BOARD OF COUNTY COMMISSIONERS
Nancy Bostock
Neil Brickfield
Susan Latvala
John Morroni
Norm Roche
Karen Williams Seel
Kenneth T. Welch

RECEIVED
JAN 31 2012
DIVISION OF AIR
RESOURCE MANAGEMENT

Pinellas County
UTILITIES
Solid Waste

January 30, 2012

A. A. Linero, P.E.
Office of Permitting and Compliance
Department of Environmental Protection
Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: **Request for Additional Information dated**
Project No. 1030117-009-AC
Pinellas County Resource Recovery Facility
Emission and Process Limit Modifications

Dear Mr. Linero:

On January 11, 2012, we received your request for additional information in support of the above referenced PSD permit modification. Each question has been repeated below, with the answer following or, in most cases, included as an attachment to this response letter.

1. Please provide estimates of the annual SO_2 and CO emissions and waste throughput for 2011. Estimate the SO_2 based on arithmetically averaged emissions. Submit the emissions estimates based on geometric averaged emissions as well if available in that form.

   Please see Attachment 1, which includes annual CO emissions as well as arithmetically and geometric averaged SO_2 emissions. Please note that the baseline value for SO_2 was calculated based on geometric averaged emissions. I have also included a table showing monthly waste throughput and calculated higher heating value of the waste.

2. Provide electronic or hardcopies of the compliance stack test reports for the stack testing conducted in 2011.

   Please see Attachment 2.

3. Provide information relating the rated capacities of the units in terms of tons of waste per day to pounds of steam per hour. Include the variations expected based on variability of the heating value of the fuel (essentially the operating windows).

4. Please see Attachment 3, which includes actual performance data for the Pinellas WTE showing the variations in throughput that occur with differing heating value of the waste to maintain a relatively consistent steam flow. As has been discussed, the operators cannot directly measure the feed rate and the heating value of the waste is unknown until it is calculated at the end of the month, therefore, steam flow is used as the controlling mechanism for ensuring operation within the plant's capacity.

PLEASE ADDRESS REPLY TO:
3095 - 114th Avenue North
St. Petersburg, Florida 33716
Phone: (727) 464-7500
FAX: (727) 464-7713
Website: www.pinellascounty.org

5. Provide SO_2 modeling information if any has been prepared in support of these requests.

   Please see Attachment 4.

6. Provide the outage times for each unit that was refurbished pursuant to the Facility Improvement Project that was authorized in Project No. 1030117-007-AC.

Boiler	*Construction Period*
1	September – November 2009
2	March – May, 2009 (water wall) February – March 2010 (grates)
3	January – March 2008

7. Please provide the dates that the continuous emissions monitor systems (CEMS) were replaced on each unit. Supply approximately two days to two weeks of emissions data immediately before and after the switch over to the present arrangement. Include lime injection rates if available.

   The inlets for all three units were replaced in July 2008 and RATA testing was performed July 23 and 24, 2008, prior to putting the new inlet CEMS in service. The three outlets were replaced in December 2008 and RATA testing was performed January 6 - 8, 2009, prior to putting the new outlet CEMS in service. Attachment 5 contains a summary of inlet CO and outlet SO_2 emissions data from the period immediately preceding and following CEMS replacement.

   Lime injection rates are also provided in Attachment 5 for the period immediately preceding and following the outlet CEMS replacement. Actual injection rates are not measured, so the data provided reflects the feed rate settings. The settings were averaged over a weekly period as there is significantly variability from day to day based on the inlet SO_2 concentration and we felt that using the averages provided a better picture of overall performance.

   Turbine Generator 1 was out of service from May through early December 2008, and we were therefore only able to operate either boiler 1 or boiler 2 during this period due to limitations of the bypass condenser. The boilers were being rotated and periodically both units had to be shut down for testing and work associated with the generator replacement. This resulted in some data gaps, so we therefore included two months of data rather than two days to two weeks requested in the RAI. Additionally, where only one CO value was available and the value exceeded the standard (typically associated with shut down), these values were excluded from the graph.

8. Provide a technical description of the work performed on the spray dryer absorbers (scrubbers).

   The NELS report dated September 2011 is included as Attachment 6. This report details the modeling that was performed, and the recommended system improvements. A summary of the recommendations are provided on page 17, and drawings showing the proposed changes are provided on pages 54 and 55 of the PDF, with photographic representation on pages 185 and 186 of the PDF. The actual fabrication drawings (Appendix A to the report) were not included as part of the PDF, but can be made available upon request.

Please let us know if you have any additional questions regarding this submittal.

Sincerely,

Robert Hauser
Director, Division of Solid Waste
Department of Environment and Infrastructure

This letter was sent to the following people by electronic mail with received receipt requested.

Kelsi Oswald, Pinellas County: koswald@pinellascounty.org
Rebecca Macionski, Veolia ES Pinellas: rebecca.macionski@veoliaes.com
Christopher C. Tilman, P.E., ARCADIS: christopher.tilman@arcadis-us.com
Robert Wong, DEP SWD: robert.wong@dep.state.fl.us
Cindy Mulkey, DEP Siting Office: cindy.mulkey@dep.state.fl.us
Heather Abrams, EPA Region 4: abrams.heather@epa.gov
Peter Hessling, Pinellas County DEM: phesslin@co.pinellas.fl.us
Barbara Friday, DEP OPC: barbara.friday@dep.state.fl.us
Lynn Scearce, DEP OPC: lynn.scearce@dep.state.fl.us
Don Elias, RTP: elias@rtpenv.com
Tammy Stankunas, Earthshine Environmental: tstankunas@earthshineinc.com
Melody Lovin, DEP: melody.lovin@dep.state.fl.us
Tammy McWade, DEP: tammy.mcwade@dep.state.fl.us
David Dee, Esq., Gardner, Bist, Wiener, Wadsworth: ddee@gbwlegal.com

Attachments

Attachment 1 - 2011 CO and SO_2 Emissions Data

Attachment 2 - 2011 Compliance Stack Test Report

Attachment 3 - Unit Capacity

Attachment 4 - SO2 Modeling

Attachment 5 - Historical CEMS and Lime Usage Data

Attachment 6 - NELS Study

Pinellas County Resource Recovery Facility **Title V Permit No: 1030117-008-AV**

Facility Location:
3001 - 110th Avenue North
St. Petersburg, FL 33716
Pinellas County

Mailing Address:
John Wesley White, Executive Director
Pinellas County Dept. of Env and Infrastucture
14 South Fort Harrison Avenue, 5th Floor
Clearwater, FL 33756

Attached Document(s): PSD Permit Modification - Response to Request for Additional Information

RESPONSIBLE OFFICIAL CERTIFICATION

I, the undersigned, am the responsible official as defined in Chapter 62-213, F.A.C., of the Title V source for which this document is being submitted. I hereby certify, based on the information and belief formed after reasonable inquiry, that the statements made and data contained in this document are true, accurate, and complete.

Robert Hauser
Signature

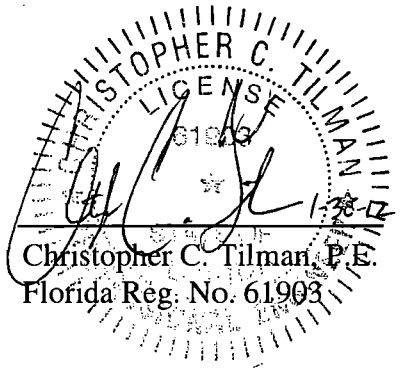
January 30, 2012
Date

Robert Hauser
Name

Director, Solid Waste Division
Title

ENGINEER'S CERTIFICATION

This response to the Department's Request for Additional Information dated January 11, 2012 was prepared by a Professional Engineer registered in the State of Florida and is being filed for public record. In accordance with Florida Administrative Code Chapter 62-4.050(3), the responses to Department's requests for additional information of an engineering nature must be certified by a professional engineer registered in the State of Florida. I hereby certify that, to the best of my knowledge, the statements made and data contained in this document are true, accurate and complete.



Christopher C. Tilman, P.E.
Florida Reg. No. 61903

Attachment 1

Pinellas County WTE Facility
Summary of CEM Concentration Data for Calendar Year 2011

Month	Unit 1				Unit 2				Unit 3				Facility Monthly Averages [1]			
	Operating Hours [2]	CO PPM	A SO_2 PPM	G SO_2 PPM	Operating Hours [2]	CO PPM	A SO_2 PPM	G SO_2 PPM	Operating Hours [2]	CO PPM	A SO_2 PPM	G SO_2 PPM	Operating Hours [2]	CO PPM	A SO_2 PPM	G SO_2 PPM
January	744.0	30.6	8.8	7.1	531.4	40.0	8.4	5.9	372.4	48.0	10.1	8.4	1,647.8	37.6	9.0	7.0
February	412.3	25.1	7.3	6.2	538.5	35.7	9.8	6.9	446.4	42.7	11.5	10.0	1,397.3	34.8	9.6	7.7
March	742.3	30.2	10.5	8.2	600.1	44.0	12.7	10.4	600.1	44.9	15.8	13.5	1,942.5	39.0	12.8	10.5
April	615.1	21.8	13.0	9.4	618.6	40.5	14.0	11.1	571.5	60.3	14.8	14.8	1,805.2	40.4	13.9	11.7
May	566.9	24.3	17.6	12.7	561.6	44.9	17.2	12.9	572.4	57.5	15.7	13.5	1,701.0	42.3	16.9	13.1
June	642.5	26.6	14.2	11.1	348.5	28.7	13.0	9.9	600.8	37.2	15.5	12.6	1,591.9	31.0	14.4	11.4
July	540.2	27.8	13.5	10.9	524.1	42.6	8.5	7.2	674.9	48.0	12.2	10.9	1,739.2	40.1	11.5	9.8
August	591.9	42.8	12.4	10.3	308.1	44.5	17.4	14.0	459.9	50.9	14.7	13.0	1,359.9	45.9	14.3	12.1
September	404.2	35.8	20.3	18.8	534.7	39.2	17.2	15.0	591.1	44.6	21.3	19.6	1,529.9	40.4	19.6	17.8
October	293.5	37.3	22.4	20.6	0.6	31.5	18.3	18.1	743.4	33.0	22.7	21.5	1,037.5	23.6	16.3	15.4
November	543.8	41.7	20.1	19.6	543.8	31.3	21.4	19.4	270.4	32.3	18.5	17.2	1,358.0	35.7	19.6	18.5
December	217.4	30.2	19.5	18.9	593.4	27.8	19.5	18.0	538.1	43.2	20.3	19.3	1,348.9	34.3	19.8	18.7
Total / Average [1]	6,314.0	30.9	14.1	11.8	5,703.5	38.2	14.4	11.9	6,441.4	45.4	16.4	14.8	18,459.0	37.6	14.6	12.5

Notes
1) Monthly and annual averages weighted based on operating hours.
2) Based on the actual hours of operation for the CEM system.
3) A SO2 references the arithmetic average and G references geometric average.

Pinellas County WTE Facility
Summary of CEM Mass Emission Data for Calendar Year 2011 (1)

Month	Unit 1			Unit 2			Unit 3			Total Facility		
	CO Tons (2)	A SO_2 Tons (2)	G SO_2 Tons (2)	CO Tons (2)	A SO_2 Tons (2)	G SO_2 Tons (2)	CO Tons (2)	A SO_2 Tons (2)	G SO_2 Tons (2)	CO Tons (2)	A SO_2 Tons (2)	G SO_2 Tons (2)
January	5.6	3.7	3.0	5.1	2.4	1.7	4.5	2.2	1.8	15.2	8.3	6.5
February	2.5	1.7	1.4	4.6	2.9	2.0	4.8	3.0	2.6	12.0	7.6	6.0
March	5.5	4.4	3.4	6.3	4.2	3.4	6.8	5.5	4.7	18.7	14.0	11.6
April	3.3	4.5	3.3	6.0	4.7	3.8	8.7	4.9	4.9	18.0	14.1	12.0
May	3.4	5.6	4.0	6.0	5.3	4.0	8.3	5.2	4.5	17.8	16.1	12.5
June	4.2	5.1	4.0	2.4	2.5	1.9	5.7	5.4	4.4	12.3	13.0	10.3
July	3.7	4.1	3.3	5.3	2.4	2.1	8.2	4.8	4.3	17.3	11.3	9.7
August	6.2	4.1	3.4	3.3	2.9	2.4	5.9	3.9	3.5	15.4	11.0	9.3
September	3.6	4.6	4.3	5.0	5.0	4.4	6.7	7.3	6.7	15.3	16.9	15.4
October	2.7	3.7	3.4	0.0	0.0	0.0	6.2	9.8	9.3	8.9	13.5	12.7
November	5.6	6.1	6.0	4.1	6.3	5.8	2.2	2.9	2.7	11.9	15.4	14.5
December	1.6	2.4	2.3	3.9	6.3	5.8	5.9	6.3	6.0	11.5	15.0	14.2
YTD Total	48.0	50.1	41.9	52.0	45.0	37.2	74.1	61.2	55.4	174.1	156.3	134.5

2011 Stack Test Data	
	Average Flue Gas Flow (dscfm @ 7% O_2)
Unit 1	112,911
Unit 2	109,590
Unit 3	116,365

Molecular Weight	
	(Lb/Lb Mol)
CO	28
SO_2	64
NO_x	46

Conversion Factors	
0.0025956	moles/dscf
60	min/hr
2,000	lbs/ton
1,000,000	ppm

Notes:

1) CEM measured pollutants only

2) Concentration from Table 4-2 (ppm) divided by 1,000,000 times air flow (dscfm) times molecular weight (lb/lb mol) times 0.0025956 (lb moles/dscf) times 60 (min/hr) times operating hours from Table 4-2 (hrs/yr) divided by 2000 (lbs/ton).

3) Applies for a 5 year period beginning with calendar year 2011.

PINELLAS COUNTY SOLID WASTE MANAGEMENT
TONNAGE ACTIVITY REPORT

	Tons Processed	Waste HHV
January 2011	71,622	4,839
February 2011	68,071	4,632
March 2011	78,546	4,721
April 2011	79,245	4,583
May 2011	73,225	4,877
June 2011	74,054	4,650
July 2011	73,717	4,546
August 2011	72,905	4,233
September 2011	66,398	4,612
October 2011	52,636	4,705
November 2011	54,538	4,767
December 2011	56,749	4,881
Monthly Average	68,476	4,671
Calendar Year Total	821,706	

Attachment 2

The Air Compliance Group, LLC

Virginia Office
5075 Hollins Road
Roanoke, VA 24019
Phone: (540) 265-1987
Fax: (540) 265-0082

Pennsylvania Office
449 Veit Road
Huntingdon Valley, PA 19006
Phone: (215) 364-8940
Fax: (215) 364-4596

Air Emissions Test Report For Compliance Testing Conducted on Units 1, 2, and 3 at Pinellas County Resource Recovery Facility in St. Petersburg, Florida

Facility ID No. 1030117

Prepared for

Veolia ES Pinellas, Inc.

St. Petersburg, Florida

Test Dates: April 12-14, 2011
Report Date: May 24, 2011

ACG Contract Number V11841

The Air Compliance Group, LLC

TEST REPORT CERTIFICATION

Air Emissions Test Report for Compliance Testing
Conducted on Units 1, 2, &3 at Pinellas County Resource Recovery Facility

Prepared by The Air Compliance Group, LLC of Roanoke, Virginia for
Veolia ES Pinellas, Inc. of St. Petersburg, Florida

Test Dates: April 12-14, 2011
Report Date: May 24, 2011
Contract Number V11841

We certify that, to the best of our knowledge, this source test report has been checked for completeness, and that the results presented herein are accurate, error-free, legible, and representative of the actual emissions measured during testing.

Signature ..... *Date* 5/24/2011.....
Kenley Houtz, QSTI (electronic signature)
Project Manager
The Air Compliance Group, LLC

Signature ..... *Date* 5/24/2011.....
David Vecellio, QSTI (electronic signature)
Project Manager - Reporting
The Air Compliance Group, LLC

Signature ..... *Date* 5/24/2011.....
Arthur B. Nunn, III, QEP (electronic signature)
President
The Air Compliance Group, LLC

I have supplied facility data in Appendix P of this test report, and I certify that I believe the information provided to be true, accurate, and complete. For results of the facility's QA/QC program, refer to the Pinellas County Resource Recovery Facility.

Signature ..... *Date* .....
Rebecca Macionski
Environmental Manager
Representative of Pinellas County Resource Recovery Facility

TABLE OF CONTENTS

			Page
1.0	**Introduction**		1
	1.1	Background	1
	1.2	Objective	1
	1.3	Test Program	2
2.0	**Summary of Results**		3
	2.1	Presentation	3
	2.2	Particulate Emissions	3
	2.3	Visible and Fugitive Emissions	3
	2.4	Total Fluoride Emissions	5
	2.5	Dioxins and Furans Emissions	5
	2.6	Hydrogen Chloride (HCl) Emissions and Reduction Efficiency	5
	2.7	Metals Emissions and Mercury Reduction Efficiency	5
	2.8	Audit Samples	6
	2.9	Facility Operation	6
3.0	**Test Program Changes and Problems**		6
4.0	**Facility Description**		7
5.0	**Sampling and Analytical Procedures**		11
	5.1	Sampling Procedures	12
		5.1.1 Sampling Point Determination - EPA Method 1	12
		5.1.2 Volumetric Measurements - EPA Method 2	12
		5.1.3 Molecular Weight Determination - EPA Method 3	12
		5.1.4 Flue Gas Moisture Content - EPA Method 4	13
		5.1.5 Particulate and Metals Sampling - EPA Method 29	13
		5.1.5.1 Sampling Train Description	13
		5.1.5.2 Sampling Train Operation	16
		5.1.5.3 Sample Recovery and Clean-up	16
		5.1.5.4 Blanks	18
		5.1.6 Fluoride Sampling - EPA Method 13B	18
		5.1.6.1 Sampling Train Description	18
		5.1.6.2 Sampling Train Operation	20
		5.1.6.3 Sample Recovery and Clean-up	20
		5.1.6.4 Blanks	20
		5.1.7 Dioxins and Furans - EPA Method 23	20
		5.1.7.1 Sampling Train Description	20
		5.1.7.2 Sampling Train Operation	22

TABLE OF CONTENTS (CONTINUED)

		Page
5.1.7.3	Sample Recovery and Clean-up	23
5.1.7.4	Blanks	24
5.1.8	Hydrogen Chloride Sampling - Modified EPA Method 26	24
5.1.8.1	Sampling Train Description	25
5.1.8.2	Sampling Train Operation	25
5.1.8.3	Sample Recovery and Clean-up	25
5.1.8.4	Blanks	25
5.1.9	Visible Emissions Evaluation - EPA Method 9	27
5.1.9.1	Observer Position	27
5.1.9.2	Opacity Observations	27
5.1.10	Fugitive Emission Evaluations - EPA Method 22	27
5.1.10.1	Observer Position	27
5.1.10.2	Fugitive Emissions Observations	27
5.2	Analytical Procedures	28
5.2.1	Molecular Weight Determination - EPA Method 3A	28
5.2.2	Moisture Content - EPA Method 4	28
5.2.3	Particulate Analysis - EPA Method 5	28
5.2.4	Fluoride Analysis - EPA Method 13B	29
5.2.5	Dioxins and Furans Analyses - EPA 23	29
5.2.6	Hydrogen Chloride Analyses - EPA Method 26	29
5.2.7	Metals Analyses - EPA Method 29	29
5.3	Data Analysis	30
5.4	Equipment Calibration	30
6.0	**Quality Assurance**	31
6.1	Equipment Inspection and Maintenance	31
6.2	Equipment Calibration	31
6.3	Sampling Quality Control Procedures	32
6.4	Analytical Quality Control Procedures	34

