.1	3.7	4.8		
w/o points by wall:		7.9	10.0	9.1		3.6	3.3	4.4		

Instruments Used:

S-type pitot	<u>Pitot 2</u>	Cal. Due	
Velocity sensor	<u>TSI 8360 SN 209060</u>	Cert of conformance	<u>11/1/2007</u>
Angle indicator	<u>Shop built</u>		<u>N.A.</u>
Manometer	<u>Man-3</u>		<u>10/12/2007</u>

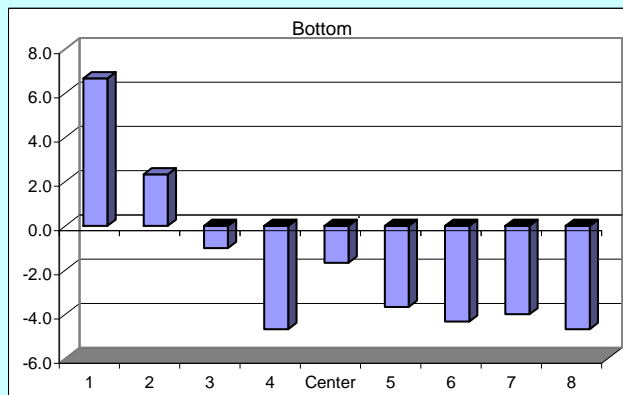
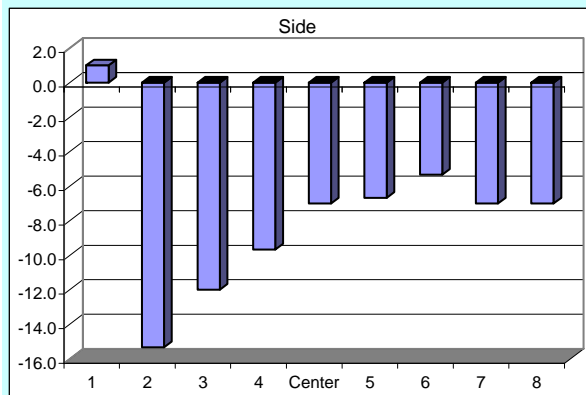
all	6.1
w/o wall pts	6.4

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:

70 deg. & full open dampers
With plug in port



Signature signifies compliance with Procedure EMS-JAG-05

Signature verifying data and calculations:

Signature/date

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
FlowAngleRev0.xls
4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
FA13
4/18/2007

FLOW ANGLE DATA FORM

Site HV-C2 scale model	Run No. FA-14
Date <u>1/9/2007</u>	Fan Setting <u>40 Hz</u>
Tester <u>JGD & MSP</u>	Fan configuration <u>A & B</u> w/ 3M Filtrete prefilters
Stack Dia. <u>12</u> in	Approx. air vel. <u>2030</u> fpm at point >> Side port 2
Stack X-Area <u>113.1</u> in ²	Units <u>degrees (clockwise > pos. nos.)</u>
Elevation <u>Port 2</u> ft	Stack Temp <u>62</u>
Distance to disturbance <u>113.75</u> in	
Start/End Time <u>1415--1500</u>	

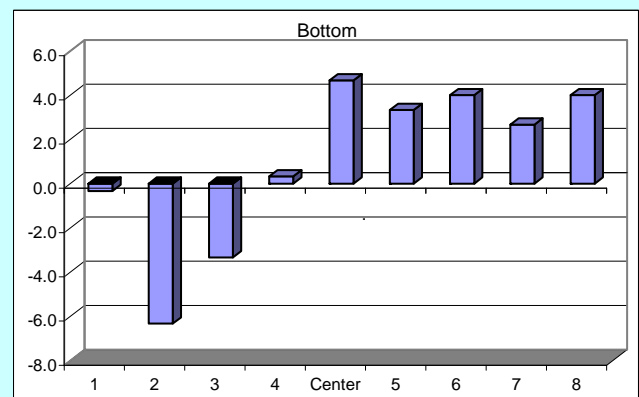
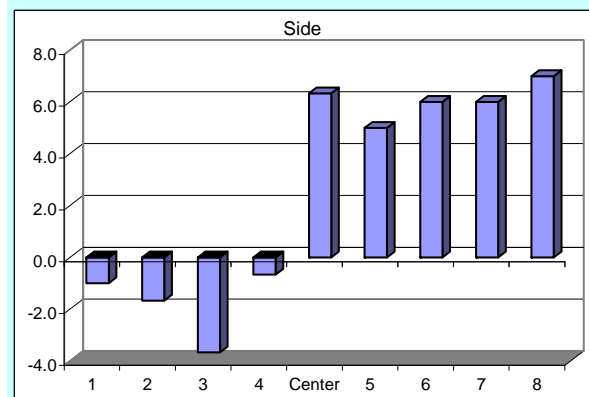
		2nd				1st			
Order		Side				Bottom			
Trial ---->		1	2	3	Avg.	1	2	3	Avg.
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	0	0	-3	-1.0	0	6	-7	-0.3
2	1.26	-1	-2	-2	-1.7	-6	-6	-7	-6.3
3	2.33	-3	-4	-4	-3.7	-3	-3	-4	-3.3
4	3.88	-1	0	-1	-0.7	3	-2	0	0.3
Center	6.00	6	7	6	6.3	6	4	4	4.7
5	8.12	5	5	5	5.0	4	3	3	3.3
6	9.67	6	6	6	6.0	4	3	5	4.0
7	10.74	6	6	6	6.0	3	2	3	2.7
8	11.50	7	7	7	7.0	5	3	4	4.0
Mean of absolute values		3.9	4.1	4.4		3.8	3.6	4.1	
w/o points by wall:		4.0	4.3	4.3		4.1	3.3	3.7	
									all 4.0
									w/o wall pts 4.0

Instruments Used:

S-type pitot	Pitot 2	Cal. Due	
Velocity sensor	TSI 8360 SN 209060	Cert of conformance	11/1/2007
Angle indicator	Shop built		N.A.
Manometer	Man-3		10/12/2007

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:
70 deg. and full open dampers
Made with port plugs



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

FLOW ANGLE DATA FORM

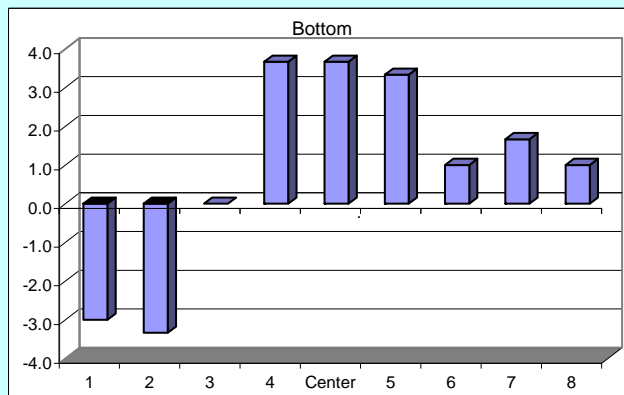
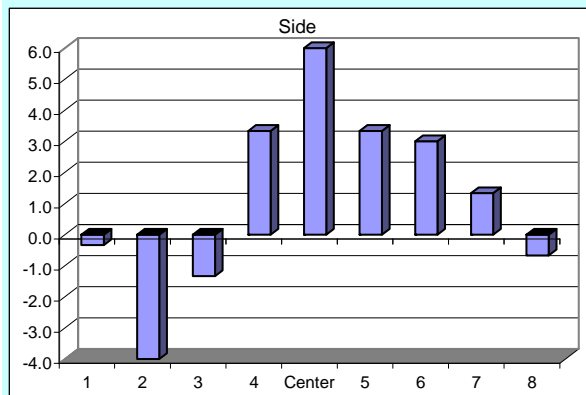
Site HV-C2 scale model Date <u>1/9/2007</u> Tester <u>JGD & MSP</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 2</u> ft Distance to disturbance <u>113.75</u> in Start/End Time <u>1500--1532</u>	Run No. <u>FA-15</u> Fan Setting <u>35 Hz</u> Fan configuration <u>A</u> w/ 3M Filtrete prefilters Approx. air vel. <u>1300</u> fpm at point >> Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>62</u>
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Order		1st				2nd			
Trial ---->		Side				Bottom			
		1	2	3	Avg.	1	2	3	Avg.
Point	Depth, in.	deg. cw	deg. cw	deg. cw		deg. cw	deg. cw	deg. cw	
1	0.50	-1	0	0	-0.3	-2	-3	-4	-3.0
2	1.26	-3	-5	-4	-4.0	-3	-4	-3	-3.3
3	2.33	-1	-2	-1	-1.3	1	1	-2	0.0
4	3.88	4	2	4	3.3	4	4	3	3.7
Center	6.00	6	6	6	6.0	4	3	4	3.7
5	8.12	2	4	4	3.3	4	4	2	3.3
6	9.67	3	2	4	3.0	2	1	0	1.0
7	10.74	1	1	2	1.3	3	0	2	1.7
8	11.50	0	-1	-1	-0.7	1	-1	3	1.0
Mean of absolute values		2.3	2.6	2.9		2.7	2.3	2.6	
w/o points by wall:		2.9	3.1	3.6		3.0	2.4	2.3	

Instruments Used:	Cal. Due	all 2.6
S-type pitot	Pitot 2	w/o wall pts 2.9
Velocity sensor	TSI 8360 SN 209060	
Angle indicator	Shop built	
Manometer	Man-3	
	Cert of conformance	
	11/1/2007	
	N.A.	
	10/12/2007	

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:
 70 deg. and full open dampers
 Made with port plugs



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA15
 4/18/2007

FLOW ANGLE DATA FORM

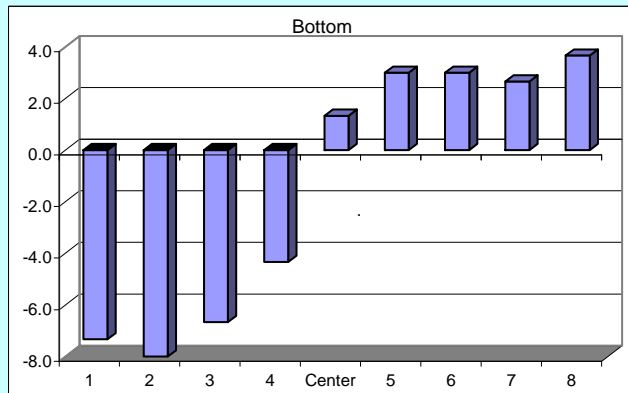
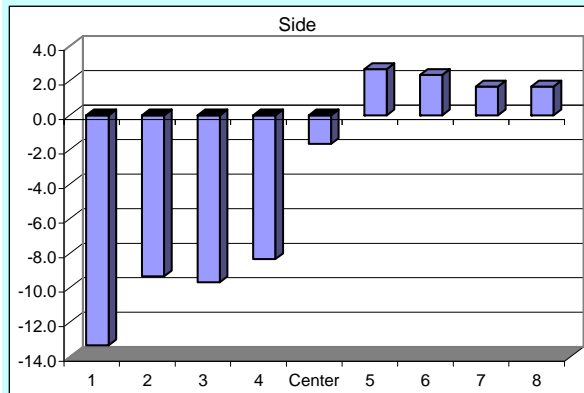
Site <u>HV-C2 scale model</u> Date <u>1/9/2007</u> Tester <u>JGD & MSP</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 2</u> ft Distance to disturbance <u>142.25</u> in Start/End Time <u>1537--1608</u>	Run No. <u>FA-16</u> Fan Setting <u>35 Hz</u> Fan configuration <u>B</u> w/ 3M Filtrete prefilters Approx. air vel. <u>1400</u> fpm at point >> Side port 2 Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>62</u>
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Order		2nd				1st			
Trial ---->		Side				Bottom			
Point	Depth, in.	1	2	3	Avg.	1	2	3	Avg.
1	0.50	-15	-12	-13	-13.3	-9	-9	-4	-7.3
2	1.26	-10	-6	-12	-9.3	-9	-8	-7	-8.0
3	2.33	-10	-9	-10	-9.7	-6	-8	-6	-6.7
4	3.88	-9	-7	-9	-8.3	-4	-5	-4	-4.3
Center	6.00	-2	0	-3	-1.7	1	1	2	1.3
5	8.12	1	4	3	2.7	3	3	3	3.0
6	9.67	2	3	2	2.3	2	3	4	3.0
7	10.74	2	1	2	1.7	3	2	3	2.7
8	11.50	1	1	3	1.7	3	4	4	3.7
Mean of absolute values		5.8	4.8	6.3		4.4	4.8	4.1	
w/o points by wall:		5.1	4.3	5.9		4.0	4.3	4.1	

Instruments Used:	Cal. Due	all 5.0
S-type pitot	Pitot 2	w/o wall pts 4.6
Velocity sensor	TSI 8360 SN 209060	
Angle indicator	Shop built	
Manometer	Man-3	
		Cert of conformance 11/1/2007 N.A. 10/12/2007

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:
 70 deg. & full open dampers
 Used port plugs



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA16
 4/18/2007

FLOW ANGLE DATA FORM

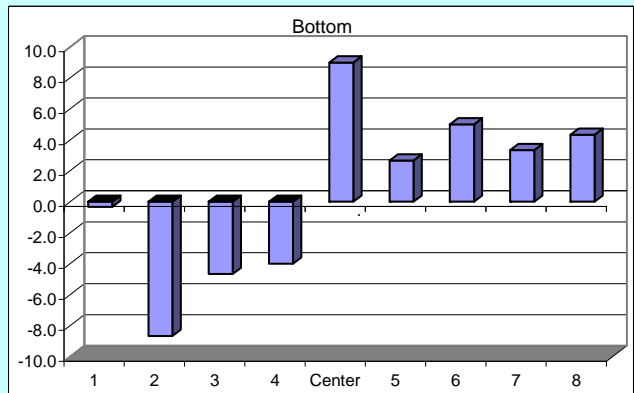
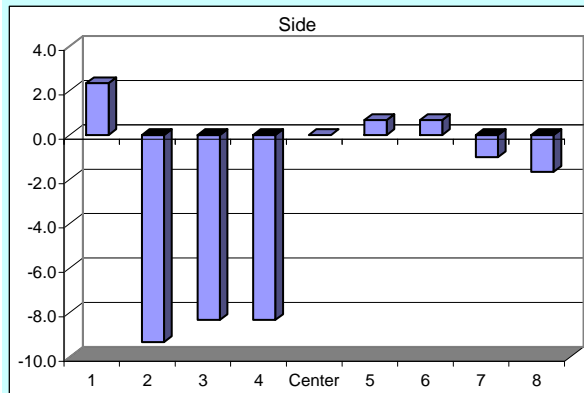
Site HV-C2 scale model	Run No. FA-17
Date <u>1/9/2007</u>	Fan Setting <u>35 Hz</u>
Tester <u>JGD & MSP</u>	Fan configuration <u>B</u> w/ 3M Filtrete prefilters
Stack Dia. <u>12</u> in	Approx. air vel. <u>1400</u> fpm at point >>
Stack X-Area <u>113.1</u> in ²	Units <u>degrees (clockwise > pos. nos.)</u>
Elevation <u>Port 3</u> ft	Stack Temp <u>62</u>
Distance to disturbance <u>202.75</u> in	
Start/End Time <u>1615--1641</u>	

Order	1st					2nd				
	Side					Bottom				
	1	2	3	Avg.		1	2	3	Avg.	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.	
1	0.50	3	3	1	2.3	3	3	-7	-0.3	
2	1.26	-10	-8	-10	-9.3	-7	-8	-11	-8.7	
3	2.33	-11	-6	-8	-8.3	-5	-4	-5	-4.7	
4	3.88	-9	-8	-8	-8.3	-4	-5	-3	-4.0	
Center	6.00	5	-2	-3	0.0	9	8	10	9.0	
5	8.12	0	1	1	0.7	0	4	4	2.7	
6	9.67	0	1	1	0.7	5	4	6	5.0	
7	10.74	-2	0	-1	-1.0	4	1	5	3.3	
8	11.50	-4	-1	0	-1.7	3	5	5	4.3	
Mean of absolute values		4.9	3.3	3.7		4.4	4.7	6.2		
w/o points by wall:		5.3	3.7	4.6		4.9	4.9	6.3		

Instruments Used:	Cal. Due	all 4.5
S-type pitot	Cert of conformance	w/o wall pts 4.9
Velocity sensor	<u>Pitot 2</u>	
Angle indicator	<u>TSI 8360 SN 209060</u>	
Manometer	<u>Shop built</u>	
	<u>Man-3</u>	
	<u>10/12/2007</u>	

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:
70 deg. & full open dampers settings
Used port plugs



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA17
 4/18/2007

FLOW ANGLE DATA FORM

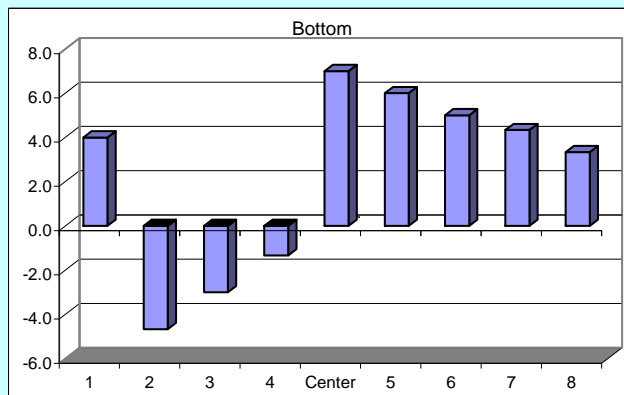
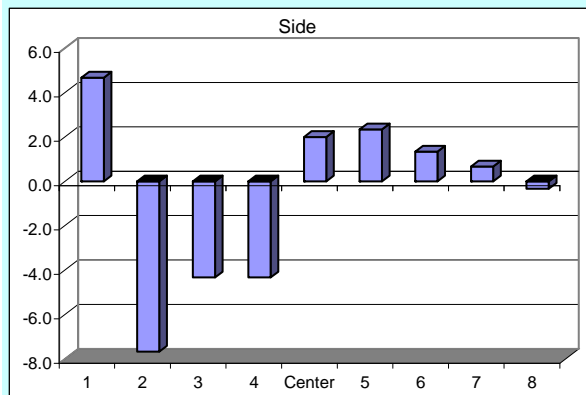
Site <u>HV-C2 scale model</u> Date <u>1/9/2007</u> Tester <u>JGD & MSP</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 3</u> ft Distance to disturbance <u>174.25</u> in Start/End Time <u>1645--1714</u>	Run No. <u>FA-18</u> Fan Setting <u>35 Hz</u> Fan configuration <u>A</u> w/ 3M Filtrete prefilters Approx. air vel. <u>1290</u> fpm at point >> Side port 2 Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>62</u>
--	---

Order	2nd				1st				
Traverse-->	Side				Bottom				
Trial ---->	1	2	3	Avg.	1	2	3	Avg.	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	7	0	7	4.7	6	4	2	4.0
2	1.26	-7	-7	-9	-7.7	-6	-4	-4	-4.7
3	2.33	-4	-5	-4	-4.3	-4	-2	-3	-3.0
4	3.88	-4	-4	-5	-4.3	-2	-2	0	-1.3
Center	6.00	2	2	2	2.0	5	6	10	7.0
5	8.12	2	2	3	2.3	5	6	7	6.0
6	9.67	1	2	1	1.3	3	7	5	5.0
7	10.74	1	1	0	0.7	2	7	4	4.3
8	11.50	0	0	-1	-0.3	4	3	3	3.3
Mean of absolute values		3.1	2.6	3.6		4.1	4.6	4.2	
w/o points by wall:		3.0	3.3	3.4		3.9	4.9	4.7	

Instuments Used: S-type pitot Velocity sensor Angle indicator Manometer	Pitot 2 TSI 8360 SN 209060 Shop built Man-3	Cal. Due Cert of conformance 11/1/2007 N.A. 10/12/2007	all 3.7 w/o wall pts 3.9
--	--	--	-----------------------------

Notes:
 70 deg. & full open damper settings
 Used port plugs

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).



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA18
 4/18/2007

FLOW ANGLE DATA FORM

Site HV-C2 scale model Date <u>1/10/2007</u> Tester <u>JGD & MSP</u> Stack Dia. <u>12</u> in Stack X-Area <u>113.1</u> in ² Elevation <u>Port 3</u> ft Distance to disturbance <u>174.25</u> in Start/End Time <u>1030--1112</u>	Run No. <u>FA-19</u> Fan Setting <u>40 Hz</u> Fan configuration <u>A & B</u> w/ 3M Filtrete prefilters Approx. air vel. <u>2960</u> fpm at point >> Side port 2 Units <u>degrees (clockwise > pos. nos.)</u> Stack Temp <u>64</u>
---	---

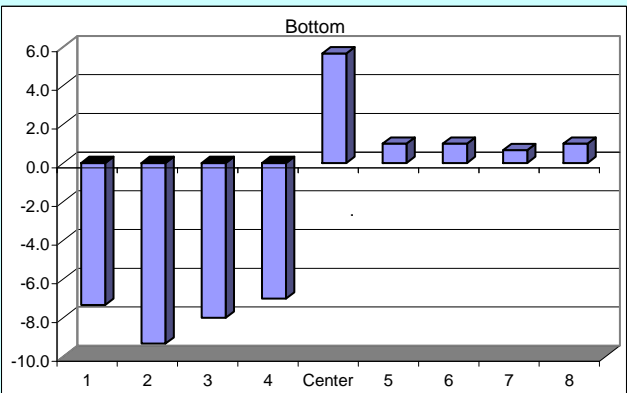
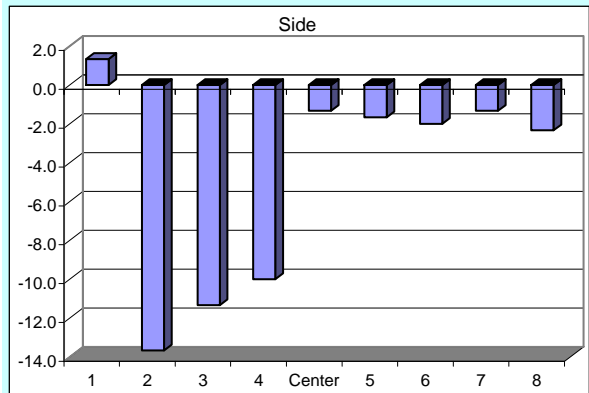
Order	2nd				1st				
Traverse-->	Side				Bottom				
Trial ---->	1	2	3	Avg.	1	2	3	Avg.	
Point	Depth, in.	deg. cw	deg. cw	deg. cw	Avg.	deg. cw	deg. cw	deg. cw	Avg.
1	0.50	2	1	1	1.3	-9	-8	-5	-7.3
2	1.26	-14	-13	-14	-13.7	-7	-11	-10	-9.3
3	2.33	-11	-11	-12	-11.3	-8	-9	-7	-8.0
4	3.88	-11	-9	-10	-10.0	-8	-6	-7	-7.0
Center	6.00	-1	-3	0	-1.3	6	5	6	5.7
5	8.12	-2	-1	-2	-1.7	1	1	1	1.0
6	9.67	-2	-2	-2	-2.0	1	1	1	1.0
7	10.74	-1	-2	-1	-1.3	0	1	1	0.7
8	11.50	-2	-2	-3	-2.3	1	0	2	1.0
Mean of absolute values		5.1	4.9	5.0		4.6	4.7	4.4	
w/o points by wall:		6.0	5.9	5.9		4.4	4.9	4.7	
									all 4.8
									w/o wall pts 5.3

Instruments Used:

S-type pitot	<u>Pitot 2</u>	Cal. Due	
Velocity sensor	<u>TSI 8360 SN 209060</u>	Cert of conformance	<u>11/1/2007</u>
Angle indicator	<u>Shop built</u>		<u>N.A.</u>
Manometer	<u>Man-3</u>		<u>10/12/2007</u>

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:
70 deg. and full open damper settings
Used port plug
Made with positive angle clockwise drives meniscus to left



Signature signifies compliance with Procedure EMS-JAG-05	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-463

Reference: CCP-WTPSP-178
 FlowAngleRev0.xls
 4 August 2006

(HVC2_FlowAngleRev0 (3)).xls
 FA19
 4/18/2007

Appendix E

Tracer-Gas Uniformity Data Sheets

Appendix E: Tracer-Gas Uniformity Data Sheets

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-1
Date	11/20/2006	Fan Configuration	A & B w/ 3M filterete prefilters
Tester	BGF	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	61 deg F
Stack X-Area	113.1 in. ²	Start/End Time	1115 -- 1245
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	A -- Center

Trial ---->		Side				Bottom			
Point	Depth, in.	1	2	3	Mean	1	2	3	Mean
		ppm				ppm			
1	0.50	1.09	1.21	1.19	1.163	1.16	1.17	1.08	1.137
2	1.26	1.25	1.27	1.16	1.227	1.04	1.19	1.13	1.120
3	2.33	1.22	1.24	1.21	1.223	1.16	1.22	1.18	1.187
4	3.88	1.31	1.31	1.27	1.297	1.18	1.22	1.15	1.183
Center	6.00	1.04	1.12	1.09	1.083	0.976	1.05	1.12	1.049
5	8.12	0.862	0.822	0.778	0.821	0.796	0.735	0.716	0.749
6	9.67	0.574	0.632	0.596	0.601	0.516	0.594	0.602	0.571
7	10.74	0.351	0.459	0.385	0.398	0.481	0.495	0.482	0.486
8	11.50	0.275	0.322	0.318	0.305	0.373	0.386	0.376	0.378
Averages ----->		0.886	0.932	0.889	0.902	0.854	0.896	0.871	0.873

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.89		Mean	0.95	0.91	0.93
Min Point	0.31	-65.6%	Std. Dev.	0.35	0.30	0.31
Max Point	1.30	46.1%	COV as %	36.8	33.0	33.7

Avg. Conc. 0.865 ppm

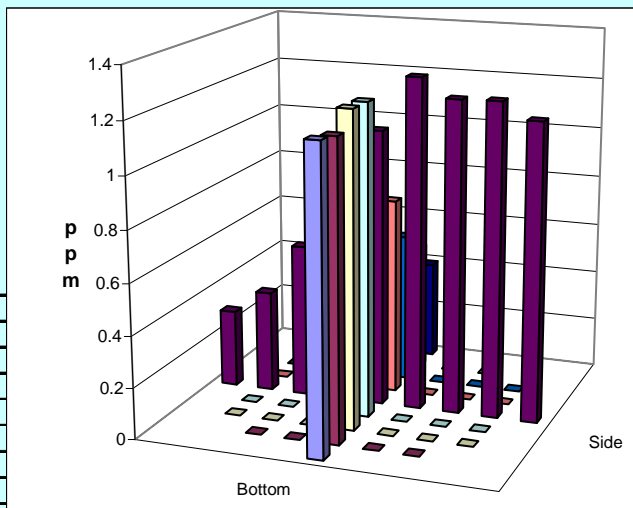
Gas analyzer checked:
11/17/2006

	Start	Finish	
Tracer tank pressure	250	270	psig
Stack Temp	60	62	F°
Center Pt. air vel.	3440	3350.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.58	29.56	in Hg
Ambient humidity	55	55	RH
B&K vapor correction	Y	Y	Y/N
Back-Gd gas ppb	1.7, 3.5, 2.0, 3.5, 1.4	2.72, -2.1, 1.4, 2.0	
No. Bk-Gd samples	5	4	n
Ambient Temp, F	55	58	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



Signature signifies compliance with
Procedure EMS-JAG-01
Signature/date

Signature verifying data and calculations:
Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT1
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/20/2006**
 Tester **BG Fritz**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-2**
 Fan Configuration **A & B on** w/ 3M filterete prefilters
 Fan Setting **40 Hz**
 Stack Temp **60.5 deg F**
 Start/End Time **2 pm/ 3:30**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A near port, left side**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.54	1.53	1.47	1.513	0.795	0.839	0.714	0.783
2	1.26	1.38	1.35	1.28	1.337	0.739	0.806	0.785	0.777
3	2.33	1.21	1.22	1.17	1.200	0.882	0.789	0.812	0.828
4	3.88	1.07	1.06	1.02	1.050	0.844	0.79	0.806	0.813
Center	6.00	0.858	0.851	0.875	0.861	0.795	0.835	0.772	0.801
5	8.12	0.629	0.649	0.689	0.656	0.726	0.746	0.762	0.745
6	9.67	0.547	0.485	0.516	0.516	0.671	0.727	0.695	0.698
7	10.74	0.462	0.396	0.385	0.414	0.749	0.659	0.668	0.692
8	11.50	0.385	0.367	0.395	0.382	0.644	0.8	0.637	0.694
Averages ----->		0.898	0.879	0.867	0.881	0.761	0.777	0.739	0.759

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.82		Mean	0.86	0.76	0.81
Min Point	0.38	-53.4%	Std. Dev.	0.35	0.05	0.25
Max Point	1.51	84.6%	COV as %	40.7	7.2	30.3

Avg. Conc. 0.819 ppm

Gas analyzer checked:

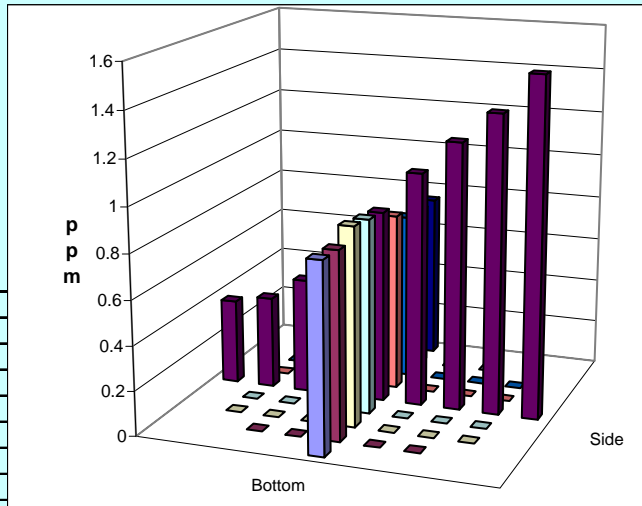
11/17/2006

	Start	Finish	
Tracer tank pressure	300	300	psig
Stack Temp	61	60	F°
Center Pt. air vel.	3300	3240.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.53	29.52	in Hg
Ambient humidity	47	--	RH
B&K vapor correction	yes	yes	Y/N
Back-Gd gas ppb	5.5, 5.5, 7.3, 5.4	7.3, 4.7, 8.0, 8.1	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	58	58	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: without water correction, background was approx. 25 ppb



Signature signifies compliance with

Signature verifying data and calculations:

Procedure EMS-JAG-01

Signature/date

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT2
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/21/2006**
 Tester **BG Fritz**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-3**
 Fan Configuration **A & B on w/ 3M filterete prefilers**
 Fan Setting **40 Hz**
 Stack Temp **56 deg F**
 Start/End Time **11:15/1:30**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A near port, right side**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.20	1.16	1.32	1.227	1.15	1.14	1.12	1.137
2	1.26	1.32	1.30	1.22	1.280	1.12	1.15	1.10	1.123
3	2.33	1.25	1.27	1.18	1.233	1.09	1.06	1.06	1.070
4	3.88	1.23	1.22	1.19	1.213	1.07	1.09	1.14	1.100
Center	6.00	1.08	1.02	1.12	1.073	0.939	0.926	0.956	0.940
5	8.12	0.697	0.820	0.791	0.769	0.682	0.683	0.709	0.691
6	9.67	0.659	0.572	0.593	0.608	0.597	0.499	0.517	0.538
7	10.74	0.365	0.465	0.357	0.396	0.513	0.496	0.515	0.508
8	11.50	0.371	0.340	0.355	0.355	0.584	0.501	0.473	0.519
Averages ----->		0.908	0.907	0.903	0.906	0.861	0.838	0.843	0.847

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.88		Mean	0.94	0.85	0.90
Min Point	0.36	-59.5%	Std. Dev.	0.35	0.27	0.30
Max Point	1.28	46.0%	COV as %	37.1	31.5	33.8

Avg. Conc. 0.861 ppm

Gas analyzer checked:

11/17/2006

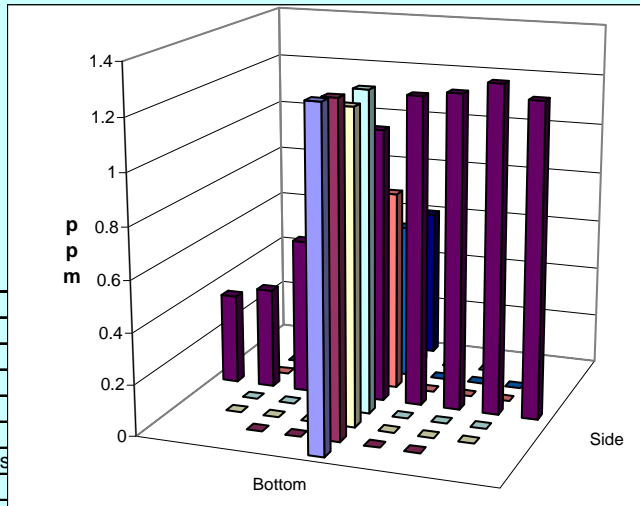
	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	49	63	F°
Center Pt. air vel.	3200	3220.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.28	29.30	in Hg
Ambient humidity	76	50	RH
B&K vapor correction	yes	yes	Y/N
Back-Gd gas ppb	-2.0, -1.1, -2.2, -1.8	3.6, 3.7, 2.3, -1.4	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	46	52	

Instruments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:

Need water correction
 background results: -2.0, -1.1, -2.2, -1.8
 allowed 40 min before taking end background meas
 test port 1 used



Signature signifies compliance with

Signature verifying data and calculations:

Procedure EMS-JAG-01

Signature/date

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT3
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/21/2006**
 Tester **BG Fritz**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-4**
 Fan Configuration **A & B on** w/ 3M filterete prefilters
 Fan Setting **40 Hz**
 Stack Temp **59 deg F**
 Start/End Time **1:45/3:00**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far right**