LIST OF TABLES

Table 1 - Overall Summary of Test Program Results 4
Table 2 - Summary of Particulate and Metals Emissions: Unit 1 FF Outlet 35
Table 3 - Summary of Particulate and Metals Emissions: Unit 2 FF Outlet 36
Table 4 - Summary of Particulate and Metals Emissions: Unit 3 FF Outlet 37
Table 5 - Summary of Mercury Loadings: Unit 1 SDA Inlet 38
Table 6 - Summary of Mercury Loadings: Unit 2 SDA Inlet 39
Table 7 - Summary of Mercury Loadings: Unit 3 SDA Inlet 40
Table 8 - Summary of Total Fluoride Emissions: Unit 3 FF Outlet 41
Table 9 - Summary of Dioxins and Furans Emissions: Unit 3 FF Outlet 42
Table 10 - Summary of Hydrogen Chloride Emissions: Unit 1 FF Outlet 43
Table 11 - Summary of Hydrogen Chloride Emissions: Unit 2 FF Outlet 44
Table 12 - Summary of Hydrogen Chloride Emissions: Unit 3 FF Outlet 45
Table 13 - Summary of Hydrogen Chloride Loadings: Unit 1 SDA Inlet 46
Table 14 - Summary of Hydrogen Chloride Loadings: Unit 2 SDA Inlet 47
Table 15 - Summary of Hydrogen Chloride Loadings: Unit 3 SDA Inlet 48
Table 16 - Summary of Visible and Fugitive Emissions: MWC Stacks, Ash Conditioning Building, Residue Storage and Processing Building and Ash Handling System 49
Table 17 - Summary of Run-by-Run Isokinetic Test Air Flow Results at Units 1-3 FF Outlets 50

LIST OF FIGURES

Figure 1 - Process General Flow Arrangement 8
Figure 2 - SDA Inlet Sampling Location 9
Figure 3 - FF Outlet Sampling Location 10
Figure 4 - EPA Method 3 Sampling Train 14
Figure 5 - EPA Method 29 Sampling Train 15
Figure 6 - EPA Method 13B Sampling Train 19
Figure 7 - EPA Method 23 Sampling Train 21
Figure 8 - Modified EPA Method 26 Sampling Train 26

LIST OF APPENDICES

Appendix A - Test Log and Contact Information

Appendix B - EPA Method 29 Data and Results
Appendix B.1 - EPA Method 29 Data and Results: Unit 1 FF Outlet
Appendix B.2 - EPA Method 29 Data and Results: Unit 1 SDA Inlet
Appendix B.3 - EPA Method 29 Data and Results: Unit 2 FF Outlet
Appendix B.4 - EPA Method 29 Data and Results: Unit 2 SDA Inlet
Appendix B.5 - EPA Method 29 Data and Results: Unit 3 FF Outlet
Appendix B.6 - EPA Method 29 Data and Results: Unit 3 SDA Inlet

Appendix C - EPA Method 13B Data and Results

Appendix D- EPA Method 23 Data and Results

Appendix E - Modified EPA Method 26 Data and Results
Appendix E.1 - Modified EPA Method 26 Data and Results: Unit 1 FF Outlet
Appendix E.2 - Modified EPA Method 26 Data and Results: Unit 1 SDA Inlet
Appendix E.3 - Modified EPA Method 26 Data and Results: Unit 2 FF Outlet
Appendix E.4 - Modified EPA Method 26 Data and Results: Unit 2 SDA Inlet
Appendix E.5 - Modified EPA Method 26 Data and Results: Unit 3 FF Outlet
Appendix E.6 - Modified EPA Method 26 Data and Results: Unit 3 SDA Inlet

Appendix F - EPA Method 9 Data and Results

Appendix G - Equations and Sample Calculations

Appendix H - EPA Method 1 Raw Field Data: Cyclonic Flow Checks

Appendix I - EPA Method 29 Raw Field Data
Appendix I.1 - EPA Method 29 Raw Field Data: Unit 1 FF Outlet
Appendix I.2 - EPA Method 29 Raw Field Data: Unit 1 SDA Inlet
Appendix I.3 - EPA Method 29 Raw Field Data: Unit 2 FF Outlet
Appendix I.4 - EPA Method 29 Raw Field Data: Unit 2 SDA Inlet
Appendix I.5 - EPA Method 29 Raw Field Data: Unit 3 FF Outlet
Appendix I.6 - EPA Method 29 Raw Field Data: Unit 3 SDA Inlet

Appendix J - EPA Method 13B Raw Field Data

Appendix K - EPA Method 23 Raw Field Data

Appendix L - Modified EPA Method 26 Raw Field Data
Appendix L.1 - Modified EPA Method 26 Raw Field Data: Unit 1 FF Outlet
Appendix L.2 - Modified EPA Method 26 Raw Field Data: Unit 1 SDA Inlet
Appendix L.3 - Modified EPA Method 26 Raw Field Data: Unit 2 FF Outlet
Appendix L.4 - Modified EPA Method 26 Raw Field Data: Unit 2 SDA Inlet
Appendix L.5 - Modified EPA Method 26 Raw Field Data: Unit 3 FF Outlet
Appendix L.6 - Modified EPA Method 26 Raw Field Data: Unit 3 SDA Inlet

Appendix M - EPA Method 9 and 22 Raw Field Data
Appendix M.1 - EPA Method 9 Raw Field Data: Unit 1 Stack
Appendix M.2 - EPA Method 9 Raw Field Data: Unit 2 Stack
Appendix M.3 - EPA Method 9 Raw Field Data: Unit 3 Stack
Appendix M.4 - EPA Method 9 Raw Field Data: Ash Conditioning Building
Appendix M.5 - EPA Method 9 Raw Field Data: Residue Storage and Processing Bldg.
Appendix M.6 - EPA Method 22 Raw Field Data: Ash Handling System

Appendix N - Analytical Data
Appendix N.1 - EPA Method 3A Analytical Data
Appendix N.2 - EPA Method 5 Gravimetric Analytical Data
Appendix N.3 - EPA Method 13B Laboratory Analytical Data*
Appendix N.4 - EPA Method 23 Laboratory Analytical Data*
Appendix N.5 - EPA Method 26 Analytical Data*
Appendix N.6 - EPA Method 29 Laboratory Analytical Data*
*(see attached CD for full lab report)

Appendix O - Field Equipment Calibration Data
Appendix O.1 - Pitot Tube, Barometer and Nozzle Calibration Data
Appendix O.2 - Meter Console and Thermocouple Calibration Data
Appendix O.3 - Gas Analyzer Calibration and Related Data
Appendix O.4 - Visible Emissions Evaluator Certification

Appendix P - Facility Operational Data
Appendix P.1 - Facility Operational Data: Unit 1
Appendix P.2 - Facility Operational Data: Unit 2
Appendix P.3 - Facility Operational Data: Unit 3

1.0 Introduction

1.1 Background

An air emissions test program was conducted for Veolia ES Pinellas, Inc. (Veolia) at the Pinellas County Resource Recovery Facility (PCRRF) in St. Petersburg, Florida. The plant is owned by Pinellas County and operated by Veolia. The plant consists of three municipal waste combustor units, designated Unit 1, Unit 2, and Unit 3. The test program was conducted April 12–14, 2011 by The Air Compliance Group, LLC (ACG) of Roanoke, Virginia. The following personnel participated in the test program:

Name	Affiliation	Test Program Position
Rebecca Macionski Kenley	Veolia	Overall Program Manager
Kenley Houtz	ACG	Project Manager
Tony Underwood	ACG	Field Technician
Frank Craighead	ACG	Field Technician
Craig Tallman	ACG	Field Technician
Chris Gish	ACG	Field Technician
Michael Wilson	ACG	Field Technician
Mike Henry	ACG	Field Technician
James Stultz	ACG	Field Technician
Ryan Cooper	ACG	Field Technician

1.2 Objective

Testing was conducted on Units 1, 2, and 3 (Emission Unit ID Nos. -001, -002, and -003, respectively), as well as the Ash Conditioning Building (Emission Unit ID No. -008), the Residue Storage and Processing Building (Emission Unit ID No. -005) and the Ash Handling System at the facility, as required by Title V Permit No. 1030117-008-AV and Construction Permit No 1030117-007-AC. In accordance with the permit, testing was conducted for the following pollutants on Units 1, 2, and 3 while the units were being operated at or near the maximum permitted operating rate:

<table>
<tr><td>• Particulate Matter (PM)</td><td>• Total Fluoride (total F^-) (only conducted on Unit 3)</td></tr>
<tr><td rowspan="3">• Visible Emissions (VE) (also conducted at vents)</td><td>• Beryllium (Be - only conducted on Unit 3)</td></tr>
<tr><td>• Cadmium (Cd)</td></tr>
<tr><td>• Lead (Pb)</td></tr>
<tr><td>• Hydrogen Chloride (HCl)</td><td>• Mercury (Hg)</td></tr>
<tr><td colspan="2">• Dioxins/Furans (D/F - only conducted on Unit 3)</td></tr>
<tr><td colspan="2">• Fugitive Emissions (only conducted at the Ash Handling System)</td></tr>
</table>

1.3 Test Program

The majority of the sampling program was conducted at the Spray Dryer Absorber (SDA) inlet and the Fabric Filter (FF) outlet of each unit. Additionally, visible (at the vents) and fugitive (at the ash handling system) emissions were visually determined at the applicable test locations.

Three valid measurements were made at the Units 1, 2, and 3 FF outlets for: PM, VE, HCl, and metals (Be (only at Unit 3), Cd, Pb, and Hg). Three valid measurements were also made at the Unit 3 FF outlet for D/F and total F^-. For the purpose of determining reduction efficiency, concurrent testing was also conducted at the Units 1, 2, and 3 SDA inlets for HCl and Hg. Three valid fugitive emission measurements were conducted at the Ash Handling System, and one valid VE test was also conducted at each of the vents.

Each pollutant measurement (excluding visible emissions) included determination of the given pollutant emissions as well as average gas temperature, moisture content, molecular weight, and volumetric flow rate. Unit steam flow and conditions were also recorded during the testing period. The testing was conducted in accordance with the procedures of Appendix A of the *Code of Federal Regulations*, Title 40, Part 60 (40 CFR 60), or other methods accepted by the EPA and the Florida Department of Environmental Protection (FDEP). Appendix A contains a test log that provides the exact date and time for each test.

2.0 Summary of Results

2.1 Presentation

Table 1 summarizes the average emissions for each pollutant tested versus the established permit limits. Detailed test results can be found in Tables 2 through 17, which are located at the end of the report text. Appendices B through F contain detailed data and results for each test.

2.2 Particulate Emissions

During the test program, particulate emissions from Unit 1 averaged 0.009 grains per dry standard cubic foot corrected 7% O_2 (gr/dscf @ 7% O_2) and 20 milligrams per dry standard cubic meter corrected to 7% O_2 (mg/dscm @ 7% O_2). Particulate emissions from Unit 2 averaged 0.006 gr/dscf @ 7% O_2 and 13 mg/dscm @ 7% O_2. Particulate emissions from Unit 3 averaged 0.004 gr/dscf @ 7% O_2 and 9.2 mg/dscm @ 7% O_2. The Title V permit limit for PM for each unit is 0.012 gr/dscf @ 7% O_2 and 27 mg/dscm @ 7% O_2, and the MACT limit is 25 mg/dscm @ 7% O_2. Tables 2 through 4 and Appendix B contain more detailed results.

2.3 Visible and Fugitive Emissions

Opacity of visible emissions (maximum six-minute average value measured by EPA Method 9, concurrently with particulate testing) was 0.00 percent for each of Units 1, 2, and 3. The permitted limit for each unit is 10 percent opacity (six-minute average).

No VEs were observed (all were uniformly zero percent opacity) at the Ash Conditioning Building (ACB) or at the Residue Storage and Processing Building (RSPB).

Fugitive visible emissions measured by EPA Method 22 at the ash handling system were observed for 0 seconds (0.00%) of the three 60-minute tests. Table 16 and Appendix F contain more detailed results for the visible and fugitive emissions tests.

Table 1 – Overall Summary of Test Program Results

Pinellas County Resource Recovery Facility (April 2011)

Pollutant		Reporting Units	Title V Emission Limits	MACT Emission Limits	Average Emissions		
					Unit 1	Unit 2	Unit 3
Particulate Matter		gr/dscf @7% O_2	0.012 (1.2×10^{-2})	N/A	0.009 (8.7×10^{-3})	0.006 (5.8×10^{-3})	0.004 (4.0×10^{-3})
		mg/dscm @7% O_2	27	25	20	13	9.2
		lb/hr	N/A		7.98	5.31	3.86
Dioxins and Furans		ng/dscm @ 7% O_2	30		N/A	N/A	1.4
		lb/hr	N/A		N/A	N/A	6.07×10^{-7}
Beryllium		lb/hr	9×10^{-5}	N/A	N/A	N/A	$< 1.2 \times 10^{-5}$
Cadmium		mg/dscm @7% O_2	0.040 (4.0×10^{-2})	0.035 (3.5×10^{-2})	0.010 (9.7×10^{-3})	0.001 (1.2×10^{-3})	0.001 (5.7×10^{-4})
		lb/hr	N/A		3.95×10^{-3}	4.92×10^{-4}	2.40×10^{-4}
Lead		mg/dscm @7% O_2	0.44 (4.4×10^{-1})	0.400 (4.00×10^{-1})	0.027 (2.7×10^{-2})	0.010 (1.0×10^{-2})	0.004 (3.8×10^{-3})
		lb/hr	N/A		1.09×10^{-2}	4.02×10^{-3}	1.61×10^{-3}
Mercury	*Outlet concentration*	mg/dscm @7% O_2	0.070 (7.0×10^{-2})	0.050 (5.0×10^{-2})	0.003 (3.0×10^{-3})	< 0.003 (2.9×10^{-3})	0.013 (1.3×10^{-2})
			OR				
	Removal efficiency	Reduction Efficiency % (based on mass flow - lb/hr)	85		92	93	47
	Outlet Mass Rate	lb/hr	N/A		1.20×10^{-3}	1.15×10^{-3}	5.27×10^{-3}
Hydrogen Chloride	*Outlet concentration*	ppmdv @7% O_2	29		0.63	11	4.6
			OR				
	Removal efficiency	Reduction Efficiency % (based on ppmdv @7% O_2)	95		99.9	98	99
	Outlet Mass Rate	lb/hr	N/A		0.40	6.85	2.83
Total Fluoride		lb/hr	8.31		N/A	N/A	$< 4.96 \times 10^{-2}$
Visible Emissions		% Opacity (6-minute Average)	10		0.00	0.00	0.00
			5		From ACB and RSPB locations: All sources were 0.00%.		
Fugitive Emissions		% of Observation Period	5		Fugitive emissions were observed for 0.00% of the observation period duration on the Ash Handling System.		
Maximum demonstrated unit load (steam flow) [1]		Klb/hr			N/A	N/A	236
		run no.					U3O-M23-R3
Maximum demonstrated particulate matter control device temperature (baghouse inlet temperature) [2]		°F					320
		run no.					U3O-M23-R2
Avg. carbon mass feed		lb/hr					15 [3]
					15 [4]	15 [4]	15 [4]

"<" denotes that one or more fractions were below the detection limit. Detection limits were used in cases of non-detect results.

[1] See 40 CFR 60.58b(i)(8) – Highest 4 hour average block demonstrated during the Method 23 dioxin/furan test runs.

[2] See 40 CFR 60.58b(i)(9) – Highest 4 hour average block demonstrated during the Method 23 dioxin/furan test runs.

[3] Average value during three valid EPA Method 23 dioxins/furans test runs.

[4] Average value during three valid EPA Method 29 metals test runs.

Please note that Appendix F only contains data reduction for test locations in which emissions were observed, and the raw field data for all locations is in Appendix M.

2.4 Total Fluoride Emissions Total fluoride emissions from Unit 3 averaged 4.96 x 10^{-2} lb/hr. The permitted emissions limit for total fluoride is 8.31 lb/hr. Table 8 and Appendix C contain more detailed data and results.

2.5 Dioxins and Furans Emissions

Dioxins/furans emissions from Unit 3 averaged 1.37 ng/dscm @ 7% O_2. The Title V permit limit for dioxins/furans, as well as the MACT standard, for each unit is 30 ng/dscm @ 7% O_2. Table 9 and Appendix D contain more detailed results. Please see Appendix P.3 for the 2011 compliance stack established limits for carbon feed rate, baghouse inlet temperature, and steam flow based on the dioxins/furans testing.

2.6 Hydrogen Chloride (HCl) Emissions and Reduction Efficiency

HCl emissions from Units 1, 2, and 3 averaged 0.63, 11, and 4.6 ppmdv @ 7% O_2, respectively. HCl reduction efficiency for Units 1, 2, and 3 averaged 99.9%, 98%, and 99%, respectively. The Title V permit limit, as well as the MACT standard, for each unit is 29 ppmdv @ 7% O_2 or 95% reduction. Tables 10 through 15 and Appendix E contain more detailed results.

2.7 Metals Emissions and Reduction Efficiency

Beryllium emissions from Unit 3 averaged < 1.2 x 10^{-5}. Cadmium emissions from Units 1, 2, and 3 averaged 0.010, 0.001, and 0.001 mg/dscm @ 7% O_2, respectively. Lead emissions from Units 1, 2, and 3 averaged 0.027, 0.010, and 0.004 mg/dscm @ 7% O_2, respectively. Mercury emissions from Units 1, 2, and 3 averaged 0.003, < 0.003, and 0.013 mg/dscm @ 7% O_2, respectively. Mercury reduction efficiency for Units 1, 2, and 3 averaged 92%, 93%, and 47%, respectively. The Title V permit limit for beryllium for each unit is 9 x 10^{-5} lb/hr. The Title V permit limits (in mg/dscm @ 7% O_2) for each unit are: 0.040 (for cadmium); 0.44 (lead); and 0.070 (mercury) or 85% mercury reduction. The MACT limits (in mg/dscm @ 7% O_2) for each unit are: 0.035 (for cadmium); 0.400

(lead); and 0.050 (mercury) or 85% mercury reduction. Tables 2 through 7 and Appendix B contain more detailed results.

2.8 Audit Samples

No audit samples were analyzed for the test program, as none were provided.

2.9 Facility Operation

Appendix P contains the facility operating data (steam flow in Klb/hr) recorded during the test program. Testing of emissions was conducted at or near the maximum permitted operating rate. Only MSW was burned during the testing.

3.0 Test Program Changes and Problems

Except as noted below, all testing was conducted in accordance with the test protocol submitted to the FDEP, issued by ACG and dated March 8, 2011, and no problems were experienced by the test team or the contracted analytical laboratories during the execution of the test program. The following should be noted:

- Several runs were delayed during the testing either due to loss of electrical power to the sampling equipment or due to replacing the SDA inlet EPA Method 29 sample train filter, which became plugged. The delays are noted in the test log.

- The visible emissions tests were not conducted at the Lime Storage Silo for SDA (Emission Unit ID No. -007, which is also known as the Pebble Lime Silo), Hydrated Lime Storage Silo for Lime Softening (Emission Unit ID No. -004, which is also known as the Hydrated Lime Storage Silo or Hydrated Lime Silo Vent) and the Activated Carbon Storage Silo (Emission Unit ID No. -006, which is also known as the Carbon Silo Vent), as specified in the test protocol. This was because the facility did not have truck shipments available during the test program. The testing of those locations was to have been conducted by the facility at a later date, and the results are being submitted separately from this test report.

4.0 Facility Description

PCRRF consists of three 1,000 ton per day (1,100 ton per day maximum) municipal waste fired combustors. Each combustor consists of a Riley Stoker water wall boiler with a reciprocating grate stoker system. Each combustor is equipped with a spray dryer absorber (SDA), a fabric filter (FF), a Selective Non-Catalytic Reduction (SNCR) NOx control system, and a powdered activated carbon injection system (PACIS) supplied by Wheelabrator Air Pollution Control, Inc. Combustion gases exit the boiler economizer and pass through the SDA and FF, then to an induced draft fan prior to entering separate flues in a common stack.

Figure 1 presents a general flow arrangement of the process. Figure 2 depicts a cross-section of the SDA Inlet test locations. Figure 3 depicts a cross-section of the FF Outlet test locations. The test locations meet EPA Methods 1 and 2 minimum criteria for upstream (2.0) and downstream (0.5) dimensions.

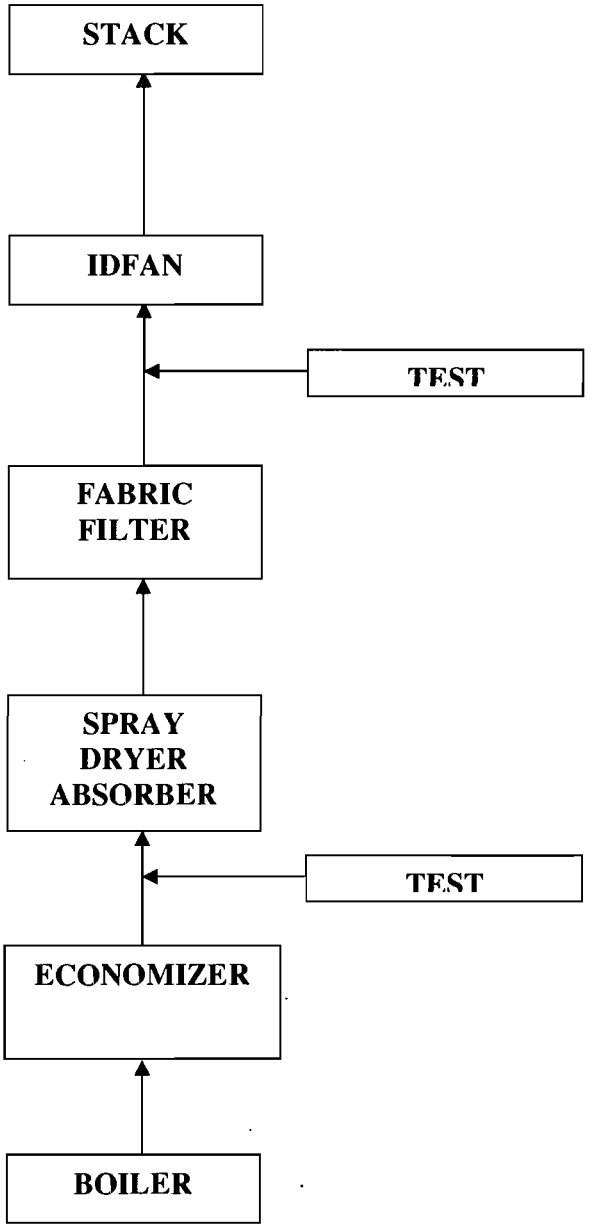
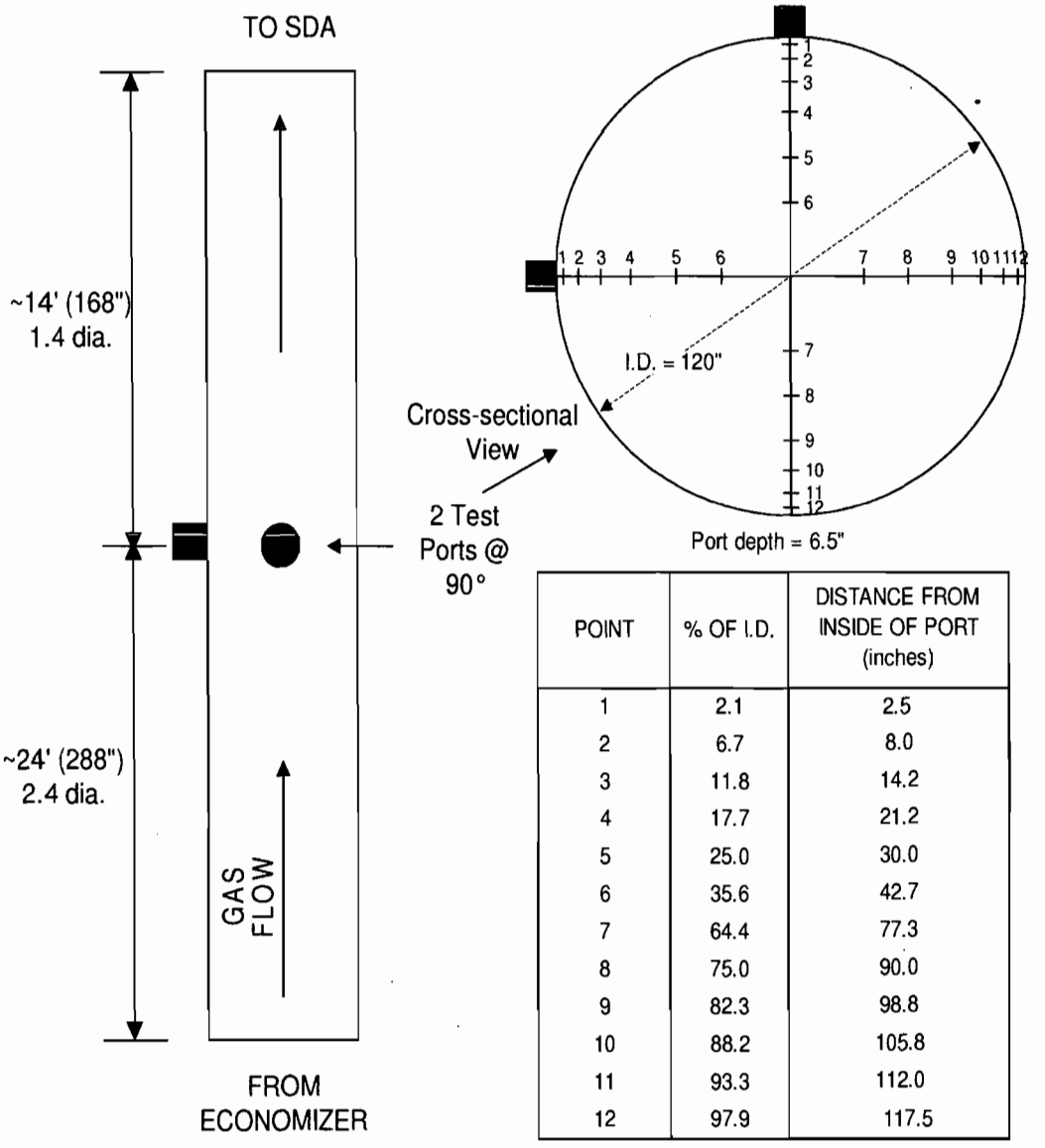


Figure 1 - Process General Flow Arrangement
(Units 1, 2, & 3 are identical)



POINT	% OF I.D.	DISTANCE FROM INSIDE OF PORT (inches)
1	2.1	2.5
2	6.7	8.0
3	11.8	14.2
4	17.7	21.2
5	25.0	30.0
6	35.6	42.7
7	64.4	77.3
8	75.0	90.0
9	82.3	98.8
10	88.2	105.8
11	93.3	112.0
12	97.9	117.5

INSIDE DIAMETER	120.0 in.	10.0 ft.
DISTANCE UPSTREAM FROM DISTURBANCE	168 in.	1.4 dia.
DISTANCE DOWNSTREAM FROM DISTURBANCE	288 in.	2.4 dia.

Figure 2 - SDA Inlet Sampling Location
(Units are Identical)

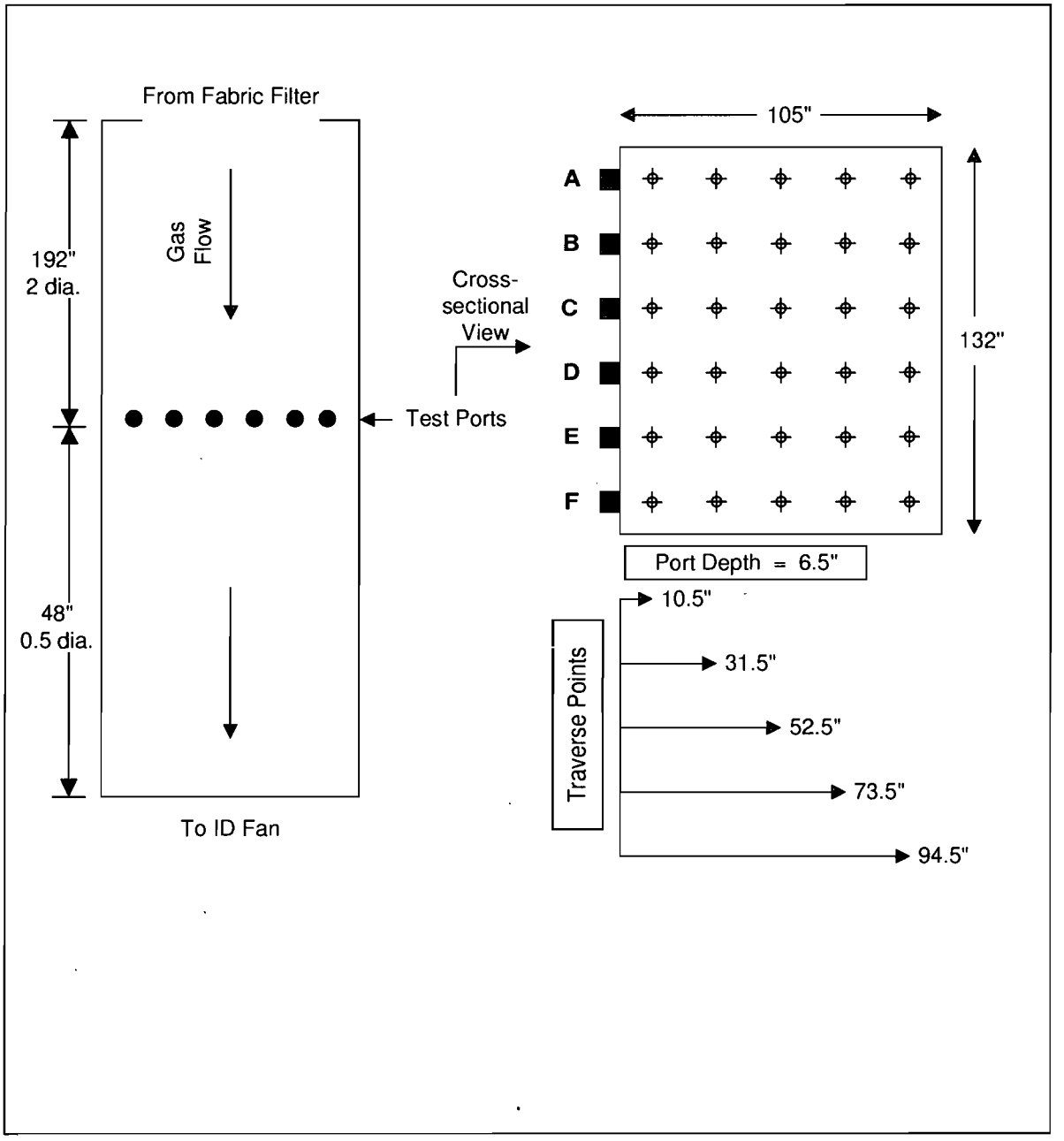


Figure 3 - FF Outlet Sampling Location
(Units 1, 2, & 3 are Identical)

5.0 Sampling and Analytical Procedures

All sampling and analytical procedures followed those recommended by the U.S. Environmental Protection Agency (EPA), Title 40, Part 60, Appendix A of the *Code of Federal Regulations* (40 CFR 60), or other methods generally accepted by the EPA and the Florida Department of Environmental Protection. The following specific methods were used:

- EPA Method 1 for determining sampling and traverse points;
- EPA Method 2 for determining flue gas velocity and volumetric flow rate;
- EPA Method 3 (sampling procedure) and 3A (analytical procedure) for determining flue gas composition and molecular weight;
- EPA Method 4 for determining flue gas moisture content;
- EPA Method 5 (in conjunction with EPA Method 29) for determining total particulate emissions;
- EPA Method 9 for determining opacity of visible emissions;
- EPA Method 13B for determining total fluoride emissions;
- EPA Method 22 for determining fugitive emissions;
- EPA Method 23 for determining PCDD/PCDF emissions;
- EPA Method 26 (modified, as allowed by FDEP) for determining HCl emissions; and
- EPA Method 29 for determining metals emissions (beryllium, cadmium, lead and mercury).

5.1 Sampling Procedures

5.1.1 Sampling Point Determination - EPA Method 1

At each FF Outlet, thirty sampling and traverse points (five for each of six ports – see Figure 3) were used for all isokinetic pollutant sampling and gas flow rate measurements. Modified EPA Method 26 sampling was conducted at a single point near the center of the outlet duct cross section.

At each SDA Inlet (see Figure 2), twenty-four sampling and traverse points were used for all isokinetic pollutant sampling and gas flow rate measurements. Modified EPA Method 26 sampling was conducted at a single point near the center of the inlet duct cross section.

5.1.2 Volumetric Measurements - EPA Method 2

EPA Reference Method 2 was used to determine the velocity and volumetric flow rates of the stack gases. Stainless steel type-S pitot tubes were used to measure the gas velocity heads. The pitot tubes were assigned a baseline coefficient of 0.84 in accordance with Method 2. Calibrated type-K thermocouples were used to determine gas temperatures.

Velocity and temperature measurements were made at each of the traverse points, as shown in Figures 2 and 3. These measurements were performed in conjunction with the pollutant sampling described below.

5.1.3 Molecular Weight Determination - EPA Method 3

Gas compositional measurements (O_2 and CO_2) for determining the average molecular weight of the stack gases, and for correction of pollutant emissions to 7% O_2, were conducted in accordance with EPA Reference Method 3. Multipoint, integrated sampling was used to obtain a constant-rate sample of flue gas concurrent with the pollutant testing. Sampling was of the same duration as the pollutant testing.

A stainless steel probe affixed to the pollutant sampling probe was used for this purpose, and a peristaltic pump was used to fill a Tedlar bag. Moisture was removed from the sample gas by an air-cooled condenser located prior to the pump. Figure 4 shows a schematic of the Method 3 sampling train.

5.1.4 Flue Gas Moisture Content - EPA Method 4

The flue gas moisture was measured in conjunction with the pollutant tests according to the sampling and analytical procedures outlined in EPA Method 4. The flue gas moisture for each test was determined by gravimetric or volumetric analysis of the water collected in the impingers of the pollutant sampling trains. All impingers were contained in an ice bath throughout the testing to ensure complete condensation of the moisture in the flue gas stream. Any moisture not condensed in the impinger condensers was captured in the silica gel contained in the final impinger.

5.1.5 Particulate and Metals Sampling - EPA Method 29

Sampling for total suspended particulate (TSP), beryllium (Unit 3 only), cadmium, lead and mercury was performed in accordance with EPA Method 29 (in conjunction with EPA Method 5).

5.1.5.1 Sampling Train Description

The Method 29 testing was conducted using the metals sampling train illustrated in Figure 5. A heated stainless steel probe with a glass liner was used to withdraw the gas sample. The probe was equipped with an appropriately sized glass nozzle for isokinetic gas withdrawal.

From the nozzle and probe, sample gas was drawn through a Pallflex ultra-pure 2500 QUAT-UP quartz filter supported on a Teflon frit in a heated glass filter holder. The filter was maintained at a temperature sufficiently high to prevent the condensation of