Traverse-->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.24	1.26	1.16	1.220	1.23	1.22	1.27	1.240
2	1.26	1.25	1.24	1.21	1.233	1.30	1.35	1.30	1.317
3	2.33	1.30	1.28	1.20	1.260	1.29	1.35	1.26	1.300
4	3.88	1.24	1.27	1.20	1.237	1.20	1.26	1.19	1.217
Center	6.00	1.11	1.19	1.09	1.130	1.02	1.04	1.03	1.030
5	8.12	0.800	0.726	0.831	0.786	0.740	0.698	0.590	0.676
6	9.67	0.523	0.561	0.571	0.552	0.485	0.559	0.511	0.518
7	10.74	0.375	0.441	0.404	0.407	0.495	0.422	0.454	0.457
8	11.50	0.371	0.314	0.386	0.357	0.419	0.427	0.455	0.434
Averages ----->		0.912	0.920	0.895	0.909	0.909	0.925	0.896	0.910

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.91		Mean	0.94	0.93	0.94
Min Point	0.36	-60.7%	Std. Dev.	0.36	0.37	0.35
Max Point	1.32	44.8%	COV as %	38.0	40.1	37.5

Avg. Conc. 0.888 ppm

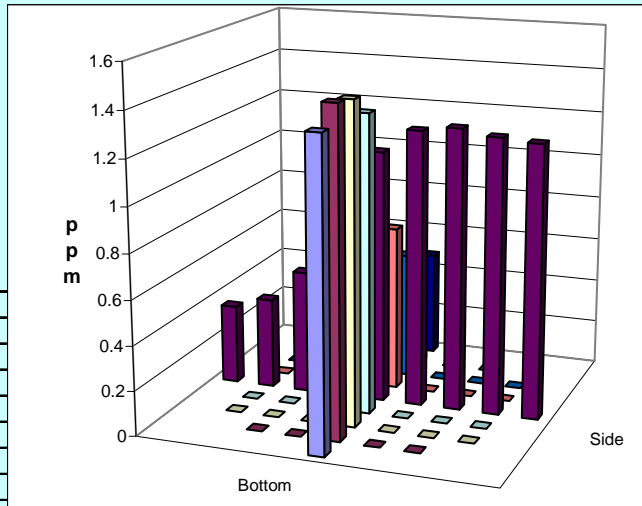
Gas analyzer checked:
11/17/2006

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	63	55	F°
Center Pt. air vel.	3220.0	3240.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.30	29.30	in Hg
Ambient humidity	50	43	RH
B&K vapor correction	yes	yes	Y/N
Back-Gd gas ppb	-1.4, 3.6, 3.7, 2.3	2.2, 6.2, 6.4, 2.0	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	52	56	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: Test port 1 used
 system only off approx 5 min before collecting
 background measurements at end



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 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT4
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/22/2006**
 Tester **BG Fritz**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-5**
 Fan Configuration **A & B on** w/ 3M filterete prefilters
 Fan Setting **40** Hz
 Stack Temp **55 deg F**
 Start/End Time **12:00/1:00**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far left**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.672	0.642	0.663	0.659	1.50	1.60	1.58	1.560
2	1.26	0.774	0.775	0.715	0.755	1.53	1.51	1.52	1.520
3	2.33	0.847	0.843	0.829	0.840	1.47	1.50	1.48	1.483
4	3.88	1.01	1.01	0.998	1.006	1.42	1.31	1.31	1.347
Center	6.00	1.17	1.16	1.19	1.173	1.150	1.16	1.09	1.133
5	8.12	1.050	1.080	1.030	1.053	0.845	0.812	0.850	0.836
6	9.67	0.923	0.875	0.909	0.902	0.654	0.660	0.686	0.667
7	10.74	0.795	0.756	0.712	0.754	0.619	0.535	0.536	0.563
8	11.50	0.735	0.721	0.668	0.708	0.518	0.503	0.482	0.501
Averages ----->		0.886	0.874	0.857	0.872	1.078	1.066	1.059	1.068

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.97		Mean	0.93	1.08	1.00
Min Point	0.50	-48.4%	Std. Dev.	0.16	0.39	0.30
Max Point	1.56	60.8%	COV as %	17.1	36.5	29.8

Avg. Conc. 0.947 ppm

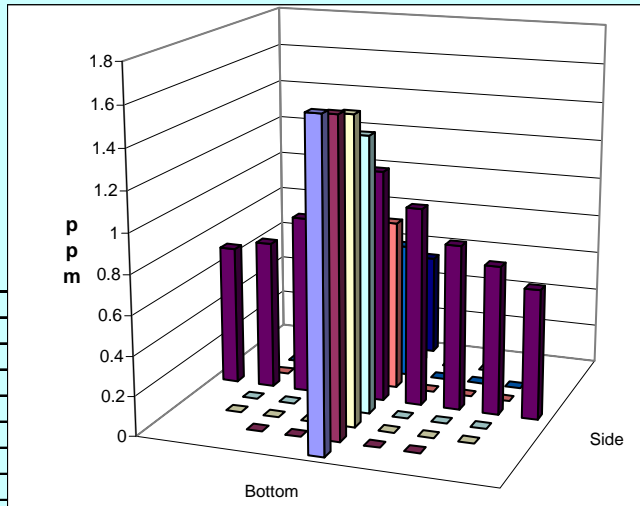
Gas analyzer checked:
11/17/2006

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	55	55	F°
Center Pt. air vel.	3350	3430.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.46	29.46	in Hg
Ambient humidity	55	55	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	19, 21, 19, 20	25, 25, 23, 24	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	50	50	

Instruments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: with water correction, background around 7 or 8 ppb



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Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

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 GT5
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/28/2006**
 Tester **BG Fritz**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-6**
 Fan Configuration **A & B on** w/ 3M filterete prefilters
 Fan Setting **40 Hz**
 Stack Temp **21 deg F**
 Start/End Time **1000 -- 1100**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **Fan A far right**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.04	0.973	1.10	1.038	1.18	1.17	1.10	1.150
2	1.26	1.17	1.16	1.11	1.147	1.13	1.15	1.17	1.150
3	2.33	1.10	1.04	1.07	1.070	1.19	1.14	1.20	1.177
4	3.88	1.12	1.15	1.13	1.133	1.15	1.05	1.17	1.123
Center	6.00	0.967	0.970	0.965	0.967	0.939	0.956	0.914	0.936
5	8.12	0.734	0.624	0.723	0.694	0.639	0.704	0.662	0.668
6	9.67	0.531	0.586	0.605	0.574	0.473	0.544	0.534	0.517
7	10.74	0.327	0.406	0.395	0.376	0.412	0.471	0.494	0.459
8	11.50	0.334	0.348	0.325	0.336	0.395	0.441	0.409	0.415
Averages ----->		0.814	0.806	0.825	0.815	0.834	0.847	0.850	0.844

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.83		Mean	0.85	0.86	0.86
Min Point	0.34	-59.5%	Std. Dev.	0.30	0.31	0.29
Max Point	1.18	41.9%	COV as %	35.7	35.9	34.4

Avg. Conc. 0.814 ppm

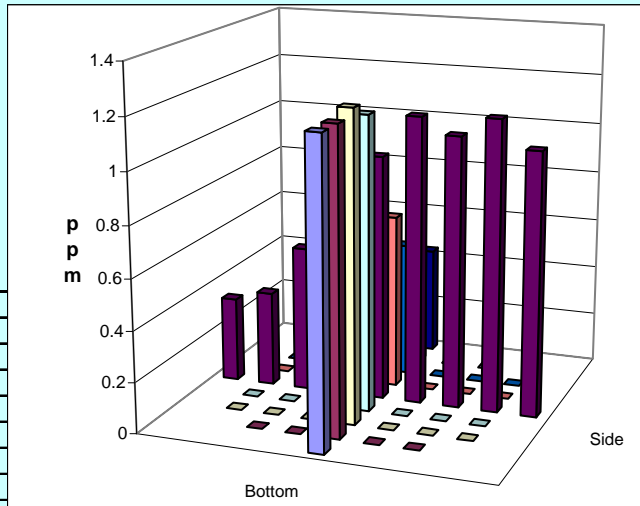
Gas analyzer checked:
11/27/2006

	Start	Finish	
Tracer tank pressure	120	120	psig
Stack Temp	21	21	F°
Center Pt. air vel.	3500	3360.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.77	29.82	in Hg
Ambient humidity	48	48	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	9.1, 10.3, 8.2, 7.4	12, 13, 12, 13	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	17	19	

Instruments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



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Reference: CCP-WTPSP-176
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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/28/2006**
 Tester **BG Fritz**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-7**
 Fan Configuration **A & B on** w/ 3M filterete prefilers
 Fan Setting **40 Hz**
 Stack Temp **23.5 deg F**
 Start/End Time **1140 -- 1300**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **Fan A far left**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.537	0.546	0.611	0.565	1.50	1.43	1.35	1.427
2	1.26	0.662	0.643	0.657	0.654	1.34	1.38	1.34	1.353
3	2.33	0.786	0.785	0.718	0.763	1.36	1.39	1.39	1.380
4	3.88	0.956	0.913	0.953	0.941	1.25	1.21	1.25	1.237
Center	6.00	1.040	1.02	1.08	1.047	1.04	1.04	1.04	1.040
5	8.12	0.951	1.01	0.965	0.975	0.699	0.722	0.735	0.719
6	9.67	0.742	0.741	0.792	0.758	0.495	0.546	0.546	0.529
7	10.74	0.634	0.729	0.823	0.729	0.419	0.481	0.499	0.466
8	11.50	0.511	0.558	0.540	0.536	0.386	0.420	0.418	0.408
Averages ----->		0.758	0.772	0.793	0.774	0.943	0.958	0.952	0.951

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.86		Mean	0.84	0.96	0.90
Min Point	0.41	-52.7%	Std. Dev.	0.15	0.39	0.29
Max Point	1.43	65.4%	COV as %	17.6	40.4	32.1

Avg. Conc. 0.840 ppm

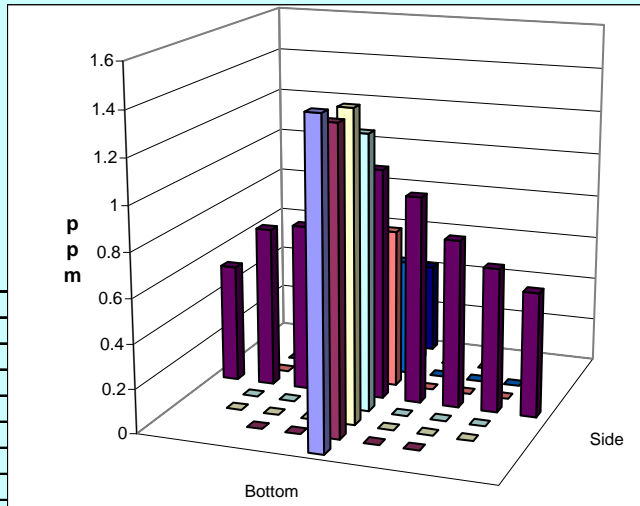
Gas analyzer checked:
11/27/2006

	Start	Finish	
Tracer tank pressure	120	120	psig
Stack Temp	23	24	F°
Center Pt. air vel.	3480	3380.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.82	29.82	in Hg
Ambient humidity	49	49	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	6.6, 7.1, 3.5, 8.3	13, 11, 8, 9	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	19	21	

Instruments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



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Reference: CCP-WTPSP-176
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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/28/2006**
 Tester **BG Fritz & JGD**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-8**
 Fan Configuration **A & B on w/ 3M filterete prefilters**
 Fan Setting **40 Hz**
 Stack Temp **24 deg F**
 Start/End Time **1315 -- 1343**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **Fan A center**
2nd

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.763	0.753	0.768	0.761	0.900	0.891	0.928	0.906
2	1.26	0.809	0.804	0.812	0.808	0.911	0.893	0.976	0.927
3	2.33	0.825	0.829	0.822	0.825	0.919	0.921	0.916	0.919
4	3.88	0.852	0.867	0.882	0.867	0.949	0.961	0.902	0.937
Center	6.00	0.970	0.926	0.968	0.955	0.970	0.927	0.949	0.949
5	8.12	0.947	0.912	0.937	0.932	0.881	0.860	0.938	0.893
6	9.67	0.857	0.809	0.866	0.844	0.754	0.822	0.840	0.805
7	10.74	0.704	0.751	0.677	0.711	0.668	0.767	0.744	0.726
8	11.50	0.602	0.632	0.586	0.607	0.680	0.795	0.797	0.757
Averages ----->		0.814	0.809	0.813	0.812	0.848	0.871	0.888	0.869

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.84		Mean	0.85	0.88	0.86
Min Point	0.61	-27.8%	Std. Dev.	0.08	0.08	0.08
Max Point	0.95	13.6%	COV as %	9.6	9.4	9.3

Avg. Conc. 0.827 ppm

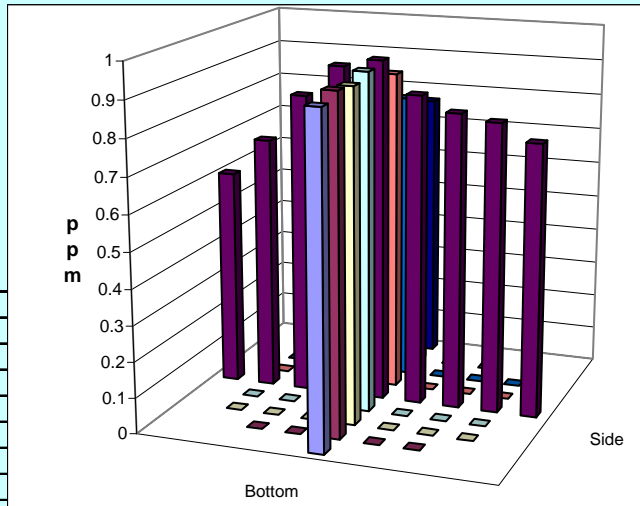
Gas analyzer checked:
11/27/2006

	Start	Finish	
Tracer tank pressure	120	120	psig
Stack Temp	24	24	F°
Center Pt. air vel.	3380	3340.0	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.82	29.86	in Hg
Ambient humidity	49	47	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	9.1, 11, 6.6, 7.5	15, 12, 7, 10	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	21	20	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



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Reference: CCP-WTPSP-176
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 31 July 2006

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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/28/2006**
 Tester **JGD & JAG**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-9**
 Fan Configuration **A & B on** w/ 3M filterete prefilters
 Fan Setting **40** Hz
 Stack Temp **24 deg F**
 Start/End Time **1345 -- 1450**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **Fan A near left**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.39	1.50	1.42	1.437	0.734	0.853	0.706	0.764
2	1.26	1.35	1.45	1.31	1.370	0.772	0.798	0.796	0.789
3	2.33	1.31	1.29	1.29	1.297	0.847	0.742	0.868	0.819
4	3.88	1.14	1.10	1.10	1.113	0.920	0.835	0.880	0.878
Center	6.00	0.819	0.900	0.811	0.843	0.797	0.866	0.712	0.792
5	8.12	0.558	0.565	0.641	0.588	0.723	0.718	0.731	0.724
6	9.67	0.440	0.382	0.414	0.412	0.708	0.697	0.692	0.699
7	10.74	0.316	0.289	0.301	0.302	0.693	0.744	0.641	0.693
8	11.50	0.260	0.261	0.252	0.258	0.703	0.734	0.823	0.753
Averages ----->		0.843	0.860	0.838	0.847	0.766	0.776	0.761	0.768

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.81		Mean	0.85	0.77	0.81
Min Point	0.26	-68.1%	Std. Dev.	0.43	0.07	0.30
Max Point	1.44	78.0%	COV as %	50.6	8.9	36.8

Avg. Conc. 0.806 ppm

Gas analyzer checked:

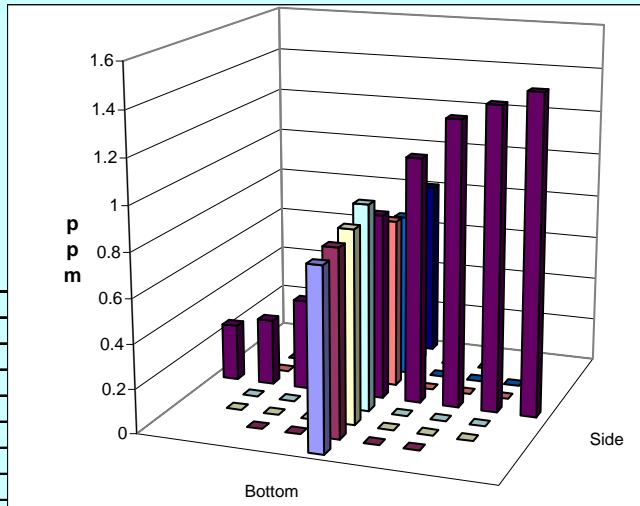
11/27/2006

	Start	Finish	
Tracer tank pressure	120	120	psig
Stack Temp	24	24	F°
Center Pt. air vel.	3340	3310	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.86	29.90	in Hg
Ambient humidity	47	48	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	12, 7, 10, 9	10, 11.6, 4.8, 6.3	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	20	20	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



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Signature verifying data and calculations:

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
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 31 July 2006

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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/28/2006**
 Tester **JAG**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-10**
 Fan Configuration **A & B on w/ 3M filterete prefilters**
 Fan Setting **40 Hz**
 Stack Temp **24 deg F**
 Start/End Time **1500 -- 1555**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **Fan A far right**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.07	1.14	1.15	1.120	0.931	1.01	0.975	0.972
2	1.26	1.12	1.12	1.16	1.133	0.985	0.990	0.934	0.970
3	2.33	1.24	1.09	1.14	1.157	0.994	1.05	1.01	1.018
4	3.88	1.19	1.07	1.16	1.140	0.960	1.01	0.999	0.990
Center	6.00	0.981	1.01	0.932	0.974	0.813	0.827	0.823	0.821
5	8.12	0.791	0.714	0.746	0.750	0.542	0.559	0.578	0.560
6	9.67	0.518	0.519	0.486	0.508	0.407	0.390	0.401	0.399
7	10.74	0.365	0.351	0.375	0.364	0.374	0.394	0.374	0.381
8	11.50	0.300	0.335	0.301	0.312	0.337	0.308	0.355	0.333
Averages ----->		0.842	0.817	0.828	0.829	0.705	0.726	0.717	0.716

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.77		Mean	0.86	0.73	0.80
Min Point	0.31	-59.6%	Std. Dev.	0.33	0.28	0.30
Max Point	1.16	49.8%	COV as %	37.8	38.4	37.6

Avg. Conc. 0.757 ppm

Gas analyzer checked:

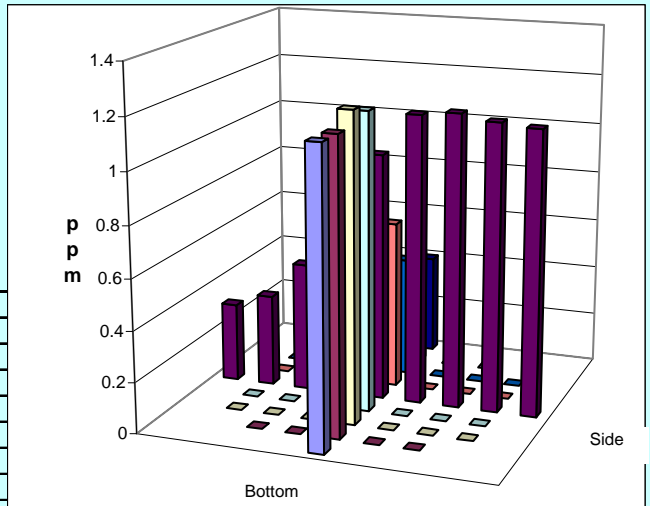
11/27/2006

	Start	Finish	
Tracer tank pressure	120	150	psig
Stack Temp	24	24	F°
Center Pt. air vel.	3310	3360	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.90	29.92	in Hg
Ambient humidity	48	51	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	10, 11.6, 4.8, 6.3	20.1, 15.5, 16.7, 18.5	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	20	20	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



Signature signifies compliance with
 Procedure EMS-JAG-01
 Signature/date

Signature verifying data and calculations:

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT10
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/29/2006**
 Tester **BG Fritz**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-11**
 Fan Configuration **A & B** w/ 3M filterete prefilters
 Fan Setting **40 Hz**
 Stack Temp **24.5 deg F**
 Start/End Time **1:15 - 2:30**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far right**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.989	0.974	0.839	0.934	0.979	0.908	0.972	0.953
2	1.26	0.994	0.863	0.883	0.913	0.934	0.982	0.985	0.967
3	2.33	0.889	0.99	0.898	0.926	0.974	0.99	0.945	0.970
4	3.88	0.955	0.911	0.937	0.934	0.927	1	0.925	0.951
Center	6.00	0.803	0.783	0.787	0.791	0.763	0.715	0.734	0.737
5	8.12	0.629	0.537	0.579	0.582	0.534	0.555	0.562	0.550
6	9.67	0.497	0.402	0.469	0.456	0.435	0.391	0.414	0.413
7	10.74	0.331	0.332	0.351	0.338	0.379	0.331	0.348	0.353
8	11.50	0.288	0.235	0.296	0.273	0.315	0.348	0.304	0.322
Averages ----->		0.708	0.670	0.671	0.683	0.693	0.691	0.688	0.691

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.69		Mean	0.71	0.71	0.71
Min Point	0.27	-60.3%	Std. Dev.	0.25	0.27	0.25
Max Point	0.97	41.2%	COV as %	34.9	38.1	35.1

Avg. Conc. 0.677 ppm

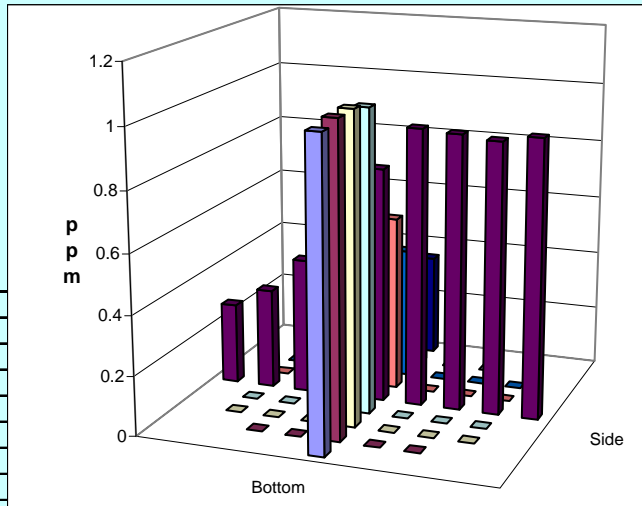
Gas analyzer checked:
11/27/2006

	Start	Finish	
Tracer tank pressure	120	120	psig
Stack Temp	26	23	F°
Center Pt. air vel.	3450	3400.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	30.32	30.30	in Hg
Ambient humidity	57	57	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	6.5, 13, 8.4, 6.6	13, 12, 13, 11	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	21	21	

Instruments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



Signature signifies compliance with Procedure EMS-JAG-01
 Signature/Date _____
 Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT11
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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/29/2006**
 Tester **BG Fritz**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-12**
 Fan Configuration **A&B w/ 3M filterete prefilers**
 Fan Setting **40 Hz**
 Stack Temp **23 deg F**
 Start/End Time **2:30 - 3:30**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A center**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.859	0.888	0.902	0.883	0.957	0.943	0.983	0.961
2	1.26	0.888	0.823	0.851	0.854	1.04	0.932	1	0.991
3	2.33	0.918	0.931	1.01	0.953	0.993	1.02	0.999	1.004
4	3.88	0.893	0.969	1.03	0.964	1.05	1.01	0.991	1.017
Center	6.00	0.916	0.881	0.832	0.876	0.827	0.821	0.835	0.828
5	8.12	0.639	0.650	0.629	0.639	0.608	0.584	0.612	0.601
6	9.67	0.474	0.446	0.475	0.465	0.446	0.458	0.461	0.455
7	10.74	0.300	0.314	0.285	0.300	0.347	0.360	0.359	0.355
8	11.50	0.293	0.242	0.263	0.266	0.345	0.351	0.340	0.345
Averages ----->		0.687	0.683	0.697	0.689	0.735	0.720	0.731	0.729

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.71		Mean	0.72	0.75	0.74
Min Point	0.27	-62.5%	Std. Dev.	0.26	0.28	0.26
Max Point	1.02	43.5%	COV as %	36.0	37.1	35.2

Avg. Conc. 0.691 ppm

Gas analyzer checked:

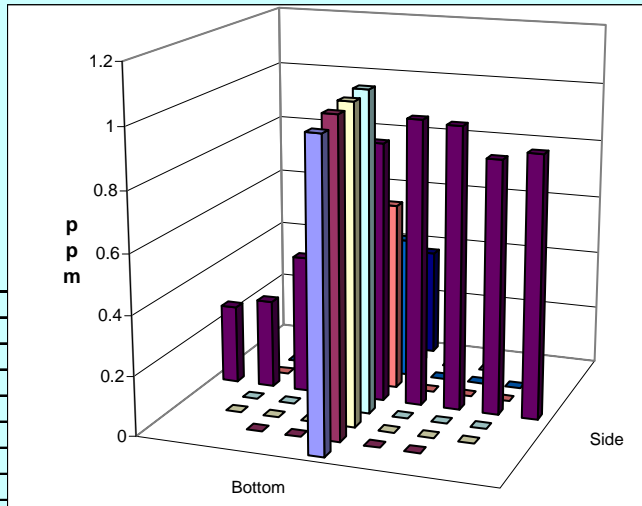
11/27/2006

	Start	Finish	
Tracer tank pressure	120	120	psig
Stack Temp	23	23	F°
Center Pt. air vel.	3400.0	3410.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	30.30	30.30	in Hg
Ambient humidity	57	60	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	13, 12, 13, 11	16, 14, 15, 13	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	21	19	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



Signature signifies compliance with
 Procedure EMS-JAG-01
 Signature/date

Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT12
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **11/30/2006**
 Tester **JGD & JAG**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-13**
 Fan Configuration **A** w/ 3M filterete prefilers
 Fan Setting **35 Hz**
 Stack Temp **31.25 deg F**
 Start/End Time **1510 -- 1600**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A center**
1st
2nd

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.64	1.59	1.60	1.610	1.58	1.61	1.58	1.590
2	1.26	1.73	1.62	1.64	1.663	1.55	1.59	1.62	1.587
3	2.33	1.70	1.70	1.62	1.673	1.66	1.61	1.70	1.657
4	3.88	1.64	1.66	1.71	1.670	1.64	1.67	1.58	1.630
Center	6.00	1.71	1.57	1.57	1.617	1.62	1.55	1.52	1.563
5	8.12	1.65	1.66	1.50	1.603	1.54	1.55	1.55	1.547
6	9.67	1.56	1.56	1.50	1.540	1.57	1.57	1.70	1.613
7	10.74	1.56	1.69	1.70	1.650	1.50	1.54	1.64	1.560
8	11.50	1.57	1.56	1.73	1.620	1.66	1.54	1.53	1.577
Averages ----->		1.640	1.623	1.619	1.627	1.59	1.58	1.60	1.591

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1.61		Mean	1.63	1.59	1.61
Min Point	1.54	-4.3%	Std. Dev.	0.05	0.04	0.05
Max Point	1.67	4.0%	COV as %	3.0	2.6	2.9

Avg. Conc. 1.612 ppm

Gas analyzer checked:

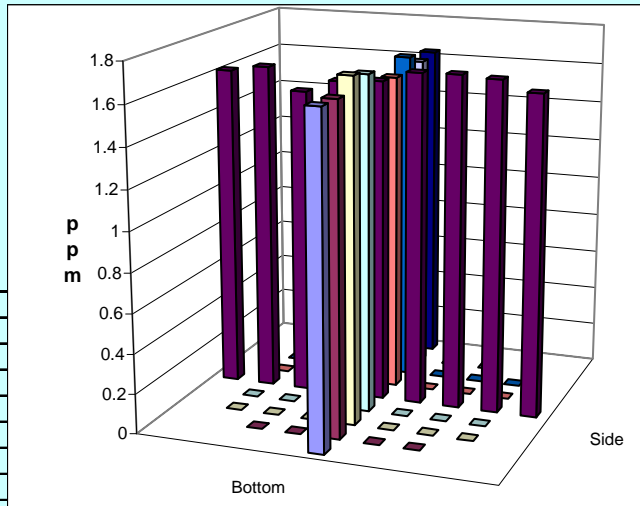
11/27/2006

	Start	Finish	
Tracer tank pressure	120	180	psig
Stack Temp	32.5	30	F°
Center Pt. air vel.	1570.0	1560.0	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	29.968	29.97	in Hg
Ambient humidity	67	67	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	16, 17, 17, 17	13, 12, 13, 11	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	28	27	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: 1015 mbar



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 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

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 GT13
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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **12/1/2006**
 Tester **BGF**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-14**
 Fan Configuration **A** w/ 3M filterete prefilers
 Fan Setting **37 Hz**
 Stack Temp **24 deg F**
 Start/End Time **0845 -- 0940**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A near right**
1st
2nd

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.59	1.69	1.62	1.633	1.66	1.54	1.48	1.560
2	1.26	1.68	1.50	1.70	1.627	1.65	1.59	1.57	1.603
3	2.33	1.65	1.50	1.52	1.557	1.60	1.50	1.54	1.547
4	3.88	1.63	1.53	1.49	1.550	1.53	1.59	1.55	1.557
Center	6.00	1.47	1.49	1.52	1.493	1.52	1.44	1.54	1.500
5	8.12	1.66	1.43	1.56	1.550	1.59	1.53	1.57	1.563
6	9.67	1.60	1.43	1.55	1.527	1.52	1.49	1.50	1.503
7	10.74	1.60	1.55	1.53	1.560	1.43	1.55	1.49	1.490
8	11.50	1.50	1.52	1.47	1.497	1.49	1.53	1.56	1.527
Averages ----->		1.598	1.516	1.551	1.555	1.55	1.53	1.53	1.539

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1.55		Mean	1.55	1.54	1.54
Min Point	1.49	-3.7%	Std. Dev.	0.04	0.04	0.04
Max Point	1.63	5.6%	COV as %	2.6	2.7	2.6

Avg. Conc. 1.553 ppm

Gas analyzer checked:

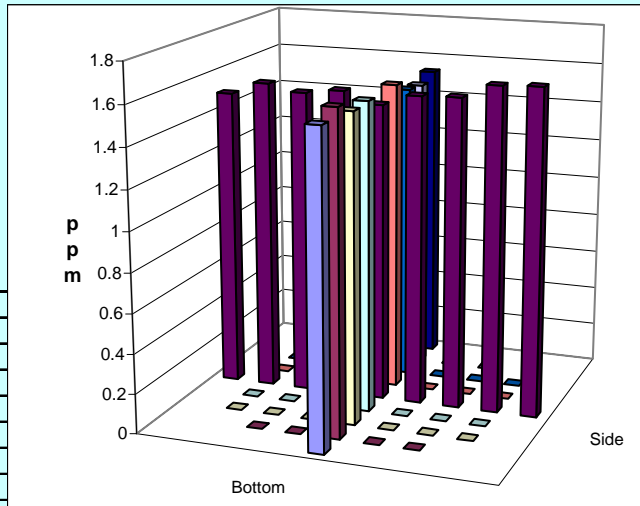
11/27/2006

	Start	Finish	
Tracer tank pressure	100	100	psig
Stack Temp	23	25	F°
Center Pt. air vel.	1520	1580	ft/min
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	30.10	30.10	in Hg
Ambient humidity	86	65	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	9, 6.3, 12.6, 6.3	14, 13, 14, 9	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	13	25	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: B inlet sealed



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Signature verifying data and calculations:

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

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 GT14
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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **12/1/2006**
 Tester **BGF**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-15**
 Fan Configuration **A** w/ 3M filterete prefilers
 Fan Setting **37 Hz**
 Stack Temp **25 deg F**
 Start/End Time **0945 -- 1045**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A near left**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.49	1.57	1.56	1.540	1.58	1.62	1.55	1.583
2	1.26	1.48	1.54	1.51	1.510	1.60	1.52	1.62	1.580
3	2.33	1.48	1.48	1.45	1.470	1.65	1.59	1.57	1.603
4	3.88	1.42	1.43	1.41	1.420	1.50	1.55	1.44	1.497
Center	6.00	1.40	1.37	1.40	1.390	1.43	1.42	1.37	1.407
5	8.12	1.36	1.34	1.35	1.350	1.34	1.36	1.35	1.350
6	9.67	1.47	1.35	1.37	1.397	1.30	1.38	1.41	1.363
7	10.74	1.38	1.43	1.33	1.380	1.45	1.34	1.35	1.380
8	11.50	1.34	1.40	1.34	1.360	1.41	1.45	--	1.430
Averages ----->		1.424	1.434	1.413	1.424	1.47	1.47	1.46	1.466

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1.45		Mean	1.42	1.45	1.44
Min Point	1.35	-6.6%	Std. Dev.	0.06	0.11	0.08
Max Point	1.60	11.0%	COV as %	3.9	7.3	5.8

Avg. Conc. 1.451 ppm

Gas analyzer checked:

11/27/2006

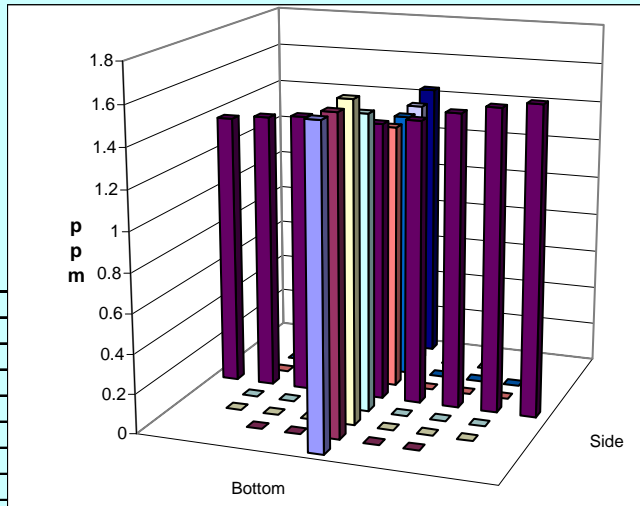
	Start	Finish	
Tracer tank pressure	100	100	psig
Stack Temp	25	25	F°
Center Pt. air vel.	1580	1540	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	30.10	30.12	in Hg
Ambient humidity	65	65	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	14, 13, 14, 9	11, 10, 12, 12	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	25	24	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:

B inlet sealed
 Last value on 3rd Bottom transect
 is missing - field recording error



Signature signifies compliance with
 Procedure EMS-JAG-01
 Signature/date

Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT15
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **12/1/2006**
 Tester **BGF**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-16**
 Fan Configuration **A** w/ 3M filterete prefilers
 Fan Setting **35 Hz**
 Stack Temp **34 deg F**
 Start/End Time **1200 -- 1235**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far left**
1st
2nd

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.28	1.34	1.38	1.333	1.52	1.57	1.50	1.530
2	1.26	1.30	1.31	1.39	1.333	1.38	1.49	1.38	1.417
3	2.33	1.42	1.38	1.39	1.397	1.66	1.63	1.52	1.603
4	3.88	1.43	1.46	1.45	1.447	1.60	1.56	1.50	1.553
Center	6.00	1.58	1.61	1.63	1.607	1.60	1.63	1.51	1.580
5	8.12	1.69	1.79	1.76	1.747	1.62	1.69	1.60	1.637
6	9.67	1.73	1.78	1.84	1.783	1.64	1.59	1.55	1.593
7	10.74	1.83	1.80	1.80	1.810	1.57	1.67	1.58	1.607
8	11.50	1.83	1.83	1.81	1.823	1.59	1.60	--	1.595
Averages ----->		1.566	1.589	1.606	1.587	1.58	1.60	1.52	1.568

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1.58		Mean	1.59	1.57	1.58
Min Point	1.33	-15.5%	Std. Dev.	0.20	0.07	0.14
Max Point	1.82	15.6%	COV as %	12.4	4.6	9.1

Avg. Conc. 1.576 ppm

Gas analyzer checked:

11/27/2006

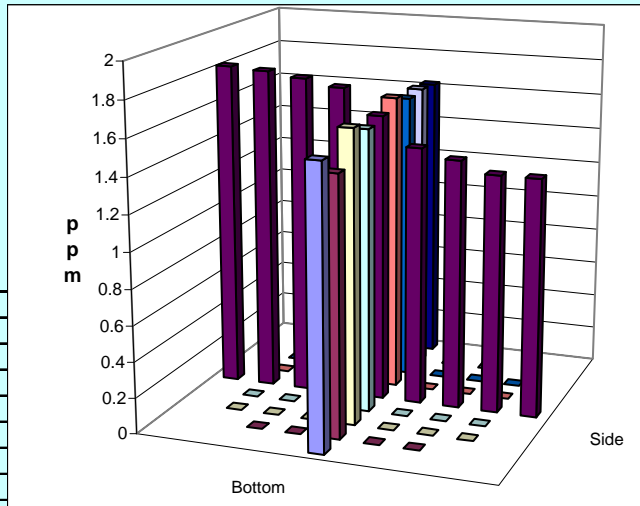
	Start	Finish	
Tracer tank pressure	180	180	psig
Stack Temp	34	34	F°
Center Pt. air vel.	1510	1570	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	30.12	30.12	in Hg
Ambient humidity	67	67	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	11, 10, 12, 12	14, 16, 16, 11	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	26	32	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: Only off about 5 min. before recording ending background

Last value on 3rd Bottom transect is missing - field recording error



Signature signifies compliance with Procedure EMS-JAG-01
 Signature/date

Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT16
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **12/1/2006**
 Tester **BGF**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-17**
 Fan Configuration **A** w/ 3M filterete prefilers
 Fan Setting **35 Hz**
 Stack Temp **34 deg F**
 Start/End Time **1245 -- 1315**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far right**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.53	1.55	1.59	1.557	1.62	1.67	1.62	1.637
2	1.26	1.66	1.56	1.54	1.587	1.60	1.65	1.60	1.617
3	2.33	1.57	1.61	1.55	1.577	1.60	1.71	1.64	1.650
4	3.88	1.62	1.56	1.58	1.587	1.68	1.63	1.61	1.640
Center	6.00	1.58	1.64	1.63	1.617	1.60	1.65	1.56	1.603
5	8.12	1.58	1.62	1.63	1.610	1.52	1.50	1.52	1.513
6	9.67	1.57	1.60	1.57	1.580	1.57	1.52	1.52	1.537
7	10.74	1.56	1.54	1.58	1.560	1.51	1.46	1.49	1.487
8	11.50	1.54	1.60	1.55	1.563	1.50	1.43	1.50	1.477
Averages ----->		1.579	1.587	1.580	1.582	1.58	1.58	1.56	1.573

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1.58		Mean	1.59	1.58	1.58
Min Point	1.48	-6.4%	Std. Dev.	0.02	0.07	0.05
Max Point	1.65	4.6%	COV as %	1.2	4.1	2.9

Avg. Conc. 1.574 ppm

Gas analyzer checked:

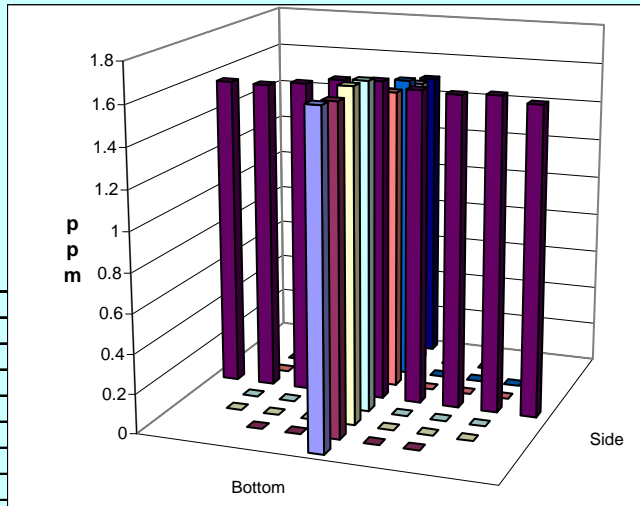
11/27/2006

	Start	Finish	
Tracer tank pressure	180	180	psig
Stack Temp	34	34	F°
Center Pt. air vel.	1570	1510	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	30.12	30.10	in Hg
Ambient humidity	67	60	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	14,16,16,11	10,9,6,11,11	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	32	33	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



Signature signifies compliance with
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 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT17
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-18
Date	12/1/2006	Fan Configuration	B on A off w/ 3M filterete prefilters
Tester	BGF	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	34.5 deg F
Stack X-Area	113.1 in.²	Start/End Time	1315 -- 1400
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	82 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	B center
	1st		2nd

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.62	1.64	1.61	1.623	1.54	1.53	1.54	1.537
2	1.26	1.58	1.61	1.62	1.603	1.51	1.54	1.54	1.530
3	2.33	1.65	1.64	1.63	1.640	1.55	1.60	1.57	1.573
4	3.88	1.61	1.64	1.63	1.627	1.55	1.56	1.55	1.553
Center	6.00	1.66	1.61	1.57	1.613	1.60	1.63	1.62	1.617
5	8.12	1.57	1.55	1.58	1.567	1.60	1.68	1.64	1.640
6	9.67	1.56	1.54	1.55	1.550	1.64	1.60	1.60	1.613
7	10.74	1.49	1.50	1.46	1.483	1.62	1.59	1.57	1.593
8	11.50	1.51	1.53	1.44	1.493	1.56	1.55	1.54	1.550
Averages ----->		1.583	1.584	1.566	1.578	1.57	1.59	1.57	1.579

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1.58		Mean	1.58	1.59	1.59
Min Point	1.48	-6.0%	Std. Dev.	0.05	0.04	0.05
Max Point	1.64	3.9%	COV as %	3.4	2.4	2.9

Avg. Conc. 1.574 ppm

Gas analyzer checked:

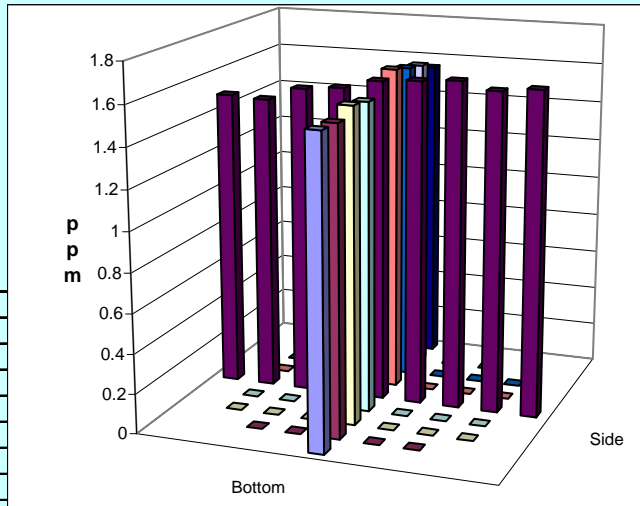
11/27/2006

	Start	Finish	
Tracer tank pressure	180	200	psig
Stack Temp	34	35	F°
Center Pt. air vel.	1660	1610	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	30.1	30.1	in Hg
Ambient humidity	60	60	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	10, 9.6, 11, 11	14, 13, 13, 14	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	33	33	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

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GT18
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **12/1/2006**
 Tester **JGD**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 2**
 Distance to disturbance **113.75 inches**
 Measurement units **ppm SF6**

Run No. **GT-19**
 Fan Configuration **A & B** w/ 3M filterete prefilters
 Fan Setting **40 Hz**
 Stack Temp **31.5 deg F**
 Start/End Time **1445 -- 1600**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far right**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	4	2	3	Mean
		ppm							
1	0.50	0.940	0.948	0.959	0.949	0.775	0.681	0.725	0.727
2	1.26	0.999	0.889	0.910	0.933	0.714	0.810	0.710	0.745
3	2.33	0.946	0.857	0.814	0.872	0.742	0.775	0.791	0.769
4	3.88	0.839	0.822	0.883	0.848	0.807	0.777	0.803	0.796
Center	6.00	0.834	0.825	0.797	0.819	0.769	0.856	0.810	0.812
5	8.12	0.667	0.684	0.702	0.684	0.713	0.761	0.749	0.741
6	9.67	0.588	0.592	0.585	0.588	0.700	0.675	0.721	0.699
7	10.74	0.539	0.534	0.488	0.520	0.654	0.730	0.744	0.709
8	11.50	0.468	0.472	0.511	0.484	0.655	0.644	0.664	0.654
Averages ----->		0.758	0.736	0.739	0.744	0.73	0.75	0.75	0.739

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.74		Mean	0.75	0.75	0.75
Min Point	0.48	-34.8%	Std. Dev.	0.16	0.04	0.11
Max Point	0.95	28.0%	COV as %	20.7	5.6	14.6

Avg. Conc. 0.732 ppm

Gas analyzer checked:

11/27/2006

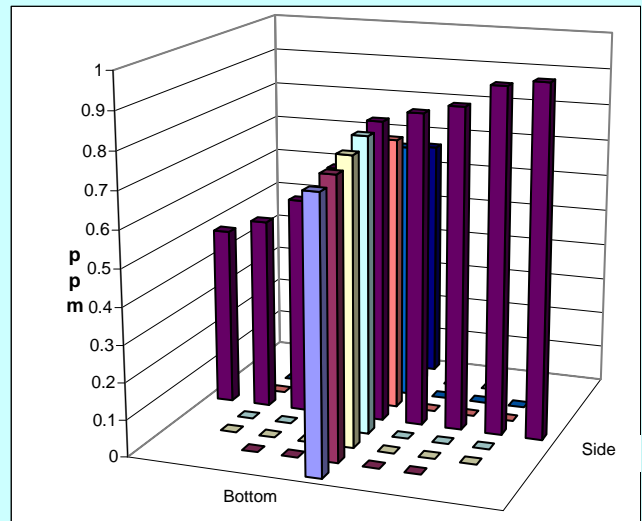
	Start	Finish	
Tracer tank pressure	180	190	psig
Stack Temp	32	31	F°
Center Pt. air vel.	3510	3460	ft/min
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	30.12	30.14	in Hg
Ambient humidity	66	69	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	15, 13, 12, 11	18, 13, 12, 13	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	30	27	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:

An extra set of bottom readings were recorded
 Suspect value in Bottom 1 - likely should
 not be used - use 2, 3, 4
 Concentration data changed to ppm units



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Procedure EMS-JAG-01

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Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

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 GT19
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TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-20
Date	12/4/2006	Fan Configuration	A&B ON w/ 3M filterete prefilers
Tester	BG Fritz	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	62 deg F
Stack X-Area	113.1 in. ²	Start/End Time	13:00-14:00
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	174.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	A far right 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.879	0.911	1.05	0.947	0.706	0.678	0.705	0.696
2	1.26	0.932	0.92	0.884	0.912	0.729	0.689	0.767	0.728
3	2.33	0.886	0.908	0.905	0.900	0.712	0.806	0.792	0.770
4	3.88	0.865	0.898	0.877	0.880	0.853	0.822	0.852	0.842
Center	6.00	0.795	0.858	0.847	0.833	0.857	0.83	0.875	0.854
5	8.12	0.724	0.750	0.720	0.731	0.904	0.807	0.816	0.842
6	9.67	0.702	0.704	0.658	0.688	0.816	0.845	0.838	0.833
7	10.74	0.665	0.653	0.562	0.627	0.921	0.871	0.757	0.850
8	11.50	0.732	0.610	0.606	0.649	0.924	0.864	0.885	0.891
Averages ----->		0.798	0.801	0.790	0.796	0.825	0.801	0.810	0.812

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.80		Mean	0.80	0.82	0.81
Min Point	0.63	-22.1%	Std. Dev.	0.11	0.05	0.08
Max Point	0.95	17.7%	COV as %	14.3	5.9	10.5

Avg. Conc. 0.799 ppm

Gas analyzer checked:

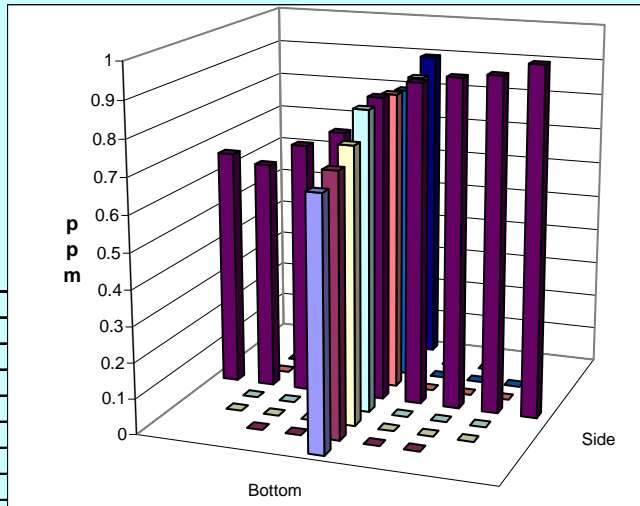
12/4/2006

	Start	Finish	
Tracer tank pressure	180	180	psig
Stack Temp	62	62	F°
Center Pt. air vel.	3200	3260.0	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	30.03	30.03	in Hg
Ambient humidity	79	79	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	14, 10, 11, 12	17, 15, 15, 12	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	25	25	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes: Duct Heaters ON



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Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

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GT20
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **12/4/2006**
 Tester **BG Fritz**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-21**
 Fan Configuration **A&B on w/ 3M filterete prefilters**
 Fan Setting **40 Hz**
 Stack Temp **57.5 deg F**
 Start/End Time **14:00- 14:45**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **B center**

Traverse-->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.785	0.673	0.723	0.727	0.554	0.589	0.596	0.580
2	1.26	0.698	0.664	0.675	0.679	0.513	0.558	0.517	0.529
3	2.33	0.697	0.712	0.719	0.709	0.57	0.551	0.565	0.562
4	3.88	0.632	0.654	0.655	0.647	0.652	0.606	0.655	0.638
Center	6.00	0.712	0.797	0.687	0.732	0.732	0.772	0.803	0.769
5	8.12	0.806	0.846	0.788	0.813	1.01	0.922	0.885	0.939
6	9.67	0.914	1.01	0.932	0.952	1.04	1.13	1.06	1.077
7	10.74	0.961	1.04	1.03	1.010	1.18	1.11	1.22	1.170
8	11.50	0.958	1.08	0.998	1.012	1.23	1.06	1.17	1.153
Averages ----->		0.796	0.831	0.801	0.809	0.831	0.811	0.830	0.824

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.82		Mean	0.79	0.81	0.80
Min Point	0.53	-35.2%	Std. Dev.	0.14	0.25	0.20
Max Point	1.17	43.3%	COV as %	17.7	31.4	24.7

Avg. Conc. 0.825 ppm

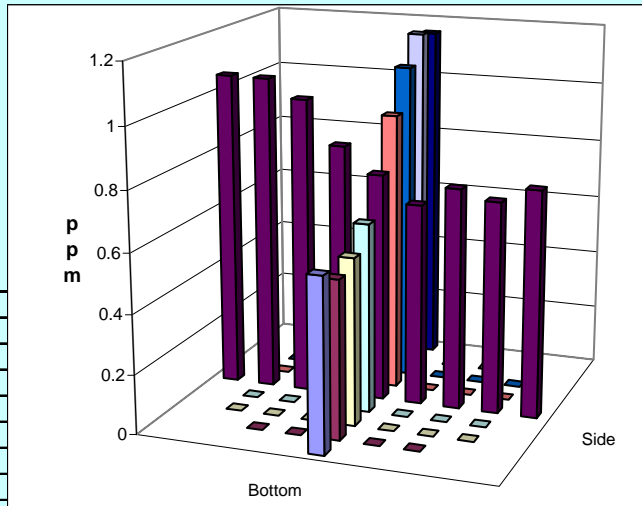
Gas analyzer checked:
12/4/2006

	Start	Finish	
Tracer tank pressure	180	180	psig
Stack Temp	57	58	F°
Center Pt. air vel.	3250.0	3320.0	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	30.03	30.03	in Hg
Ambient humidity	79	79	RH
B&K vapor correction	no	no	Y/N
Back-Gd gas ppb	17, 15, 15, 12	17, 18, 17, 16	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	25	28	

Instuments Used:

B&K 1302 Gas Analyzer SN 1765299 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: Duct Heaters ON



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Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

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 GT21
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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-22
Date	1/17/2007	Fan Configuration	A & B w/ 3M filterete prefilters
Tester	BGF, MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	50 deg F
Stack X-Area	113.1 in. ²	Start/End Time	1340 -- 1501
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	A near right
	1st		2nd

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.871	0.862	0.811	0.848	1.140	1.050	1.130	1.107
2	1.26	0.801	0.828	0.857	0.829	1.420	1.140	1.170	1.243
3	2.33	0.859	0.922	0.989	0.923	1.300	1.000	1.110	1.137
4	3.88	1.280	1.080	0.955	1.105	1.150	1.080	1.280	1.170
Center	6.00	0.933	1.060	1.010	1.001	1.030	1.030	1.060	1.040
5	8.12	0.952	0.826	1.070	0.949	0.937	0.823	0.899	0.886
6	9.67	0.902	0.898	0.967	0.922	0.812	0.687	0.938	0.812
7	10.74	0.860	0.782	0.764	0.802	0.613	0.746	0.761	0.707
8	11.50	0.751	0.850	0.729	0.777	0.687	0.475	0.608	0.590
Averages ----->		0.912	0.901	0.906	0.906	1.01	0.89	1.00	0.966

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.94		Mean	0.93	1.00	0.97
Min Point	0.59	-37.0%	Std. Dev.	0.10	0.20	0.16
Max Point	1.24	32.8%	COV as %	11.0	20.1	16.3

Avg. Conc. 0.925 ppm

Gas analyzer checked:

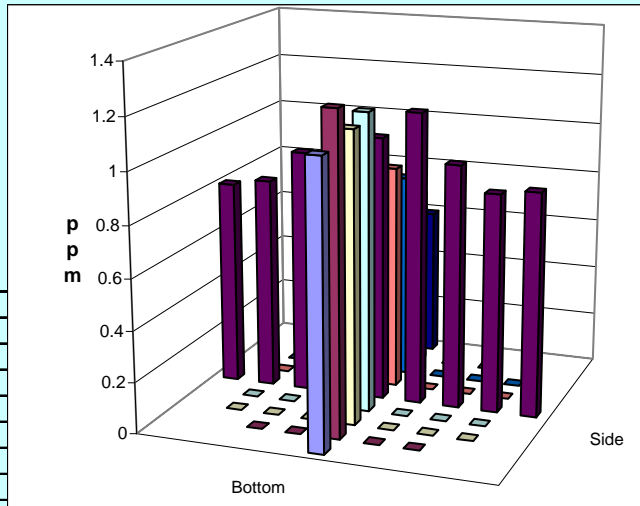
1/16/2007

	Start	Finish	
Tracer tank pressure	100	100	psig
Stack Temp	50	50	F°
Center Pt. air vel.	3050	3020	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1016.0	1016.0	mb
Ambient humidity	30	35	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	19,13,20,16	23,24,22,31	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	51	47	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes: Ambient pressure in hPa



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Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

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GT22
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/17/2007**
 Tester **MSP**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-23**
 Fan Configuration **A & B** w/ 3M filterete prefilters
 Fan Setting **40 Hz**
 Stack Temp **50.5 deg F**
 Start/End Time **1505 -- 1555**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A near left**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.988	0.958	1.13	1.025	0.96	1.12	1.05	1.043
2	1.26	0.983	1.01	0.872	0.955	0.964	1.05	1.02	1.011
3	2.33	1.05	1.03	0.812	0.964	0.933	0.876	1	0.936
4	3.88	1.06	0.921	0.938	0.973	1	0.756	0.822	0.859
Center	6.00	0.937	0.913	1.09	0.980	1.03	0.913	0.911	0.951
5	8.12	0.762	0.904	1.04	0.902	0.887	0.924	0.89	0.900
6	9.67	0.961	0.759	0.869	0.863	0.854	0.886	0.927	0.889
7	10.74	0.833	0.902	0.806	0.847	0.908	0.871	0.938	0.906
8	11.50	0.883	0.856	0.784	0.841	0.853	0.835	0.762	0.817
Averages ----->		0.940	0.917	0.927	0.928	0.93	0.91	0.92	0.924

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.93		Mean	0.93	0.92	0.92
Min Point	0.82	-11.8%	Std. Dev.	0.06	0.05	0.05
Max Point	1.04	12.7%	COV as %	5.9	5.4	5.5

Avg. Conc. 0.921 ppm

Gas analyzer checked:

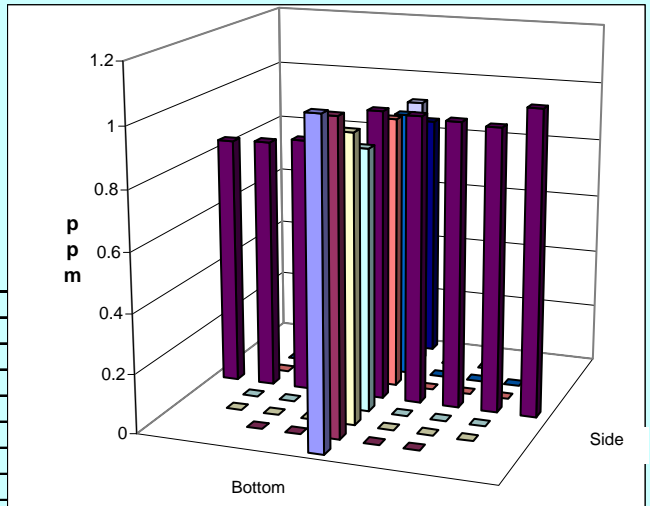
1/16/2007

	Start	Finish	
Tracer tank pressure	100	100	psig
Stack Temp	50	51	F°
Center Pt. air vel.	3020	3020	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1016.0	1017.0	mb
Ambient humidity	35	34	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	21,23,20,19	24,25,31,26	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	47	48	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: Ambient pressure in hPa



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 GT23
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TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/17/2007**
 Tester **MSP**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-24**
 Fan Configuration **A & B** w/ 3M filterete prefilters
 Fan Setting **40 Hz**
 Stack Temp **51 deg F**
 Start/End Time **1558 -- 1650**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far left**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.816	0.810	0.719	0.782	0.943	1.060	1.030	1.011
2	1.26	0.745	0.738	0.824	0.769	0.943	0.892	1.000	0.945
3	2.33	0.756	0.800	0.717	0.758	0.972	0.917	1.070	0.986
4	3.88	0.936	0.781	0.905	0.874	0.866	1.040	0.979	0.962
Center	6.00	1.060	0.914	0.861	0.945	0.948	0.935	0.900	0.928
5	8.12	0.940	0.952	0.998	0.963	0.872	0.857	0.916	0.882
6	9.67	1.150	1.050	1.050	1.083	0.977	0.910	0.919	0.935
7	10.74	0.829	1.190	1.140	1.053	1.020	0.911	0.929	0.953
8	11.50	0.899	1.290	1.180	1.123	0.763	1.060	1.100	0.974
Averages ----->		0.903	0.947	0.933	0.928	0.92	0.95	0.98	0.953

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.94		Mean	0.92	0.94	0.93
Min Point	0.76	-19.4%	Std. Dev.	0.13	0.03	0.09
Max Point	1.12	19.4%	COV as %	13.9	3.5	9.7

Avg. Conc. 0.941 ppm

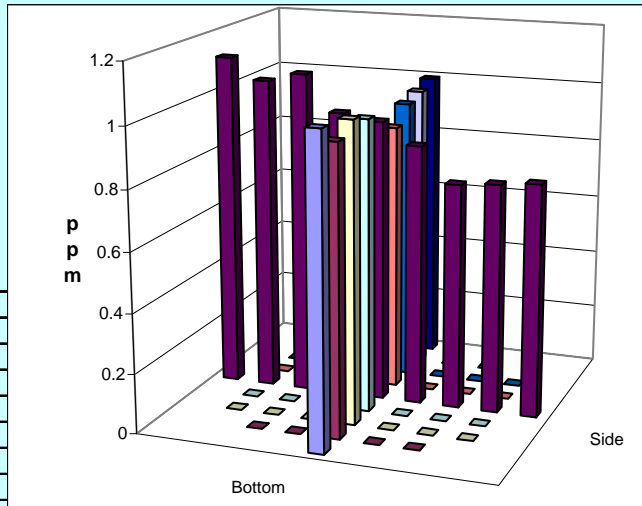
Gas analyzer checked:
1/16/2007

	Start	Finish	
Tracer tank pressure	100	100	psig
Stack Temp	51	51	F°
Center Pt. air vel.	3020	3060	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1017.0	1017.0	mb
Ambient humidity	35	34	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	25,21,29,22	21,25,35,26	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	48	48	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: Ambient pressure in hPa



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Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

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 GT24
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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/18/2007**
 Tester **MSP**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-25**
 Fan Configuration **A & B** w/ 3M filterete prefilers
 Fan Setting **40** Hz
 Stack Temp **54.5 deg F**
 Start/End Time **1239 -- 1345**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far right**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.538	0.711	0.637	0.629	1.100	1.060	0.804	0.988
2	1.26	0.555	0.759	0.868	0.727	1.300	1.180	1.130	1.203
3	2.33	0.816	0.805	0.658	0.760	1.420	1.300	1.580	1.433
4	3.88	0.995	0.954	1.160	1.036	1.090	1.410	1.110	1.203
Center	6.00	1.180	1.210	1.090	1.160	1.080	1.070	1.110	1.087
5	8.12	1.080	1.170	1.230	1.160	0.997	1.070	0.789	0.952
6	9.67	0.962	1.030	1.010	1.001	0.725	0.881	0.788	0.798
7	10.74	0.971	0.925	1.000	0.965	0.470	0.722	0.533	0.575
8	11.50	0.745	0.837	0.812	0.798	0.503	0.345	0.349	0.399
Averages ----->		0.871	0.933	0.941	0.915	0.97	1.00	0.91	0.960

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.94		Mean	0.97	1.04	1.00
Min Point	0.40	-57.4%	Std. Dev.	0.17	0.29	0.23
Max Point	1.43	52.9%	COV as %	17.8	27.7	22.9

Avg. Conc. 0.914 ppm

Gas analyzer checked:

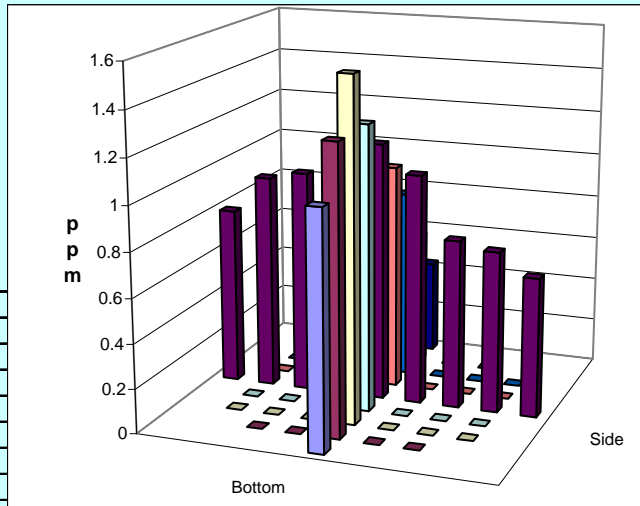
1/16/2007

	Start	Finish	
Tracer tank pressure	100	100	psig
Stack Temp	55	54	F°
Center Pt. air vel.	3130	3080	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1015.0	1015.0	mb
Ambient humidity	26	32	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	32,37,34,28	21,29,28,24	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	60	53	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: Ambient pressure in hPa



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 31 July 2006

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 GT25
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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/18/2007**
 Tester **MSP**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-26**
 Fan Configuration **A & B** w/ 3M filterete prefilers
 Fan Setting **40 Hz**
 Stack Temp **56.5 deg F**
 Start/End Time **1345 -- 1440**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A center**
1st **2nd**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.787	0.822	0.896	0.835	0.780	0.683	0.881	0.781
2	1.26	1.010	1.010	0.828	0.949	0.836	0.714	0.760	0.770
3	2.33	0.871	0.834	0.939	0.881	0.717	0.781	0.836	0.778
4	3.88	0.923	0.873	0.898	0.898	0.787	0.842	0.845	0.825
Center	6.00	0.826	0.943	1.010	0.926	0.880	0.964	0.886	0.910
5	8.12	0.882	0.944	1.030	0.952	1.140	1.010	0.888	1.013
6	9.67	0.993	0.949	1.010	0.984	0.996	1.030	1.190	1.072
7	10.74	1.060	0.894	1.020	0.991	1.040	1.260	1.010	1.103
8	11.50	0.852	1.080	0.948	0.960	1.190	1.030	1.080	1.100
Averages ----->		0.912	0.928	0.953	0.931	0.93	0.92	0.93	0.928

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.93		Mean	0.94	0.92	0.93
Min Point	0.77	-17.2%	Std. Dev.	0.04	0.14	0.10
Max Point	1.10	18.7%	COV as %	4.4	15.1	10.6

Avg. Conc. 0.931 ppm

Gas analyzer checked:

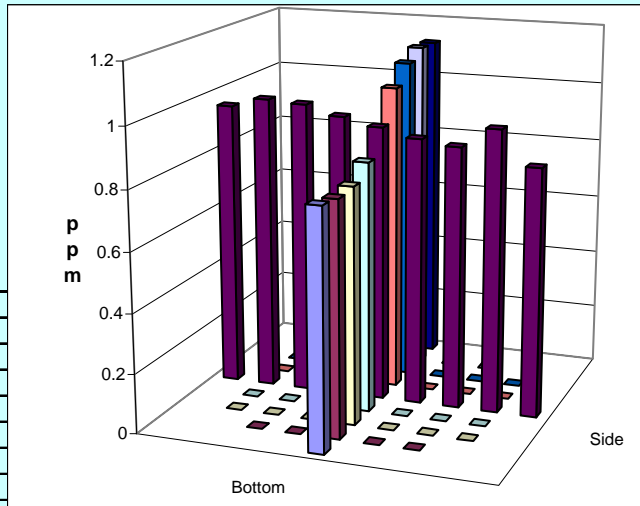
1/16/2007

	Start	Finish	
Tracer tank pressure	100	100	psig
Stack Temp	54	59	F°
Center Pt. air vel.	3080	3010	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1015.0	1015.0	mb
Ambient humidity	32	32	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	17,19,20,18	25,21,27,23	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	53	53	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: Ambient pressure in hPa



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TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/18/2007**
 Tester **MSP**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 2**
 Distance to disturbance **113.75 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-27**
 Fan Configuration **A & B** w/ 3M filterete prefilers
 Fan Setting **40 Hz**
 Stack Temp **56 deg F**
 Start/End Time **1450 -- 1540**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A center**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.891	0.973	1.000	0.955	0.897	0.840	0.795	0.844
2	1.26	0.968	0.894	1.020	0.961	0.840	0.824	0.780	0.815
3	2.33	0.960	0.955	0.930	0.948	0.810	0.886	0.809	0.835
4	3.88	0.960	0.935	0.978	0.958	0.888	0.882	0.850	0.873
Center	6.00	0.926	0.939	0.932	0.932	0.935	0.950	0.870	0.918
5	8.12	0.951	0.927	0.946	0.941	0.942	0.969	1.030	0.980
6	9.67	0.999	1.000	0.950	0.983	0.974	1.050	1.060	1.028
7	10.74	0.963	0.953	0.933	0.950	1.110	1.000	1.080	1.063
8	11.50	0.968	0.968	0.982	0.973	1.040	1.030	1.110	1.060
Averages ----->		0.954	0.949	0.963	0.956	0.94	0.94	0.93	0.935

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.95		Mean	0.95	0.93	0.94
Min Point	0.81	-13.8%	Std. Dev.	0.02	0.10	0.07
Max Point	1.06	12.5%	COV as %	1.7	10.3	7.2