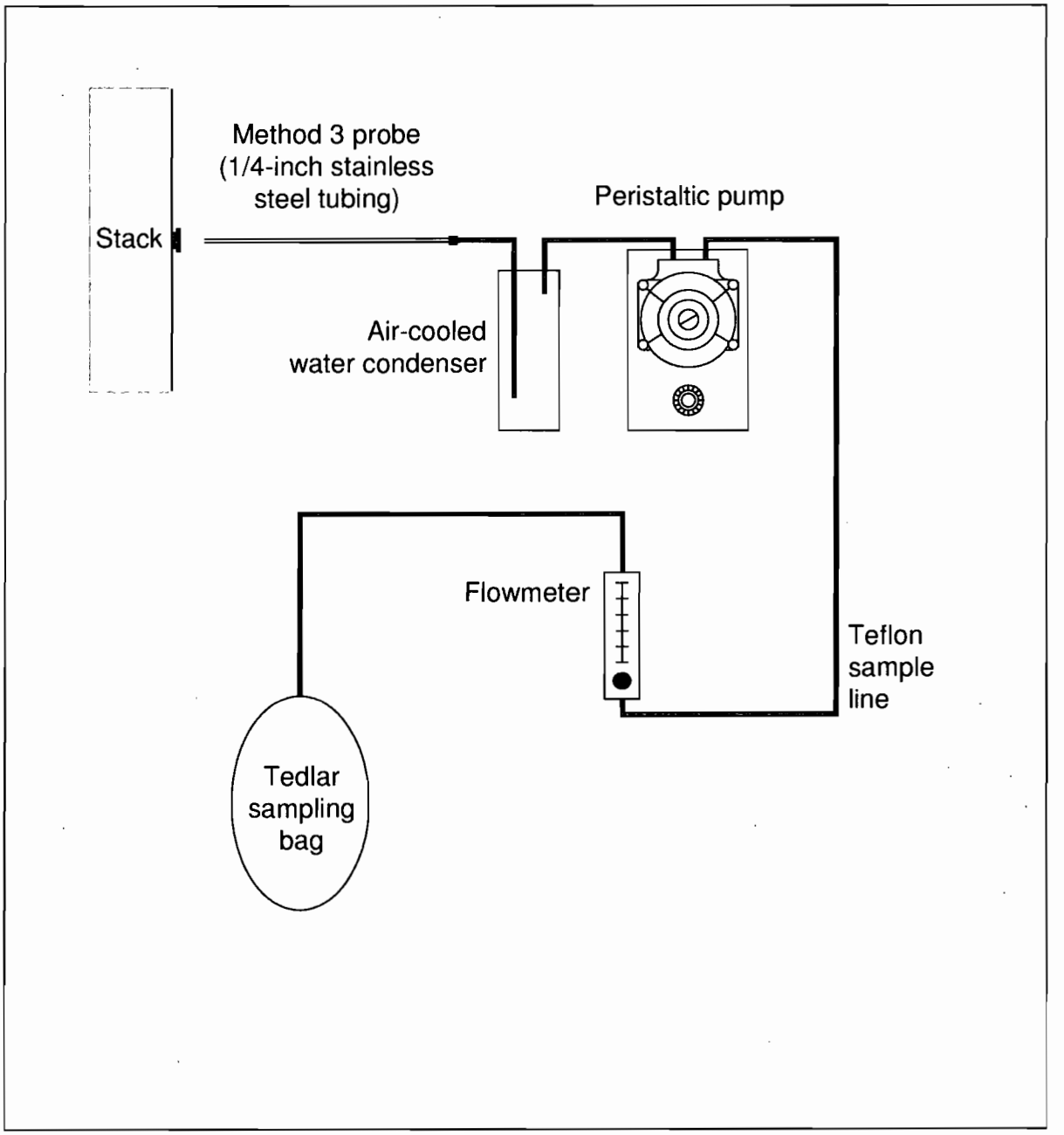


Figure 4 - EPA Method 3 Sampling Train

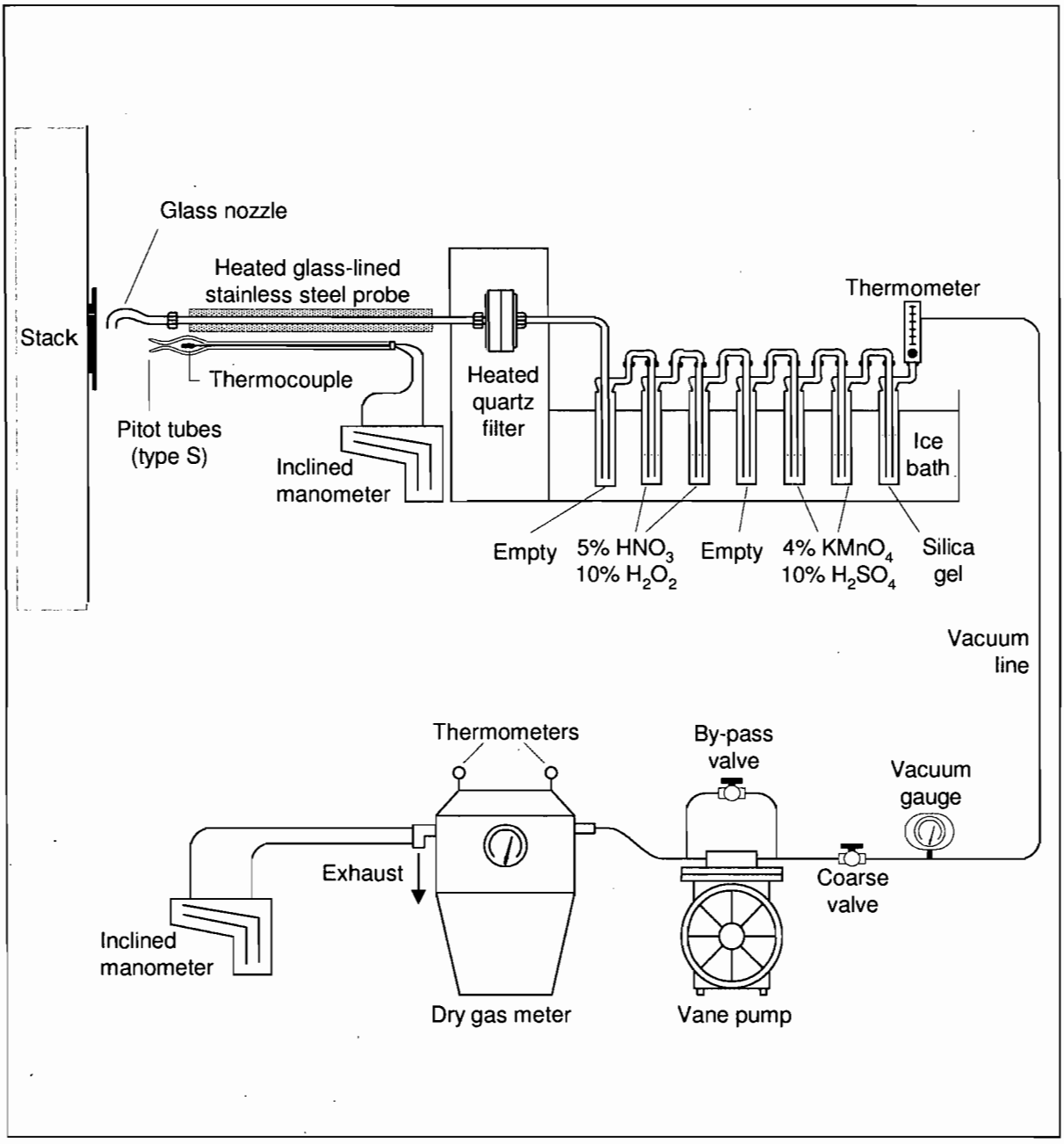


Figure 5 - EPA Method 29 Sampling Train

water (250 ± 25°F). Sample gas subsequently passed through an impinger train consisting of seven glass impingers immersed in an ice bath. The first impinger was initially empty. The second and third impingers each initially contained 100 ml of 5% nitric acid/10% hydrogen peroxide solution. The fourth impinger initially was empty. The fifth and sixth impingers each initially contained 100 ml of 4% potassium permanganate/10% sulfuric acid solution. The seventh impinger initially contained approximately 250 grams of silica gel. The moisture collected in the sampling train was quantified to determine the stack gas moisture content in accordance with Method 4.

5.1.5.2 Sampling Train Operation

Sampling was done in accordance with EPA Method 29 procedures and specifications, including leak checking, isokinetic sampling rate and stack traversing. Sampling at each SDA Inlet and FF Outlet was conducted concurrently for the purpose of determining the mercury reduction percentage. Sampling was conducted for 5 minutes at each of the 24 traverse points at each SDA Inlet, resulting in a 120-minute test per run, excluding the time required to change. Sampling was conducted for 4 minutes at each of the 30 traverse points at each FF Outlet, resulting in a 120-minute test per run, excluding the time required to change ports. A minimum sample volume of 60 dscf (1.7 m^3) was drawn, as measured by the dry gas meter.

5.1.5.3 Sample Recovery and Clean-Up

Recovery of the Method 29 sampling probe was accomplished using a Teflon-fiber probe brush. The probe was cleaned at the test platform, while the remainder of the sample train was transported to a clean-up site for recovery. Sample recovery then proceeded as follows:

1) **Front-half acetone rinse (FF Outlet Only)** The probe, front half of filter holder, and all connecting lines between the probe and filter holder were rinsed and brushed three times with acetone. A Teflon-fiber probe brush was used to brush the probe between rinses. Rinses were collected in precleaned glass

bottles fitted with Teflon-lined screw caps. This step was omitted at the inlet sampling location, since no particulate analyses were performed.

2) **Front-half acid rinse** The probe, front half of filter holder, and all connecting lines between the probe and filter holder were rinsed and brushed three times with 100 mls of 0.1N nitric acid. A Teflon-fiber probe brush was used to brush the probe between rinses. Rinses were collected in pre-cleaned polyethylene (PE) bottles fitted with a Teflon-lined screw caps.

3) **Particulate catch** The filter was removed from the housing with Teflon tweezers and placed into a precleaned glass petri dish. The dish was sealed externally with Teflon tape.

4) **Back-half and impingers 1-3 recovery** Condensate from the first three impingers was transferred to a graduated cylinder and the volumes were recorded. The back half of the filter holder, all connecting lines from the filter to the first impinger, and the first three impingers were rinsed with 100 mls of 0.1N nitric acid. The rinses were collected into the same container (PE bottle fitted with a Teflon-lined cap) as the condensate.

5) **Fourth impinger catch and rinses** The amount of condensate in the fourth impinger was measured and recorded. The impinger was then rinsed with 100 mls of 0.1N nitric acid and recovered in a pre-cleaned PE bottle fitted with a Teflon-lined screw cap. The rinses were collected into the same container as the condensate.

6) **Impinger five and six catch and rinses** The sample liquid in the fifth and sixth impingers was transferred to a graduated cylinder and the volumes were recorded. The impingers were then rinsed three times with an acidified potassium permanganate solution, followed by a water rinse, then a rinse with 8 Normal HCl to remove any residue in the impingers. All solutions were transferred to glass bottles for storage. The permanganate and HCl rinses were recovered into separate containers to prevent chlorine generation.

7) **Silica gel** The silica gel was transferred from the seventh impinger to its original container, sealed, and weighed.

5.1.5.4 Blanks

A field blank was performed for the test program for the Method 29 tests. The field blank consisted of a sample train setup at the test location and leak checked as the sample trains. The field blank train was then recovered following the sample recovery procedures as the sample trains

5.1.6 Fluoride Sampling - EPA Method 13B

Sampling for total fluorides was performed in accordance with EPA Method 13B. This method involved absorbing the fluorides in distilled water, and analyzing the solution for total fluorides by ion chromatography.

5.1.6.1 Sampling Train Description

Figure 6 shows the major components of the Method 13B sampling train. A heated stainless steel probe with a glass liner was used to withdraw the gas sample. The probe was equipped with a glass nozzle appropriately sized for isokinetic gas withdrawal. The probe liner and filter bypass (optional) were maintained at the minimum temperature necessary to prevent condensation prior to the impinger train.

From the nozzle and probe, sample gas was pulled through an impinger train consisting of four glass impingers (with a Whatman paper filter in between the third and fourth impinger) immersed in an ice bath. The first and second impingers each initially contained 100 milliliters of deionized distilled water. The third impinger was initially empty, and the fourth initially contained approximately 250 grams of silica gel.

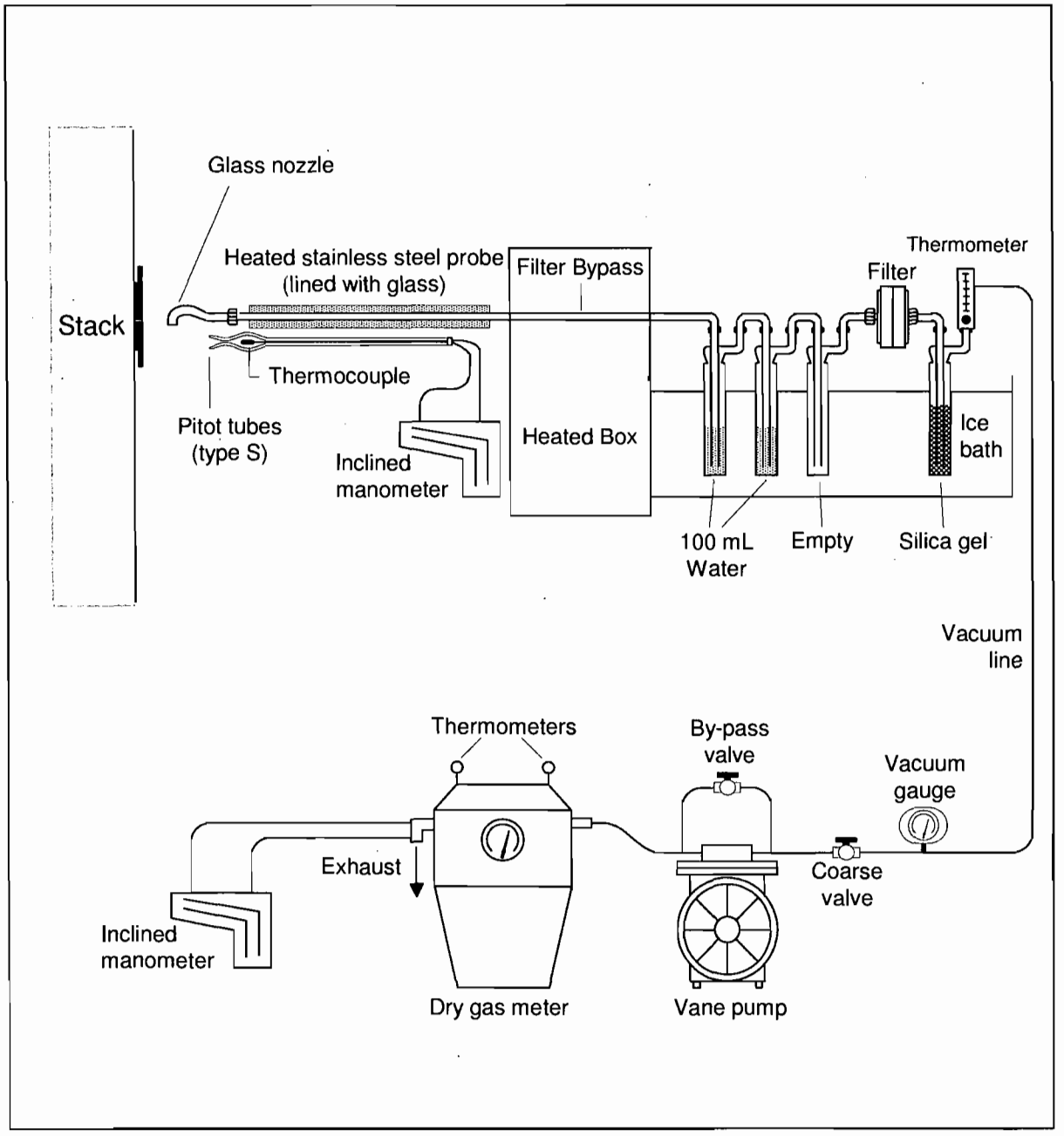


Figure 6 - EPA Method 13B Sampling Train

5.1.6.2 Sampling Train Operation

Sampling was done in accordance with EPA Method 13B procedures and specifications, including leak checking, isokinetic sampling rate and stack traversing. Sampling was conducted for 2 minutes at each of the 30 traverse points, resulting in a 60-minute test per run, excluding the time required to change ports. A minimum sample volume of 30 dscf (0.85 m^3) was obtained for each test run.

5.1.6.3 Sample Recovery and Clean-Up

At the completion of each test run, the train components were recovered according to Method 13B procedures. The probe and filter bypass were rinsed with deionized distilled water. The volumes of the impinger contents were measured, and the liquids quantitatively transferred to Nalgene sample bottles. The impingers were rinsed with distilled water, and the rinses collected into the sample bottles with the impinger contents. The Whatman filter was placed in with the impinger solutions. The silica gel in the last impinger was recovered into its original container.

5.1.6.4 Blanks

One set of reagent blanks was collected during the test program for the total fluorides tests. The blanks consisted of all reagents and filters required in the set-up and recovery of the Method 13B sampling train.

5.1.7 Dioxins and Furans (PCDDs/PCDFs) Sampling - EPA Method 23

Emissions of PCDDs and PCDFs were determined in accordance with EPA Reference Method 23.

5.1.7.1 Sampling Train Description

Figure 7 illustrates the EPA Method 23 sampling train, which used a glass nozzle and probe for sample withdrawal. The nozzle opening was appropriately sized for isokinetic

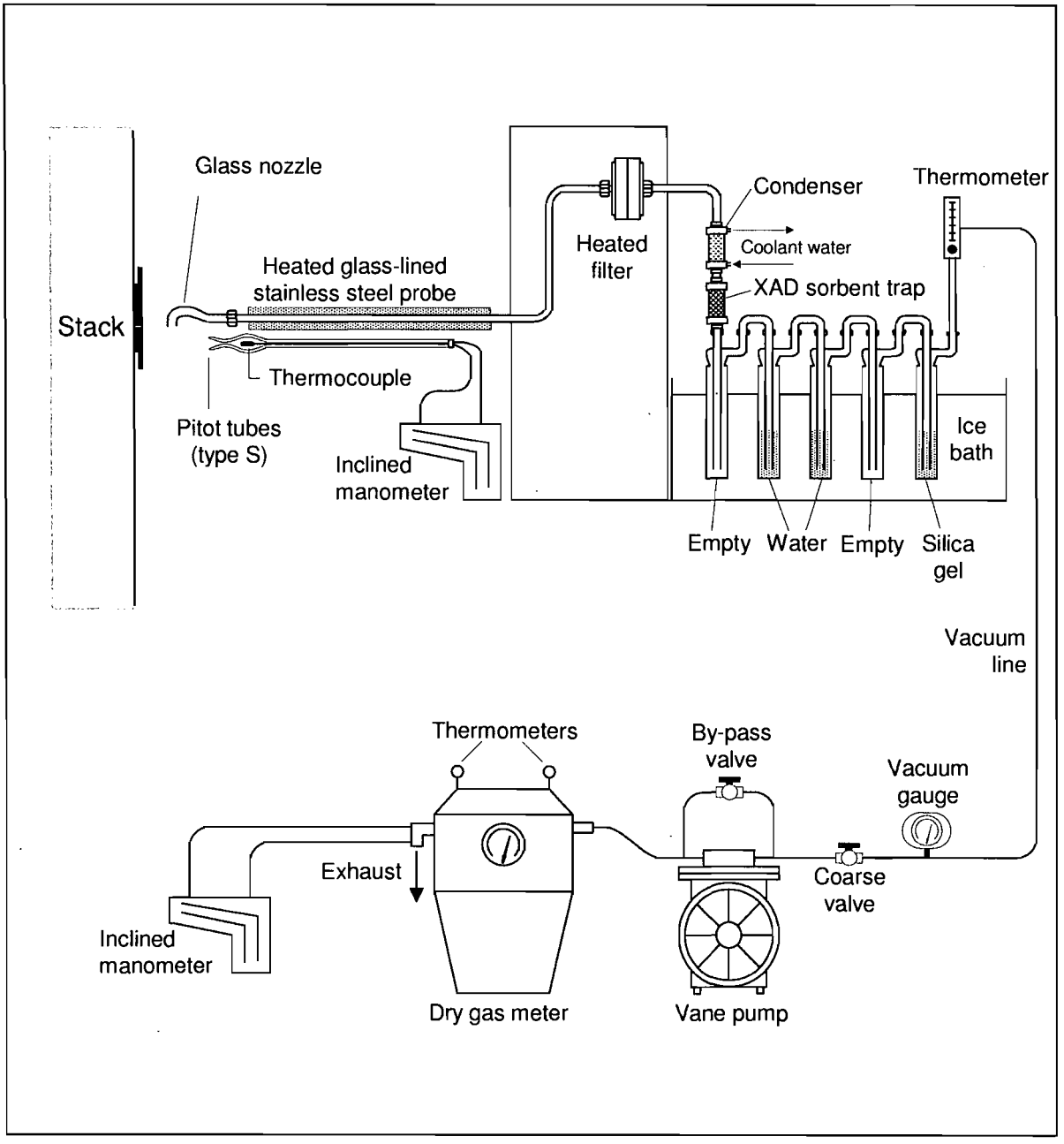


Figure 7 - EPA Method 23 Sampling Train

sampling. Particulate matter was removed from the gas stream by a heated glass filter supported on a Teflon frit.

After particulate removal, the gases passed into a water-cooled glass condenser and entered a pre-weighed XAD-2 resin sorbent trap. The sorbent trap was packed with pre-cleaned, quality control checked, amberlite XAD-2 resin. Coolant water maintained at wet-ice temperature was recirculated continuously throughout the assembly by a submersible water pump.

The condenser cooled the sample gases and condensed part of the moisture. The cooled gases and condensate flowed down through the XAD-2 resin, which retained the organics.

After passing through the sorbent trap, the sample gases entered a chilled impinger train to remove the remaining moisture. The impinger train consisted of five glass impingers packed in ice water. The first impinger was left blank to collect the condensate that passed through the XAD-2 sorbent trap. The second and third impingers each contained 100 milliliters of distilled water. The fourth impinger was left blank, and the fifth impinger contained 250 grams of silica gel. Components from the nozzle to the fourth impinger were made of glass. Connections from the probe to the exit of the fourth impinger were sealed with Teflon O-rings. Sealing grease was not used on any connections before the fifth impinger.

5.1.7.2 Sampling Train Operation

Sampling was performed in accordance with EPA Method 23 procedures and specifications, including leak checking, isokinetic sampling rate, and stack traversing.

Sampling was performed for 20 minutes at each of the 12 traverse points, yielding a 240-minute test per run. Pressure and temperature measurements, and isokinetic

sampling rate adjustments were made at five-minute intervals. A minimum sample volume of 106 dscf (3.0 m^3) was obtained for each test run.

5.1.7.3 Sample Recovery and Clean-up

At the completion of each test, the probe was removed from the train, and the ends of the sampling train were capped with Teflon tape. The probe was recovered immediately on the sampling platform, while the remainder of the sampling train was transported to a clean-up site for recovery. Sample recovery proceeded as follows:

1) **Front-half rinse** The probe, front half of the filter holder, and all connecting lines between the probe and filter holder were rinsed three times with pesticide grade acetone followed by three rinses with pesticide grade methylene chloride, and finally three rinses with pesticide grade toluene. A Teflon-fiber probe brush was used to brush the probe between rinses of acetone. All rinses were collected into pre-cleaned amber glass bottles fitted with Teflon-lined screw caps. The acetone and methylene chloride rinses were collected together into one bottle (Container 2), while the toluene rinse was collected into a separate bottle (Container 3).

2) **Particulate catch** The filter was removed from the housing with Teflon tweezers and placed into a pre-cleaned glass petri dish (Container 1). The dish was sealed externally with Teflon wrapping tape.

3) **Back-half rinse** The back half of the filter holder, all connecting lines from the filter to the condenser, and the condenser were rinsed three times with acetone. The condenser was then soaked in three separate portions of methylene chloride for five minutes. These acetone and methylene chloride rinses were combined with the front-half acetone and methylene chloride rinses. The back half of the filter holder, all connecting lines from the filter to the condenser, and the condenser were rinsed three times with toluene with the rinse combined with the front-half toluene rinse.

4) **Sorbent cartridge** The sorbent trap assembly was removed from the train and its ends sealed externally with Teflon tape. The trap was weighed (for moisture gain).

5) **Impingers 1-4 recovery** The condensate collected in the first four impingers was transferred to a graduated cylinder and the volume recorded. The liquid was then discarded.

6) **Silica gel** The silica gel in the fifth impinger was transferred into its original plastic container, sealed, and weighed (for moisture gain).

5.1.7.4 Blanks

One set of reagent blanks were collected during the test program for the Method 23 tests. The blanks consisted of samples taken directly from the stock of reagents used to conduct the Method 23 sampling. Additionally, an XAD resin trap was retained at the laboratory as a method blank.

5.1.8 Hydrogen Chloride Sampling - Modified EPA Method 26

Sampling for hydrogen chloride was performed in accordance with the procedures of EPA Method 26, except for modifications approved by the FDEP. Sampling was modified by: 1) substituting full-size impingers for the midget impingers; 2) substituting de-ionized water impingers for the NaOH impingers, since chlorine sampling was not required; and 3) utilizing a sampling rate comparable to that which would be required pursuant to EPA Method 26A. To achieve this, the sampling train configuration resembled an EPA Method 26A sampling train, except for the substitution of de-ionized water impingers for the NaOH impingers. To achieve the desired sampling rate, sampling was conducted isokinetically at a single-point near the center of the gas stream.

5.1.8.1 Sampling Train Description

Figure 8 shows the major components of the modified Method 26 sampling train. A stainless steel probe sheath containing a heated glass liner was used to withdraw the gas sample. From the probe, sample gas was pulled through a heated filter for capture of particulate matter. The filter temperature was maintained greater than 248°F to prevent water condensation. Sample gas subsequently passed into an impinger train consisting of six glass impingers immersed in an ice bath. The first impinger initially contained 50 mls of 0.1N H_2SO_4, the second and third impingers each initially contained 100 mls of 0.1N H_2SO_4, the fourth and fifth impinger initially contained DI water, and the last impinger initially contained approximately 250 grams of silica gel.

5.1.8.2 Sampling Train Operation

Except for the modifications previously noted, sampling was conducted in accordance with EPA Method 26 procedures and specifications, including leak checking. The sampling train was operated for 60 minutes for each run. A minimum sample volume of 30 dscf (0.85 m^3) was obtained for each run.

5.1.8.3 Sample Recovery and Clean-Up

Filters were discarded as necessary. Since there was not any particulate analysis on the train, no acetone probe rinse was performed. The impinger contents were first quantified to determine the stack gas moisture content in accordance with EPA Method 4. The first three impingers were rinsed with deionized distilled water, and the rinses combined with the impinger catch from the first three impingers. The silica gel from the last impinger was transferred back to its original container.

5.1.8.4 Reagent Blanks

One set of reagent blanks was collected during the test program for the modified Method 26 tests. The blanks consisted of all reagents required in the set-up and recovery of the modified Method 26 sampling train.

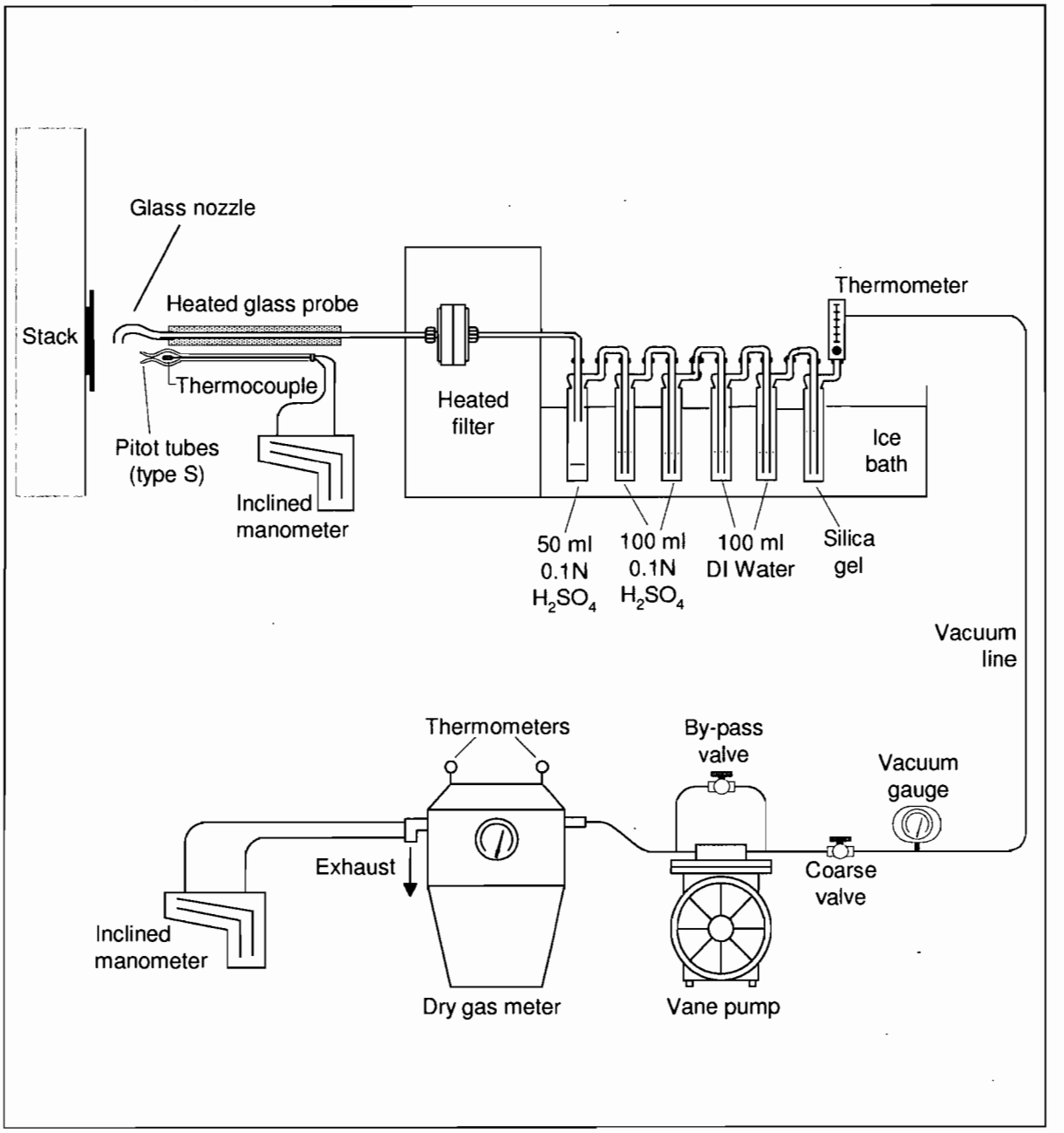


Figure 8 - Modified EPA Method 26 Sampling Train

5.1.9 Visible Emissions Evaluation - EPA Method 9

Opacity of visible emissions from each applicable test location was evaluated in accordance with EPA Method 9 by a certified observer. Certification(s) can be found in Appendix O.4. During each opacity test, 10 sets of 24 readings (readings taken every 15 seconds) were made, yielding a 60-minute test.

5.1.9.1 Observer Position

The observer was positioned such that he had a clear view of the emissions with the sun oriented in the 140° sector to his back. In addition, the observer made observations from a position at which his line of vision was approximately perpendicular to the plume direction.

5.1.9.2 Opacity Observations

Opacity observations were made at the point of greatest opacity in the portion of the plume where condensed water vapor was not present. A clearly visible background which gave the highest degree of contrast was used when the readings were made. Opacity was read at 15-second intervals, and readings were recorded to the nearest 5 percent opacity.

5.1.10 Fugitive Emission Evaluations - EPA Method 22

A fugitive emissions evaluation was performed on the facility's ash handling system for three 1-hour periods.

5.1.10.1 Observer Position

The observer surveyed the area for potential sources of emissions and selected an observation point that enabled a clear view. The observer ensured that the sun was not in his field of vision.

5.1.10.2 Fugitive Emissions Observations

The observer recorded the clock time for the start and end of observations. In accordance with Method 22, the potential emissions points were watched continuously

during each test, which consisted of 20-minute observation periods separated by short rest breaks. The clock time was recorded at the beginning and end of each rest break. If any emission was observed, the observer started a stopwatch, then stopped it (without resetting to zero) when the emissions ceased. At the end of the observation period, the elapsed time recorded on the stopwatch was recorded as the total emission time.

Fugitive emission results are reported as emission frequency (percentage of time that emissions are visible during the observation period), and emission time (accumulated amount of time that emissions are visible during the observation period).

5.2 Analytical Procedures

5.2.1 Molecular Weight Determination - EPA Method 3A

Flue gas compositional analysis for molecular weight determination was conducted using instrumental analyzers set up and operated in accordance with EPA Method 3A. Instruments were calibrated with EPA Protocol 1 calibration gas standards. Calibration data are contained in Appendix O.3. Results of the O_2 and CO_2 analyses are in Appendix N.1.

5.2.2 Moisture Content - EPA Method 4

Moisture contents were determined gravimetrically/volumetrically in accordance with Method 4 by measuring either the volume or mass gain of each impinger in the pollutant sampling trains.

5.2.3 Particulate Analysis - EPA Method 5

Particulate matter was determined in accordance with EPA Method 5 procedures. The filter was analyzed gravimetrically to a constant weight. The front-half acetone rinse was evaporated and analyzed gravimetrically to a constant weight. The total particulate catch equaled the sum of the front-half acetone rinse and the filter. Gravimetric laboratory data are contained in Appendix N.2.

5.2.4 Fluoride Analysis - EPA Method 13B

The fluoride samples were analyzed by ion chromatography in accordance with EPA Method 13B. The combined sample fractions of the probe wash, filter, and impinger catches were analyzed. Analytical results for the fluoride samples are in Appendix N.3.

5.2.5 Dioxins and Furans - EPA Method 23

Analysis of the Method 23 sampling train components for PCDDs/PCDFs was performed in accordance with the procedures outlined in EPA Reference Method 23 and Method 8290 of SW-846. The analysis was performed with high-resolution gas chromatography/high-resolution mass spectrometry (GC/MS). The filter, acetone/methylene chloride rinses, toluene rinses, and XAD sorbent trap were included in the analyses along with all required QA/QC (e.g., spikes and recoveries). The analytical laboratory data for the EPA Method 23 samples are found in Appendix N.4

5.2.6 Hydrogen Chloride Analysis - EPA Method 26

The contents and rinses of the first three impingers of the modified Method 26 sampling trains were analyzed by ion chromatography with conductivity detection for HCl in accordance with EPA Method 26 procedures. The analytical laboratory data for the modified EPA Method 26 samples are found in Appendix N.5.

5.2.7 Metals Analyses - EPA Method 29

The filter, front-half rinses, and contents of impingers 1 through 3 of the metals sampling train were analyzed for beryllium (Unit 3 only), cadmium, lead and mercury. The contents and rinses of impinger 4 were collected separately and analyzed for mercury. Impingers 5 and 6 contents and rinses were also analyzed for mercury. The analytical laboratory data for the EPA Method 29 samples are found in Appendix N.6.

The sampling train components (including the digested filter, probe washes, and impinger contents and rinses) were prepared for analysis in accordance with the procedures of EPA Method 29. After preparation, samples were analyzed by graphite furnace atomic absorption spectrophotometer (GFAAS) for beryllium, cadmium, and

lead. A cold vapor atomic absorption spectrometer (CVAAS) was used to analyze the samples for mercury.

5.3 Data Analyses All equations related to the sampling, including gas flow rates, temperatures, percent isokinetics, moisture contents, and pollutant emissions, are shown in Appendix G. This appendix also includes sample calculations using actual data from the test program.

5.4 Equipment Calibration All field equipment was calibrated in accordance with the requirements of the applicable EPA Methods. Recommendations within the *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III* (EPA/600/R-94/038c, September 1994) were also considered. Appendix O contains records for all the calibrations.

6.0 Quality Assurance

Specific quality control (QC) procedures were followed to ensure the continuous production of useful and valid data throughout the course of this test program. The QC checks and procedures described in this section represent an integral part of the overall sampling and analytical scheme. Strict adherence to prescribed procedures is quite often the most applicable QC check. A discussion of both the sampling and analytical QC checks used during this program is presented below.

6.1 Equipment Inspection and Maintenance

Each critical item of field test equipment is assigned a unique identification number. An effective preventive maintenance program is necessary to ensure data quality. Each item of equipment returning from the field is inspected before it is returned to storage. During the course of these inspections, items are cleaned, repaired, reconditioned and recalibrated where necessary.

Each item of equipment transported to the field is inspected again before being packed to detect equipment problems that may originate during periods of storage. This minimizes lost time on the job site due to equipment failure. Occasional equipment failure in the field is unavoidable despite the most rigorous inspection and maintenance procedures. For this reason, ACG routinely transports to the job site spare equipment for all critical sampling train components.

6.2 Equipment Calibration

New items for which calibration is required are calibrated before initial field use. Equipment whose calibration status may change with use or time is inspected in the field before testing begins and again upon return from each field use. When an item of equipment is found to be out of calibration, it is repaired and recalibrated, or retired from service. All equipment is periodically recalibrated in full, regardless of the outcome of these regular inspections.

Calibrations are conducted in a manner, and at a frequency, which meets or exceeds U.S. EPA specifications. ACG generally follows the calibration procedures outlined in the EPA methods, and those recommended within the *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III* (EPA/600/R-94/038c, September 1994). When these methods are inapplicable, ACG uses methods such as those prescribed by the American Society for Testing and Materials (ASTM).

Data obtained during calibrations are recorded on standardized forms, which are double checked for completeness and accuracy. Data reduction and subsequent calculations are performed using ACG's own computer facilities. Calculations are checked at least twice for accuracy. Copies of calibrations are included in the test or project reports.

Emissions sampling equipment requiring calibration includes pitot tubes, nozzles, gas analyzers, barometers, dry gas meters and thermocouples.

6.3 Sampling Quality Control Procedures

The following **pretest** QC checks are conducted:

- All sampling equipment is thoroughly checked to ensure clean and operable components.
- Equipment is inspected for possible damage from shipment.
- The oil manometer used to measure pressure across the type-S pitot tube is leveled and zeroed.
- The number and location of the sampling traverse points are checked before taking measurements.
- The temperature measurement system is visually checked for damage and operability by measuring the ambient temperature before each traverse.

In addition to the general QC procedures listed above, QC procedures specific to each sampling method are also incorporated into the sampling scheme. The following QC procedures are emphasized:

Before start of tests

- Keep all cleaned glassware and sample train components sealed until train assembly.
- Assemble the sampling trains in an environment free from uncontrolled dust.
- Visually inspect each sampling train for proper assembly.
- Perform pretest calculations to determine the proper sampling nozzle size.

During testing each day

- Readings of temperature and differential pressure are taken at each traverse point.
- All sampling data and calculations are recorded on preformatted data sheets.
- All calibration data forms are reviewed for completeness and accuracy.
- Any unusual occurrences are noted during each run on the appropriate data form.
- Project supervisor reviews sampling data sheets daily during testing.
- Properly maintain the roll and pitch axis of the type-S pitot tube and the sampling nozzle.
- Leak-check the train before and after each run, or if a filter change takes place.
- Conduct additional leak checks if the sampling time ≥ 2 hours.
- Maintain the probe, filter and impingers at the proper temperature.
- Maintain ice in the ice bath at all times.
- Make proper readings of the dry gas meter, delta P and delta H, temperature, and pump vacuum during sampling at each traverse point.
- Maintain isokinetic sampling within ± 10% of 100%.

After testing each day

- Visually inspect the sampling nozzle.
- Visually inspect the type-S pitot tube.
- Leak-check each leg of the type-S pitot tube.
- Leak-check the entire sampling train.

6.4 Analytical Quality Control Procedures

All analyses for this program were performed using accepted laboratory procedures in accordance with the specified analytical protocols. Adherence to prescribed QC procedures ensured data of consistent and measurable quality. Analytical QC focused upon the use of control standards to provide a measure of analytical precision and accuracy. Also, specific acceptance criteria were defined for various analytical operations including calibrations, control standard analyses, drift checks, blanks, etc. If any QC criteria were not met, then an explanation, and the impact that this may have had on the results, was provided.

TABLE 2

SUMMARY OF PARTICULATE, CADMIUM, LEAD AND MERCURY EMISSIONS
PINELLAS COUNTY RRF

UNIT 1 FF OUTLET

RUN I.D.	U1O-M29-R1	U1O-M29-R2	U1O-M29-R3	AVERAGE
DATE	04/12/11	04/12/11	04/12/10	
TIME STARTED	9:00	12:36	15:29	
TIME ENDED	11:28	14:51	17:41	
SAMPLING PARAMETERS				
Metered Volume (dcf)	69.004	67.631	68.777	68.471
Corrected Volume (dscf)	64.933	63.062	63.772	63.922
Total Test Time (min)	120	120	120	120
Isokinetics (%)	99.1	99.2	100.4	99.6
GAS PARAMETERS				
Gas Temperature (°F)	312	309	310	310
Oxygen (%)	8.25	8.65	8.59	8.50
Carbon Dioxide (%)	10.95	10.54	10.66	10.72
Moisture (%)	19.56	20.47	21.65	20.56
GAS FLOW RATE				
Velocity (ft/sec)	39.26	38.42	39.00	38.89
Actual Volume (acfm)	226715	221852	225213	224593
Standard Volume (dscfm)	122939	119286	119172	120465
Standard Volume @ 7% O2 (dscfm)	111883	105126	105540	107516
STEAM PRODUCTION RATE (Klb/hr)	234	235	234	234
CARBON RATE (lb/hr)	16	15	15	15
PARTICULATE EMISSIONS				
Concentration (gr/dscf @ 7% O2)	0.009	0.009	0.008	0.009
Concentration (mg/dscm @ 7% O2)	20.08	20.55	18.84	19.82
Mass Rate (lb/hr)	8.41	8.09	7.45	7.98
CADMIUM EMISSIONS				
Concentration (mg/dscm @ 7% O2)	1.69E-02	6.69E-03	5.40E-03	9.66E-03
Mass Rate (lb/hr)	7.07E-03	2.64E-03	2.13E-03	3.95E-03
LEAD EMISSIONS				
Concentration (mg/dscm @ 7% O2)	2.54E-02	2.52E-02	3.09E-02	2.72E-02
Mass Rate (lb/hr)	1.06E-02	9.91E-03	1.22E-02	1.09E-02
MERCURY EMISSIONS				
Concentration (mg/dscm @ 7% O2)	2.93E-03	2.99E-03	3.05E-03	2.99E-03
Mass Rate (lb/hr)	1.23E-03	1.18E-03	1.21E-03	1.20E-03
MERCURY REDUCTION EFFICIENCY				
Inlet Mass Rate (lb/hr)	9.41E-03	1.96E-02	2.91E-02	1.94E-02
Outlet Mass Rate (lb/hr)	1.23E-03	1.18E-03	1.21E-03	1.20E-03
Reduction Efficiency	87.0	94.0	95.9	92.3

Note(s):
"<" denotes that one or more fractions were below the detection limit. Detection limits were used in cases of non-detect results.