Avg. Conc. 0.948 ppm

Gas analyzer checked:

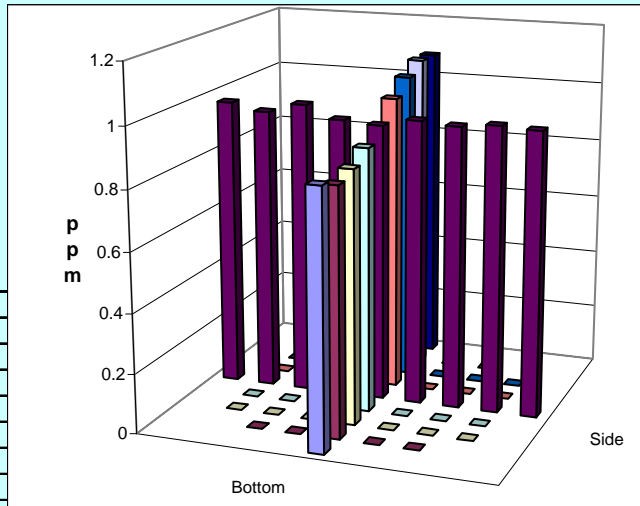
1/16/2007

	Start	Finish	
Tracer tank pressure	100	100	psig
Stack Temp	56	56	F°
Center Pt. air vel.	3120	3130	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1015.0	1015.0	mb
Ambient humidity	31	34	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	19,22,20,19	22,22,22,20	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	53	52	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: Ambient pressure in hPa



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Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

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 GT27
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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/18/2007**
 Tester **MSP**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 2**
 Distance to disturbance **113.75 inches**
 Measurement units **ppm SF6**

Run No. **GT-28**
 Fan Configuration **A & B** w/ 3M filterete prefilters
 Fan Setting **40** Hz
 Stack Temp **56 deg F**
 Start/End Time **1543 -- 1640**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far left**
1st **2nd**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.852	0.898	0.870	0.873	0.955	1.020	1.070	1.015
2	1.26	0.865	0.864	0.918	0.882	0.921	0.923	0.874	0.906
3	2.33	0.836	0.882	0.836	0.851	0.844	0.812	0.950	0.869
4	3.88	0.899	0.864	0.935	0.899	0.935	0.911	0.873	0.906
Center	6.00	0.910	0.919	0.985	0.938	0.959	0.957	0.900	0.939
5	8.12	0.928	1.010	0.937	0.958	0.947	0.883	0.990	0.940
6	9.67	0.955	1.020	0.990	0.988	0.951	0.943	0.965	0.953
7	10.74	1.060	1.050	0.991	1.034	0.914	0.995	0.966	0.958
8	11.50	0.997	1.030	1.050	1.026	1.030	0.941	1.050	1.007
Averages ----->		0.922	0.949	0.946	0.939	0.94	0.93	0.96	0.944

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.94		Mean	0.94	0.92	0.93
Min Point	0.85	-9.6%	Std. Dev.	0.06	0.03	0.05
Max Point	1.03	9.8%	COV as %	6.8	3.5	5.2

Avg. Conc. 0.942 ppm

Gas analyzer checked:

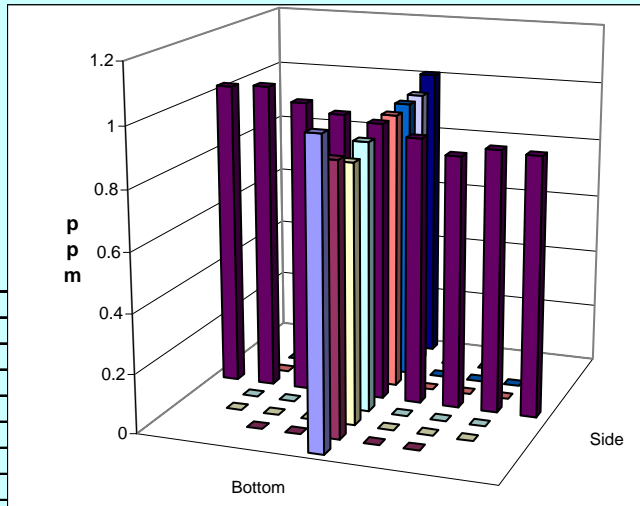
1/16/2007

	Start	Finish	
Tracer tank pressure	100	100	psig
Stack Temp	56	56	F°
Center Pt. air vel.	3130	3040	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1015.0	1015.0	mb
Ambient humidity	34	32	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	21,23,19,22	24,23,16,20	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	52	53	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: Ambient pressure in hPa



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 31 July 2006

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 GT28
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TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-29
Date	1/19/2007	Fan Configuration	A & B w/ 3M filterete prefilters
Tester	BGF	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	56.5 deg F
Stack X-Area	113.1 in. ²	Start/End Time	0820 -- 0940
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	113.75 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	A far right
	2nd		1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.684	0.736	0.639	0.686	1.070	1.070	0.992	1.044
2	1.26	0.767	0.771	0.749	0.762	1.060	1.010	1.090	1.053
3	2.33	0.771	0.922	0.861	0.851	0.946	1.140	1.090	1.059
4	3.88	0.952	0.962	0.998	0.971	0.968	0.950	0.972	0.963
Center	6.00	1.010	1.040	1.050	1.033	0.995	1.030	1.070	1.032
5	8.12	1.090	1.060	1.080	1.077	0.964	0.885	0.929	0.926
6	9.67	1.110	0.945	0.932	0.996	0.842	0.841	0.885	0.856
7	10.74	1.170	0.991	1.060	1.074	0.760	0.937	0.994	0.897
8	11.50	1.070	1.090	1.080	1.080	0.896	0.912	0.827	0.878
Averages ----->		0.958	0.946	0.939	0.948	0.94	0.98	0.98	0.968

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.96		Mean	0.97	0.97	0.97
Min Point	0.69	-28.3%	Std. Dev.	0.12	0.08	0.10
Max Point	1.08	12.8%	COV as %	12.2	8.3	10.0

Avg. Conc. 0.948 ppm

Gas analyzer checked:

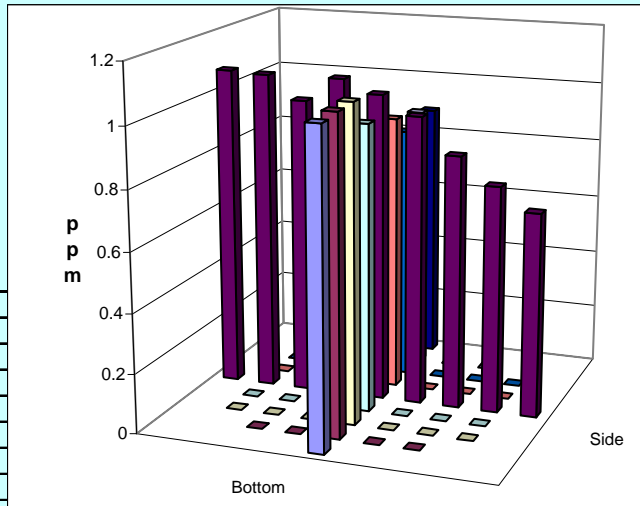
1/16/2007

	Start	Finish	
Tracer tank pressure	150	150	psig
Stack Temp	58	55	F°
Center Pt. air vel.	3010	2880	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1009.0	1009.0	mb
Ambient humidity	26	33	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	13,15,13,12	22,21,17,22	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	59	48	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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 gas-dataRev0.xls
 31 July 2006

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 GT29
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-30
Date	1/19/2007	Fan Configuration	A & B w/ 3M filterete prefilters
Tester	BGF, JGD	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	55 deg F
Stack X-Area	113.1 in. ²	Start/End Time	0950 -- 1030
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	113.75 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	A near right
	1st		2nd

Trial ---->		Side				Bottom			
Point	Depth, in.	1	2	3	Mean	1	2	3	Mean
		ppm				ppm			
1	0.50	0.895	0.982	0.955	0.944	0.997	0.844	0.903	0.915
2	1.26	0.951	0.973	0.835	0.920	1.030	1.140	0.968	1.046
3	2.33	0.992	1.160	0.949	1.034	1.010	0.867	0.967	0.948
4	3.88	1.050	1.020	0.942	1.004	0.996	0.998	1.020	1.005
Center	6.00	0.936	0.970	0.878	0.928	0.962	1.010	1.090	1.021
5	8.12	1.030	1.010	0.870	0.970	0.967	1.020	1.000	0.996
6	9.67	0.960	0.849	0.913	0.907	0.929	1.020	0.992	0.980
7	10.74	0.879	0.872	0.881	0.877	0.880	0.912	0.866	0.886
8	11.50	0.871	0.880	0.876	0.876	0.934	0.952	0.863	0.916
Averages ----->		0.952	0.968	0.900	0.940	0.97	0.97	0.96	0.968

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.95		Mean	0.95	0.98	0.97
Min Point	0.88	-8.2%	Std. Dev.	0.06	0.05	0.06
Max Point	1.05	9.6%	COV as %	5.9	5.4	5.7

Avg. Conc. 0.951 ppm

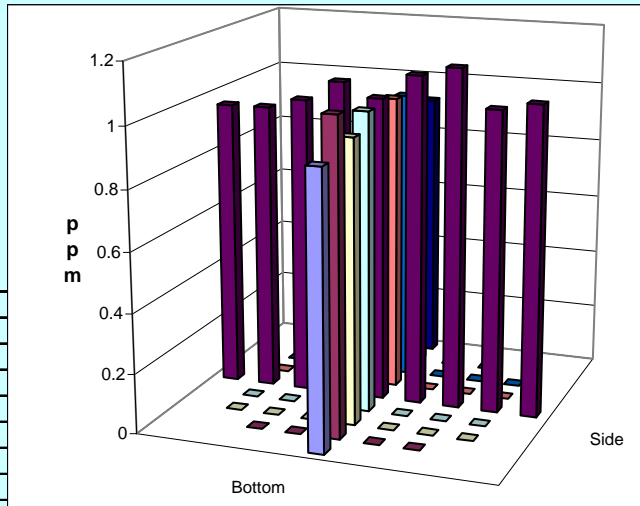
Gas analyzer checked:
1/16/2007

	Start	Finish	
Tracer tank pressure	150	110	psig
Stack Temp	55	55	F°
Center Pt. air vel.	2880	3000	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1009.0	1009.0	mb
Ambient humidity	33	23	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	22,21,17,22	32,27,25,27	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	48	56	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



Signature signifies compliance with Procedure EMS-JAG-01
Signature/Date

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Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT30
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/19/2007**
 Tester **JGD**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 2**
 Distance to disturbance **113.75 inches**
 Measurement units **ppm SF6**
 2nd

Run No. **GT-31**
 Fan Configuration **A & B** w/ 3M filterete prefilters
 Fan Setting **40 Hz**
 Stack Temp **55 deg F**
 Start/End Time **1045 -- 1130**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far left**
 1st

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.892	0.899	0.883	0.891	0.939	0.912	0.872	0.908
2	1.26	0.828	0.854	0.911	0.864	0.891	0.982	0.962	0.945
3	2.33	0.898	0.967	0.911	0.925	0.930	0.921	0.899	0.917
4	3.88	0.900	0.868	0.897	0.888	0.932	0.954	0.922	0.936
Center	6.00	0.988	0.973	0.917	0.959	0.969	0.903	0.959	0.944
5	8.12	0.971	0.929	1.010	0.970	0.917	0.947	0.951	0.938
6	9.67	1.050	0.994	1.010	1.018	0.990	0.979	0.961	0.977
7	10.74	0.975	1.020	1.030	1.008	1.010	0.953	1.010	0.991
8	11.50	1.060	1.060	1.110	1.077	0.952	0.989	1.010	0.984
Averages ----->		0.951	0.952	0.964	0.956	0.95	0.95	0.95	0.949

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.95		Mean	0.95	0.95	0.95
Min Point	0.86	-9.2%	Std. Dev.	0.06	0.03	0.04
Max Point	1.08	13.1%	COV as %	6.1	2.7	4.5

Avg. Conc. 0.952 ppm

Gas analyzer checked:

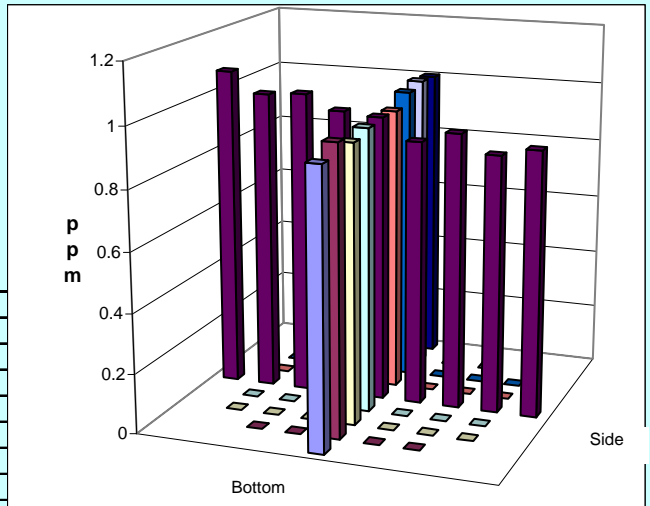
1/16/2007

	Start	Finish	
Tracer tank pressure	110	110	psig
Stack Temp	55	55	F°
Center Pt. air vel.	3000	3020	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1008.0	1007.0	mb
Ambient humidity	23	22	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	15,13,18,17	18,24,19,20	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	56	58	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



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Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT31
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/19/2007**
 Tester **JGD, MSP**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 3**
 Distance to disturbance **174.25 inches**
 Measurement units **ppm SF6**

Run No. **GT-32**
 Fan Configuration **A & B w/ 3M filterete prefilers**
 Fan Setting **40 Hz**
 Stack Temp **57 deg F**
 Start/End Time **1145 -- 1240**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A far left**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.898	0.857	0.972	0.909	0.956	0.916	0.919	0.930
2	1.26	0.864	0.857	1.040	0.920	0.954	0.965	0.974	0.964
3	2.33	0.914	0.920	0.911	0.915	0.926	0.979	0.964	0.956
4	3.88	0.965	0.980	0.926	0.957	0.869	0.894	1.020	0.928
Center	6.00	0.988	0.919	0.966	0.958	0.926	0.887	0.907	0.907
5	8.12	0.923	1.020	0.965	0.969	0.956	0.913	0.993	0.954
6	9.67	1.010	0.950	1.010	0.990	1.020	1.010	0.984	1.005
7	10.74	0.951	1.060	0.991	1.001	0.909	0.997	0.929	0.945
8	11.50	0.950	1.130	0.979	1.020	1.030	0.992	0.950	0.991
Averages ----->		0.940	0.966	0.973	0.960	0.95	0.95	0.96	0.953

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.96		Mean	0.96	0.95	0.95
Min Point	0.91	-5.2%	Std. Dev.	0.03	0.03	0.03
Max Point	1.02	6.6%	COV as %	3.4	3.2	3.2

Avg. Conc. 0.960 ppm

Gas analyzer checked:

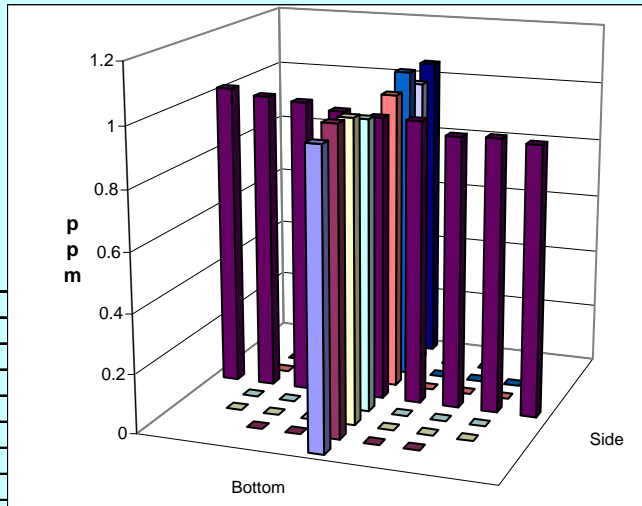
1/16/2007

	Start	Finish	
Tracer tank pressure	110	110	psig
Stack Temp	56	58	F°
Center Pt. air vel.	3020	3000	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1007.0	1006.0	mb
Ambient humidity	22	32	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	18,24,14,20	26,28,20,25	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	58	56	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



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Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

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 GT32
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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-33	
Date	1/19/2007		Fan Configuration	A & B w/ 3M filterete prefilters	
Tester	MSP		Fan Setting	40 Hz	
Stack Dia.	12 in.		Stack Temp	57.5 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	1242 -- 1330	
Elevation	Port 3		Center 2/3 from	1.10	to: 10.90
Distance to disturbance	174.25 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	A far right	
	2nd			1st	

Traverse-->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.903	0.928	0.935	0.922	0.878	0.928	0.897	0.901
2	1.26	0.991	0.888	0.929	0.936	0.903	0.905	0.925	0.911
3	2.33	0.868	0.976	0.934	0.926	0.976	0.932	0.995	0.968
4	3.88	0.877	0.867	0.971	0.905	0.889	0.910	1.030	0.943
Center	6.00	0.873	0.959	0.937	0.923	0.904	1.080	0.902	0.962
5	8.12	0.931	1.000	0.997	0.976	0.935	0.937	0.931	0.934
6	9.67	0.922	1.030	0.948	0.967	0.929	1.080	0.931	0.980
7	10.74	0.949	0.948	0.943	0.947	0.874	0.894	0.942	0.903
8	11.50	0.965	0.946	1.070	0.994	0.908	0.896	0.901	0.902
Averages ----->		0.920	0.949	0.963	0.944	0.91	0.95	0.94	0.934

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.94		Mean	0.94	0.94	0.94
Min Point	0.90	-4.0%	Std. Dev.	0.03	0.03	0.03
Max Point	0.99	5.8%	COV as %	2.7	3.1	2.8

Avg. Conc. 0.938 ppm

Gas analyzer checked:

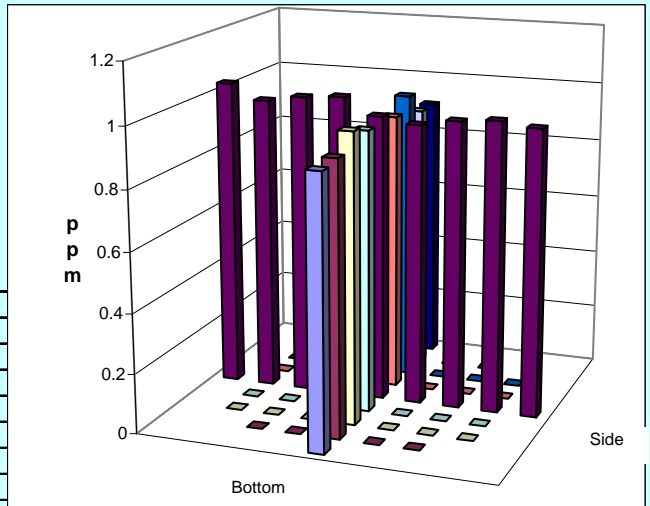
1/16/2007

	Start	Finish	
Tracer tank pressure	110	110	psig
Stack Temp	58	57	F°
Center Pt. air vel.	3000	3020	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1006.0	1006.0	mb
Ambient humidity	32	30	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	22,20,20,24	27,25,26,20	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	56	59	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT33
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-34	
Date	1/19/2007		Fan Configuration	A & B w/ 3M filterete prefilters	
Tester	MSP		Fan Setting	40 Hz	
Stack Dia.	12 in.		Stack Temp	57 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	1335 -- 1415	
Elevation	Port 3		Center 2/3 from	1.10	to: 10.90
Distance to disturbance	174.25 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	A center	
				2nd	

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.970	0.943	0.936	0.950	0.902	0.856	0.912	0.890
2	1.26	0.998	0.953	0.935	0.962	0.918	0.956	0.899	0.924
3	2.33	0.970	0.966	0.927	0.954	0.903	0.891	0.982	0.925
4	3.88	0.954	0.954	0.938	0.949	0.932	0.939	0.910	0.927
Center	6.00	0.995	0.964	0.980	0.980	0.965	0.965	0.957	0.962
5	8.12	0.941	0.936	0.931	0.936	0.994	0.976	0.995	0.988
6	9.67	0.911	0.938	0.952	0.934	0.952	1.020	1.020	0.997
7	10.74	0.950	0.933	0.939	0.941	1.020	1.010	1.040	1.023
8	11.50	0.946	0.945	0.934	0.942	1.070	1.040	0.985	1.032
Averages ----->		0.959	0.948	0.941	0.950	0.96	0.96	0.97	0.963

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.96		Mean	0.95	0.96	0.96
Min Point	0.89	-6.9%	Std. Dev.	0.02	0.04	0.03
Max Point	1.03	7.9%	COV as %	1.7	4.2	3.2

Avg. Conc. 0.955 ppm

Gas analyzer checked:

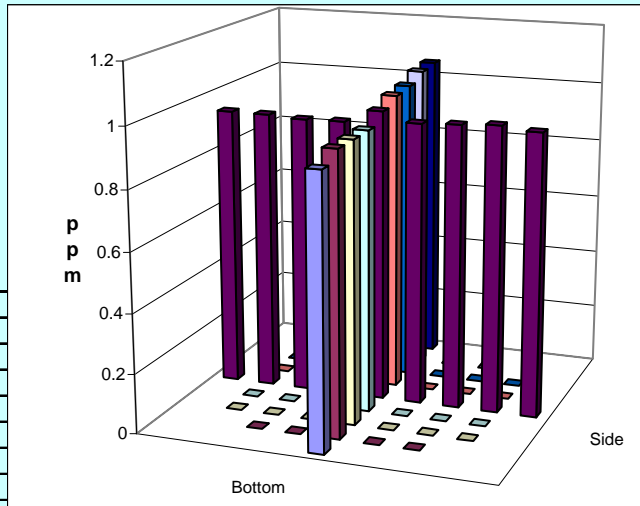
1/16/2007

	Start	Finish	
Tracer tank pressure	110	110	psig
Stack Temp	57	57	F°
Center Pt. air vel.	3020	2980	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1006.0	1005.0	mb
Ambient humidity	30	30	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	17,15,19,16	20,22,21,20	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	59	59	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT34
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-35	
Date	1/19/2007		Fan Configuration	A & B w/ 3M filterete prefilters	
Tester	MSP		Fan Setting	40 Hz	
Stack Dia.	12 in.		Stack Temp	56.5 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	1420 -- 1510	
Elevation	Port 3		Center 2/3 from	1.10	to: 10.90
Distance to disturbance	174.25 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	A near right	
	2nd			1st	

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.030	0.905	0.899	0.945	1.010	0.949	0.989	0.983
2	1.26	0.935	1.010	0.914	0.953	0.975	0.934	0.962	0.957
3	2.33	1.000	0.974	1.040	1.005	1.090	0.972	0.932	0.998
4	3.88	0.959	0.983	1.010	0.984	0.973	1.030	0.966	0.990
Center	6.00	0.978	0.968	0.991	0.979	0.986	0.980	0.994	0.987
5	8.12	0.966	0.963	0.924	0.951	0.980	0.936	0.944	0.953
6	9.67	0.941	0.910	0.945	0.932	0.970	0.950	0.951	0.957
7	10.74	0.906	0.865	0.876	0.882	0.961	0.910	0.895	0.922
8	11.50	0.996	0.894	0.845	0.912	0.977	0.967	0.896	0.947
Averages ----->		0.968	0.941	0.938	0.949	0.99	0.96	0.95	0.966

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.96		Mean	0.96	0.97	0.96
Min Point	0.88	-7.9%	Std. Dev.	0.04	0.03	0.03
Max Point	1.00	4.9%	COV as %	4.2	2.8	3.5

Avg. Conc. 0.954 ppm

Gas analyzer checked:

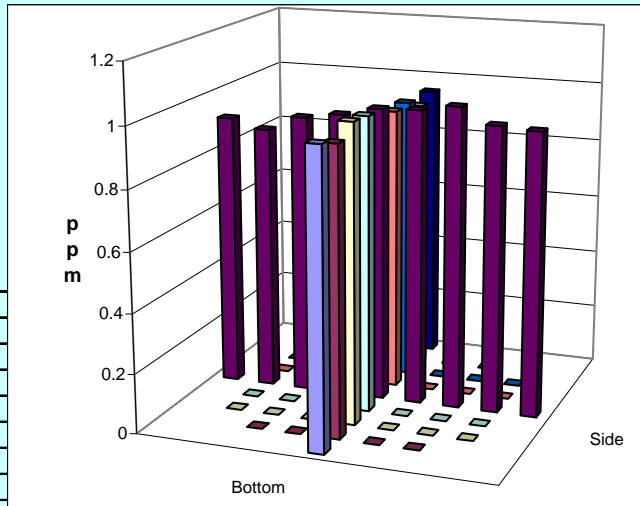
1/16/2007

	Start	Finish	
Tracer tank pressure	110	110	psig
Stack Temp	57	56	F°
Center Pt. air vel.	2980	2990	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1005.0	1004.0	mb
Ambient humidity	30	29	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	26,26,25,23	23,26,21,24	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	59	58	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT35
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-36	
Date	1/19/2007		Fan Configuration	A & B w/ 3M filterete prefilters	
Tester	MSP		Fan Setting	40 Hz	
Stack Dia.	12 in.		Stack Temp	56.5 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	1512 -- 1600	
Elevation	Port	3	Center 2/3 from	1.10	to: 10.90
Distance to disturbance	174.25 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	A near left	
	1st			2nd	

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.030	0.888	0.958	0.959	0.963	0.965	0.955	0.961
2	1.26	0.934	1.070	0.984	0.996	0.930	0.919	0.845	0.898
3	2.33	0.946	0.976	0.919	0.947	0.950	0.906	0.959	0.938
4	3.88	0.977	0.972	0.960	0.970	0.956	0.973	0.909	0.946
Center	6.00	0.943	0.884	0.913	0.913	1.000	0.860	0.931	0.930
5	8.12	0.959	0.930	0.972	0.954	1.030	0.983	0.908	0.974
6	9.67	0.862	0.917	0.936	0.905	0.944	0.960	0.991	0.965
7	10.74	0.988	0.930	0.926	0.948	0.946	0.917	0.937	0.933
8	11.50	0.897	0.883	0.905	0.895	0.978	0.921	0.974	0.958
Averages ----->		0.948	0.939	0.941	0.943	0.97	0.93	0.93	0.945

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.94		Mean	0.95	0.94	0.94
Min Point	0.90	-5.2%	Std. Dev.	0.03	0.02	0.03
Max Point	1.00	5.5%	COV as %	3.3	2.6	2.9

Avg. Conc. 0.947 ppm

Gas analyzer checked:

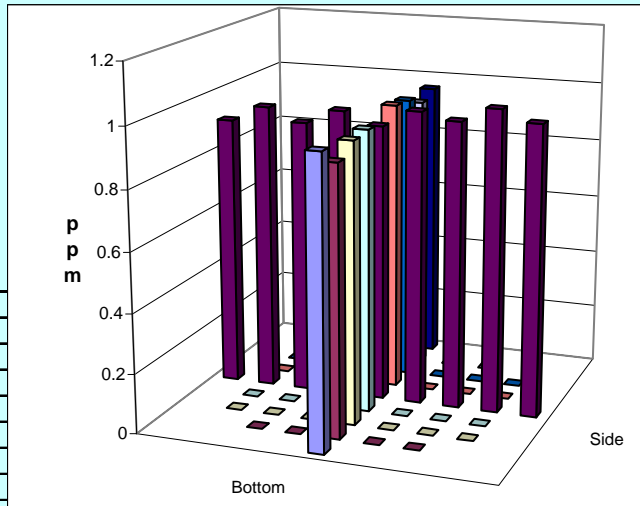
1/16/2007

	Start	Finish	
Tracer tank pressure	110	110	psig
Stack Temp	56	57	F°
Center Pt. air vel.	2990	2970	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1004.0	1004.0	mb
Ambient humidity	29	30	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	25,21,14,16	20,21,20,22	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	58	59	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT36
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-37	
Date	1/22/2007		Fan Configuration	A w/ 3M filterete prefilters	
Tester	BG Fritz		Fan Setting	35 Hz	
Stack Dia.	12 in.		Stack Temp	61.5 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	10:00/11:00	
Elevation	Port 3		Center 2/3 from	1.10	to: 10.90
Distance to disturbance	174.25 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	A center	
	2nd			1st	

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	2.09	2.00	2.13	2.07	2.15	2.12	2.11	2.13
2	1.26	1.96	2.00	2.06	2.01	1.96	2.11	1.98	2.02
3	2.33	2.04	2.07	2.05	2.05	2.15	2.13	2.07	2.12
4	3.88	2.00	1.99	1.97	1.99	1.90	2.08	1.99	1.99
Center	6.00	1.99	2.08	1.99	2.02	2.00	2.05	2.11	2.05
5	8.12	2.03	2.10	2.00	2.04	2.07	2.03	2.12	2.07
6	9.67	2.06	2.08	2.05	2.06	2.02	1.98	2.00	2.00
7	10.74	2.09	2.05	2.06	2.07	1.95	1.89	1.94	1.93
8	11.50	2.08	2.02	2.03	2.04	1.96	1.96	1.97	1.96
Averages ----->		2.04	2.04	2.04	2.04	2.02	2.04	2.03	2.03

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2.03		Mean	2.03	2.03	2.03
Min Point	1.93	-5.3%	Std. Dev.	0.03	0.06	0.05
Max Point	2.13	4.5%	COV as %	1.5	3.1	2.3

Avg. Conc. 2.034 ppm

Gas analyzer checked:

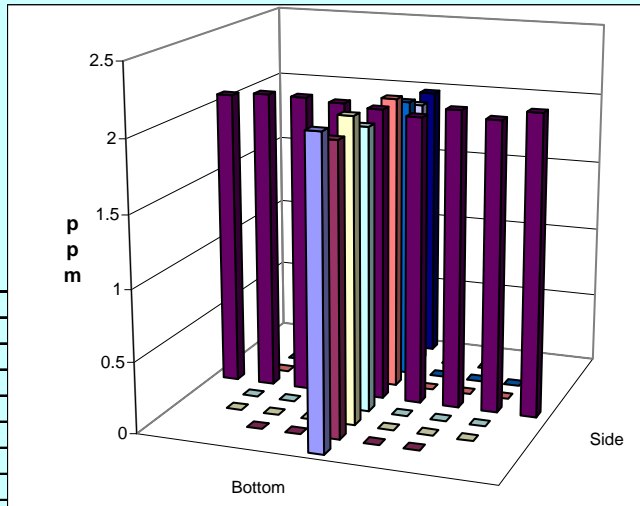
1/22/2007

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	62	61	F°
Center Pt. air vel.	1280	1180	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1010.0	1010.0	mbar
Ambient humidity	30	35	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	23,21,22,19	26,22,23,25	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	59	57	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Signature/date

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Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT37
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-38
Date	1/22/2007	Fan Configuration	A w/ 3M filterete prefilers
Tester	BG Fritz	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	64 deg F
Stack X-Area	113.1 in. ²	Start/End Time	12:30/13:15
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	113.75 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	A center
	1st		2nd

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.99	2.06	2.08	2.04	2.09	2.00	2.03	2.04
2	1.26	2.02	2.03	2.06	2.04	2.09	2.10	1.98	2.06
3	2.33	2.00	2.01	2.05	2.02	2.02	2.07	2.02	2.04
4	3.88	2.00	1.98	2.08	2.02	2.02	1.98	2.07	2.02
Center	6.00	2.03	2.03	1.99	2.02	2.07	2.11	2.04	2.07
5	8.12	2.01	2.04	2.07	2.04	2.06	2.09	2.08	2.08
6	9.67	1.95	2.02	1.98	1.98	2.10	2.07	2.05	2.07
7	10.74	2.03	2.00	2.01	2.01	2.04	1.99	2.02	2.02
8	11.50	2.00	2.02	2.02	2.01	2.08	2.06	2.12	2.09
Averages ----->		2.00	2.02	2.04	2.02	2.06	2.05	2.05	2.05

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2.04		Mean	2.02	2.05	2.03
Min Point	1.98	-2.6%	Std. Dev.	0.02	0.03	0.03
Max Point	2.09	2.4%	COV as %	0.9	1.2	1.3

Avg. Conc. 2.036 ppm

Gas analyzer checked:

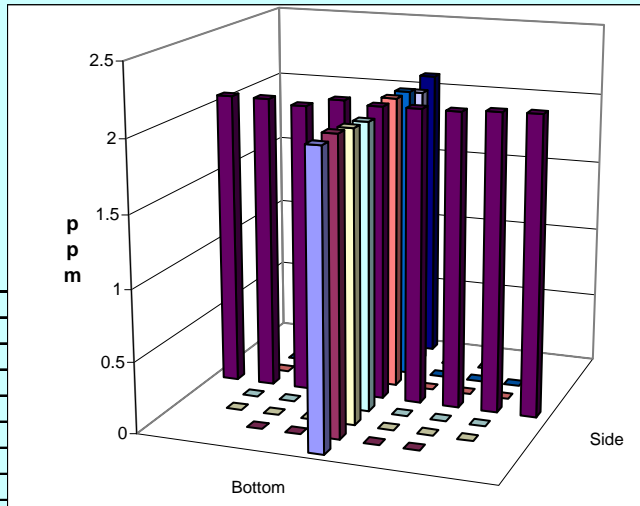
1/22/2007

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	64	64	F°
Center Pt. air vel.	1300	1260	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1009.0	1008.0	mb
Ambient humidity	35	34	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	23,23,25,22	23,22,20,24	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	60	59	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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31 July 2006

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Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-39
Date	1/22/2007	Fan Configuration	A w/ 3M filterete prefilers
Tester	BG Fritz	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	63 deg F
Stack X-Area	113.1 in. ²	Start/End Time	13:20/14:10
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	A center
	1st		2nd