Pollutant	Title V Permit Limit	MACT Limit
Particulate Matter	27 mg/dscm @ 7% O2 and 0.012 gr/dscf @ 7% O2	25 mg/dscm @ 7% O2
Cadmium	0.040 mg/dscm @ 7% O2	0.035 mg/dscm @ 7% O2
Lead	0.44 mg/dscm @ 7% O2	0.400 mg/dscm @ 7% O2
Mercury	0.070 mg/dscm @ 7% O2 or 85% Reduction	0.050 mg/dscm @ 7% O2 or 85% Reduction

TABLE 3

SUMMARY OF PARTICULATE AND METALS EMISSIONS AND MERCURY REDUCTION EFFICIENCY
PINELLAS COUNTY RRF

UNIT 2 OUTLET

RUN I.D.	U2O-M29-R1	U2O-M29-R2	U2O-M29-R3	AVERAGE
DATE	04/13/11	04/13/11	04/13/11	
TIME STARTED	9:49	12:36	15:31	
TIME ENDED	12:02	14:56	18:22	
SAMPLING PARAMETERS				
Metered Volume (dcf)	71.037	69.424	68.147	69.536
Corrected Volume (dscf)	66.545	64.013	62.123	64.227
Total Test Time (min)	120	120	120	120
Isokinetics (%)	99.9	100.9	98.3	99.7
GAS PARAMETERS				
Gas Temperature (°F)	307	309	307	308
Oxygen (%)	9.22	8.36	8.69	8.76
Carbon Dioxide (%)	10.06	10.77	10.46	10.43
Moisture (%)	20.74	22.02	19.62	20.79
GAS FLOW RATE				
Velocity (ft/sec)	40.55	39.27	37.96	39.26
Actual Volume (acfm)	234188	226792	219238	226739
Standard Volume (dscfm)	125915	119948	119520	121794
Standard Volume @ 7% O2 (dscfm)	105805	108213	104988	106335
STEAM PRODUCTION RATE - Klb/hr	227	233	231	230
CARBON RATE - lb/hr	15	14	15	15
PARTICULATE EMISSIONS				
Concentration (gr/dscf @ 7% O2)	0.005	0.006	0.006	0.006
Concentration (mg/dscm @ 7% O2)	11.81	13.43	14.73	13.33
Mass Rate (lb/hr)	4.68	5.44	5.79	5.31
CADMIUM EMISSIONS				
Concentration (mg/dscm @ 7% O2)	1.36E-03	1.27E-03	1.08E-03	1.23E-03
Mass Rate (lb/hr)	5.38E-04	5.13E-04	4.24E-04	4.92E-04
LEAD EMISSIONS				
Concentration (mg/dscm @ 7% O2)	1.17E-02	1.10E-02	7.49E-03	1.01E-02
Mass Rate (lb/hr)	4.64E-03	4.46E-03	2.95E-03	4.02E-03
MERCURY EMISSIONS				
Concentration (mg/dscm @ 7% O2)	2.98E-03	2.67E-03	< 2.99E-03	< 2.88E-03
Mass Rate (lb/hr)	1.18E-03	1.08E-03	< 1.17E-03	< 1.15E-03
MERCURY REDUCTION EFFICIENCY				
Inlet Concentration (lb/hr)	1.60E-02	2.77E-02	1.34E-02	1.91E-02
Outlet Concentration (lb/hr)	1.18E-03	1.08E-03	< 1.17E-03	< 1.15E-03
Reduction Efficiency	92.6	96.1	91.2	93.3

Note(s):

"<" denotes that one or more fractions were below the detection limit. Detection limits were used in cases of non-detect results.

Pollutant	Title V Permit Limit	MACT Limit
Particulate Matter	27 mg/dscm @ 7% O2 and 0.012 gr/dscf @ 7% O2	25 mg/dscm @ 7% O2
Cadmium	0.040 mg/dscm @ 7% O2	0.035 mg/dscm @ 7% O2
Lead	0.44 mg/dscm @ 7% O2	0.400 mg/dscm @ 7% O2
Mercury	0.070 mg/dscm @ 7% O2 or 85% Reduction	0.050 mg/dscm @ 7% O2 or 85% Reduction

TABLE 4

SUMMARY OF PARTICULATE, BERYLLIUM, CADMIUM, LEAD AND MERCURY EMISSIONS
PINELLAS COUNTY RRF

UNIT 3 FF OUTLET

RUN I.D.	U3O-M29-R1	U3O-M29-R2	U3O-M29-R3	AVERAGE
DATE	04/14/11	04/14/11	04/14/11	
TIME STARTED	8:20	11:03	13:59	
TIME ENDED	10:32	13:24	16:34	
SAMPLING PARAMETERS				
Metered Volume (dcf)	70.987	71.321	70.753	71.020
Corrected Volume (dscf)	69.459	68.751	67.360	68.523
Total Test Time (min)	120	120	120	120
Isokinetics (%)	96.2	103.1	101.4	100.2
GAS PARAMETERS				
Gas Temperature (°F)	308	310	314	311
Oxygen (%)	9.44	8.71	8.52	8.89
Carbon Dioxide (%)	9.77	10.58	10.52	10.29
Moisture (%)	17.92	20.90	20.59	19.80
GAS FLOW RATE				
Velocity (ft/sec)	42.65	40.89	40.79	41.44
Actual Volume (acfm)	246300	236168	235547	239338
Standard Volume (dscfm)	136499	126111	125568	129393
Standard Volume @ 7% O2 (dscfm)	112538	110597	111837	111657
STEAM PRODUCTION RATE (Klb/hr)	235	231	235	234
CARBON RATE (lb/hr)	15	15	15	15
PARTICULATE EMISSIONS				
Concentration (gr/dscf @ 7% O2)	0.005	0.004	0.003	0.004
Concentration (mg/dscm @ 7% O2)	11.100	8.981	7.574	9.218
Mass Rate (lb/hr)	4.68	3.72	3.17	3.86
BERYLLIUM EMISSIONS				
Concentration (mg/dscm @ 7% O2)	< 3.08E-05	< 2.93E-05	< 2.94E-05	< 2.99E-05
Mass Rate (lb/hr)	< 1.30E-05	< 1.21E-05	< 1.23E-05	< 1.25E-05
CADMIUM EMISSIONS				
Concentration (mg/dscm @ 7% O2)	8.15E-04	2.75E-04	6.25E-04	5.72E-04
Mass Rate (lb/hr)	3.43E-04	1.14E-04	2.62E-04	2.40E-04
LEAD EMISSIONS				
Concentration (mg/dscm @ 7% O2)	5.32E-03	2.68E-03	3.49E-03	3.83E-03
Mass Rate (lb/hr)	2.24E-03	1.11E-03	1.46E-03	1.61E-03
MERCURY EMISSIONS				
Concentration (mg/dscm @ 7% O2)	1.06E-02	1.43E-02	1.30E-02	1.26E-02
Mass Rate (lb/hr)	4.47E-03	5.91E-03	5.43E-03	5.27E-03
MERCURY REDUCTION EFFICIENCY				
Inlet Mass Rate (lb/hr)	8.91E-03	1.62E-02	7.45E-03	1.08E-02
Outlet Mass Rate (lb/hr)	4.47E-03	5.91E-03	5.43E-03	5.27E-03
Reduction Efficiency	49.8	63.4	27.1	46.8

Note(s):
"<" denotes that one or more fractions were below the detection limit. Detection limits were used in cases of non-detect results.

Pollutant	Title V Permit Limit	MACT Limit
Particulate Matter	27 mg/dscm @ 7% O2 and 0.012 gr/dscf @ 7% O2	25 mg/dscm @ 7% O2
Beryllium	9×10^{-5} lbs/hr	N.A.
Cadmium	0.040 mg/dscm @ 7% O2	0.035 mg/dscm @ 7% O2
Lead	0.44 mg/dscm @ 7% O2	0.400 mg/dscm @ 7% O2
Mercury	0.070 mg/dscm @ 7% O2 or 85% Reduction	0.050 mg/dscm @ 7% O2 or 85% Reduction

TABLE 5

SUMMARY OF MERCURY LOADINGS
PINELLAS COUNTY RESOURCE RECOVERY FACILITY

UNIT 1 SDA INLET

RUN I.D.	**U1IN-M29-R1**	**U1IN-M29-R2**	**U1IN-M29-R3**	AVERAGE
DATE	04/12/11	04/12/11	04/12/11	
TIME STARTED	9:00	12:36	15:29	
TIME ENDED	11:26	14:49	17:39	
SAMPLING PARAMETERS				
Metered Volume (dcf)	72.572	72.986	74.024	73.194
Corrected Volume (dscf)	71.041	71.376	72.206	71.541
Total Test Time (min)	120	120	120	120
Isokinetics (%)	97.6	97.2	101.2	98.6
GAS PARAMETERS				
Gas Temperature (°F)	502	507	507	505
Oxygen (%)	7.77	8.06	7.46	7.76
Carbon Dioxide (%)	11.06	10.76	11.51	11.11
Moisture (%)	18.64	18.34	18.82	18.60
GAS FLOW RATE				
Velocity (ft/sec)	52.52	53.06	51.90	52.49
Actual Volume (acfm)	247493	250042	244583	247373
Standard Volume (dscfm)	111516	112450	109324	111097
Standard Volume @ 7% O2 (dscfm)	105339	103875	105706	104973
STEAM PRODUCTION RATE (lb/hr)	234	235	234	234
MERCURY EMISSIONS				
Conc. (mg/dscm @ 7% O2)	0.024	0.050	0.073	0.049
Mass Rate (lb/hr)	9.41E-03	1.96E-02	2.91E-02	1.94E-02

Pollutant	**Limit**
Mercury	Not Applicable to Inlet Location

TABLE 6

SUMMARY OF MERCURY EMISSIONS
PINELLAS COUNTY RESOURCE RECOVERY FACILITY

UNIT 2 SDA INLET

RUN I.D.	U2IN-M29-R1	U2IN-M29-R2	U2IN-M29-R3	AVERAGE
DATE	04/13/11	04/13/11	04/13/11	
TIME STARTED	9:49	12:36	15:31	
TIME ENDED	12:00	14:54	18:20	
SAMPLING PARAMETERS				
Metered Volume (dcf)	71.455	72.731	70.607	71.598
Corrected Volume (dscf)	71.532	71.381	68.017	70.310
Total Test Time (min)	120	120	120	120
Isokinetics (%)	99.1	99.5	96.8	98.5
GAS PARAMETERS				
Gas Temperature (°F)	504	508	512	508
Oxygen (%)	8.37	7.78	7.85	8.00
Carbon Dioxide (%)	10.66	10.79	11.25	10.90
Moisture (%)	17.22	18.51	16.78	17.50
GAS FLOW RATE				
Velocity (ft/sec)	51.19	51.89	50.09	51.05
Actual Volume (acfm)	241207	244519	236026	240584
Standard Volume (dscfm)	110511	109818	107647	109325
Standard Volume @ 7% O2 (dscfm)	99619	103655	101064	101446
STEAM PRODUCTION RATE (lb/hr)	227	233	231	230
MERCURY EMISSIONS				
Conc. (mg/dscm @ 7% O2)	0.043	0.071	0.035	0.050
Mass Rate (lb/hr)	1.60E-02	2.77E-02	1.34E-02	1.91E-02

Pollutant	Limit
Mercury	Not Applicable to Inlet Location

TABLE 7

SUMMARY OF MERCURY LOADINGS
PINELLAS COUNTY RESOURCE RECOVERY FACILITY

UNIT 3 SDA INLET

RUN I.D.	U3IN-M29-R1	U3IN-M29-R2	U3IN-M29-R3	AVERAGE
DATE	04/14/11	04/14/11	04/14/11	
TIME STARTED	8:20	11:03	13:59	
TIME ENDED	10:30	13:22	16:32	
SAMPLING PARAMETERS				
Metered Volume (dcf)	74.393	73.759	74.148	74.100
Corrected Volume (dscf)	75.071	72.939	72.422	73.477
Total Test Time (min)	120	120	120	120
Isokinetics (%)	100.2	96.3	97.0	97.9
GAS PARAMETERS				
Gas Temperature (°F)	555	556	551	554
Oxygen (%)	8.25	8.51	7.43	8.06
Carbon Dioxide (%)	10.94	10.64	11.71	11.10
Moisture (%)	16.88	16.07	16.11	16.35
GAS FLOW RATE				
Velocity (ft/sec)	55.73	55.81	54.77	55.44
Actual Volume (acfm)	262640	262986	258104	261243
Standard Volume (dscfm)	114701	115942	114292	114979
Standard Volume @ 7% O2 (dscfm)	104386	103347	110756	106163
STEAM PRODUCTION RATE (lb/hr)	235	231	235	234
MERCURY EMISSIONS				
Conc. (mg/dscm @ 7% O2)	0.023	0.042	0.018	0.027
Mass Rate (lb/hr)	8.91E-03	1.62E-02	7.45E-03	1.08E-02

Pollutant	Limit
Mercury	Not Applicable to Inlet Location

TABLE 8

SUMMARY OF TOTAL FLUORIDE EMISSIONS
PINELLAS COUNTY RRF

UNIT 3 FF OUTLET

RUN I.D.	U3O-M13B-R1	U3O-M13B-R2	U3O-M13B-R3	AVERAGE
DATE	04/13/11	04/13/11	04/13/11	
TIME STARTED	13:41	15:17	16:55	
TIME ENDED	14:46	16:22	18:00	
SAMPLING PARAMETERS				
Metered Volume (dcf)	38.633	37.989	37.466	38.029
Corrected Volume (dscf)	37.134	36.227	35.691	36.351
Total Test Time (min)	60	60	60	60
Isokinetics (%)	100.9	99.9	99.7	100.2
GAS PARAMETERS				
Gas Temperature (°F)	315	312	313	313
Oxygen (%)	9.12	8.87	8.97	8.99
Carbon Dioxide (%)	9.95	10.21	10.45	10.20
Moisture (%)	19.73	19.34	18.94	19.34
GAS FLOW RATE				
Velocity (ft/sec)	44.48	43.51	42.83	43.61
Actual Volume (acfm)	256896	251298	247370	251854
Standard Volume (dscfm)	138190	136084	134380	136218
Standard Volume @ 7% O2 (dscfm)	117113	117776	115335	116741
STEAM PRODUCTION RATE (Klb/hr)	234	238	236	236
FLUORIDE EMISSIONS				
Concentration (ppmdv)	< 0.120	< 0.123	< 0.125	< 0.123
Conc. (ppmdv @7% O2)	< 0.142	< 0.143	< 0.146	< 0.144
Mass Rate (lb/hr)	< 4.92E-02	< 4.97E-02	< 4.98E-02	< 4.96E-02

Notes

"<" denotes that one or more fractions were below the detection limit. Detection limits were used in cases of non-detect results.

Pollutant	Emission Limit
Total Fluoride	8.31 lbs/hr

TABLE 9

SUMMARY OF DIOXIN/FURAN EMISSIONS
PINELLAS COUNTY RRF

UNIT 3 FF OUTLET

RUN I.D.	U3O-M23-R1	U2O-M23-R2	U3O-M23-R3	AVERAGE
DATE	04/12/11	04/12/11	04/13/11	
TIME STARTED	8:26	14:45	7:56	
TIME ENDED	13:42	18:51	12:01	
SAMPLING PARAMETERS				
Metered Volume - dcf	151.617	156.792	154.765	154.391
Corrected Volume - dscf	145.131	148.044	150.716	147.964
Total Test Time - min	240	240	240	240
% Isokinetics	99.9	98.8	100.6	99.8
GAS PARAMETERS				
Gas Temperature - °F	313	314	310	312
Oxygen - %	9.20	8.94	8.99	9.04
Carbon Dioxide - %	9.84	10.28	10.30	10.14
Moisture - %	20.89	19.40	19.81	20.03
GAS FLOWRATE				
Velocity - ft/sec	44.57	45.13	45.05	44.92
Actual Volume - acfm	257369	260602	260187	259386
Standard Volume - dscfm	136272	140660	140584	139172
Standard Volume @ 7% O2 (dscfm)	114704	121029	120457	118730
STEAM PRODUCTION RATE - Klb/hr	234	235	236	235
CARBON RATE - lb/hr	15	14	15	15
BAGHOUSE INLET TEMPERATURE - °F	318	320	317	318
TOTAL PCDD EMISSIONS				
Conc. - ng/Nm^3 @ 7% O2	0.73	0.60	0.39	0.57
Conc. - ng/dscm @ 7% O2	0.68	0.56	0.37	0.53
Mass Rate - lb/hr	2.92E-07	2.52E-07	1.65E-07	2.36E-07
TOTAL PCDF EMISSIONS				
Conc. - ng/Nm^3 @ 7% O2	1.21	0.89	0.60	0.90
Conc. - ng/dscm @ 7% O2	1.13	0.83	0.56	0.84
Mass Rate - lb/hr	4.85E-07	3.75E-07	2.53E-07	3.71E-07
TOTAL PCDD + PCDF EMISSIONS				
Conc. - ng/Nm^3 @ 7% O2	1.94	1.48	1.00	1.47
Conc. - ng/dscm @ 7% O2	1.81	1.38	0.93	1.37
Mass Rate - lb/hr	7.77E-07	6.27E-07	4.18E-07	6.07E-07
TOTAL PCDD + PCDF EMISSIONS (as 2378-TCDD TEF)				
Conc. - ng/Nm^3 @ 7% O2	0.03	0.02	0.01	0.02
Conc. - ng/dscm @ 7% O2	0.03	0.02	0.01	0.02
Mass Rate - lb/hr	1.31E-08	9.26E-09	5.16E-09	9.18E-09
TOTAL PCDD + PCDF EMISSIONS (as European Standard - TEC)				
Conc. - ng/dscm @ 11% O2	0.02	0.02	0.01	0.02

Permitted limit for total PCDD/PCDF emissions is 30 ng/dscm @ 7%O2.

TABLE 10

SUMMARY OF HYDROGEN CHLORIDE EMISSIONS
PINELLAS COUNTY RRF

UNIT 1 FF OUTLET

RUN I.D.	U1O-M26A-R1	U1O-M26A-R2	U1O-M26A-R3	AVERAGE
DATE	04/12/11	04/12/11	04/12/11	
TIME STARTED	9:00	12:36	15:29	
TIME ENDED	10:00	13:36	16:29	
SAMPLING PARAMETERS				
Metered Volume (dcf)	36.832	36.413	36.448	36.564
Corrected Volume (dscf)	34.684	34.067	34.343	34.365
Total Test Time (min)	60	60	60	60
Isokinetics (%)	100.9	98.9	97.6	99.1
GAS PARAMETERS				
Gas Temperature (°F)	310	308	309	309
Oxygen (%)	8.11	8.05	8.43	8.20
Carbon Dioxide (%)	11.02	11.15	10.54	10.90
Moisture (%)	21.06	22.35	18.67	20.69
GAS FLOW RATE				
Velocity (ft/sec)	42.19	42.88	41.84	42.30
Actual Volume (acfm)	243652	247627	241600	244293
Standard Volume (dscfm)	129962	130223	132999	131061
Standard Volume @ 7% O2 (dscfm)	119584	120386	119316	119762
Standard Volume (dscfm) [1]	122939	119286	119172	120465
Standard Volume @ 7% O2 (dscfm) [1]	111883	105126	105540	107516
STEAM PRODUCTION RATE (Klb/hr)	234	235	234	234
HCl EMISSIONS				
Concentration (ppmdv)	0.89	0.37	0.47	0.58
Concentration @ 7% O2 (ppmdv)	0.97	0.40	0.52	0.63
Mass Rate (lb/hr) [2]	0.62	0.25	0.32	0.40
HCl REDUCTION EFFICIENCY				
Inlet Concentration @ 7% O2 (ppmdv)	714.49	605.25	491.38	603.71
Outlet Concentration @ 7% O2 (ppmdv)	0.97	0.40	0.52	0.63
Reduction Efficiency	99.9	99.9	99.9	99.9

Note(s):

[1] Flow rate taken from concurrent EPA Method 5/29 sampling.
[2] lb/hr result calculated using the flow rate from concurrent EPA Method 5/29 sampling.

Pollutant	Permit Limit
Hydrogen Chloride (HCl)	29 ppmdv @ 7% O2 or 95% Reduction

TABLE 11

SUMMARY OF HYDROGEN CHLORIDE EMISSIONS
PINELLAS COUNTY RRF

UNIT 2 FF OUTLET

RUN I.D.	U2O-M26A-R1	U2O-M26A-R2	U2O-M26A-R3	AVERAGE
DATE	04/13/11	04/13/11	04/13/11	
TIME STARTED	9:49	12:36	15:31	
TIME ENDED	10:49	13:44	16:50	
SAMPLING PARAMETERS				
Metered Volume (dcf)	45.035	43.545	43.397	43.992
Corrected Volume (dscf)	44.070	42.048	41.674	42.597
Total Test Time (min)	60	60	60	60
Isokinetics (%)	100.7	102.9	99.6	101.0
GAS PARAMETERS				
Gas Temperature (°F)	303	307	302	304
Oxygen (%)	9.06	8.15	9.02	8.74
Carbon Dioxide (%)	10.50	10.99	10.13	10.54
Moisture (%)	21.06	21.45	20.03	20.85
GAS FLOW RATE				
Velocity (ft/sec)	43.03	40.59	40.61	41.41
Actual Volume (acfm)	248502	234387	234527	239139
Standard Volume (dscfm)	134036	125157	128192	129129
Standard Volume @ 7% O2 (dscfm)	114172	114803	109563	112846
Standard Volume (dscfm) [1]	125915	119948	119520	121794
Standard Volume @ 7% O2 (dscfm) [1]	105805	108213	104988	106335
STEAM PRODUCTION RATE (Klb/hr)	225	232	232	229
HCl EMISSIONS				
Concentration (ppmdv)	10.84	10.20	8.62	9.89
Concentration @ 7% O2 (ppmdv)	12.72	11.12	10.08	11.31
Mass Rate (lb/hr) [2]	7.75	6.95	5.85	6.85
HCl REDUCTION EFFICIENCY				
Inlet Concentration @ 7% O2 (ppmdv)	514.01	580.85	456.55	517.14
Outlet Concentration @ 7% O2 (ppmdv)	12.72	11.12	10.08	11.31
Reduction Efficiency	97.5	98.1	97.8	97.8

Note(s):

[1] Flow rate taken from concurrent EPA Method 5/29 sampling.
[2] lb/hr result calculated using the flow rate from concurrent EPA Method 5/29 sampling.

Pollutant	Permit Limit
Hydrogen Chloride (HCl)	29 ppmdv @ 7% O2 or 95% Reduction

TABLE 12

SUMMARY OF HYDROGEN CHLORIDE EMISSIONS
PINELLAS COUNTY RRF

UNIT 3 FF OUTLET

RUN I.D.	U3O-M26A-R1	U3O-M26A-R2	U3O-M26A-R3	AVERAGE
DATE	04/14/11	04/14/11	04/14/11	
TIME STARTED	8:20	11:03	13:59	
TIME ENDED	9:20	12:10	15:14	
SAMPLING PARAMETERS				
Metered Volume (dcf)	47.455	47.786	47.152	47.464
Corrected Volume (dscf)	46.319	45.438	44.583	45.447
Total Test Time (min)	60	60	60	60
Isokinetics (%)	100.5	101.0	96.5	99.3
GAS PARAMETERS				
Gas Temperature (°F)	304	312	315	310
Oxygen (%)	9.39	9.24	8.86	9.16
Carbon Dioxide (%)	9.75	9.85	10.05	9.88
Moisture (%)	20.45	22.39	19.87	20.90
GAS FLOW RATE				
Velocity (ft/sec)	45.35	45.82	45.56	45.58
Actual Volume (acfm)	261907	264583	263134	263208
Standard Volume (dscfm)	141083	137805	141503	140130
Standard Volume @ 7% O2 (dscfm)	116825	115598	122568	118330
Standard Volume (dscfm) [1]	136499	126111	125568	129393
Standard Volume @ 7% O2 (dscfm) [1]	112538	110597	111837	111657
STEAM PRODUCTION RATE (Klb/hr)	233	235	235	234
HCl EMISSIONS				
Concentration (ppmdv)	3.103	4.482	4.054	3.880
Concentration @ 7% O2 (ppmdv)	3.748	5.343	4.680	4.590
Mass Rate (lb/hr) [2]	2.405	3.209	2.890	2.835
HCl REDUCTION EFFICIENCY				
Inlet Concentration @ 7% O2 (ppmdv)	453.21	564.83	380.02	466.02
Outlet Concentration @ 7% O2 (ppmdv)	3.75	5.34	4.68	4.59
Reduction Efficiency	99.17	99.05	98.77	99.00

Note(s):

[1] Flow rate taken from concurrent EPA Method 5/29 sampling.
[2] lb/hr result calculated using the flow rate from concurrent EPA Method 5/29 sampling.

Pollutant	Permit Limit
Hydrogen Chloride (HCl)	29 ppmdv @ 7% O2 or 95% Reduction

TABLE 13

SUMMARY OF HYDROGEN CHLORIDE EMISSIONS
PINELLAS COUNTY RRF

UNIT 1 FF INLET

RUN I.D.	**U1IN-M26A-R1**	**U1IN-M26A-R2**	**U1IN-M26A-R3**	AVERAGE
DATE	04/12/11	04/12/11	04/12/11	
TIME STARTED	9:00	12:36	15:29	
TIME ENDED	10:00	13:36	16:29	
SAMPLING PARAMETERS				
Metered Volume (dcf)	41.012	39.100	38.637	39.583
Corrected Volume (dscf)	39.950	37.907	37.227	38.362
Total Test Time (min)	60	60	60	60
Isokinetics (%)	104.9	100.4	101.9	102.4
GAS PARAMETERS				
Gas Temperature (°F)	498	504	502	501
Oxygen (%)	7.24	7.66	7.41	7.44
Carbon Dioxide (%)	11.63	11.57	11.59	11.60
Moisture (%)	20.68	18.58	17.94	19.07
GAS FLOW RATE				
Velocity (ft/sec)	56.09	54.56	52.26	54.31
Actual Volume (acfm)	264326	257122	246285	255911
Standard Volume (dscfm)	116614	115615	111914	114714
Standard Volume @ 7% O2 (dscfm)	114601	110125	108613	111113
Standard Volume (dscfm) [1]	111516	112450	109324	111097
Standard Volume @ 7% O2 (dscfm) [1]	105339	103875	105706	104973
STEAM PRODUCTION RATE - Klb/hr	234	235	234	234
HCl EMISSIONS				
Concentration (ppmdv)	702.15	576.51	476.89	585.18
Concentration (ppmdv @ 7% O_2)	714.49	605.25	491.38	603.71
Mass Rate (lb/hr)	444.56	368.07	296.00	369.54

Notes

[1] Flow rate taken from concurrent EPA Method 5/29 sampling.
[2] lb/hr result calculated using the flow rate from concurrent EPA Method 5/29 sampling.

Pollutant	**Limit**
Hydrogen Chloride	Not applicable to inlet.

TABLE 14

SUMMARY OF HYDROGEN CHLORIDE EMISSIONS
PINELLAS COUNTY RRF

UNIT 2 FF INLET

RUN I.D.	**U2IN-M26A-R1**	**U2IN-M26A-R2**	**U2IN-M26A-R3**	AVERAGE
DATE	04/13/11	04/13/11	04/13/11	
TIME STARTED	9:49	12:36	15:31	
TIME ENDED	10:49	13:44	16:50	
SAMPLING PARAMETERS				
Metered Volume (dcf)	46.803	44.903	46.123	45.943
Corrected Volume (dscf)	46.513	43.623	43.703	44.613
Total Test Time (min)	60	60	60	60
Isokinetics (%)	103.0	101.9	102.1	102.3
GAS PARAMETERS				
Gas Temperature (°F)	505	503	515	508
Oxygen (%)	8.33	7.25	8.24	7.94
Carbon Dioxide (%)	10.88	11.49	10.91	11.09
Moisture (%)	18.73	17.56	17.01	17.77
GAS FLOW RATE				
Velocity (ft/sec)	53.39	49.75	50.14	51.10
Actual Volume (acfm)	251605	234457	236285	240783
Standard Volume (dscfm)	112890	107007	107012	108970
Standard Volume @ 7% O2 (dscfm)	102088	105082	97466	101545
Standard Volume (dscfm) [1]	110511	109818	107647	109325
Standard Volume @ 7% O2 (dscfm) [1]	99619	103655	101064	101446
STEAM PRODUCTION RATE - Klb/hr	225	232	232	229
HCl EMISSIONS				
Concentration (ppmdv)	464.83	570.40	415.82	483.69
Concentration (ppmdv @ 7% O_2)	514.01	580.85	456.55	517.14
Mass Rate (lb/hr)	291.65	355.64	254.14	300.48

Notes

[1] Flow rate taken from concurrent EPA Method 5/29 sampling.
[2] lb/hr result calculated using the flow rate from concurrent EPA Method 5/29 sampling.

Pollutant	**Limit**
Hydrogen Chloride	Not applicable to inlet.

TABLE 15

SUMMARY OF HYDROGEN CHLORIDE EMISSIONS
PINELLAS COUNTY RRF

UNIT 3 FF INLET

RUN I.D.	**U3IN-M26A-R1**	**U3IN-M26A-R2**	**U3IN-M26A-R3**	AVERAGE
DATE	04/14/11	04/14/11	04/14/11	
TIME STARTED	8:20	11:03	13:59	
TIME ENDED	9:20	12:10	15:14	
SAMPLING PARAMETERS				
Metered Volume (dcf)	47.718	43.793	44.831	45.447
Corrected Volume (dscf)	48.202	43.217	43.778	45.066
Total Test Time (min)	60	60	60	60
Isokinetics (%)	101.7	102.6	101.1	101.8
GAS PARAMETERS				
Gas Temperature (°F)	550	550	550	550
Oxygen (%)	7.81	8.31	7.78	7.97
Carbon Dioxide (%)	11.27	11.09	11.37	11.24
Moisture (%)	15.76	16.07	16.19	16.01
GAS FLOW RATE				
Velocity (ft/sec)	56.49	50.38	51.89	52.92
Actual Volume (acfm)	266208	237432	244529	249390
Standard Volume (dscfm)	118402	105268	108196	110622
Standard Volume @ 7% O2 (dscfm)	111502	95347	102124	102991
Standard Volume (dscfm) [1]	114701	115942	114292	114979
Standard Volume @ 7% O2 (dscfm) [1]	104386	103347	110756	106163
STEAM PRODUCTION RATE - Klb/hr	233	235	235	234
HCl EMISSIONS				
Concentration (ppmdv)	426.80	511.60	358.70	432.37
Concentration (ppmdv @ 7% O_2)	453.21	564.83	380.02	466.02
Mass Rate (lb/hr)	277.94	336.77	232.76	282.49

Notes

[1] Flow rate taken from concurrent EPA Method 5/29 sampling.
[2] lb/hr result calculated using the flow rate from concurrent EPA Method 5/29 sampling.

Pollutant	**Limit**
Hydrogen Chloride	Not applicable to inlet.

TABLE 16

SUMMARY OF VISIBLE AND FUGITIVE EMISSIONS
PINELLAS COUNTY RESOURCE RECOVERY FACILITY

MWC STACKS, ASH CONDITIONING BLDG., RESIDUE STORAGE AND PROCESSING BLDG., AND ASH HANDLING SYSTEM

LOCATION	MWC UNIT 1 STACK			
RUN I.D.	U1-M9-R1	U1-M9-R2	U1-M9-R3	Averege
DATE	04/12/11	04/12/11	04/12/11	
TIME STARTED	9:00	12:36	15:29	
TIME ENDED	10:00	13:36	16:29	
STEAM PRODUCTION RATE (Klb/hr)	234	235	234	234
All values are percent opacity				
Maximum 6-Minute Value	0.00	0.00	0.00	0.00
Average for 60 Minutes	0.00	0.00	0.00	0.00

POLLUTANT	LIMIT
Visible Emissions	10% opacity (6-min. avg.)

LOCATION	MWC UNIT 2 STACK			
RUN I.D.	U2-M9-R1	U2-M9-R2	U2-M9-R3	Average
DATE	04/13/11	04/13/11	04/13/11	
TIME STARTED	9:49	12:36	15:31	
TIME ENDED	10:49	13:44	16:50	
STEAM PRODUCTION RATE (Klb/hr)	225	232	232	229
All values are percent opacity				
Maximum 6-Minute Value	0.00	0.00	0.00	0.00
Average for 60 Minutes	0.00	0.00	0.00	0.00

POLLUTANT	LIMIT
Visible Emissions	10% opacity (6-min. avg.)

LOCATION	MWC UNIT 3 STACK			
RUN I.D.	U3-M9-R1	U3-M9-R2	U3-M9-R3	Average
DATE	04/14/11	04/14/11	04/14/11	
TIME STARTED	8:20	11:03	13:59	
TIME ENDED	9:20	12:10	15:14	
STEAM PRODUCTION RATE (Klb/hr)	233	235	235	234
All values are percent opacity				
Maximum 6-Minute Value	0.00	0.00	0.00	0.00
Average for 60 Minutes	0.00	0.00	0.00	0.00

POLLUTANT	LIMIT
Visible Emissions	10% opacity (6-min. avg.)

LOCATION	ASH CONDITIONING BLDG.	RESIDUE STORAGE & PROCESSING BLDG.
RUN I.D.	ACBO-M9-R1	RSPBBVO-M9-R1
DATE	04/14/11	04/14/11
TIME STARTED	11:56	10:17
TIME ENDED	12:56	11:17
All values are percent opacity		
Maximum 6-Minute Value	0.00	0.00
Average for 60 Minutes	0.00	0.00

POLLUTANT	LIMIT
Visible Emissions	5% opacity (6-min. avg.)

LOCATION	ASH HANDLING SYSTEM		
	East Face	West Face	Northeast Face
RUN I.D.	AHS-M22-R1	AHS-M22-R2	AHS-M22-R3
DATE	04/14/11	04/14/11	04/14/11
TIME STARTED	13:39	14:59	16:19
TIME ENDED	14:54	16:09	17:29
Observation Period Duration (min:sec)	60:00	60:00	60:00
Accumulated Fugitive Emissions Time (min:sec)	00:00	00:00	00:00
Fugitive Emissions (% of Observation Period Duration)	0.00	0.00	0.00

POLLUTANT	LIMIT
Fugitive Emissions	5% of observation period duration

TABLE 17

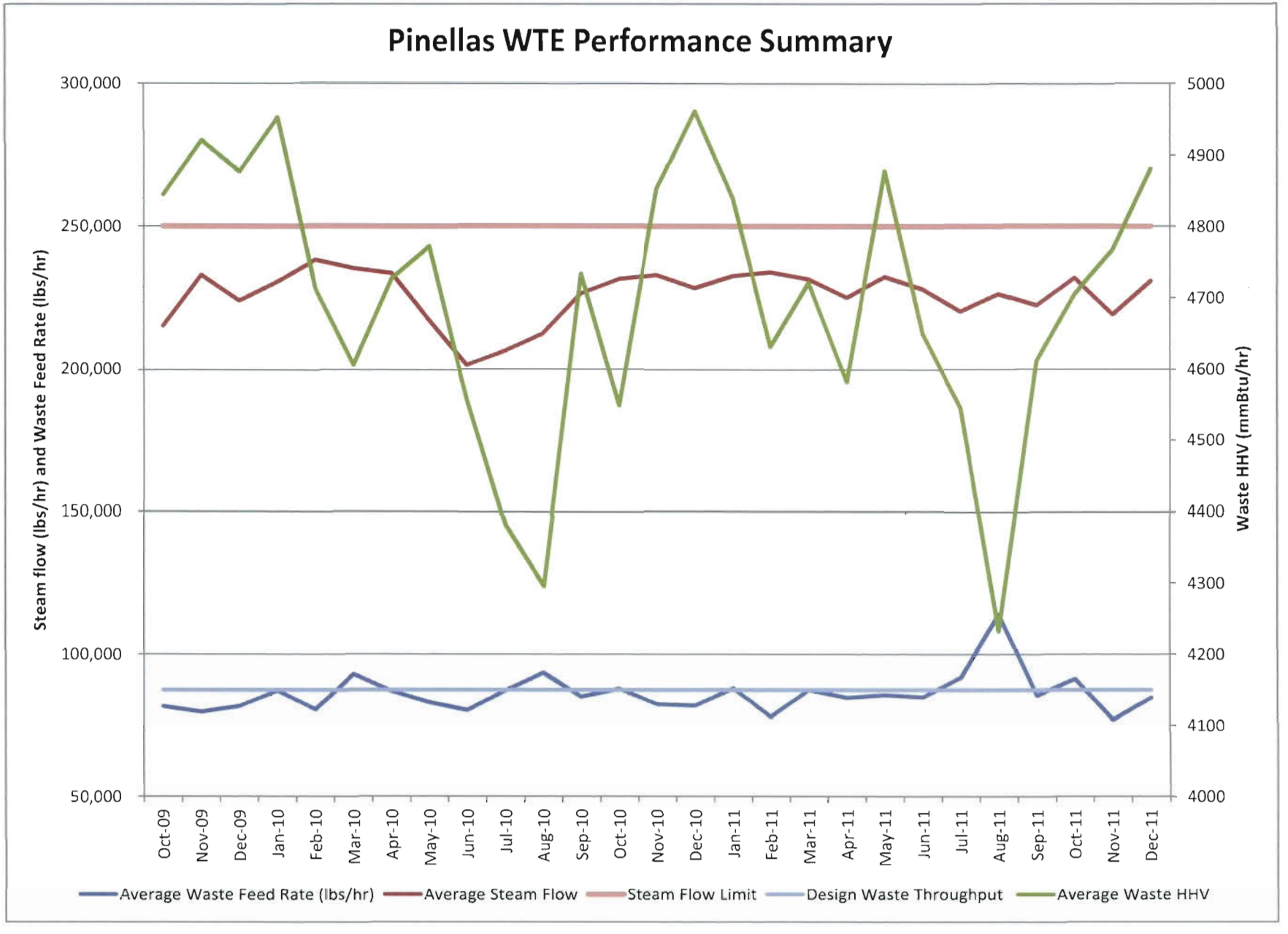
SUMMARY OF RUN-BY-RUN ISOKINETIC TEST AIR FLOW RESULTS AT UNITS 1-3 FF OUTLETS
PINELLAS COUNTY RRF

Unit No.	Run No.	Run Date	Run Time	Steam Flow (Klbs/hr)	Flue Gas Temp. (°F)	SDA Outlet Temp	Activated Carbon	Air Flow (ACFM)	O2 (%dv)	Air Flow (DSCFM)	Air Flow (DSCFM @ 7% O2)
1	U1O-M26A-R1	4/12/2011	09:00-10:00	234	310	Not Applicable	Not Applicable	243652	8.11	129962	119584
	U1O-M26A-R2	4/12/2011	12:36-13:36	235	308	Not Applicable	Not Applicable	247627	8.05	130223	120386
	U1O-M26A-R3	4/12/2011	15:29-16:29	234	309	Not Applicable	Not Applicable	241600	8.43	132999	119316
	U1O-M29-R1	4/12/2011	09:00-11:28	234	312	Not Applicable	16	224,593	8.25	120,465	107,516
	U1O-M29-R2	4/12/2011	12:36-14:51	235	309	Not Applicable	15	221852	8.65	119286	105126
	U1O-M29-R3	4/12/2011	15:29-17:41	234	310	Not Applicable	15	225213	8.59	119172	105540
	Average =>			234	310	Not Applicable	15	234,089	8.35	125,351	112,911
2	U2O-M26A-R1	4/13/2011	09:49-10:49	225	303	Not Applicable	Not Applicable	248502	9.06	134036	114172
	U2O-M26A-R2	4/13/2011	12:36-13:44	232	307	Not Applicable	Not Applicable	234387	8.15	125157	114803
	U2O-M26A-R3	4/13/2011	15:31-16:50	232	302	Not Applicable	Not Applicable	234527	9.02	128192	109563
	U2O-M29-R1	4/13/2011	09:49-12:02	227	307	Not Applicable	15	234188	9.22	125915	105805
	U2O-M29-R2	4/13/2011	12:36-14:56	233	309	Not Applicable	14	226792	8.36	119948	108213
	U2O-M29-R3	4/13/2011	15:31-16:22	231	307	Not Applicable	15	219238	8.69	119520	104988
	Average =>			230	306	Not Applicable	15	232,939	8.75	125,462	109,590
3	U3O-M26A-R1	4/14/2011	08:20-09:20	233	304	Not Applicable	Not Applicable	261,907	9.39	141,083	116,825
	U3O-M26A-R2	4/14/2011	11:03-12:10	235	312	Not Applicable	Not Applicable	264,583	9.24	137,805	115,598
	U3O-M26A-R3	4/14/2011	13:59-15:14	235	315	Not Applicable	Not Applicable	263,134	8.86	141,503	122,568
	U3O-M29-R1	4/14/2011	08:20-10:32	235	308	Not Applicable	15	246,300	9.44	136,499	112,538
	U3O-M29-R2	4/14/2011	11:03-13:24	231	310	Not Applicable	15	236,168	8.71	126,111	110,597
	U3O-M29-R3	4/14/2011	13:59-16:34	235	314	Not Applicable	15	235,547	8.52	125,568	111,837
	U3O-M13B-R1	4/13/2011	13:41-14:46	234	315	Not Applicable	Not Applicable	256,896	9.12	138,190	117,113
	U3O-M13B-R2	4/13/2011	15:17-16:22	238	312	Not Applicable	Not Applicable	251,298	8.87	136,084	117,776
	U3O-M13B-R3	4/13/2011	16:55-18:00	236	313	Not Applicable	Not Applicable	247,370	8.97	134,380	115,335
	U3O-M23-R1	4/12/2011	08:26-13:42	234	313	318	14.7	257,369	9.20	136,272	114,704
	U3O-M23-R2	4/12/2011	14:45-18:51	235	314	320	14.3	260,602	8.94	140,660	121,029
	U3O-M23-R3	4/13/2011	07:56-12:01	236	310	317	14.9	260,187	8.99	140,584	120,457
	Average =>			235	312	318	15	253,447	9.02	136,228	116,365
	Facility Average =>			**233**	**309**	**318**	**15**	**240,158**	**8.71**	**129,014**	**112,955**

Note(s):

* EPA Method 26A testing was conducted isokinetically at a single point in the gas stream.