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	2.05	2.04	1.97	2.02	1.85	1.92	1.77	1.85
2	1.26	2.09	2.02	2.01	2.04	1.84	1.93	1.76	1.84
3	2.33	2.01	2.05	1.95	2.00	1.83	1.94	1.91	1.89
4	3.88	1.98	1.95	1.93	1.95	1.88	1.87	1.94	1.90
Center	6.00	1.91	1.89	1.84	1.88	1.88	1.80	1.81	1.83
5	8.12	1.91	1.89	1.88	1.89	1.97	1.86	1.88	1.90
6	9.67	1.92	1.91	1.92	1.92	1.98	1.94	2.03	1.98
7	10.74	1.96	1.89	1.89	1.91	2.10	2.00	2.08	2.06
8	11.50	1.93	1.94	1.88	1.92	2.17	2.23	2.19	2.20
Averages ----->		1.97	1.95	1.92	1.95	1.94	1.94	1.93	1.94

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1.94		Mean	1.94	1.92	1.93
Min Point	1.83	-5.9%	Std. Dev.	0.06	0.08	0.07
Max Point	2.20	13.0%	COV as %	3.1	4.2	3.6

Avg. Conc. 1.955 ppm

Gas analyzer checked:

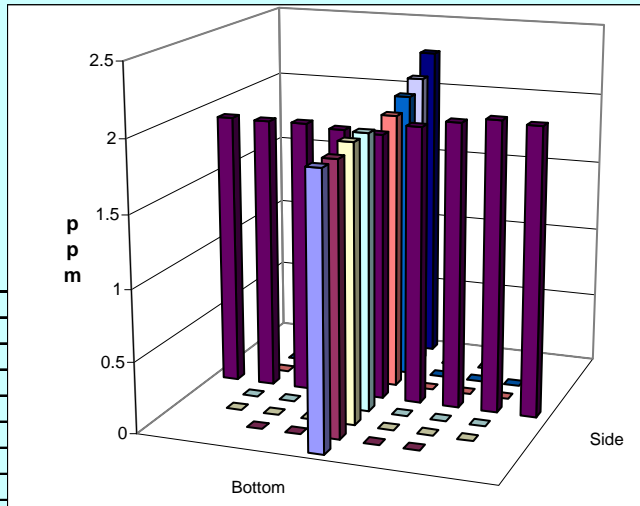
1/22/2007

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	64	62	F°
Center Pt. air vel.	1260	1240	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1008.0	1008.0	mb
Ambient humidity	34	35	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	23,22,20,24	25,23,22,25	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	59	60	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

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 GT39
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-40	
Date	1/23/2007		Fan Configuration	A w/ 3M filterete prefilters	
Tester	BGF		Fan Setting	35 Hz	
Stack Dia.	12 in.		Stack Temp	61.5 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	0930 -- 1040	
Elevation	Port 1		Center 2/3 from	1.10	to: 10.90
Distance to disturbance	53.5 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	A Center	
	2			1	

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	2.450	2.440	2.420	2.437	2.460	2.440	2.400	2.433
2	1.26	2.480	2.460	2.470	2.470	2.520	2.500	2.430	2.483
3	2.33	2.440	2.460	2.460	2.453	2.490	2.410	2.430	2.443
4	3.88	2.440	2.450	2.450	2.447	2.460	2.500	2.440	2.467
Center	6.00	2.460	2.470	2.450	2.460	2.450	2.490	2.400	2.447
5	8.12	2.450	2.480	2.470	2.467	2.470	2.340	2.380	2.397
6	9.67	2.410	2.440	2.430	2.427	2.480	2.370	2.400	2.417
7	10.74	2.450	2.410	2.440	2.433	2.430	2.230	2.400	2.353
8	11.50	2.490	2.540	2.480	2.503	2.350	2.370	2.360	2.360
Averages ----->		2.452	2.461	2.452	2.455	2.46	2.41	2.40	2.422

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2.44		Mean	2.45	2.43	2.44
Min Point	2.35	-3.5%	Std. Dev.	0.02	0.04	0.03
Max Point	2.50	2.7%	COV as %	0.7	1.8	1.4

Avg. Conc. 2.437 ppm

Gas analyzer checked:

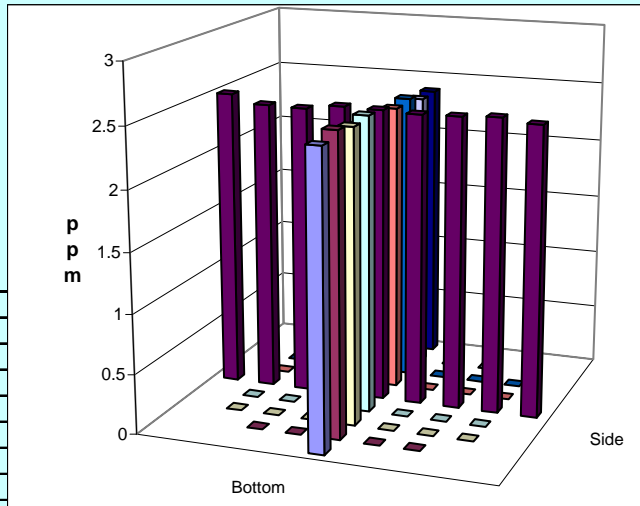
1/22/2007

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	61	62	F°
Center Pt. air vel.	980	1070	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1009.0	1010.0	mb
Ambient humidity	32	39	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	30,25,25,27	22,25,27,25	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	53	55	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

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GT40
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-41	
Date	1/23/2007		Fan Configuration	A w/ 3M filterete prefilters	
Tester	BGF		Fan Setting	35 Hz	
Stack Dia.	12 in.		Stack Temp	62.5 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	1040 -- 1125	
Elevation	Port 1		Center 2/3 from	1.10	to: 10.90
Distance to disturbance	53.5 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	A far right	
	1			2	

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	2.250	2.270	2.280	2.267	2.740	2.630	2.730	2.700
2	1.26	2.300	2.200	2.170	2.223	2.750	2.690	2.650	2.697
3	2.33	2.230	2.310	2.210	2.250	2.770	2.760	2.740	2.757
4	3.88	2.260	2.260	2.230	2.250	2.640	2.530	2.590	2.587
Center	6.00	2.350	2.390	2.410	2.383	2.410	2.500	2.400	2.437
5	8.12	2.560	2.620	2.570	2.583	2.450	2.420	2.360	2.410
6	9.67	2.740	2.560	2.740	2.680	2.380	2.420	2.370	2.390
7	10.74	2.700	2.830	2.680	2.737	2.340	2.390	2.330	2.353
8	11.50	2.660	2.700	2.620	2.660	2.360	2.390	2.390	2.380
Averages ----->		2.450	2.460	2.434	2.448	2.54	2.53	2.51	2.523

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2.49		Mean	2.44	2.52	2.48
Min Point	2.22	-10.6%	Std. Dev.	0.22	0.16	0.19
Max Point	2.76	10.9%	COV as %	9.0	6.4	7.6

Avg. Conc. 2.495 ppm

Gas analyzer checked:

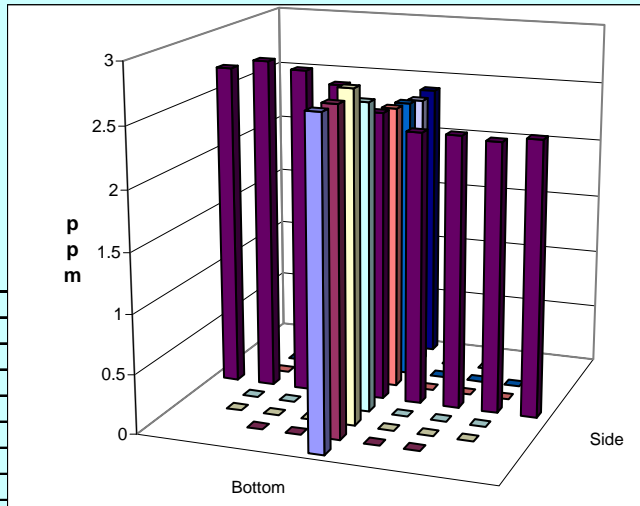
1/22/2007

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	62	63	F°
Center Pt. air vel.	1070	1100	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1010.0	1011.0	mb
Ambient humidity	39	37	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	22,25,27,25	28,24,27,24	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	55	59	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Reference: CCP-WTPSP-176
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31 July 2006

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GT41
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-42	
Date	1/23/2007		Fan Configuration	A w/ 3M filterete prefilters	
Tester	MSP		Fan Setting	35 Hz	
Stack Dia.	12 in.		Stack Temp	62.5 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	1305 -- 1405	
Elevation	Port 1		Center 2/3 from	1.10	to: 10.90
Distance to disturbance	53.5 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	A far left	
	1			2	

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	2.330	2.280	2.340	2.317	2.500	2.720	2.490	2.570
2	1.26	2.320	2.410	2.370	2.367	2.500	2.440	2.540	2.493
3	2.33	2.360	2.300	2.290	2.317	2.510	2.540	2.570	2.540
4	3.88	2.480	2.360	2.260	2.367	2.480	2.530	2.520	2.510
Center	6.00	2.430	2.440	2.420	2.430	2.530	2.480	2.480	2.497
5	8.12	2.450	2.460	2.440	2.450	2.420	2.430	2.460	2.437
6	9.67	2.550	2.570	2.520	2.547	2.330	2.320	2.370	2.340
7	10.74	2.560	2.550	2.530	2.547	2.400	2.410	2.420	2.410
8	11.50	2.570	2.440	2.540	2.517	2.310	2.410	2.330	2.350
Averages ----->		2.450	2.423	2.412	2.429	2.44	2.48	2.46	2.461

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2.44		Mean	2.43	2.46	2.45
Min Point	2.32	-5.2%	Std. Dev.	0.09	0.07	0.08
Max Point	2.57	5.1%	COV as %	3.7	2.8	3.2

Avg. Conc.

2.442 ppm

Gas analyzer checked:

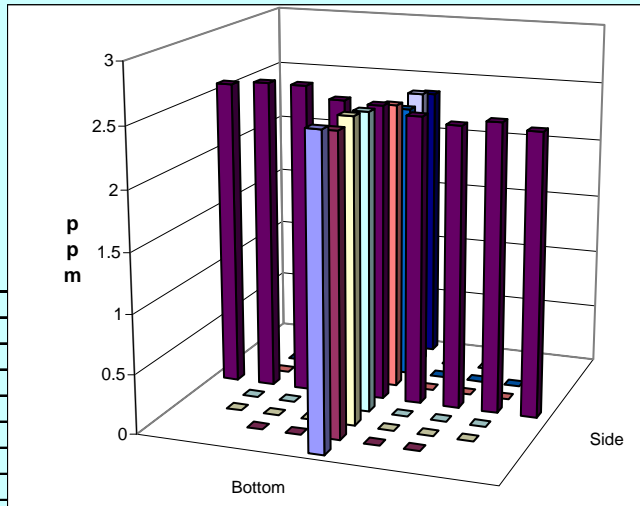
1/22/2007

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	62	63	F°
Center Pt. air vel.	1150	1140	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1010.0	1010.0	mb
Ambient humidity	46	33	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	25,25,24,25	36,38,35,34	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	59	69	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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gas-dataRev0.xls
31 July 2006

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GT42
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-43	
Date	1/23/2007		Fan Configuration	A w/ 3M filterete prefilters	
Tester	MSP		Fan Setting	35 Hz	
Stack Dia.	12 in.		Stack Temp	62 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	1410 -- 1505	
Elevation	Port 1		Center 2/3 from	1.10	to: 10.90
Distance to disturbance	53.5 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	A near left	
	2			1	

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	2.650	2.570	2.550	2.590	2.380	2.590	2.410	2.460
2	1.26	2.550	2.510	2.470	2.510	2.470	2.410	2.340	2.407
3	2.33	2.470	2.490	2.600	2.520	2.480	2.400	2.480	2.453
4	3.88	2.500	2.620	2.510	2.543	2.490	2.490	2.370	2.450
Center	6.00	2.510	2.430	2.440	2.460	2.510	2.460	2.470	2.480
5	8.12	2.490	2.420	2.410	2.440	2.450	2.490	2.420	2.453
6	9.67	2.280	2.410	2.430	2.373	2.410	2.380	2.370	2.387
7	10.74	2.330	2.360	2.410	2.367	2.410	2.260	2.460	2.377
8	11.50	2.270	2.290	2.360	2.307	2.380	2.400	2.400	2.393
Averages ----->		2.450	2.456	2.464	2.457	2.44	2.43	2.41	2.429

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2.44		Mean	2.46	2.43	2.44
Min Point	2.31	-5.6%	Std. Dev.	0.07	0.04	0.06
Max Point	2.59	6.0%	COV as %	2.9	1.6	2.3

Avg. Conc. 2.439 ppm

Gas analyzer checked:

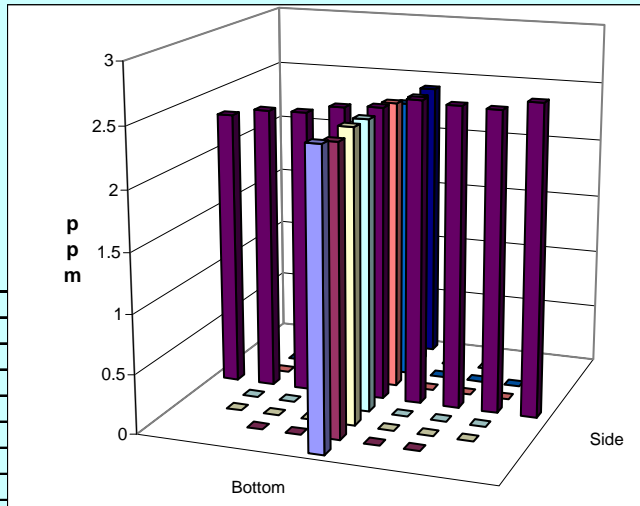
1/22/2007

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	62	62	F°
Center Pt. air vel.	1140	1140	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1010.0	1010.0	mb
Ambient humidity	33	34	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	37,33,41,33	35,30,35,38	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	69	66	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



Signature signifies compliance with
Procedure EMS-JAG-01
Signature/date

Signature verifying data and calculations:

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT43
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-44	
Date	1/23/2007		Fan Configuration	A w/ 3M filterete prefilers	
Tester	MSP		Fan Setting	35 Hz	
Stack Dia.	12 in.		Stack Temp	62 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	1510 -- 1555	
Elevation	Port 1		Center 2/3 from	1.10	to: 10.90
Distance to disturbance	53.5 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	A near right	
	1			2	

Traverse-->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	2.700	2.630	2.750	2.693	2.260	2.330	2.220	2.270
2	1.26	2.740	2.640	2.690	2.690	2.330	2.380	2.270	2.327
3	2.33	2.660	2.690	2.680	2.677	2.350	2.310	2.280	2.313
4	3.88	2.620	2.620	2.600	2.613	2.440	2.350	2.440	2.410
Center	6.00	2.440	2.460	2.500	2.467	2.460	2.490	2.470	2.473
5	8.12	2.270	2.330	2.270	2.290	2.480	2.450	2.460	2.463
6	9.67	2.170	2.270	2.180	2.207	2.430	2.460	2.350	2.413
7	10.74	2.180	2.220	2.290	2.230	2.460	2.450	2.600	2.503
8	11.50	2.210	2.240	2.180	2.210	2.420	2.390	2.380	2.397
Averages ----->		2.443	2.456	2.460	2.453	2.40	2.40	2.39	2.397

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2.42		Mean	2.45	2.41	2.43
Min Point	2.21	-9.0%	Std. Dev.	0.21	0.07	0.15
Max Point	2.69	11.1%	COV as %	8.6	3.0	6.3

Avg. Conc. 2.419 ppm

Gas analyzer checked:

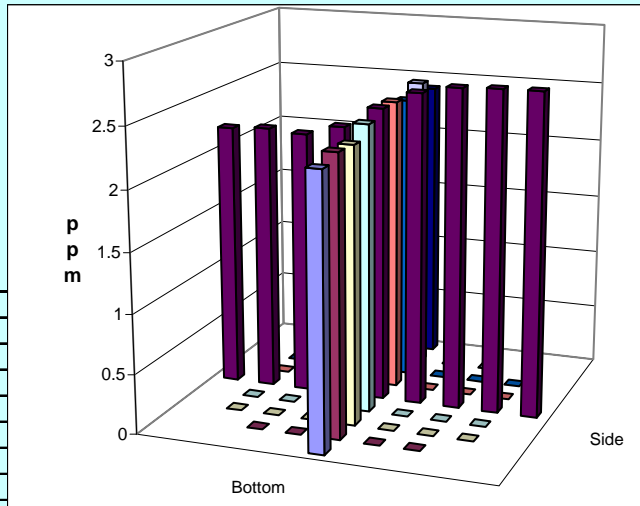
1/22/2007

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	62	62	F°
Center Pt. air vel.	1140	1150	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1010.0	1010.0	mb
Ambient humidity	34	33	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	40,44,41,42	41,39,40,38	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	66	66	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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 Signature/date

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 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT44
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model		Run No.	GT-45	
Date	1/23/2007		Fan Configuration	B w/ 3M filterete prefilters	
Tester	MSP		Fan Setting	35 Hz	
Stack Dia.	12 in.		Stack Temp	63 deg F	
Stack X-Area	113.1 in. ²		Start/End Time	1600 -- 1655	
Elevation	Port 1		Center 2/3 from	1.10	to: 10.90
Distance to disturbance	53.5 inches		Points in Center 2/3	2	to: 7
Measurement units	ppm SF6		Injection Point	B center	
	2			1	

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	2.120	2.160	2.140	2.140	2.290	2.270	2.230	2.263
2	1.26	2.110	2.120	2.160	2.130	2.140	2.100	2.200	2.147
3	2.33	2.200	2.050	2.140	2.130	2.260	2.230	2.150	2.213
4	3.88	2.110	2.230	2.110	2.150	2.160	2.210	2.090	2.153
Center	6.00	2.130	2.220	2.160	2.170	2.150	2.140	2.180	2.157
5	8.12	2.140	2.160	2.020	2.107	2.040	2.130	2.050	2.073
6	9.67	2.040	2.060	2.090	2.063	2.000	2.110	2.040	2.050
7	10.74	2.100	2.050	2.120	2.090	2.020	2.000	2.050	2.023
8	11.50	2.110	2.060	1.980	2.050	1.980	2.050	2.020	2.017
Averages ----->		2.118	2.123	2.102	2.114	2.12	2.14	2.11	2.122

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2.12		Mean	2.12	2.12	2.12
Min Point	2.02	-4.8%	Std. Dev.	0.04	0.07	0.05
Max Point	2.26	6.9%	COV as %	1.7	3.2	2.5

Avg. Conc.

2.113 ppm

Gas analyzer checked:

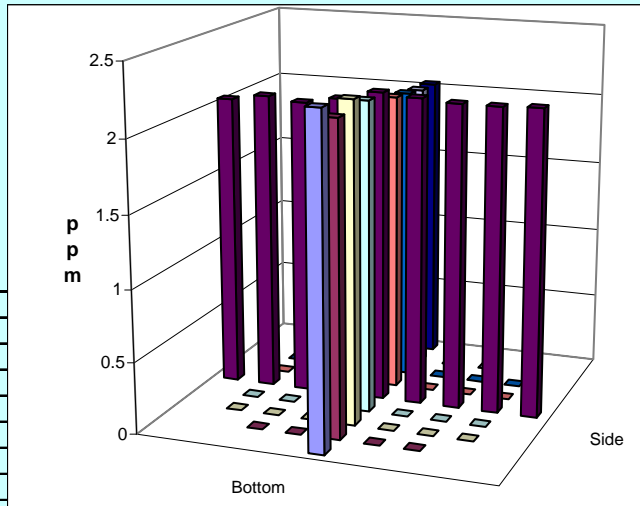
1/22/2007

	Start	Finish	
Tracer tank pressure	200	200	psig
Stack Temp	63	63	F°
Center Pt. air vel.	1350	1360	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1010.0	1010.0	mb
Ambient humidity	33	34	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	26,26,25,22	36,38,34,31	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	66	63	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



Signature signifies compliance with

Procedure EMS-JAG-01

Signature/date

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Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT45
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-46
Date	1/24/2007	Fan Configuration	B w/ 3M filterete prefilters
Tester	BG Frtiz	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	60.5 deg F
Stack X-Area	113.1 in. ²	Start/End Time	9:15/10:00
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	142.25 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	B Center

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm				ppm			
1	0.50	1.98	2.17	2.15	2.10	2.15	2.03	2.13	2.103
2	1.26	2.15	2.05	2.08	2.09	2.09	2.06	2.09	2.080
3	2.33	2.04	2.15	2.01	2.07	2.08	2.17	2.01	2.087
4	3.88	1.99	2.06	2.07	2.04	2.03	2.04	2.18	2.083
Center	6.00	2.16	2.01	2.01	2.06	2.18	2.15	2.02	2.117
5	8.12	2.02	2.14	2.12	2.09	2.01	2.06	2.14	2.070
6	9.67	2.08	2.00	2.09	2.06	2.09	2.02	2.06	2.057
7	10.74	2.02	2.06	2.05	2.04	2.03	2.17	2.12	2.107
8	11.50	2.06	2.06	2.03	2.05	2.13	2.01	2.07	2.070
Averages ----->		2.056	2.078	2.068	2.067	2.088	2.079	2.091	2.086

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2.08		Mean	2.06	2.09	2.08
Min Point	2.04	-1.8%	Std. Dev.	0.02	0.02	0.02
Max Point	2.12	1.9%	COV as %	1.0	1.0	1.1

Avg. Conc. 2.075 ppm

Gas analyzer checked:

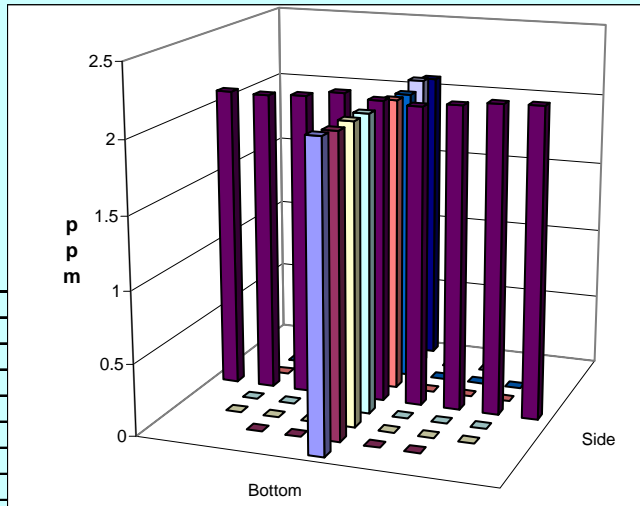
1/22/2007

	Start	Finish	
Tracer tank pressure	180	180	psig
Stack Temp	60	61	F°
Center Pt. air vel.	1410	1250.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1012.00	1012.00	mb
Ambient humidity	38	47	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	19,22,22,26	22,22,30,24	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	47	52	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Signature/date

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Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT46
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-47
Date	1/24/2007	Fan Configuration	B w/ 3M filterete prefilters
Tester	BG Frtiz	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	60.5 deg F
Stack X-Area	113.1 in. ²	Start/End Time	1010 -- 1050
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	202.75 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	B Center

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	2.06	2.09	2.11	2.09	2.19	2.05	2.09	2.110
2	1.26	2.10	2.03	2.01	2.05	2.06	2.20	2.05	2.103
3	2.33	2.08	2.18	2.12	2.13	2.08	2.06	2.07	2.070
4	3.88	2.20	2.04	2.09	2.11	2.11	2.18	2.19	2.160
Center	6.00	2.03	2.15	2.14	2.11	2.03	2.07	2.03	2.043
5	8.12	2.03	2.07	2.07	2.06	2.21	2.05	2.17	2.143
6	9.67	2.16	2.05	2.08	2.10	2.06	2.16	2.12	2.113
7	10.74	2.02	2.21	2.11	2.11	2.12	2.07	2.06	2.083
8	11.50	2.17	2.02	2.10	2.10	2.08	2.18	2.11	2.123
Averages ----->		2.094	2.093	2.092	2.093	2.104	2.113	2.099	2.106

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	2.10		Mean	2.09	2.10	2.10
Min Point	2.04	-2.7%	Std. Dev.	0.03	0.04	0.03
Max Point	2.16	2.9%	COV as %	1.4	1.9	1.7

Avg. Conc. 2.103 ppm

Gas analyzer checked:

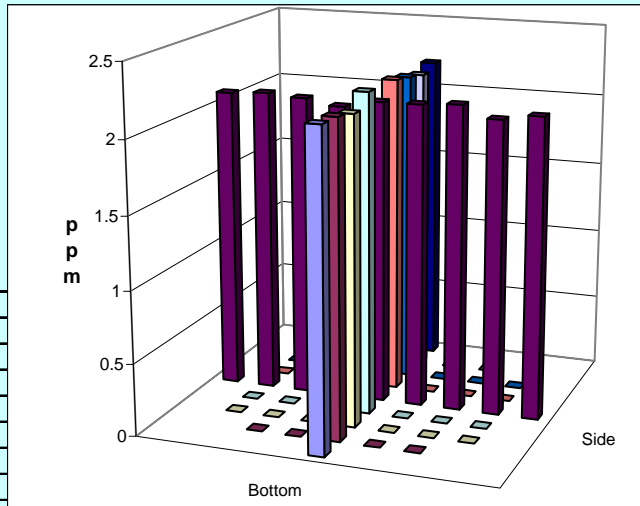
1/22/2007

	Start	Finish	
Tracer tank pressure	180	180	psig
Stack Temp	61	60	F°
Center Pt. air vel.	1250	1310.0	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1012.00	1012.00	mb
Ambient humidity	47	44	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	22,22,30,24	27,22,21,24	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	52	56	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



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Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT47
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/24/2007**
 Tester **JG Droppo**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 3**
 Distance to disturbance **174.25 inches**
 Measurement units **ppm SF6**

Run No. **GT-48**
 Fan Configuration **A&B w/ 3M filterete prefilters**
 Fan Setting **40 Hz**
 Stack Temp **61 deg F**
 Start/End Time **11:30/13:00**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **B Center 1st**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.04	1.06	1.08	1.06	1.06	1.07	1.07	1.067
2	1.26	1.04	1.05	1.05	1.05	1.06	1.09	1.08	1.077
3	2.33	1.04	1.02	1.05	1.04	1.05	1.05	1.06	1.053
4	3.88	1.07	1.06	1.08	1.07	1.06	1.05	1.05	1.053
Center	6.00	1.05	1.05	1.03	1.04	1.06	1.04	1.05	1.050
5	8.12	1.05	1.06	1.04	1.05	1.03	1.02	1.02	1.023
6	9.67	1.04	1.07	1.07	1.06	1.03	1.03	1.04	1.033
7	10.74	1.04	1.04	1.05	1.04	1.05	1.06	1.05	1.053
8	11.50	1.05	1.06	1.04	1.05	1.02	1.02	1.03	1.023
Averages ----->		1.047	1.052	1.054	1.051	1.047	1.048	1.050	1.048

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1.05		Mean	1.05	1.05	1.05
Min Point	1.02	-2.5%	Std. Dev.	0.01	0.02	0.01
Max Point	1.08	2.6%	COV as %	1.1	1.6	1.3

Avg. Conc. 1.050 ppm

Gas analyzer checked:

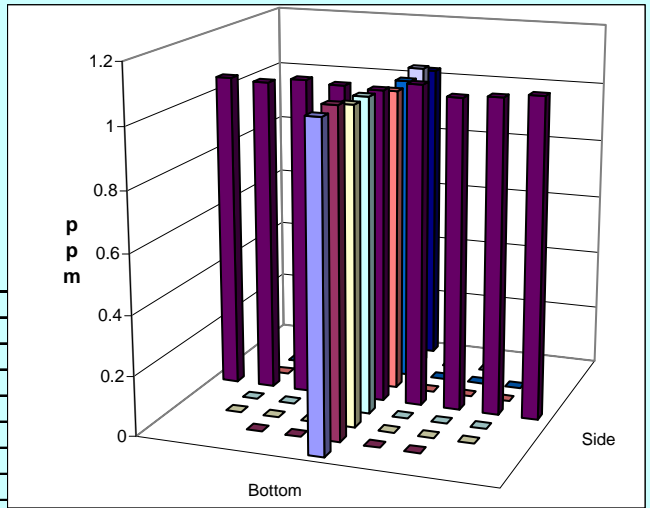
1/22/2007

	Start	Finish	
Tracer tank pressure	125	120	psig
Stack Temp	61	61	F°
Center Pt. air vel.	2730	2720.0	fpm
Injection flowmeter	59	59	scfm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1011.00	1009.00	mb
Ambient humidity	63	40	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	26,23,27,23	31,30,27,26,27,29	
No. Bk-Gd samples	4	6	n
Ambient Temp, F	46	64	

Instruments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes: Tent had cooled off during lunch



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 Signature/date

Signature verifying data and calculations:

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT48
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/24/2007**
 Tester **JG Droppo**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 2**
 Distance to disturbance **113.45 inches**
 Measurement units **ppm SF6**
 1st

Run No. **GT-49**
 Fan Configuration **A&B w/ 3M filterete prefilters**
 Fan Setting **40 Hz**
 Stack Temp **61 deg F**
 Start/End Time **1300/1405**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **B Center**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.07	1.06	1.06	1.063	1.09	1.09	1.11	1.097
2	1.26	1.06	1.04	1.05	1.050	1.12	1.10	1.08	1.100
3	2.33	1.06	1.07	1.05	1.060	1.06	1.07	1.07	1.067
4	3.88	1.06	1.06	1.06	1.060	1.07	1.08	1.07	1.073
Center	6.00	1.05	1.06	1.05	1.053	1.05	1.07	1.09	1.070
5	8.12	1.05	1.09	1.05	1.063	1.04	1.03	1.03	1.033
6	9.67	1.06	1.06	1.04	1.053	1.03	1.07	1.03	1.043
7	10.74	1.05	1.04	1.04	1.043	1.02	1.03	1.04	1.030
8	11.50	1.03	1.09	1.05	1.057	1.02	1.01	1.00	1.010
Averages ----->		1.054	1.063	1.050	1.056	1.056	1.061	1.058	1.058

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1.06		Mean	1.05	1.06	1.06
Min Point	1.01	-4.4%	Std. Dev.	0.01	0.03	0.02
Max Point	1.10	4.1%	COV as %	0.7	2.4	1.7

Avg. Conc. 1.056 ppm

Gas analyzer checked:

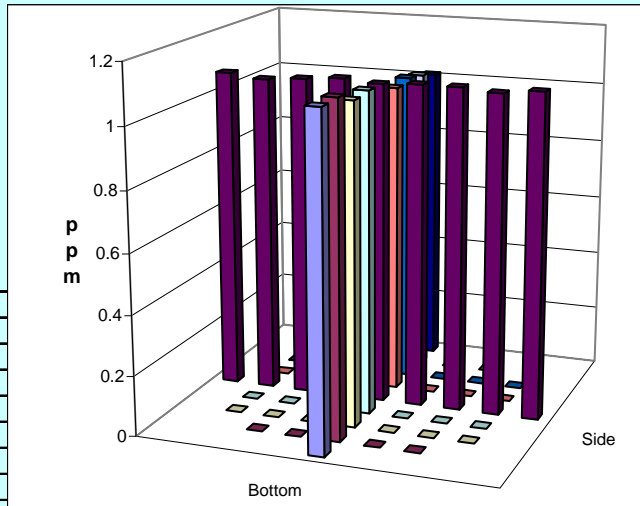
1/22/2007

	Start	Finish	
Tracer tank pressure	120	117	psig
Stack Temp	61	61	F°
Center Pt. air vel.	2720	2720.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1009.00	1008.00	mb
Ambient humidity	40	35	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	27,28,29,29	28,32,26,28	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	64	64	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



Signature signifies compliance with
 Procedure EMS-JAG-01
 Signature/date

Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT49
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/24/2007**
 Tester **JG Droppo**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 1**
 Distance to disturbance **53.5 inches**
 Measurement units **ppm SF6**

Run No. **GT-50**
 Fan Configuration **A&B w/ 3M filterete prefilters**
 Fan Setting **40 Hz**
 Stack Temp **61 deg F**
 Start/End Time **1405/1510**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **B Center**
Ist

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.03	1.02	1.06	1.037	1.07	1.08	1.09	1.080
2	1.26	0.993	1.01	1.04	1.014	1.05	1.05	1.13	1.077
3	2.33	1.00	1.01	1.05	1.020	1.07	1.06	1.08	1.070
4	3.88	1.02	1.06	1.05	1.043	1.12	1.12	1.08	1.107
Center	6.00	1.09	1.07	1.06	1.073	1.13	1.08	1.11	1.107
5	8.12	1.08	1.11	1.12	1.103	1.07	1.05	1.08	1.067
6	9.67	1.04	1.11	1.08	1.077	1.07	1.06	1.07	1.067
7	10.74	1.06	1.11	1.12	1.097	1.07	1.08	1.02	1.057
8	11.50	1.090	1.090	1.080	1.087	1.06	1.05	1.05	1.053
Averages ----->		1.045	1.066	1.073	1.061	1.079	1.070	1.079	1.076

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	1.07		Mean	1.06	1.08	1.07
Min Point	1.01	-5.1%	Std. Dev.	0.04	0.02	0.03
Max Point	1.11	3.6%	COV as %	3.4	1.9	2.7

Avg. Conc. 1.066 ppm

Gas analyzer checked:

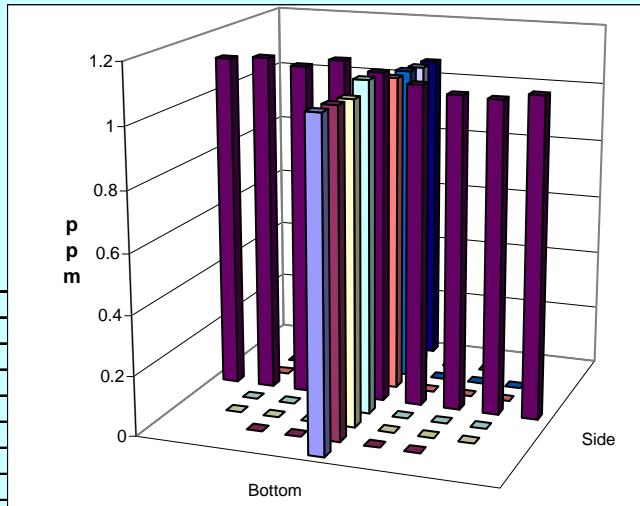
1/22/2007

	Start	Finish	
Tracer tank pressure	117	115	psig
Stack Temp	61	61	F°
Center Pt. air vel.	2720	2750.0	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1009.00	1008.00	mb
Ambient humidity	35	33	RH
B&K vapor correction	n	n	Y/N
Back-Gd gas ppb	28,32,26,28	27,31,28,29	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	64	66	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



Signature signifies compliance with
 Procedure EMS-JAG-01
 Signature/date

Signature verifying data and calculations:

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT50
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/26/2007**
 Tester **BGF**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 2**
 Distance to disturbance **113.75 inches**
 Measurement units **ppm SF6**
 2

Run No. **GT-51**
 Fan Configuration **A & B** w/ 3M filterete prefilters
 Fan Setting **40 Hz**
 Stack Temp **61 deg F**
 Start/End Time **1015 -- 1115**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **A near left**
 1

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.957	0.930	0.942	0.943	0.932	0.951	0.948	0.944
2	1.26	0.962	0.965	0.971	0.966	0.921	0.927	0.965	0.938
3	2.33	0.970	0.994	0.938	0.967	0.929	0.957	0.941	0.942
4	3.88	0.955	0.935	0.950	0.947	0.951	0.957	0.962	0.957
Center	6.00	0.938	0.951	0.948	0.946	0.955	0.960	0.953	0.956
5	8.12	0.949	0.966	0.961	0.959	0.971	0.975	0.970	0.972
6	9.67	0.951	0.940	0.957	0.949	0.986	0.993	0.979	0.986
7	10.74	0.922	0.940	0.921	0.928	0.979	1.040	0.986	1.002
8	11.50	0.947	0.975	0.966	0.963	1.010	0.989	0.992	0.997
Averages ----->		0.950	0.955	0.950	0.952	0.96	0.97	0.97	0.966

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.96		Mean	0.95	0.96	0.96
Min Point	0.93	-3.3%	Std. Dev.	0.01	0.02	0.02
Max Point	1.00	4.5%	COV as %	1.4	2.4	2.0

Avg. Conc. 0.960 ppm

Gas analyzer checked:

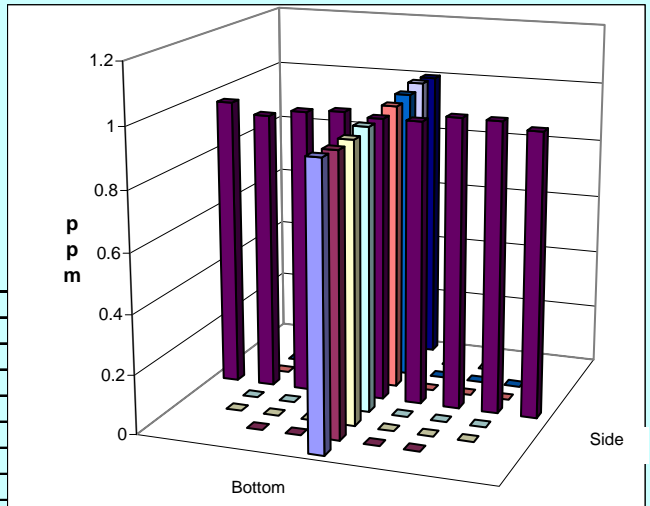
1/22/2007

	Start	Finish	
Tracer tank pressure	180	180	psig
Stack Temp	62	60	F°
Center Pt. air vel.	3000	3060	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1010.0	1010.0	mb
Ambient humidity	34	34	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	18,21,22,21	23,22,27,21	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	59	58	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



Signature signifies compliance with
 Procedure EMS-JAG-01
 Signature/date

Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT51
 4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-52
Date	1/26/2007	Fan Configuration	A & B w/ 3M filterete prefilters
Tester	BGF	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	61.5 deg F
Stack X-Area	113.1 in.²	Start/End Time	1145 -- 1245
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	113.75 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	B center
	1		2

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	1.070	1.070	1.040	1.060	1.070	1.090	1.130	1.097
2	1.26	1.040	1.070	1.060	1.057	1.110	1.080	1.070	1.087
3	2.33	1.030	1.020	1.050	1.033	1.040	1.060	0.998	1.033
4	3.88	0.980	0.993	0.987	0.987	1.030	1.020	1.020	1.023
Center	6.00	0.958	0.954	0.955	0.956	0.961	0.972	0.986	0.973
5	8.12	0.933	0.937	0.933	0.934	0.910	0.928	0.915	0.918
6	9.67	0.878	0.943	0.914	0.912	0.892	0.959	0.911	0.921
7	10.74	0.921	0.915	0.898	0.911	0.898	0.908	0.915	0.907
8	11.50	0.917	0.817	0.847	0.860	0.917	0.915	0.903	0.912
Averages ----->		0.970	0.969	0.965	0.968	0.98	0.99	0.98	0.985

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.98		Mean	0.97	0.98	0.98
Min Point	0.86	-11.9%	Std. Dev.	0.06	0.07	0.06
Max Point	1.10	12.3%	COV as %	6.0	7.1	6.3

Avg. Conc. 0.978 ppm

Gas analyzer checked:

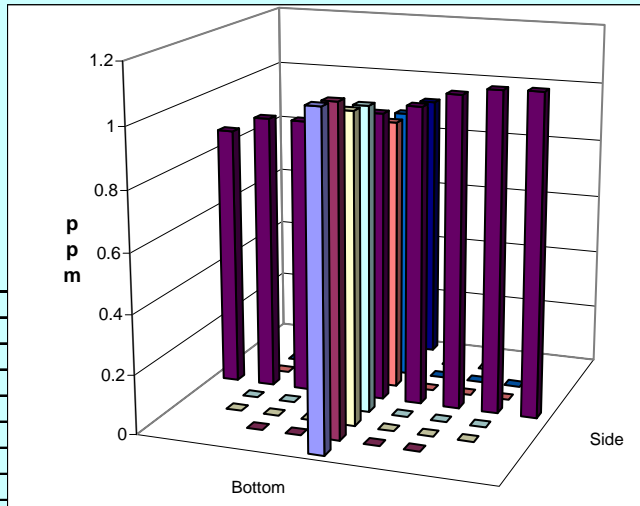
1/22/2007

	Start	Finish	
Tracer tank pressure	180	180	psig
Stack Temp	61	62	F°
Center Pt. air vel.	3110	3080	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1009.0	1009.0	mb
Ambient humidity	34	34	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	19,23,19,19	21,16,27,18	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	60	60	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



Signature signifies compliance with
Procedure EMS-JAG-01
Signature/date

Signature verifying data and calculations:
Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT52
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site	HV-C2 Model	Run No.	GT-53
Date	1/26/2007	Fan Configuration	A & B w/ 3M filterete prefilters
Tester	BGF & MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	62 deg F
Stack X-Area	113.1 in. ²	Start/End Time	1245 -- 1330
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	ppm SF6	Injection Point	B center
	1		2

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm				ppm			
1	0.50	1.280	1.270	1.320	1.290	1.020	1.030	0.987	1.012
2	1.26	1.190	1.230	1.200	1.207	0.983	0.988	0.948	0.973
3	2.33	1.090	1.140	1.120	1.117	0.952	0.878	0.975	0.935
4	3.88	1.010	1.100	1.060	1.057	0.930	0.898	0.875	0.901
Center	6.00	0.911	0.918	0.890	0.906	0.890	0.906	0.884	0.893
5	8.12	0.789	0.803	0.811	0.801	0.928	0.933	0.957	0.939
6	9.67	0.755	0.710	0.723	0.729	0.975	0.940	0.955	0.957
7	10.74	0.731	0.706	0.682	0.706	1.020	0.999	1.030	1.016
8	11.50	0.771	0.706	0.751	0.743	1.050	1.080	1.050	1.060
Averages ----->		0.947	0.954	0.951	0.951	0.97	0.96	0.96	0.965

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.96		Mean	0.93	0.94	0.94
Min Point	0.71	-26.3%	Std. Dev.	0.20	0.04	0.14
Max Point	1.29	34.7%	COV as %	21.2	4.5	14.7

Avg. Conc. 0.965 ppm

Gas analyzer checked:

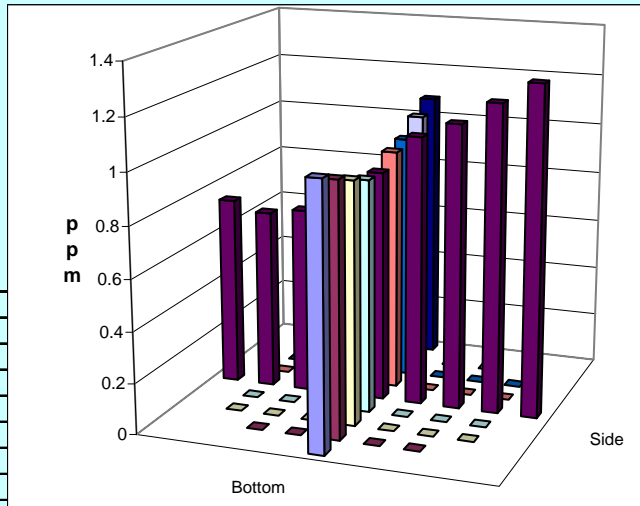
1/22/2007

	Start	Finish	
Tracer tank pressure	180	180	psig
Stack Temp	62	62	F°
Center Pt. air vel.	3080	2930	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1009.0	1009.0	mb
Ambient humidity	34	34	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	21,16,27,18	22,25,27,25	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	60	60	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615	Cat2 MTE
TSI 8360 Velocity SN 209060	due 11/01/07
Omega FMA-2617A flowmeter SN30348	FIO

Notes:



Signature signifies compliance with Procedure EMS-JAG-01
Signature/date

Signature verifying data and calculations:

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
gas-dataRev0.xls
31 July 2006

(HVC2_gas-dataRev0 (8)).xls
GT53
4/18/2007

Rev. 0

TRACER GAS TRAVERSE DATA FORM

31-Jul-06

Site **HV-C2 Model**
 Date **1/26/2007**
 Tester **MSP**
 Stack Dia. **12 in.**
 Stack X-Area **113.1 in.²**
 Elevation **Port 3**
 Distance to disturbance **174.25 inches**
 Measurement units **ppm SF6**
 2

Run No. **GT-54**
 Fan Configuration **A & B** w/ 3M filterete prefilters
 Fan Setting **40 Hz**
 Stack Temp **62 deg F**
 Start/End Time **1335 -- 1430**
 Center 2/3 from **1.10** to: **10.90**
 Points in Center 2/3 **2** to: **7**
 Injection Point **B center**
 1

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		ppm							
1	0.50	0.981	0.987	1.000	0.989	1.040	1.060	1.080	1.060
2	1.26	0.983	0.972	1.020	0.992	1.060	1.040	1.060	1.053
3	2.33	0.985	0.997	1.010	0.997	1.020	1.020	1.010	1.017
4	3.88	0.955	0.967	0.953	0.958	0.983	0.988	0.981	0.984
Center	6.00	0.957	0.965	0.942	0.955	0.949	0.946	0.959	0.951
5	8.12	0.955	0.945	0.945	0.948	0.942	0.920	0.922	0.928
6	9.67	0.960	0.937	0.953	0.950	0.938	0.908	0.922	0.923
7	10.74	0.958	0.970	0.959	0.962	0.920	0.920	0.925	0.922
8	11.50	0.967	0.971	0.981	0.973	0.942	0.907	0.938	0.929
Averages ----->		0.967	0.968	0.974	0.969	0.98	0.97	0.98	0.974

All	ppm	Dev. from mean	Center 2/3	Side	Bottom	All
Mean	0.97		Mean	0.97	0.97	0.97
Min Point	0.92	-5.2%	Std. Dev.	0.02	0.05	0.04
Max Point	1.06	9.1%	COV as %	2.1	5.3	3.9

Avg. Conc. 0.974 ppm

Gas analyzer checked:

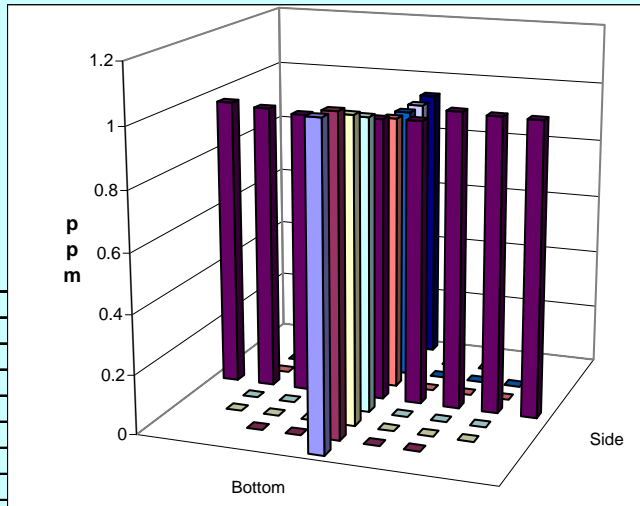
1/22/2007

	Start	Finish	
Tracer tank pressure	180	180	psig
Stack Temp	62	62	F°
Center Pt. air vel.	2930	2950	fpm
Injection flowmeter	59	59	sccm
Stack flow	--	--	cfm
Sampling flowmeter	10	10	lpm Sierra
Ambient pressure	1009.0	1008.0	mb
Ambient humidity	34	34	RH
B&K vapor correction	N	N	Y/N
Back-Gd gas ppb	23,23,24,26	23,25,23,26	
No. Bk-Gd samples	4	4	n
Ambient Temp, F	60	59	

Instuments Used:

B&K 1302 Gas Analyzer SN 1788615 Cat2 MTE
 TSI 8360 Velocity SN 209060 due 11/01/07
 Omega FMA-2617A flowmeter SN30348 FIO

Notes:



Signature signifies compliance with
 Procedure EMS-JAG-01
 Signature/date

Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-176
 gas-dataRev0.xls
 31 July 2006

(HVC2_gas-dataRev0 (8)).xls
 GT54
 4/18/2007

Sulfur hexafluoride Gas Calibration performed on B&K on 11/17/2006 **by** Jim Droppo
B&K Model 1302: Property No. WD17210 Serial No. 1765299

Setup: 6.8 ft B&K sample inlet tube length
 1007.45 mbar station pressure
 45 deg F ambient temp analyzer corrects to 20 deg C
 54 percent RH

5.0 ppm	
Cylinder	SV17699
start P = 1100 psi end P = 1000 psi	
B&K	
Calibration readings: (ppm)	
5.20	Compensating for water vapor
5.19	
5.19	
5.18	
5.19	
5.18	Not compensating for water vapor
5.18	
5.18	
5.17	
5.16	
5.18	= avg

0.5 ppm	
Cylinder	SV18280
start P = 1200 psi end P = 1100 psi	
B&K	
Calibration readings: (ppm)	
0.499	Compensating for water vapor
0.494	
0.494	
0.496	
0.496	
0.497	Not compensating for water vapor
0.498	
0.497	
0.494	
0.497	
0.496	= avg

Pre-Test Room background, ppb					
Not compensating for water vapor, monitoring task 2					
32.0	36.0	31.0	32.0	31.0	
Compensating for water vapor, monitoring task 1					
8.0	6.8	5.8	7.1	6.7	

Standards Used:	Expiration date:
SV17699	15-May-08
SV18280	15-Jun-08

Signature signifies compliance with Procedure EMS-JAG-01
 Signature/Date Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465
 Signature verifying data and calculations:

Reference: CCP-WTPSP-
 BcalcheckRev0.xls
 4 August 2006

BK calibration check data sheets.xls
 Nov17
 4/18/2007

Sulfur hexafluoride Gas Calibration performed on B&K on 11/27/2006 **by** John Glissmeyer

B&K Model 1302: Property No. WD17210 Serial No. 1765299

Setup: 6.7 ft B&K sample inlet tube length
 991.2 mbar station pressure
 71 deg F ambient temp analyzer corrects to 20 deg C
 24 percent RH

0.5 ppm

Cylinder SV18280 start P = 1100 psi
 end P = 1050 psi

B&K

Calibration readings: (ppm)

0.499	Compensating for water vapor
0.497	
0.507	
0.503	
0.509	
0.502	Not compensating for water vapor
0.505	
0.498	
0.500	
0.497	
0.502	= avg

5.0 ppm

Cylinder SV17699 start P = 1000 psi
 end P = 950 psi

B&K

Calibration readings: (ppm)

5.24	Compensating for water vapor
5.21	
5.20	
5.21	
5.21	
5.20	Not compensating for water vapor
5.19	
5.19	
5.18	
5.20	
5.20	= avg

Pre-Test Room background, ppb							
Not compensating for water vapor, monitoring task 2							
18.0	15.7	13.4	13.7	12.5	12.8	14.9	18.7
Compensating for water vapor, monitoring task 1							
1.7	2.7	2.7	5.45	-0.25	6.3		

Standards Used:	Expiration date:
5.0 ppm SV17699	15-May-08
0.5 ppm SV18280	15-Jun-08

Signature signifies compliance with Procedure EMS-JAG-01
 Signature/Date Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465
 Signature verifying data and calculations:

Reference: CCP-WTPSP-
 BcalcheckRev0.xls
 4 August 2006

BK calibration check data sheets.xls
 Nov27
 4/18/2007

Sulfur hexafluoride Gas Calibration performed on B&K on 12/4/2006 **by** BG Fritz

B&K Model 1302: Property No. WD17210 Serial No. 1765299
 Setup: 6 ft B&K sample inlet tube length
 1016.9 mbar station pressure
 70 deg F ambient temp analyzer corrects to 20 deg C
 < 50 percent RH

0.5 ppm	
Cylinder	SV18280
start P = 1000 psi end P = 1000 psi	
B&K	
Calibration readings: (ppm)	
0.499	Compensating for water vapor
0.501	
0.499	
0.495	
0.499	
0.493	Not compensating for water vapor
0.493	
0.492	
0.491	
0.492	
0.495	= avg

5.0 ppm	
Cylinder	SV17699
start P = 900 psi end P = 800 psi	
B&K	
Calibration readings: (ppm)	
5.15	Compensating for water vapor
5.16	
5.16	
5.15	
5.16	
5.16	Not compensating for water vapor
5.15	
5.15	
5.15	
5.14	
5.15	= avg

Pre-Test Room background, ppb			
Not compensating for water vapor, monitoring task 2			
11	16	13	11
Compensating for water vapor, monitoring task 1			
0.918	4.10	2.11	7.83

Standards Used:	Expiration date:
5.0 ppm SV17699 Matheson Tri-Gas	15-May-08
0.5 ppm SV18280 Matheson Tri-Gas	15-Jun-08

Signature signifies compliance with Procedure EMS-JAG-01
 Signature/Date Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465
 Signature verifying data and calculations:

Reference: CCP-WTPSP-185
 BcalcheckRev0.xls
 4 August 2006EA7C3E

BK calibration check data sheets.xls
 Dec04
 4/18/2007

Sulfur hexafluoride Gas Calibration performed on B&K on 12/8/2006 **by** Brad Fritz

B&K Model 1302: Property No. WD17210 Serial No. 1765299
 Setup: 6 ft B&K sample inlet tube length
 1006.1 mbar station pressure
 55 deg F ambient temp analyzer corrects to 20 deg C
 50 percent RH

0.5 ppm

Cylinder SV18280

start P = 950 psi
 end P = 900 psi

B&K

Calibration

readings: (ppm)

0.502	Compensating for water vapor
0.494	
0.494	
0.494	
0.491	

0.495 Not compensating for water vapor

0.505
0.496
0.496
0.496

0.496 = avg

5.0 ppm

Cylinder SV17699

start P = 800 psi
 end P = 750 psi

B&K

Calibration

readings: (ppm)

5.10	Compensating for water vapor
5.11	
5.11	
5.10	
5.09	

5.10 Not compensating for water vapor

5.08
5.11
5.11
5.10

5.10 = avg

Pre-Test Room background, ppb					
Not compensating for water vapor, monitoring task 2					
22.4	21.5	18.0	21.2	19.9	
Compensating for water vapor, monitoring task 1					
7.77	5.35	6.58	5.15	3.17	

Standards Used:	Expiration date:
5.0 ppm SF6 Matheson Tri-Gas	15-May-08
0.5 ppm SF6 Matheson Tri-Gas	15-Jun-08

Signature signifies compliance with Procedure EMS-JAG-01
 Signature/Date Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465
 Signature verifying data and calculations:

Reference: CCP-WTPSP-185
 BcalcheckRev0.xls
 4 August 2006EA7C3E

BK calibration check data sheets.xls
 Dec08
 4/18/2007

Sulfur hexafluoride Gas Calibration performed on B&K on 1/3/2007 **by** Jim Droppo

B&K Model 1302: Property No. WD17210 Serial No. 1765299

Setup: 6.7 ft B&K sample inlet tube length
 989.5 mbar station pressure
 71.6 deg F ambient temp analyzer corrects to 20 deg C
 38 percent RH

5.0 ppm

Cylinder SV17699

start P = 500 psi
 end P = 500 psi

B&K

Calibration

readings: (ppm)

5.26	Compensating for water vapor
5.28	
5.28	
5.26	
5.24	

5.18 Not compensating for water vapor

5.17
5.22
5.22
5.26

5.24 = avg

0.5 ppm

Cylinder SV18280

start P = 900 psi
 end P = 900 psi

B&K

Calibration

readings: (ppm)

0.506	Compensating for water vapor
0.507	
0.507	
0.499	
0.497	

0.503 Not compensating for water vapor

0.502
0.499
0.500
0.508

0.503 = avg

Pre-Test Room background, ppb					
Not compensating for water vapor, monitoring task 2					
30.0	27.0	30.0	31.0	29.0	
Compensating for water vapor, monitoring task 1					
0.168	0	0.3	0	0	

Standards Used:

Expiration date:

5.0 ppm SF6 Matheson Tri-Gas	15-May-08
0.5 ppm SF6 Matheson Tri-Gas	15-Jun-08

Signature signifies compliance with Procedure EMS-JAG-01
 Signature/Date Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465
 Signature verifying data and calculations:

Reference: CCP-WTPSP-185
 BcalcheckRev0.xls
 4 August 2006EA7C3E

BK calibration check data sheets.xls
 Jan03
 4/18/2007

Sulfur hexafluoride Gas Calibration performed on B&K on 1/16/2007 by JGD & MSP
B&K Model 1302: Property No. WC74247 Serial No. 1804888

Setup: 6 ft B&K sample inlet tube length
 1015 mbar station pressure
 68 deg F ambient temp analyzer corrects to 20 deg C
 16 percent RH

5.0 ppm	
Cylinder	SV17699
start P = 500 psi end P = 500 psi	
B&K	
Calibration readings: (ppm)	
5.15	Compensating for water vapor
5.15	
5.15	
5.14	
5.13	
5.14	Not compensating for water vapor
5.12	
5.13	
5.11	
5.12	
5.13	= avg

0.5 ppm	
Cylinder	SV18280
start P = 700 psi end P = 700 psi	
B&K	
Calibration readings: (ppm)	
0.520	Compensating for water vapor
0.512	
0.512	
0.508	
0.509	
0.511	Not compensating for water vapor
0.510	
0.508	
0.509	
0.507	
0.511	= avg

Pre-Test Room background, ppb				
Not compensating for water vapor, monitoring task 2				
20.0	23.0	22.0	19.0	22.0
Compensating for water vapor, monitoring task 1				
18	14	14	15	12

Standards Used:		Expiration date:	
Matheson Tri-Gas 5.0 ppm	SV17699	15-May-08	
Matheson Tri-Gas 0.5 ppm	SV18280	15-Jun-08	

Signature signifies compliance with Procedure EMS-JAG-01
 Signature/Date
 Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-185
 BcalcheckRev0.xls
 4 August 2006EEA7C3E

BK calibration check data sheets.xls
 Jan16_1
 4/18/2007

Sulfur hexafluoride Gas Calibration performed on B&K on 1/16/2007 **by** Jim Droppo
B&K Model 1302: Property No. WC74073 Serial No. 1788615

Setup: 6 ft B&K sample inlet tube length
 1016.9 mbar station pressure
 61.5 deg F ambient temp analyzer corrects to 20 deg C
 15.1 percent RH

5.0 ppm

Cylinder SV17699

start P = 500 psi
 end P = 500 psi

B&K

Calibration readings: (ppm)

5.03	Compensating for water vapor
5.04	
5.08	
5.09	
5.06	
5.05	Not compensating for water vapor
5.01	
5.09	
5.10	
5.04	
5.06	= avg

0.5 ppm

Cylinder SV18280

start P = 700 psi
 end P = 700 psi

B&K

Calibration readings: (ppm)

0.510	Compensating for water vapor
0.509	
0.505	
0.501	
0.507	
0.508	Not compensating for water vapor
0.512	
0.513	
0.511	
0.504	
0.508	= avg

Pre-Test Room background, ppb					
Not compensating for water vapor, monitoring task 2					
19.0	20.0	20.0	19.0	19.0	
Compensating for water vapor, monitoring task 1					
12	10	15	11	10	12

Standards Used:	Expiration date:
0.5 ppm SF6 Matheson Tri-Gas	15-Jun-08
5.0 ppm SF6 Matheson Tri-Gas	15-May-08

Signature signifies compliance with Procedure EMS-JAG-01
 Signature/Date Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465
 Signature verifying data and calculations:

Reference: CCP-WTPSP-185
 BcalcheckRev0.xls
 4 August 2006EEA7C3E

BK calibration check data sheets.xls
 Jan16_2
 4/18/2007

Sulfur hexafluoride Gas Calibration performed on B&K on 1/22/2007 by Brad Fritz
 B&K Model 1302: Property No. WC74073 Serial No. 1788615

Setup: 6 ft B&K sample inlet tube length
 1011 mbar station pressure
 68 deg F ambient temp analyzer corrects to 20 deg C
 25 percent RH

5.0 ppm	
Cylinder	SV17699
start P = 500 psi end P = 480 psi	
B&K	
Calibration readings: (ppm)	
5.19	Compensating for water vapor
5.18	
5.15	
5.15	
5.13	
5.12	Not compensating for water vapor
5.11	
5.10	
5.10	
5.10	
5.13	= avg

0.5 ppm	
Cylinder	SV18280
start P = 700 psi end P = 600 psi	
B&K	
Calibration readings: (ppm)	
0.507	Compensating for water vapor
0.508	
0.506	
0.504	
0.506	
0.504	Not compensating for water vapor
0.500	
0.502	
0.499	
0.508	
0.504	= avg

Pre-Test Room background, ppb				
Not compensating for water vapor, monitoring task 2				
17.0	18.0	17.0	19.0	14.0
Compensating for water vapor, monitoring task 1				
6.81	7.15	8.27	6.69	7.89

Standards Used:		Expiration date:	
Matheson Tri-Gas	0.5 ppm SF6		6/15/08
Matheson Tri-Gas	5.0 ppm SF6		5/15/08

Signature signifies compliance with Procedure EMS-JAG-01	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465

Reference: CCP-WTPSP-185
 BcalcheckRev0.xls
 4 August 2006EEA7C3E

BK calibration check data sheets.xls
 Jan22
 4/18/2007

Sulfur hexafluoride Gas Calibration performed on B&K on 1/25/2007 **by** Brad Fritz
B&K Model 1302: Property No. WD17210 Serial No. 1765299

Setup: 6 ft B&K sample inlet tube length
 1009 mbar station pressure
 67 deg F ambient temp analyzer corrects to 20 deg C
 30 percent RH

5.0 ppm

Cylinder SV17699 start P = 400 psi
 end P = 370 psi

B&K

Calibration readings: (ppm)

5.15	Compensating for water vapor
5.19	
5.14	
5.28	
5.15	
5.19	Not compensating for water vapor
5.13	
5.11	
5.13	
5.07	
5.15	= avg

0.5 ppm

Cylinder SV18280 start P = 600 psi
 end P = 520 psi

B&K

Calibration readings: (ppm)

0.502	Compensating for water vapor
0.506	
0.504	
0.503	
0.505	
0.506	Not compensating for water vapor
0.498	
0.506	
0.504	
0.510	
0.504	= avg

Pre-Test Room background, ppb						
Not compensating for water vapor, monitoring task 2						
17.8	16.1	17.1	17.2	19.1	16	
Compensating for water vapor, monitoring task 1						
6.38	7.63	4.78	6.96	7.72	6.73	

Standards Used:		Expiration date:	
Matheson Tri-Gas	0.5 ppm SF6	6/15/08	
Matheson Tri-Gas	5.0 ppm SF6	5/15/08	

Signature signifies compliance with Procedure EMS-JAG-01
 Signature/Date Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465
 Signature verifying data and calculations:

Reference: CCP-WTPSP-185
 BcalcheckRev0.xls
 4 August 2006EEA7C3E

BK calibration check data sheets.xls
 Jan25
 4/18/2007

Sulfur hexafluoride Gas Calibration performed on B&K on 2/5/2007 by Brad Fritz
B&K Model 1302: Property No.WC74073 Serial No.1788615

Setup: 6 ft B&K sample inlet tube length
 1009 mbar station pressure
 67 deg F ambient temp analyzer corrects to 20 deg C
 40 percent RH

5.0 ppm

Cylinder SV17699 start P = 350 psi
 end P = 300 psi

B&K

Calibration readings: (ppm)

5.21	Compensating for water vapor
5.19	
5.19	
5.18	
5.12	
5.45	Not compensating for water vapor
5.14	
5.17	
5.28	
5.20	
5.21	= avg

0.5 ppm

Cylinder SV18280 start P = 500 psi
 end P = 420 psi

B&K

Calibration readings: (ppm)

0.518	Compensating for water vapor
0.518	
0.504	
0.505	
0.509	
0.503	Not compensating for water vapor
0.516	
0.520	
0.518	
0.513	
0.512	= avg

Pre-Test Room background, ppb			
Not compensating for water vapor, monitoring task 2			
25.4	27.1	25.9	24.9
Compensating for water vapor, monitoring task 1			
11.3	12.3	12.1	12.5

Standards Used:	Expiration date:
SV18280	6/15/08
SV17699	5/15/08

Signature signifies compliance with Procedure EMS-JAG-01
 Signature/Date Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-465
 Signature verifying data and calculations:

Reference: CCP-WTPSP-185
 BcalcheckRev0.xls
 4 August 2006EEA7C3E

BK calibration check data sheets.xls
 Feb05
 4/18/2007

Appendix F

Particle-Tracer Uniformity Data Sheets

Appendix F: Particle-Tracer Uniformity Data Sheets

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-1
Date	12/6/2006	Fan configuration	A&B w/ 3M filtrete macroallergen prefilers
Tester	BGF MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	61 deg F
Stack X-Area	113.1 in.2	Start/End Time	1130 -- 1315
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	1st		2nd

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3							
1	0.50	2831	3901	3012	3248.0	3325	4738	4183	4082.0
2	1.26	2653	2925	2732	2770.0	3773	4901	4344	4339.3
3	2.33	2499	2073	2924	2498.7	3691	5166	4214	4357.0
4	3.88	2891	2375	2029	2431.7	3731	4944	4281	4318.7
Center	6.00	2189	2494	2623	2435.3	3290	4354	3841	3828.3
5	8.12	1694	1308	1871	1624.3	2530	3437	2844	2937.0
6	9.67	1225	921	965	1037.0	2273	2902	2540	2571.7
7	10.74	800	787	874	820.3	2095	2592	2255	2314.0
8	11.50	556	525	716	599.0	1311	1792	1529	1544.0
Averages ----->		1926.4	1923.2	1971.8	1940.5	2891.0	3869.6	3336.8	3365.8

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	2653.1		Mean	1945.3	3523.7	2734.5	3290.88
Min Point	599.0	-77.4%	Std. Dev.	780.7	894.3	1149.4	1059.51
Max Point	4357.0	64.2%	COV as %	40.1	25.4	42.0	32.20

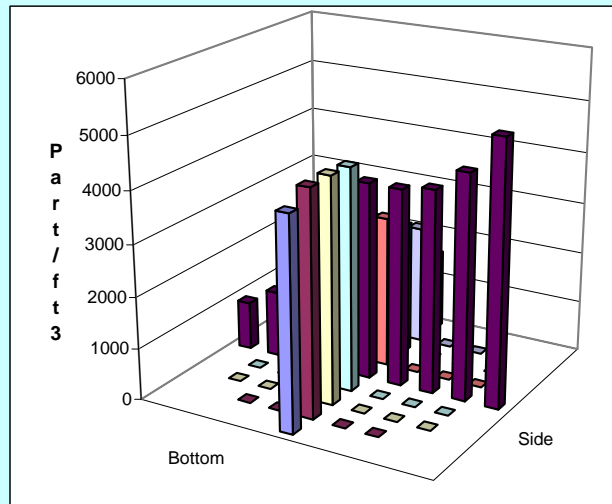
Avg Conc 2593 pt/ft3

	Start	Finish	
Generator Inlet Press	5	5	psig
Stack Temp	62	60	F
Centerline vel.	3200	3500	fpm
Ambient pressure	30.06	30.06	inHg
Ambient humidity	76%	50%	RH
Ambient temp	31	42	F
Back-Gd aerosol	2, 6, 4, 3	3, 3, 4, 2	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	110	120	psig

Instruments Used:		Cal. Due
TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007

Notes: There was no obvious reason why the count change between runs 1 and 2 on the bottom was so large. Nothing changed in the setups.

Oil Used: FisherBrand 19



Signature signifies compliance with Procedure EMS-JAG-02
 Signature/Date _____
 Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-2
Date	12/6/2006	Fan configuration	A&B w/ 3M filtrete macroallergen prefilters
Tester	BGF	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	60 deg F
Stack X-Area	113.1 in.2	Start/End Time	1330 -- 1515
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1307	886	1108	1100.3	2328	1929	1814	2023.7
2	1.26	1130	1186	984	1100.0	2409	1997	2010	2138.7
3	2.33	1197	1056	993	1082.0	2571	2166	2091	2276.0
4	3.88	716	1150	950	938.7	2484	2104	1970	2186.0
Center	6.00	1107	1028	806	980.3	2093	1744	1711	1849.3
5	8.12	618	766	829	737.7	1496	1260	1153	1303.0
6	9.67	297	548	575	473.3	1096	982	957	1011.7
7	10.74	390	352	398	380.0	807	774	675	752.0
8	11.50	123	205	189	172.3	405	386	562	451.0
Averages ----->		765.0	797.4	759.1	773.9	1743.2	1482.4	1438.1	1554.6

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1164.2		Mean	813.1	1645.2	1229.2	1589.59
Min Point	172.3	-85.2%	Std. Dev.	290.7	618.0	633.8	564.30
Max Point	2276.0	95.5%	COV as %	35.8	37.6	51.6	35.50

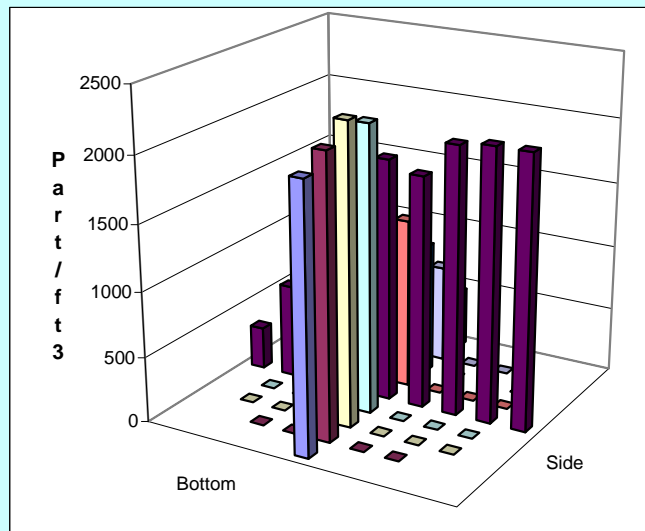
Avg Conc 1133 pt/ft3

	Start	Finish	
Generator Inlet Press	3	3	psig
Stack Temp	60	60	F
Centerline vel.	3500	3380	fpm
Ambient pressure	30.06	30.06	inHg
Ambient humidity	50%	70%	RH
Ambient temp	42	36	F
Back-Gd aerosol	3, 3, 4, 2	3, 5, 5, 7	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	120	110	psig

Instuments Used:	Cal. Due
TSI Velocity Calc Plus S/N 209060	11/1/2007
Met One A2408 SN 96258675	10/6/2007

Notes:

Oil Used: FisherBrand 19



Signature signifies compliance with Procedure EMS-JAG-02	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Reference: CCP-WTPSP-175
part-dataRev0.xls
3 August 2006

(HVC2_part-dataRev0 (7)).xls / PT2
4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-3
Date	12/7/2006	Fan configuration	A&B w/ 3M filtrete macroallergen prefilters
Tester	JGD JAG	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	60 deg F
Stack X-Area	113.1 in.2	Start/End Time	1025 -- 1200
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	1st		2nd

Order ---->		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	967	780	1088	945.0	1201	1810	1592	1534.3
2	1.26	1115	1048	1278	1147.0	1849	2143	1886	1959.3
3	2.33	1106	1128	1227	1153.7	2013	2339	1928	2093.3
4	3.88	1078	1149	1209	1145.3	1988	2152	1920	2020.0
Center	6.00	984	1099	1106	1063.0	1841	1866	1655	1787.3
5	8.12	756	937	950	881.0	1339	1280	1175	1264.7
6	9.67	575	701	727	667.7	962	950	807	906.3
7	10.74	434	436	532	467.3	819	736	701	752.0
8	11.50	241	304	398	314.3	388	406	347	380.3
Averages ----->		806.2	842.4	946.1	864.9	1377.8	1520.2	1334.6	1410.9

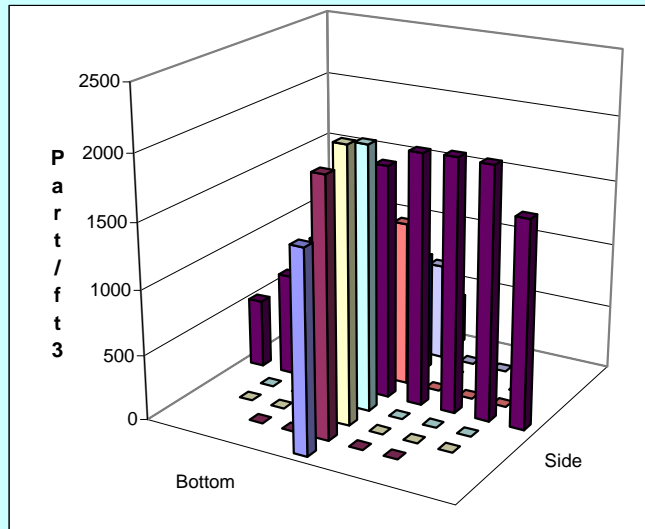
All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1137.9		Mean	932.1	1540.4	1236.3	1553.87
Min Point	314.3	-72.4%	Std. Dev.	272.8	558.6	527.2	491.19
Max Point	2093.3	84.0%	COV as %	29.3	36.3	42.6	31.61

Avg Conc 1102 pt/ft3

	Start	Finish	
Generator Inlet Press	35	37	psig
Stack Temp	60	60	F
Centerline vel.	3280	3250	fpm
Ambient pressure	29.99	29.96	inHg
Ambient humidity	31%	27%	RH
Ambient temp	61	64	F
Back-Gd aerosol	6, 0, 2, 5	1, 4, 0, 1	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	115	112	psig

Instuments Used: Cal. Due

TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007



Notes:

Oil Used: FisherBrand 19

Signature signifies compliance with Procedure EMS-JAG-02	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Reference: CCP-WTPSP-175
part-dataRev0.xls
3 August 2006

(HVC2_part-dataRev0 (7)).xls / PT3
4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-4
Date	12/7/2006	Fan configuration	A&B w/ 3M filtrete macroallergen prefilters
Tester	JGD	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	62 deg F
Stack X-Area	113.1 in.2	Start/End Time	1430 -- 1600
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ----->	2nd		1st

Order ----->		Side				Bottom			
Trial ----->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1216	1222	1145	1194.3	2626	2661	2511	2599.3
2	1.26	1327	1286	1252	1288.3	3220	2974	2866	3020.0
3	2.33	1320	1318	1224	1287.3	3256	3134	2929	3106.3
4	3.88	1336	1247	1182	1255.0	3265	3109	2943	3105.7
Center	6.00	1249	1252	1304	1268.3	2627	2501	2437	2521.7
5	8.12	837	968	1050	951.7	1934	1776	1644	1784.7
6	9.67	662	680	766	702.7	1350	1331	1231	1304.0
7	10.74	438	466	506	470.0	1078	1073	953	1034.7
8	11.50	333	239	309	293.7	502	481	455	479.3
Averages ----->		968.7	964.2	970.9	967.9	2206.4	2115.6	1996.6	2106.2

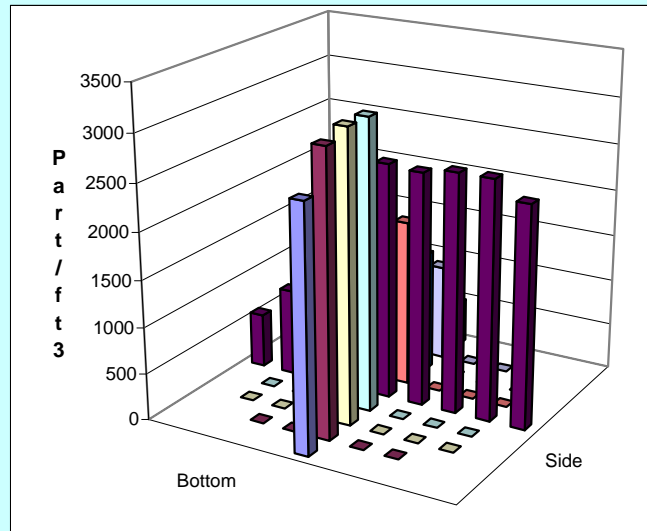
All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1537.1		Mean	1031.9	2268.1	1650.0	2159.87
Min Point	293.7	-80.9%	Std. Dev.	333.5	886.8	908.7	760.56
Max Point	3106.3	102.1%	COV as %	32.3	39.1	55.1	35.21

Avg Conc	1492 pt/ft3	
	Start	Finish
Generator Inlet Press	37	35 psig
Stack Temp	62	62 F
Centerline vel.	3330	3260 fpm
Ambient pressure	29.92	29.91 inHg
Ambient humidity	26%	26% RH
Ambient temp	64	65 F
Back-Gd aerosol	2, 3, 1, 6	2, 1, 3, 2 pt/ft3
No. Bk-Gd samples	4	4
Compressor output reg	120	115 psig

Instuments Used:	Cal. Due
TSI Velocity Calc Plus S/N 209060	11/1/2007
Met One A2408 SN 96258675	10/6/2007

Notes:

Oil Used: FisherBrand 19



Signature signifies compliance with Procedure EMS-JAG-02	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Reference: CCP-WTPSP-175
part-dataRev0.xls
3 August 2006

(HVC2_part-dataRev0 (7)).xls / PT4
4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-5
Date	12/8/2006	Fan configuration	A w/ 3M filtrete macroallergen prefilters
Tester	BGF JGD MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	61.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	0900 -- 1034
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	1st		2nd

Trial ---->		Side				Bottom			
Point	Depth, in.	1	2	3	Mean	1	2	3	Mean
		particles/ft3							
1	0.50	1951	1305	2172	1809.3	2699	2549	2643	2630.3
2	1.26	2001	1333	2314	1882.7	2625	2695	2644	2654.7
3	2.33	1899	1256	2177	1777.3	2577	2698	2531	2602.0
4	3.88	1766	1296	2159	1740.3	2754	2703	2493	2650.0
Center	6.00	1608	1236	2052	1632.0	2691	2687	2525	2634.3
5	8.12	1212	1218	1401	1277.0	2647	2607	2486	2580.0
6	9.67	1270	1335	1589	1398.0	2795	2666	2673	2711.3
7	10.74	1315	1273	1661	1416.3	2745	2717	2713	2725.0
8	11.50	1235	1559	1877	1557.0	2368	2407	2533	2436.0
Averages ----->		1584.1	1312.3	1933.6	1610.0	2655.7	2636.6	2582.3	2624.9

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	2117.4		Mean	1589.1	2651.0	2120.1	2608.06
Min Point	1277.0	-39.7%	Std. Dev.	227.3	53.0	573.4	255.81
Max Point	2725.0	28.7%	COV as %	14.3	2.0	27.0	9.81

Avg Conc 2115 pt/ft3

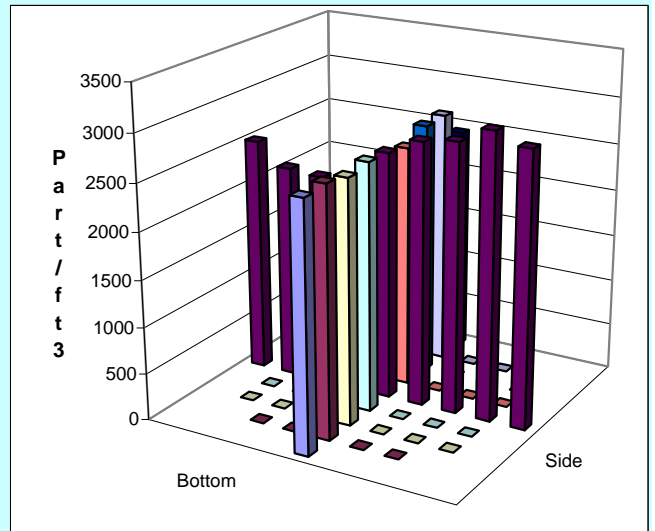
	Start	Finish	
Generator Inlet Press	35	35	psig
Stack Temp	60	63	F
Centerline vel.	1450	1440	fpm
Ambient pressure	29.71	29.68	inHg
Ambient humidity	34%	23%	RH
Ambient temp	60	71	F
Back-Gd aerosol	2, 0, 0, 1	3, 2, 0, 7	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	110	150	psig

Instuments Used: Cal. Due

TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007

Notes:

Oil Used: FisherBrand 19



Signature signifies compliance with Procedure EMS-JAG-02	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Reference: CCP-WTPSP-175
part-dataRev0.xls
3 August 2006

(HVC2_part-dataRev0 (7)).xls / PT5
4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-6
Date	12/8/2006	Fan configuration	B w/ 3M filtrete macroallergen prefilters
Tester	BGF JGD MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	60 deg F
Stack X-Area	113.1 in.2	Start/End Time	1040 -- 1245
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	82 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	B Center
Order ---->	2nd		1st

Trial ---->		Side				Bottom			
Point	Depth, in.	1	2	3	Mean	1	2	3	Mean
		particles/ft3				particles/ft3			
1	0.50	2285	2069	2111	2155.0	2611	2621	2436	2556.0
2	1.26	2277	2299	2284	2286.7	2799	2753	2767	2773.0
3	2.33	2177	2430	2428	2345.0	2731	2926	2778	2811.7
4	3.88	2336	2377	2412	2375.0	2850	3048	2722	2873.3
Center	6.00	2442	2401	2416	2419.7	3013	3046	2949	3002.7
5	8.12	2334	2254	2334	2307.3	3000	3065	2972	3012.3
6	9.67	2202	2192	2277	2223.7	3000	3016	2898	2971.3
7	10.74	2184	2141	2105	2143.3	3047	3302	3047	3132.0
8	11.50	2101	1982	2090	2057.7	2965	3046	3106	3039.0
Averages ----->		2259.8	2238.3	2273.0	2257.0	2890.7	2980.3	2852.8	2907.9

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	2582.5		Mean	2300.1	2939.5	2619.8	2896.88
Min Point	2057.7	-20.3%	Std. Dev.	93.6	126.4	348.5	124.70
Max Point	3132.0	21.3%	COV as %	4.1	4.3	13.3	4.30

Avg Conc 2566 pt/ft3

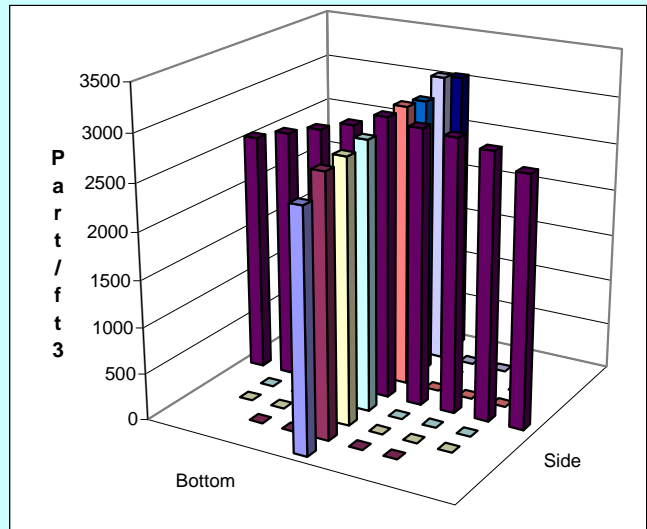
	Start	Finish	
Generator Inlet Press	35	35	psig
Stack Temp	58	62	F
Centerline vel.	1519	1480	fpm
Ambient pressure	29.68	29.62	inHg
Ambient humidity	23%	28%	RH
Ambient temp	71	63	F
Back-Gd aerosol	0, 7, 5, 7	0, 1, 0, 0	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	120	120	psig

Instuments Used: Cal. Due

TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007

Notes:
 Bottom #3 is recorded at spare place

Oil Used: FisherBrand 19



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 Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Reference: CCP-WTPSP-175
 part-dataRev0.xls
 3 August 2006

(HVC2_part-dataRev0 (7)).xls / PT6
 4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-7
Date	12/8/2006	Fan configuration	A & B w/ 3M filtrete macroallergen prefilters
Tester	JGD MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	62.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1315 -- 1400
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	1st		2nd

Order ---->		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1811	1758	1586	1718.3	2063	2196	2179	2146.0
2	1.26	2424	2289	2261	2324.7	2452	2524	2465	2480.3
3	2.33	2566	2534	2501	2533.7	2483	2752	2553	2596.0
4	3.88	2386	2319	2205	2303.3	2486	2594	2584	2554.7
Center	6.00	2059	2119	2103	2093.7	1970	2225	2150	2115.0
5	8.12	1549	1515	1520	1528.0	1547	1576	1602	1575.0
6	9.67	1105	1237	1161	1167.7	1116	1318	1202	1212.0
7	10.74	879	861	884	874.7	877	1117	1038	1010.7
8	11.50	396	349	307	350.7	576	660	668	634.7
Averages ----->		1686.1	1664.6	1614.2	1655.0	1730.0	1884.7	1826.8	1813.8

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1734.4		Mean	1832.2	1934.8	1883.5	1892.86
Min Point	350.7	-79.8%	Std. Dev.	642.4	665.5	630.6	632.98
Max Point	2596.0	49.7%	COV as %	35.1	34.4	33.5	33.44

Avg Conc **1688 pt/ft3**

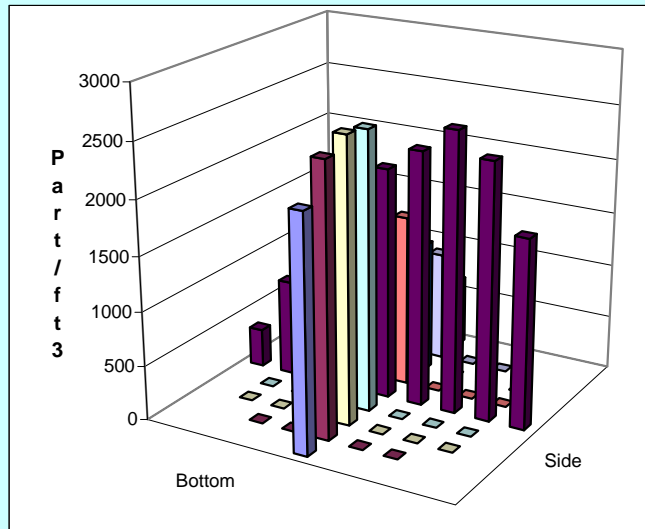
	Start	Finish	
Generator Inlet Press	37	35	psig
Stack Temp	62	63	F
Centerline vel.	3340	3090	fpm
Ambient pressure	29.62	29.553	inHg
Ambient humidity	28%	29%	RH
Ambient temp	64	62	F
Back-Gd aerosol	4, 1, 4, 2	1, 1, 4, 0	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	117	115	psig

Instuments Used: Cal. Due

TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007

Notes:
 Same probe used on top and bottom
 Analyzer turned on end for side port

Oil Used: FisherBrand 19



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 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site **HV-C2 Model**

Run No. **PT-8**

Date **12/11/2006**

Fan configuration **A & B** w/ 3M filtrete macroallergen prefilters

Tester **JGD MSP**

Fan Setting **40 Hz**

Stack Dia. **12 in.**

Stack Temp **62.5 deg F**

Stack X-Area **113.1 in.2**

Start/End Time **1100 -- 1255**

Elevation **Port 2**

Center 2/3 from **1.10** to: **10.90**

Distance to disturbance **113.75 inches**

Points in Center 2/3 **2** to: **7**

Measurement units **particles/ft3**

Injection Point **A** Center

Order ---->

1st

2nd

Traverse-->

Trial ---->

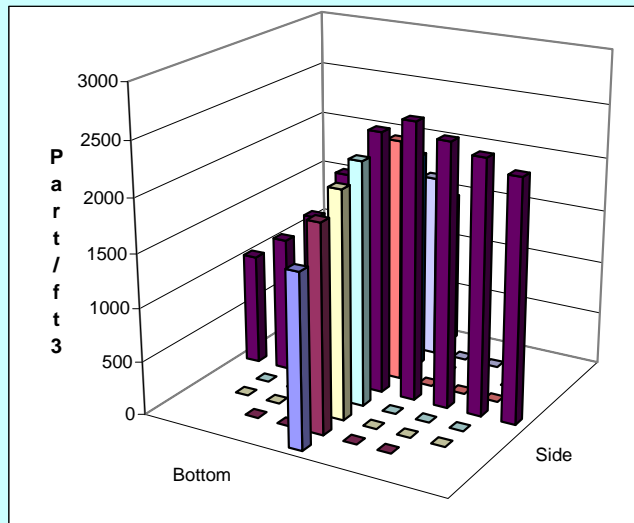
Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		particles/ft3							
1	0.50	2014	2064	2113	2063.7	1498	1530	1800	1609.3
2	1.26	2133	2141	2227	2167.0	1783	1821	2180	1928.0
3	2.33	2264	2213	2270	2249.0	1947	1991	2407	2115.0
4	3.88	2266	2473	2348	2362.3	2110	2128	2560	2266.0
Center	6.00	2220	2212	2261	2231.0	2333	2284	2685	2434.0
5	8.12	1816	1862	1813	1830.3	2121	2141	2539	2267.0
6	9.67	1415	1402	1429	1415.3	1768	2064	2262	2031.3
7	10.74	1082	1138	1256	1158.7	1588	1654	1956	1732.7
8	11.50	951	978	929	952.7	1343	1229	1742	1438.0
Averages ----->		1795.7	1831.4	1849.6	1825.6	1832.3	1871.3	2236.8	1980.1

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1902.9		Mean	1916.2	2110.6	2013.4	2100.58
Min Point	952.7	-49.9%	Std. Dev.	466.2	236.5	369.2	381.20
Max Point	2434.0	27.9%	COV as %	24.3	11.2	18.3	18.15

Avg Conc **1849 pt/ft3**

	Start	Finish	
Generator Inlet Press	38	38	psig
Stack Temp	61	64	F
Centerline vel.	3220	3180	fpm
Ambient pressure	29.56	29.54	inHg
Ambient humidity	40%	41%	RH
Ambient temp	63	63	F
Back-Gd aerosol	0, 1, 0, 2	26, 19, 25, 32	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	105	120	psig

Instuments Used:	Cal. Due
TSI Velocity Calc Plus S/N 209060	11/1/2007
Met One A2408 SN 96258675	10/6/2007



Notes:

Started raining at Bottom transect #2.

Oil Used: FisherBrand 19

Signature signifies compliance with Procedure EMS-JAG-02

Signature verifying data and calculations:

Signature/date

Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Reference: CCP-WTPSP-175
part-dataRev0.xls
3 August 2006

(HVC2_part-dataRev0 (7)).xls / PT8
4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-9
Date	12/8/2006	Fan configuration	A & B w/ 3M filtrete macroallergen prefilters
Tester	JGD MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	62 deg F
Stack X-Area	113.1 in.2	Start/End Time	1640 -- 1900
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	174.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1260	981	956	1065.7	1042	1094	1031	1055.7
2	1.26	1280	1281	1259	1273.3	1263	1262	1276	1267.0
3	2.33	1345	1457	1505	1435.7	1390	1485	1483	1452.7
4	3.88	1586	1309	1355	1416.7	1578	1567	1522	1555.7
Center	6.00	1472	1392	1341	1401.7	1699	1721	1748	1722.7
5	8.12	1342	943	1199	1161.3	1719	1662	1685	1688.7
6	9.67	1133	841	1139	1037.7	1520	1575	1583	1559.3
7	10.74	978	627	957	854.0	1318	1349	1381	1349.3
8	11.50	839	608	776	741.0	1191	1117	1157	1155.0
Averages ----->		1248.3	1048.8	1165.2	1154.1	1413.3	1425.8	1429.6	1422.9

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1288.5		Mean	1225.8	1513.6	1369.7	1510.05
Min Point	741.0	-42.5%	Std. Dev.	220.4	168.2	240.4	216.64
Max Point	1722.7	33.7%	COV as %	18.0	11.1	17.6	14.35

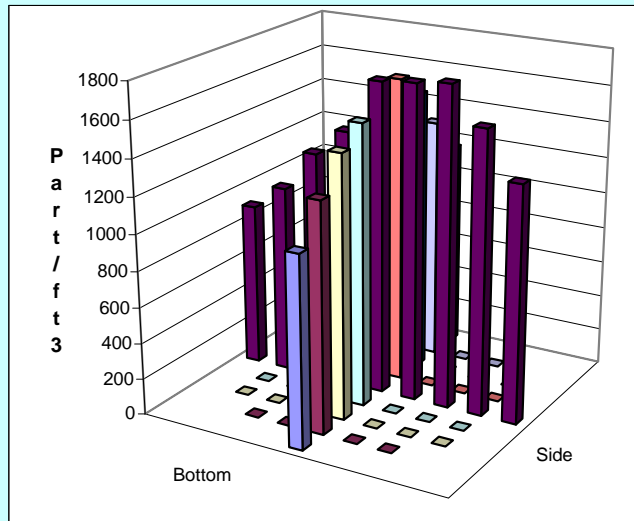
Avg Conc 1254 pt/ft3

	Start	Finish	
Generator Inlet Press	37	38	psig
Stack Temp	62	62	F
Centerline vel.	3280	3250	fpm
Ambient pressure	29.529	29.485	inHg
Ambient humidity	28%	28%	RH
Ambient temp	62	64	F
Back-Gd aerosol	0, 4, 3, 3	3, 1, 1, 3	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	120	118	psig

Instuments Used:	Cal. Due
TSI Velocity Calc Plus S/N 209060	11/1/2007
Met One A2408 SN 96258675	10/6/2007

Notes:

Vertical side
 [Bottom] Gromet replaced at start (was missing)
 Vertical side data is on page 2 of original datasheets
Oil Used: FisherBrand 19
 (Notes on Extra - Page 2: Extra set with new gromet, see page 1 for missing data)



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 Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Reference: CCP-WTPSP-175
 part-dataRev0.xls
 3 August 2006

(HVC2_part-dataRev0 (7)).xls / PT9
 4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site **HV-C2 Model**

Run No. **PT-10**

Date **12/18/2006**

Fan configuration **A** w/ 3M filtrete macroallergen prefilters

Tester **MSP**

Fan Setting **35 Hz**

Stack Dia. **12 in.**

Stack Temp **57.5 deg F**

Stack X-Area **113.1 in.2**

Start/End Time **1525 -- 1709**

Elevation **Port 1**

Center 2/3 from **1.10** to: **10.90**

Distance to disturbance **113.75 inches**

Points in Center 2/3 **2** to: **7**

Measurement units **particles/ft3**

Injection Point **A** Center

Order ----> **2nd** **1st**

Traverse-->

Trial ---->

Point	Depth, in.	Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
		particles/ft3							
1	0.50	1865	1911	2015	1930.3	2597	2571	2567	2578.3
2	1.26	2086	1967	2257	2103.3	2692	2604	2449	2581.7
3	2.33	2014	1949	2293	2085.3	2696	2510	2521	2575.7
4	3.88	2087	1977	2219	2094.3	2647	2517	2407	2523.7
Center	6.00	2077	2046	2376	2166.3	2540	2539	2458	2512.3
5	8.12	2023	1957	2319	2099.7	2554	2508	2567	2543.0
6	9.67	1937	2049	2271	2085.7	2638	2523	2555	2572.0
7	10.74	1944	2081	2130	2051.7	2812	2566	2701	2693.0
8	11.50	1956	2086	2288	2110.0	2938	2751	2682	2790.3
Averages ----->		1998.8	2002.6	2240.9	2080.7	2679.3	2565.4	2545.2	2596.7

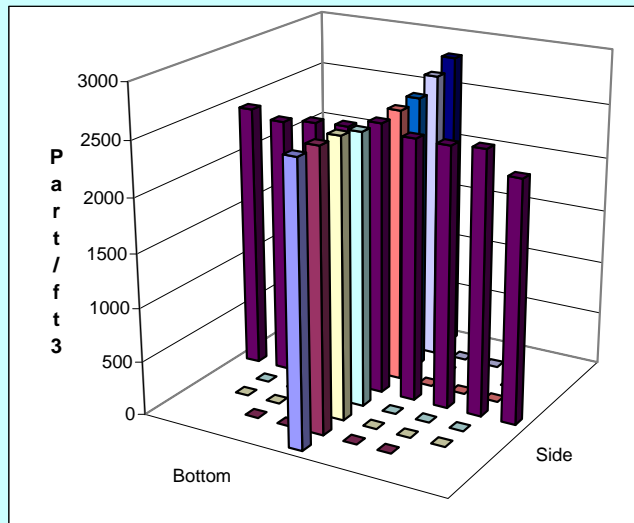
All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	2338.7		Mean	2098.0	2571.6	2334.8	2502.38
Min Point	1930.3	-17.5%	Std. Dev.	34.6	59.8	250.2	86.93
Max Point	2790.3	19.3%	COV as %	1.6	2.3	10.7	3.47

Avg Conc **2339 pt/ft3**

	Start	Finish	
Generator Inlet Press	40	40	psig
Stack Temp	58	57	F
Centerline vel.	1210	1120.0	fpm
Ambient pressure	30.08	30.07	inHg
Ambient humidity	31%	33%	RH
Ambient temp	62	60	F
Back-Gd aerosol	4,0,1,2	1,0,1,1	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	120	125	psig

Instuments Used: Cal. Due

TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007



Notes:
 Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 Both shutters @ 45 deg

Oil Used: FisherBrand 19

Signature signifies compliance with Procedure EMS-JAG-02
 Signature/Date _____
 Signature verifying data and calculations:
 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-11
Date	12/19/2006	Fan configuration	A&B w/ 3M filtrete macroallergen prefilters
Tester	JGD	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	60 deg F
Stack X-Area	113.1 in.2	Start/End Time	1000 -- 1230
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	1st		2nd

		Side				Bottom			
Trial ---->		4	5	6	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	896	896	910	900.7	641	446	500	529.0
2	1.26	1154	1142	1199	1165.0	711	602	607	640.0
3	2.33	1130	1134	1294	1186.0	817	706	672	731.7
4	3.88	1232	1269	1303	1268.0	909	834	794	845.7
Center	6.00	1302	1308	1327	1312.3	1161	1035	1041	1079.0
5	8.12	1553	1613	1685	1617.0	1364	1202	1258	1274.7
6	9.67	1824	1952	2136	1970.7	1734	1606	1510	1616.7
7	10.74	2014	2084	2239	2112.3	1854	1706	1667	1742.3
8	11.50	1660	1748	1710	1706.0	1135	1310	1382	1275.7
Averages ----->		1418.3	1460.7	1533.7	1470.9	1147.3	1049.7	1047.9	1081.6

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1276.3		Mean	1518.8	1132.9	1325.8	1448.30
Min Point	529.0	-58.6%	Std. Dev.	388.9	431.1	442.3	449.47
Max Point	2112.3	65.5%	COV as %	25.6	38.1	33.4	31.03

Avg Conc 1286 pt/ft3

	Start	Finish	
Generator Inlet Press	40	40	psig
Stack Temp	60	60	F
Centerline vel.	3250	3250.0	fpm
Ambient pressure	30	29.98	inHg
Ambient humidity	30%	28%	RH
Ambient temp	57	57	F
Back-Gd aerosol	1,0,2,4,5	2,0,3,1	pt/ft3
No. Bk-Gd samples	5	4	
Compressor output reg	100	115	psig

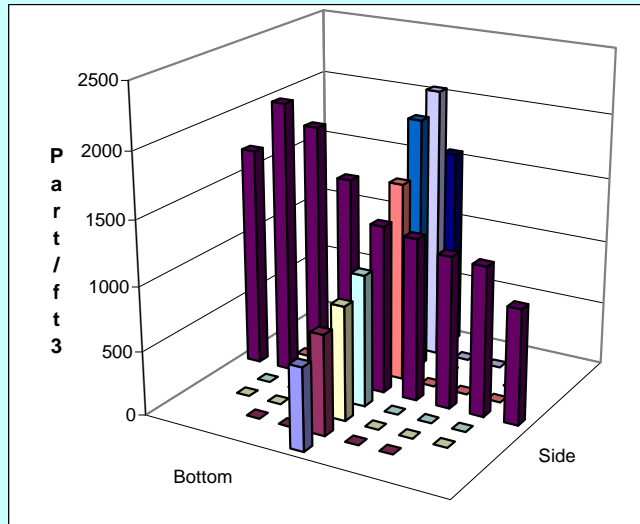
Instuments Used:	Cal. Due
TSI Velocity Calc Plus S/N 209060	11/1/2007
Met One A2408 SN 96258675	10/6/2007

Notes:

Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 Backflow @70 deg, Damper control @ full open

Oil Used: FisherBrand 19

Side values taken on second datasheet



Signature signifies compliance with Procedure EMS-JAG-02
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 Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Reference: CCP-WTPSP-175
 part-dataRev0.xls
 3 August 2006

(HVC2_part-dataRev0 (7)).xls / PT11
 4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-12
Date	12/19/2006	Fan configuration	A&B w/ 3M filtrete macroallergen prefilters
Tester	MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	59.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1330 -- 1540
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	113.75 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1052	1066	1093	1070.3	975	976	958	969.7
2	1.26	1091	1158	1133	1127.3	1109	1060	1031	1066.7
3	2.33	1188	1210	1168	1188.7	1181	1265	1165	1203.7
4	3.88	1361	1290	1314	1321.7	1402	1466	1304	1390.7
Center	6.00	1157	1283	1301	1247.0	1669	1465	1484	1539.3
5	8.12	1276	1284	1289	1283.0	1692	1694	1728	1704.7
6	9.67	1250	1264	1301	1271.7	1805	1765	1808	1792.7
7	10.74	1298	1338	1360	1332.0	1826	1799	1817	1814.0
8	11.50	1200	1206	1192	1199.3	1718	1682	1595	1665.0
Averages ----->		1208.1	1233.2	1239.0	1226.8	1486.3	1463.6	1432.2	1460.7

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1343.7		Mean	1253.0	1501.7	1377.4	1524.23
Min Point	969.7	-27.8%	Std. Dev.	73.2	293.0	242.4	209.65
Max Point	1814.0	35.0%	COV as %	5.8	19.5	17.6	13.75

Avg Conc 1338 pt/ft3

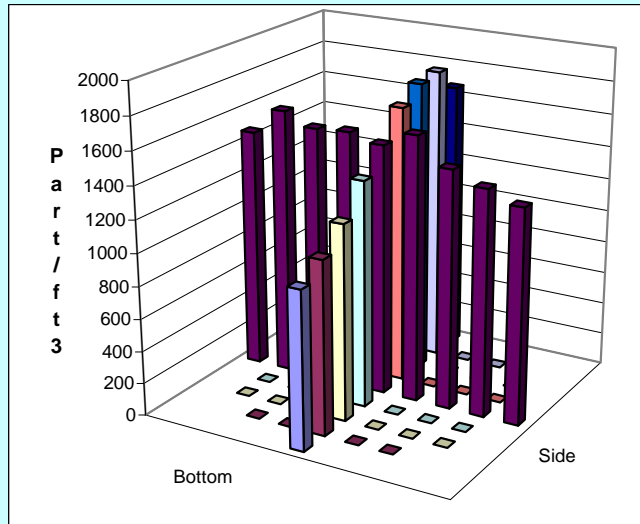
	Start	Finish	
Generator Inlet Press	40	40	psig
Stack Temp	60	59	F
Centerline vel.	3130	3170.0	fpm
Ambient pressure	29.99	29.96	inHg
Ambient humidity	43%	26%	RH
Ambient temp	54	57	F
Back-Gd aerosol	1,4,0,5	2,1,1,4	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	105	115	psig

Instuments Used:	Cal. Due
TSI Velocity Calc Plus S/N 209060	11/1/2007
Met One A2408 SN 96258675	10/6/2007

Notes:

Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 Dampers: full open; 70 deg

Oil Used: FisherBrand 19



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Reference: CCP-WTPSP-175
 part-dataRev0.xls
 3 August 2006

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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-13
Date	12/20/2006	Fan configuration	A&B w/ 3M filtrete macroallergen prefilters
Tester	MSP	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	62 deg F
Stack X-Area	113.1 in.2	Start/End Time	1350 -- 1550
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	174.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	1st		2nd

		Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	923	949	936	936.0	957	961	894	937.3
2	1.26	1178	950	1028	1052.0	1028	970	1039	1012.3
3	2.33	1125	1112	1107	1114.7	1166	1188	1173	1175.7
4	3.88	1181	1080	1202	1154.3	1301	1240	1345	1295.3
Center	6.00	1139	1161	1060	1120.0	1358	1440	1386	1394.7
5	8.12	1063	1037	1061	1053.7	1446	1563	1444	1484.3
6	9.67	988	1016	967	990.3	1501	1427	1477	1468.3
7	10.74	965	992	972	976.3	1310	1360	1279	1316.3
8	11.50	853	869	736	819.3	1141	1206	1142	1163.0
Averages ----->		1046.1	1018.4	1007.7	1024.1	1245.3	1261.7	1242.1	1249.7

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1136.9		Mean	1065.9	1306.7	1186.3	1317.01
Min Point	819.3	-27.9%	Std. Dev.	67.3	168.1	175.3	128.04
Max Point	1484.3	30.6%	COV as %	6.3	12.9	14.8	9.72

Avg Conc 1122 pt/ft3

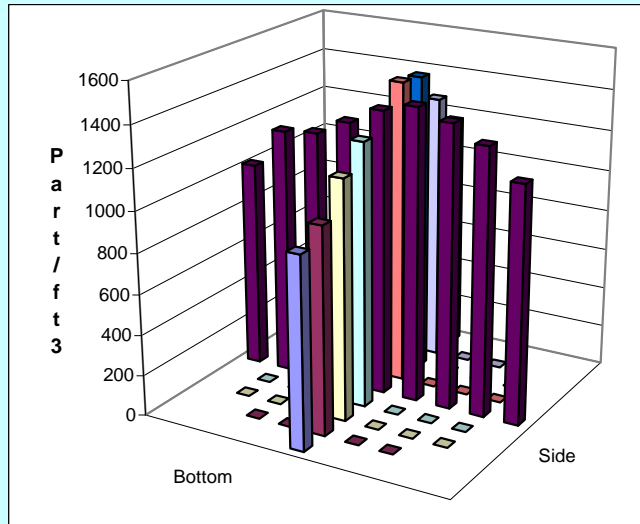
	Start	Finish	
Generator Inlet Press	40	40	psig
Stack Temp	62	62	F
Centerline vel.	3110	3010.0	fpm
Ambient pressure	29.86	29.83	inHg
Ambient humidity	22%	22%	RH
Ambient temp	61	61	F
Back-Gd aerosol	7,10,7,2	2,3,9,1	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	110	110	psig

Instuments Used:		Cal. Due
TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007

Notes:

Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 Dampers: full open; 70 deg

Oil Used: FisherBrand 19



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Reference: CCP-WTPSP-175
 part-dataRev0.xls
 3 August 2006

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 4/18/2007

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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-14
Date	12/20/2006	Fan configuration	A w/ 3M filtrete macroallergen prefilters
Tester	MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	62.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1550 -- 1750
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	174.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ----->	2nd		1st

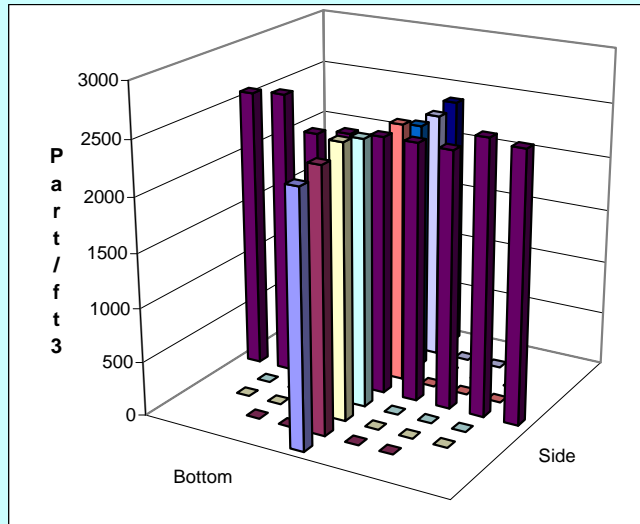
		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	2388	2031	1469	1962.7	2348	2367	2269	2328.0
2	1.26	2323	2183	1482	1996.0	2389	2509	2338	2412.0
3	2.33	1931	2170	1512	1871.0	2521	2639	2383	2514.3
4	3.88	1979	1980	1684	1881.0	2461	2480	2424	2455.0
Center	6.00	2156	1799	1688	1881.0	2384	2350	2415	2383.0
5	8.12	2148	1821	1620	1863.0	2393	2354	2475	2407.3
6	9.67	2065	1744	1663	1824.0	2453	2158	2317	2309.3
7	10.74	2328	2090	1780	2066.0	2362	2039	2542	2314.3
8	11.50	2103	1821	2194	2039.3	2298	2106	2675	2359.7
Averages ----->		2157.9	1959.9	1676.9	1931.6	2401.0	2333.6	2426.4	2387.0

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	2159.3		Mean	1911.7	2399.3	2155.5	2410.62
Min Point	1824.0	-15.5%	Std. Dev.	86.1	73.2	264.4	90.03
Max Point	2514.3	16.4%	COV as %	4.5	3.1	12.3	3.73

Avg Conc 2163 pt/ft3

	Start	Finish	
Generator Inlet Press	40	40	psig
Stack Temp	63	62	F
Centerline vel.	1280	1270.0	fpm
Ambient pressure	29.83	29.81	inHg
Ambient humidity	22%	22%	RH
Ambient temp	62	62	F
Back-Gd aerosol	2,2,3,2	1,1,2,2	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	115	115	psig

Instuments Used:	Cal. Due
TSI Velocity Calc Plus S/N 209060	11/1/2007
Met One A2408 SN 96258675	10/6/2007



Notes:

Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 Dampers: full open; 70 deg

Oil Used: FisherBrand 19

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Reference: CCP-WTPSP-175
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 3 August 2006

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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-15
Date	12/21/2006	Fan configuration	A w/ 3M filtrete macroallergen prefilters
Tester	MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	62 deg F
Stack X-Area	113.1 in.2	Start/End Time	1125 -- 1340
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	113.75 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	1st		2nd

		Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	2975	2979	3009	2987.7	3345	2488	2876	2903.0
2	1.26	3086	2810	2974	2956.7	3456	2624	3209	3096.3
3	2.33	3033	2900	2959	2964.0	3437	2562	3441	3146.7
4	3.88	3021	2978	3031	3010.0	3541	2581	3543	3221.7
Center	6.00	2965	2957	2948	2956.7	3755	2731	3301	3262.3
5	8.12	2956	2854	2973	2927.7	3875	2570	3308	3251.0
6	9.67	2787	2829	2911	2842.3	3808	2490	3165	3154.3
7	10.74	2847	2782	2820	2816.3	3818	2438	2955	3070.3
8	11.50	2824	2734	2842	2800.0	3579	2585	2938	3034.0
Averages ----->		2943.8	2869.2	2940.8	2917.9	3623.8	2563.2	3192.9	3126.6

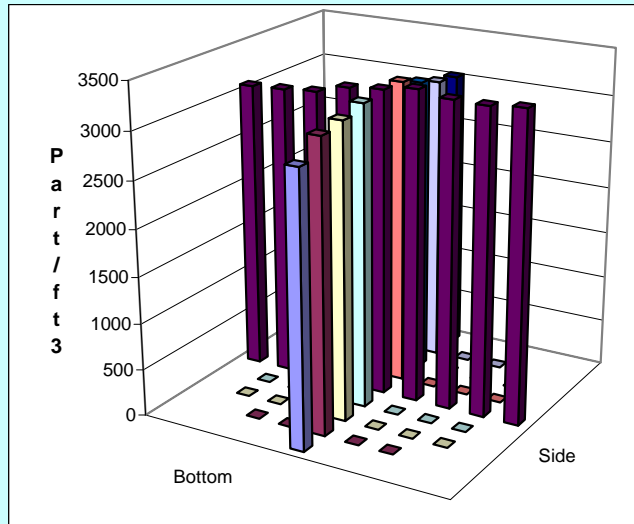
All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	3022.3		Mean	2924.8	3171.8	3048.3	3199.50
Min Point	2800.0	-7.4%	Std. Dev.	70.0	75.1	145.9	78.65
Max Point	3262.3	7.9%	COV as %	2.4	2.4	4.8	2.46

Avg Conc 3011 pt/ft3

	Start	Finish	
Generator Inlet Press	40	40	psig
Stack Temp	62	62	F
Centerline vel.	1320	1320.0	fpm
Ambient pressure	29.72	29.68	inHg
Ambient humidity	26%	31%	RH
Ambient temp	60	63	F
Back-Gd aerosol	2,6,4,0	0,0,0,2	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	110	110	psig

Instuments Used: Cal. Due

TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007



Notes:
 Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 Dampers: full open; 70 deg
 Re-ran bottom #2 and #3
Oil Used: FisherBrand 19

Signature signifies compliance with Procedure EMS-JAG-02	Signature verifying data and calculations:
Signature/date	Signatures on original data sheet in Test Instruction Package TI-RPP-WTP-466

Reference: CCP-WTPSP-175
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 3 August 2006

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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-16
Date	12/21/2006	Fan configuration	A w/ 3M filtrete macroallergen prefilters
Tester	MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	62 deg F
Stack X-Area	113.1 in.2	Start/End Time	1500 -- 1645
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	A Center
Order ---->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1183	1150	1231	1188.0	1112	1217	1241	1190.0
2	1.26	1089	1186	1092	1122.3	1249	1240	1202	1230.3
3	2.33	1032	1040	1081	1051.0	1005	1240	1232	1159.0
4	3.88	956	997	1062	1005.0	1113	1264	1165	1180.7
Center	6.00	1039	971	1066	1025.3	1252	1231	1183	1222.0
5	8.12	918	1017	1030	988.3	1423	1367	1406	1398.7
6	9.67	906	1134	1029	1023.0	1584	1611	1705	1633.3
7	10.74	1035	1145	1075	1085.0	1770	1759	1897	1808.7
8	11.50	1031	1128	1092	1083.7	2019	1783	2099	1967.0
Averages ----->		1021.0	1085.3	1084.2	1063.5	1391.9	1412.4	1458.9	1421.1

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1242.3		Mean	1042.9	1376.1	1209.5	1309.49
Min Point	988.3	-20.4%	Std. Dev.	47.0	253.0	245.9	189.14
Max Point	1967.0	58.3%	COV as %	4.5	18.4	20.3	14.44

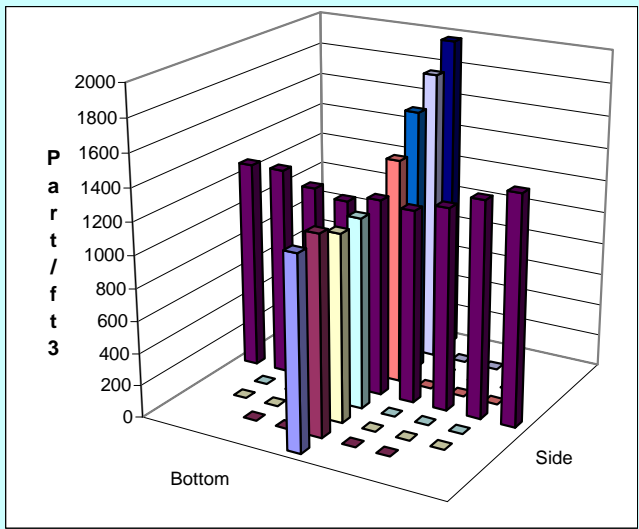
Avg Conc 1257 pt/ft3

	Start	Finish	
Generator Inlet Press	35	35	psig
Stack Temp	62	62	F
Centerline vel.	1300	1290.0	fpm
Ambient pressure	29.69	29.7	inHg
Ambient humidity	31%	29%	RH
Ambient temp	64	62	F
Back-Gd aerosol	1,1,0,3	0,0,1,1	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	120	115	psig

Instuments Used:		Cal. Due
TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007

Notes:
 Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 Dampers: full open; 70 deg

Oil Used: FisherBrand 19



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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-17
Date	12/22/2006	Fan configuration	B w/ 3M filtrete macroallergen prefilters
Tester	MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	58 deg F
Stack X-Area	113.1 in.2	Start/End Time	1030 -- 1215
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	82 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	B Center
Order ---->	1st		2nd

		Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1322	1345	1224	1297.0	1489	1581	1497	1522.3
2	1.26	1368	1340	1357	1355.0	1629	1583	1465	1559.0
3	2.33	1345	1290	1377	1337.3	1505	1610	1488	1534.3
4	3.88	1370	1337	1287	1331.3	1549	1559	1447	1518.3
Center	6.00	1313	1378	1270	1320.3	1515	1590	1455	1520.0
5	8.12	1334	1304	1295	1311.0	1501	1473	1485	1486.3
6	9.67	1276	1282	1383	1313.7	1448	1490	1508	1482.0
7	10.74	1290	1318	1371	1326.3	1550	1350	1432	1444.0
8	11.50	1331	1334	1482	1382.3	1392	1187	1326	1301.7
Averages ----->		1327.7	1325.3	1338.4	1330.5	1508.7	1491.4	1455.9	1485.3

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1407.9		Mean	1327.9	1506.3	1417.1	1517.47
Min Point	1297.0	-7.9%	Std. Dev.	15.2	38.2	96.7	30.82
Max Point	1559.0	10.7%	COV as %	1.1	2.5	6.8	2.03

Avg Conc 1406 pt/ft3

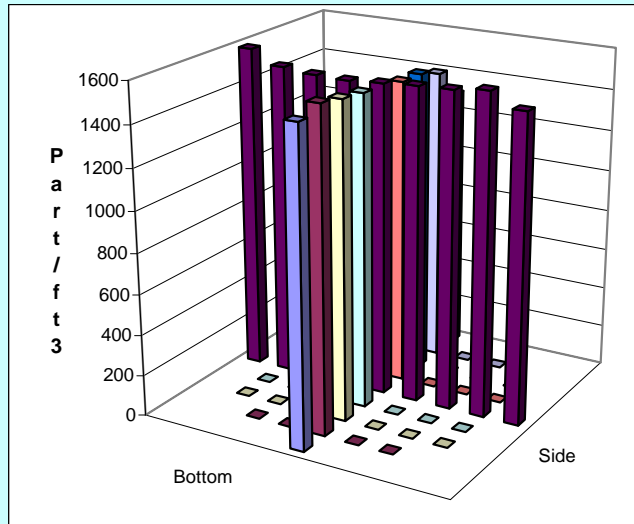
	Start	Finish	
Generator Inlet Press	35	35	psig
Stack Temp	58	58	F
Centerline vel.	1370	1400	fpm
Ambient pressure	29.98	30	inHg
Ambient humidity	35%	29%	RH
Ambient temp	60	65	F
Back-Gd aerosol	3,3,1,3	1,3,1,0	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	110	110	psig

Instuments Used:	Cal. Due
TSI Velocity Calc Plus S/N 209060	11/1/2007
Met One A2408 SN 96258675	10/6/2007

Notes:

Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 Dampers: full open; 70 deg

Oil Used: FisherBrand 19



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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-18
Date	12/22/2006	Fan configuration	B w/ 3M filtrete macroallergen prefilers
Tester	MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	59 deg F
Stack X-Area	113.1 in.2	Start/End Time	1230 -- 1400
Elevation	Port 2	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	142.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	B Center
Order ---->	2nd		1st

		Side				Bottom			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1054	1156	1083	1097.7	1249	1316	1361	1308.7
2	1.26	1089	1207	1158	1151.3	1431	1348	1399	1392.7
3	2.33	1173	1227	1142	1180.7	1390	1309	1527	1408.7
4	3.88	1108	1133	1206	1149.0	1368	1313	1461	1380.7
Center	6.00	1126	1142	1139	1135.7	1321	1306	1473	1366.7
5	8.12	1138	1127	1137	1134.0	1328	1269	1371	1322.7
6	9.67	1170	1146	1179	1165.0	1327	1270	1403	1333.3
7	10.74	1086	1118	1150	1118.0	1279	1198	1305	1260.7
8	11.50	1030	1146	1092	1089.3	1207	1175	1317	1233.0
Averages ----->		1108.2	1155.8	1142.9	1135.6	1322.2	1278.2	1401.9	1334.1

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1234.9		Mean	1147.7	1352.2	1249.9	1366.65
Min Point	1089.3	-11.8%	Std. Dev.	20.9	50.7	112.5	41.29
Max Point	1408.7	14.1%	COV as %	1.8	3.8	9.0	3.02

Avg Conc 1233 pt/ft3

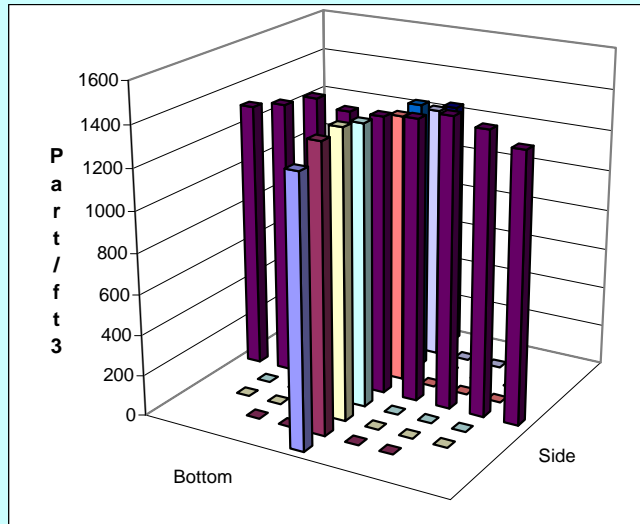
	Start	Finish	
Generator Inlet Press	35	35	psig
Stack Temp	59	59	F
Centerline vel.	1320	1320	fpm
Ambient pressure	30	29.94	inHg
Ambient humidity	35%	29%	RH
Ambient temp	60	65	F
Back-Gd aerosol	0,0,0,1	0,0,0,1	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	115	115	psig

Instuments Used:	Cal. Due
TSI Velocity Calc Plus S/N 209060	11/1/2007
Met One A2408 SN 96258675	10/6/2007

Notes:

Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 Dampers: full open; 70 deg

Oil Used: FisherBrand 19



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PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-19
Date	12/22/2006	Fan configuration	B w/ 3M filtrete macroallergen prefilters
Tester	MSP	Fan Setting	35 Hz
Stack Dia.	12 in.	Stack Temp	59.5 deg F
Stack X-Area	113.1 in.2	Start/End Time	1415 -- 1550
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	202.75 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	B Center
Order ---->	1st		2nd

		Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1439	1407	1408	1418.0	1676	1694	1624	1664.7
2	1.26	1529	1452	1520	1500.3	1609	1686	1739	1678.0
3	2.33	1446	1490	1528	1488.0	1691	1798	1741	1743.3
4	3.88	1443	1615	1561	1539.7	1648	1699	1806	1717.7
Center	6.00	1563	1598	1441	1534.0	1689	1760	1661	1703.3
5	8.12	1560	1535	1594	1563.0	1672	1685	1514	1623.7
6	9.67	1573	1575	1484	1544.0	1536	1690	1589	1605.0
7	10.74	1468	1584	1549	1533.7	1543	1567	1447	1519.0
8	11.50	1579	1433	1477	1496.3	1423	1561	1425	1469.7
Averages ----->		1511.1	1521.0	1506.9	1513.0	1609.7	1682.2	1616.2	1636.0

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1574.5		Mean	1529.0	1655.7	1592.3	1676.72
Min Point	1418.0	-9.9%	Std. Dev.	26.0	78.1	86.3	60.60
Max Point	1743.3	10.7%	COV as %	1.7	4.7	5.4	3.61

Avg Conc 1569 pt/ft3

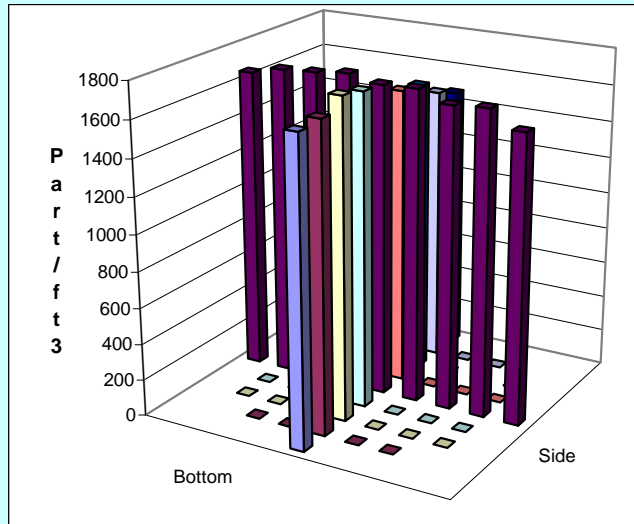
	Start	Finish	
Generator Inlet Press	35	35	psig
Stack Temp	60	59	F
Centerline vel.	1410	1410	fpm
Ambient pressure	29.94	30	inHg
Ambient humidity	29%	30%	RH
Ambient temp	65	65	F
Back-Gd aerosol	1,4,0,0	0,0,1,0	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	120	120	psig

Instuments Used:		Cal. Due
TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007

Notes:

Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 Dampers: full open; 70 deg

Oil Used: FisherBrand 19



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Reference: CCP-WTPSP-175
 part-dataRev0.xls
 3 August 2006

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 4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-20
Date	1/2/2007	Fan configuration	A&B w/ 3M filtrete macroallergen prefilters
Tester	BGF	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	62 deg F
Stack X-Area	113.1 in.2	Start/End Time	1245 -- 1445
Elevation	Port 3	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	174.25 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	B Center
Order ---->	2nd		1st

Trial ---->		Side				Bottom			
Point	Depth, in.	1	2	3	Mean	1	2	3	Mean
		particles/ft3							
1	0.50	1523	1302	1425	1416.7	1947	1477	1634	1686.0
2	1.26	1534	1758	1628	1640.0	2166	1424	1575	1721.7
3	2.33	1634	1927	1710	1757.0	2109	1532	1570	1737.0
4	3.88	1642	1732	1659	1677.7	2157	1467	1528	1717.3
Center	6.00	1623	1722	1621	1655.3	2192	1617	1734	1847.7
5	8.12	1564	1665	1749	1659.3	2151	2168	2345	2221.3
6	9.67	1613	1534	1737	1628.0	1959	2129	2269	2119.0
7	10.74	1453	1428	1650	1510.3	1740	1848	1906	1831.3
8	11.50	1126	1105	1216	1149.0	1503	1430	1602	1511.7
Averages ----->		1523.6	1574.8	1599.4	1565.9	1991.6	1676.9	1795.9	1821.4

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1693.7		Mean	1646.8	1885.0	1765.9	1861.60
Min Point	1149.0	-32.2%	Std. Dev.	73.4	203.7	192.1	151.11
Max Point	2221.3	31.2%	COV as %	4.5	10.8	10.9	8.12

Avg Conc 1686 pt/ft3

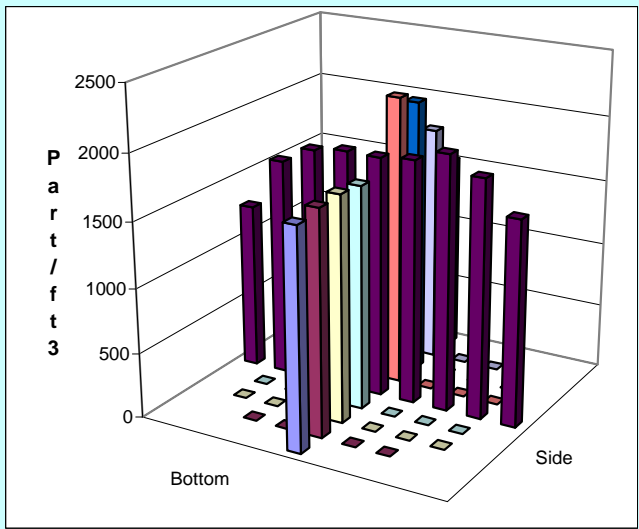
	Start	Finish	
Generator Inlet Press	40	40	psig
Stack Temp	63	61	F
Centerline vel.	2850	2900	fpm
Ambient pressure	29.45	29.45	inHg
Ambient humidity	49%	27%	RH
Ambient temp	53	75	F
Back-Gd aerosol	3,2,4,5	1,8,1,2	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	120	120	psig

Instuments Used: Cal. Due

TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007

Notes:
 Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements

Oil Used: FisherBrand 19



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Reference: CCP-WTPSP-175
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 3 August 2006

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 4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006 Site **HV-C2 Model** Run No. **PT-21** With bottom repeated with replacement grommet
 Date **1/3/2007** Fan configuration **A & B** w/ 3M filtrete macroallergen prefilters
 Tester **BGF** Fan Setting **40** Hz
 Stack Dia. **12 in.** Stack Temp **63 deg F**
 Stack X-Area **113.1 in.2** Start/End Time **1230 -- 1330**
 Elevation **Port 2** Center 2/3 from **1.10** to: **10.90**
 Distance to disturbance **113.75 inches** Points in Center 2/3 **2** to: **7**
 Measurement units **particles/ft3** Injection Point **B** Center

Order ---->		1st				2nd			
Trial ---->		Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1128	1086	1111	1108.3	1676	1682	1720	1692.7
2	1.26	1141	1110	1186	1145.7	1697	1910	1988	1865.0
3	2.33	1160	1056	1204	1140.0	1902	1981	2030	1971.0
4	3.88	1178	1041	1175	1131.3	1996	2036	2055	2029.0
Center	6.00	1150	1033	1099	1094.0	2018	2058	2046	2040.7
5	8.12	982	992	931	968.3	1887	2125	2020	2010.7
6	9.67	916	962	919	932.3	1897	2032	2014	1981.0
7	10.74	914	825	950	896.3	1868	1884	1886	1879.3
8	11.50	800	780	924	834.7	1601	1586	1789	1658.7
Averages ----->		1041.0	987.2	1055.4	1027.9	1838.0	1921.6	1949.8	1903.1

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1465.5		Mean	1044.0	1968.1	1506.0	1957.75
Min Point	834.7	-43.0%	Std. Dev.	107.8	70.1	487.4	145.02
Max Point	2040.7	39.2%	COV as %	10.3	3.6	32.4	7.41

Avg Conc 1453 pt/ft3

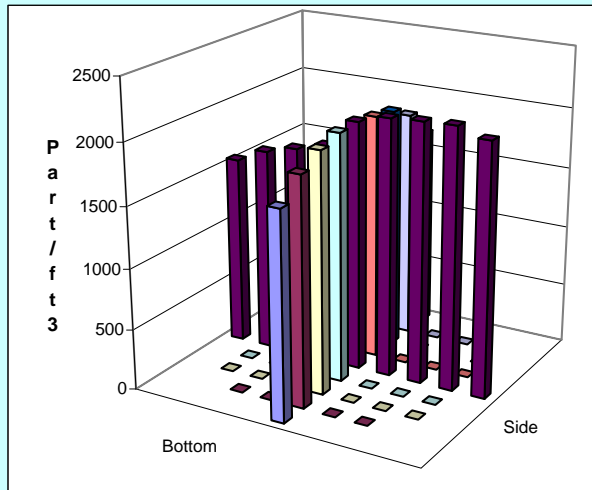
	Start	Finish	
Generator Inlet Press	22	22	psig
Stack Temp	61	65	F
Centerline vel.	2900	3000	fpm
Ambient pressure	29.19	29.19	inHg
Ambient humidity	44%	45%	RH
Ambient temp	65	65	F
Back-Gd aerosol	1, 2, 1, 2	3, 1, 1, 2	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	120	120	psig

Instuments Used: Cal. Due
 TSI Velocity Calc Plus S/N 209060 11/1/2007
 Met One A2408 SN 96258675 10/6/2007

Notes:

Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements
 New aerosol generator nozzle installed

Oil Used: FisherBrand 19



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Reference: CCP-WTPSP-175
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 3 August 2006

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 4/18/2007

Rev. 0

PARTICLE TRACER TRAVERSE DATA FORM

3 Aug. 2006

Site	HV-C2 Model	Run No.	PT-22
Date	1/3/2007	Fan configuration	A & B w/ 3M filtrete macroallergen prefilters
Tester	BGF	Fan Setting	40 Hz
Stack Dia.	12 in.	Stack Temp	65 deg F
Stack X-Area	113.1 in.2	Start/End Time	1330 -- 1445
Elevation	Port 1	Center 2/3 from	1.10 to: 10.90
Distance to disturbance	53.5 inches	Points in Center 2/3	2 to: 7
Measurement units	particles/ft3	Injection Point	B Center
Order ---->	2nd		1st

		Side				Bottom			
		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	particles/ft3				particles/ft3			
1	0.50	1833	1992	1907	1910.7	1848	1734	1740	1774.0
2	1.26	1938	2290	2026	2084.7	2037	2422	2163	2207.3
3	2.33	1838	1790	1853	1827.0	1910	2308	2120	2112.7
4	3.88	1783	1787	1534	1701.3	1849	2149	1996	1998.0
Center	6.00	1540	1434	1231	1401.7	1880	2014	1960	1951.3
5	8.12	1467	1384	1170	1340.3	2244	2272	2039	2185.0
6	9.67	1430	1422	1347	1399.7	2463	2218	2303	2328.0
7	10.74	1390	1376	1471	1412.3	2552	2471	2461	2494.7
8	11.50	1071	1166	1141	1126.0	1533	1562	1557	1550.7
Averages ----->		1587.8	1626.8	1520.0	1578.2	2035.1	2127.8	2037.7	2066.9

All	pt/ft3	Dev. from mean	Center 2/3	Side	Bottom	All	Normlzd
Mean	1822.5		Mean	1595.3	2182.4	1888.9	2201.65
Min Point	1126.0	-38.2%	Std. Dev.	282.4	187.8	382.0	296.71
Max Point	2494.7	36.9%	COV as %	17.7	8.6	20.2	13.48

Avg Conc 1841 pt/ft3

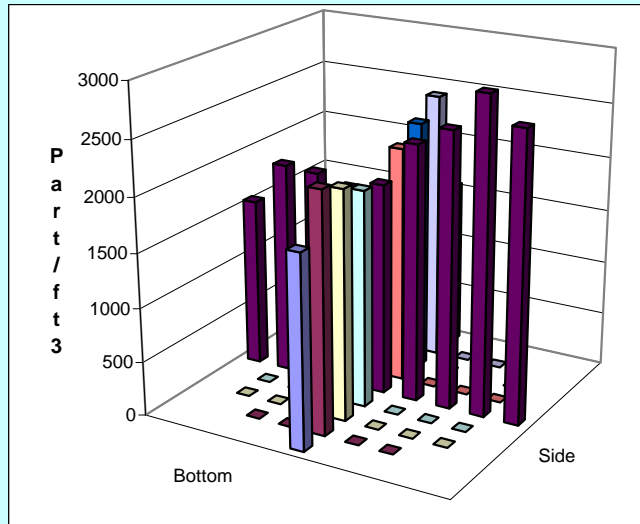
	Start	Finish	
Generator Inlet Press	22	22	psig
Stack Temp	65	65	F
Centerline vel.	3000	2880	fpm
Ambient pressure	29.19	29.19	inHg
Ambient humidity	45%	40%	RH
Ambient temp	65	66	F
Back-Gd aerosol	3, 1, 1, 2	2, 2, 3, 1	pt/ft3
No. Bk-Gd samples	4	4	
Compressor output reg	120	120	psig

Instuments Used:		Cal. Due
TSI Velocity Calc Plus	S/N 209060	11/1/2007
Met One A2408	SN 96258675	10/6/2007

Notes:

Used same probe on side and bottom transects.
 Analyzer turned on end for the side port measurements

Oil Used: FisherBrand 19



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