Attachment 3


Pinellas WTE Performance Summary
Steam flow (lbs/hr) and Waste Feed Rate (lbs/hr)
Waste HHV (mmBtu/hr)
300,000
250,000
200,000
150,000
100,000
50,000
5000
4900
4800
4700
4600
4500
4400
4300
4200
4100
4000
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Jul-10
Aug-10
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Average Waste Feed Rate (lbs/hr)
Average Steam Flow
Steam Flow Limit
Design Waste Throughput
Average Waste HHV

Attachment 4

Attachment 4

SO2 Modeling Report

For the

Pinellas County Resource Recovery Facility

January 27, 2012

1.0 Background

The Pinellas County Resource Recovery Facility (PCRRF) was constructed pursuant to Florida Department of Environmental Protection (FDEP) PSD air construction permits (FDEP Permit Numbers PSD-FL-11B and PSD-FL-98B). An application was submitted by the County in December, 2011 to modify these permits and thereby authorize potentially significant increases in SO_2 and CO emissions from the PCRRF. The County's application also sought a permit modification concerning the method of determining compliance with the PCRRF's limits for capacity or load.

1.2 Purpose of Air Dispersion Modeling

This modeling report documents the SO_2 modeling that was performed for the PCRRF at the new potential emission rate of 24 ppm_{dv} (24 hour geometric mean). This report also includes the ambient air monitoring data from a monitoring site that is very close to the PCRRF and a second site that is located approximately 3.6 miles from the PCRRF. The modeling and monitoring data provide reasonable assurance that the PCRRF is in compliance with the new SO_2 one hour (1-hr) ambient air quality standard (AAQS).

It should be noted that the incremental increase in current actual emissions to future potential emissions is much less than the new proposed BACT level of 24 ppmdv (24 hour geometric mean), which has been used for this modeling. The new BACT level of 24 ppmdv represents the maximum total future emissions, not the incremental increase.

CO has not been modeled because there has been no change to the AAQS for CO. The prior modeling for the PCRRF demonstrated compliance at the proposed emission level.

1.3 Area Map, Plot Plan and Process Flow Diagram

The PSD permit application submitted by the County in May 1995 included: (a) an Area Map, which identified the site orientation, scale, and PCRRF boundaries; (b) a Plot Plan showing the scale, north direction, a benchmark, and emissions point associated with the PCRRF; and (c) a Process Flow Diagram. Additional figures showing the PCRRF buildings, emission point, site characteristics, receptors and 1-hr SO_2 concentrations are shown in Section 3, below.

1.4 Federal Applicability

1.4.1 Nonattainment New Source Review (NNSR)

Pinellas County is classified as in attainment with the new 1-hr averaging time SO_2 ambient air quality standard and, thus NNSR does not apply to the PCRRF.

1.4.2 Prevention of Significant Deterioration (PSD)

As discussed in the County's December 2011 application, there may have been emission increases of carbon monoxide (CO) and sulfur dioxide (SO_2) associated with the PCRRF that are greater than the respective PSD Significant Emissions Rate, as defined in Rule 62-210.200(275), F.A.C. Therefore, FDEP's PSD requirements in Rule 62-212.400, F.A.C., apply to the PCRRF.

2.0 Air Quality Impact Approach

As part of the County's application for a PSD permit modification, an air quality dispersion modeling analysis is required to demonstrate that the incremental emission increases from the PCRRF will not cause or contribute to exceedances of the new 1-hr average SO_2 AAQS. Previous air dispersion modeling was performed in support of the County's 1995 PSD permit application. The 1995 modeling verified that the PCRRF will not cause or contribute to a violation of any applicable AAQS and the PCRRF will not fully consume the available PSD increments.

Given the information contained in this report, we believe modeling of cumulative impacts from the modification associated with the PCRRF and background emission sources for comparison to the applicable NAAQS will not be necessary. An increment consumption analysis also is not necessary because a 1-hr SO_2 PSD increment has not yet been established.

2.1 Applicable Air Quality Standards

There is one averaging period of interest for this analysis, the one hour SO_2 level. The significant impact limit (SIL) and AAQS are presented in Table 1. The modeled emission and source parameters used in this analysis for the PCRRF were taken from the County's 1995 permit application, and these parameters have been confirmed with recent stack testing data and best engineering judgment. The modeling has been conducted and prepared in accordance with Appendix W of the EPA Guideline on Air Quality Models and the FDEP Air Quality Modeling Guidelines.

Table 1 Applicable SO_2, AAQS, PSD Monitoring, SIL and PSD Increments

Air Constituent	Averaging Time	AAQS Primary ($\mu g/m^3$)	AAQS Secondary ($\mu g/m^3$)	PSD Monitoring Significance ($\mu g/m^3$)	Significant Impact Levels ($\mu g/m^3$)	PSD Increment Class II Area ($\mu g/m^3$)
Sulfur Dioxide	1-hr	196.5	NA	NA	7.6	NA

NA = there is no applicable standard

2.2 Emissions Inventory

The County believes that the emissions from the PCRRF will not be increasing as a result of the proposed permit modification. The emission rates for the PCRRF were detailed in the modeling protocol that was submitted by the County and approved by FDEP in October 1994. The PCRRF emissions for the County's 2011 application were developed based on full-time operations (24 hours per day, 365 days per year) at the maximum case load, as determined in the 1995 application. The emission rate is based on ppm_{dv} (geometric mean). This value is converted to lb/hr as follows:

SO_2 ppm to lb/hr
lb/hr = ppm\1,000,000 X dscfm X 64 lb/mole 0.0025956 mole/dscf X
60min/hr = 103.3 lb/hr

Table 2 presents the SO_2 emission rate and stack characteristics used in the current modeling for the PSD permit modification. The emission rate is the rate proposed as BACT in the County's December 2011 application and it is lower than the current permit level. The stack characteristics are based on the 1995 permit application's screening analysis of varying thermal loads and highest heating values. The maximum emission rate occurs with 110 percent thermal load when burning fuel with a higher heating value of 5000 Btu/lb.

Table 2 Emission Rate and Stack Characteristics

	UTM East	UTM North	SO_2	SO_2	SO_2	Ht	Temp	Velocity	Dia*
Emission Source	m	m	tpy	lb/hr	g/s	m	K	m/s	m
Main Stack	335,273	3,084,303	439.4	100.3	12.64	50.29	405.4	21.76	4.49

Note: *Effective Stack Diameter and Exit Velocity for three flues

2.3 Model Selection

The American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) was formed to introduce state-of-the-art modeling concepts into the EPA's air quality models. Through AERMIC, a modeling system, AERMOD, was introduced that incorporated air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. It was developed as an improved air dispersion model for replacement of the Industrial Source Complex (ISC) model and has been accepted by the State of Florida for use in PSD permitting applications. AERMOD handles the same variety of possible emission source configurations, as did ISC3, and incorporates the BPIP Prime algorithm for building downwash, and provides program modules for preparing a more robust meteorological data base and digital terrain model processing.

RTP used the most recent version of the AMS/EPA Regulatory Model (AERMOD version 11353) to predict the maximum 1-hr SO_2 concentrations in support of the air dispersion analyses. AERMOD is used to model concentrations on both surrounding terrain, which is above or below the lowest physical stack height, and on intermediate terrain (between physical stack height and height of final plume rise). Modeling incorporates building downwash algorithms to estimate the maximum ground-level concentrations near the facility. A building downwash analysis is performed by using the current BPIP-PRIME program (version 04274) provided by EPA. AERMOD modeling was performed in the regulatory mode using the rural dispersion mode as determined in the 1995 permit application. An urban classification increases the dispersion rates of a pollutant because of increased surface roughness from more numerous buildings in the area, and greater heat release from concrete and similar surfaces. Thus, a rural classification generally results in more conservative modeled impacts in an area.

2.4 Meteorological Data

FDEP has prepared and provided the meteorological data using the AERMET processor. RTP believes that the 5 year surface and profile data sets (2006 through 2010) from the Tampa Airport meteorological monitoring system are representative and suitable for use to predict impacts from the proposed modification at the PCRRF. RTP believes that, while the PCRRF itself is an industrial land use, the land uses surrounding the PCRRF are primarily rural/suburban because the surrounding area is predominately comprised of light industrial and residential land uses, with a few warehouse buildings, apartment buildings, grass fields and short trees.

Terrain and prevailing synoptic meteorological patterns between the Tampa Airport and the PCWEF are believed to be similar because the PCRRF is located approximately 2 miles south-southwest of the meteorological station at the Tampa Airport. RTP proposes to use these data for the air dispersion modeling of the air pollutant impacts from sources operating at the PCRRF.

2.5 Receptors

The modeling for the annual and 1-hour SO_2 standard was performed using the new receptor grid; namely, receptors were placed on a Cartesian grid network designed to ensure that the maximum impact was captured. As shown in Figure 1, a fine 100 meter (m)-spaced grid was placed out to 3 kilometers (km). A coarser grid with 500-m spacing was placed from 3-km to 10-km, followed by a coarser 1,000-m spaced grid from 10-km out to 30-km. Receptors were also placed around the PCRRF fence line at a spacing of 50 meters. Figure 2 represents the total receptor grid that was modeled. AERMAP was used to generate elevations using the applicable NED files.

Figure 1 - 100 m Spacing Receptor Grid

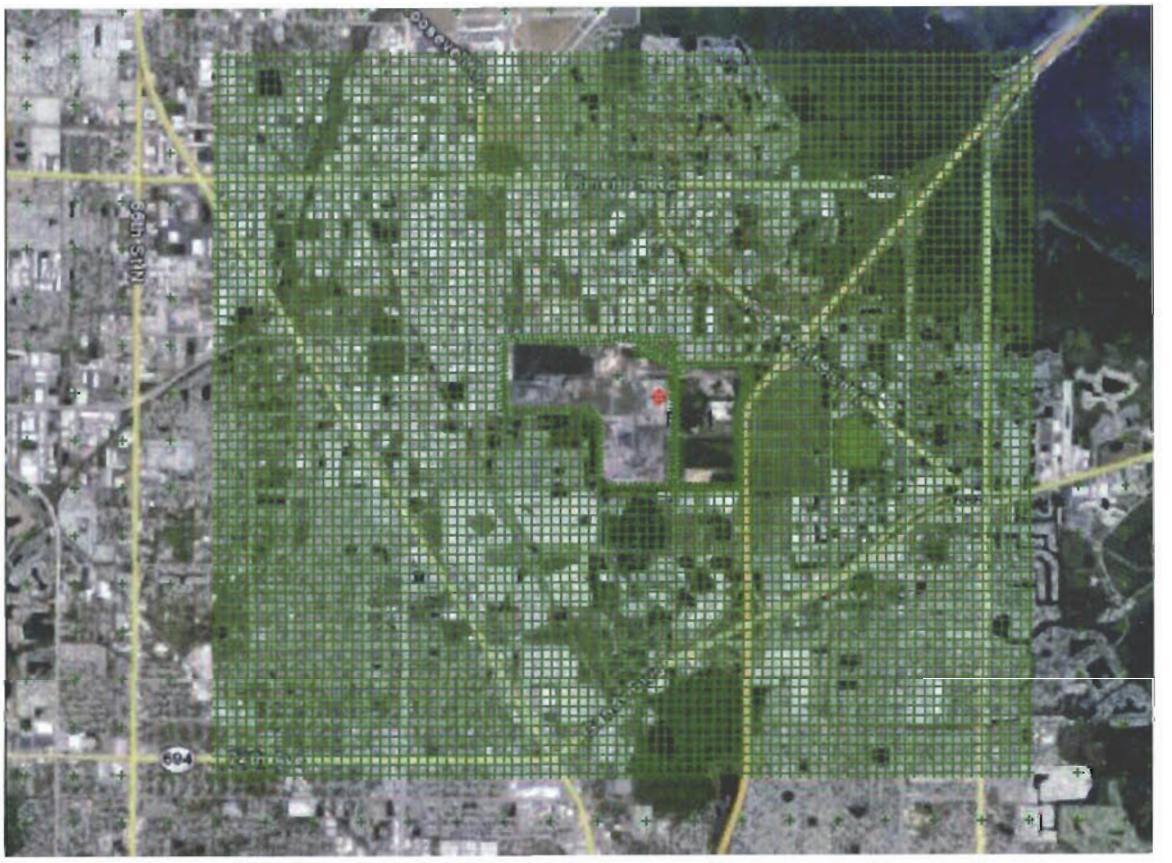
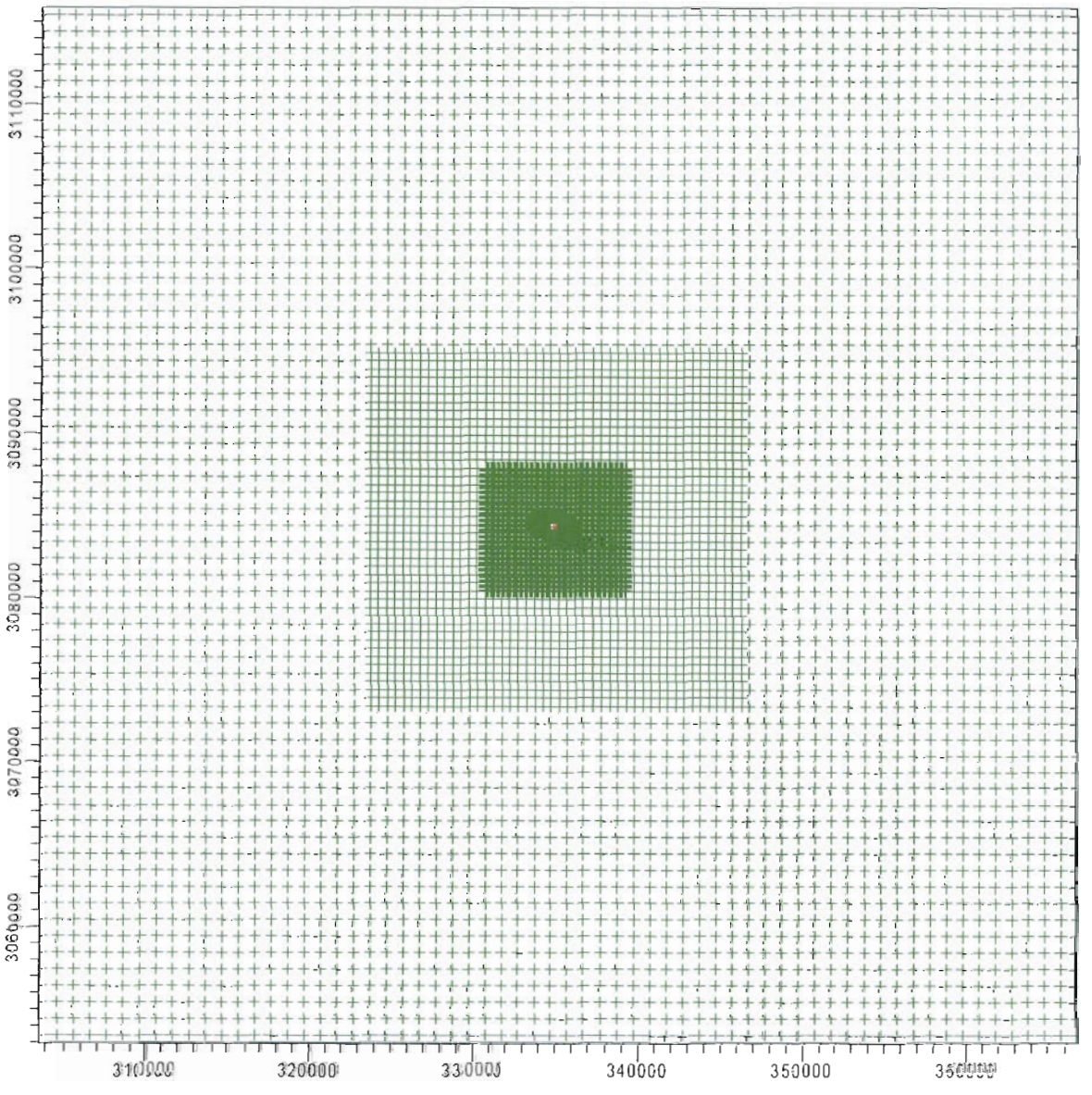


Figure 2 - Full Receptor Grid



2.6 Building Downwash - BPIP-PRIME

The effects of building downwash on the emission sources at PCRRF were included in the modeling study. The purpose of the evaluation is to determine if stack discharges may become caught in the turbulent wakes generated by these structures. Wind blowing around a structure creates zones of turbulence that are greater than if the structures were absent. Emission sources with a stack height less than the minimum Good Engineering Practice (GEP) stack height may be affected by downwash caused by a nearby structure. The PCRRF stack is not a GEP stack, because the height of the stack is limited due to the close proximity of the St. Petersburg Clearwater International Airport. Direction-specific structure dimensions and the dominant downwash structure parameters used as input to the air quality dispersion model were determined using USEPA's BPIP-PRIME (dated 04274 for AERMOD) program.

Table 3 summarizes the description and heights of each structure at PCRRF that was considered in the downwash analysis, and its corresponding tier height. Figure 3 includes a plot plan that shows the location of the structures relative to the emission sources.

The output from the analysis lists the names and dimensions of the structures generating wake effects and the locations and heights of the affected emission source. In addition, the output contains a summary of the dominant structure of the stack (considering all wind directions) and the actual structure height and the projected widths for all wind directions. This information is then incorporated into the input files for the AERMOD model.

2.7 Air Quality Monitoring Data

The U.S. EPA's Guidelines on Ambient Monitoring require PSD permit applicants to provide air quality monitoring data to determine if emissions of a pollutant would cause or contribute to a violation of the NAAQS or a PSD increment. The data must be gathered over a period of at least a year and must represent at least the year preceding receipt of the permit application. EPA allows substitution of existing representative air quality data in lieu of having the source generate its own preconstruction monitoring data, provided these data meet the criteria in the Ambient Monitoring Guidelines for PSD (May 1987). FDEP also has authority to waive the monitoring requirement if representative air quality monitoring data are available.

Table 3 Buildings Included in BPIP-PRIME Analysis

Building No.	No. of Tiers	Building Name	Tier 1 Ht (m)	Tier 1 Ht (ft)	Tier 2 Ht (m)	Tier 2 Ht (ft)
BLD_1	1	Boiler Enclosures	33.5	109.9		
BLD_2	1	B.E. w/ Refuse Pit	32.1	105.2		
BLD_3	1	B.E. w / Spray Dry Absorbers	25.1	82.5		
BLD_4	1	B.E w/ Tipping Floor	20.7	68.0		
BLD_5	1	B.E.w /FF Baghouses	16.2	53.0		
BLD_7	1	Carbon Silo	11.0	36.0		
BLD_9	1	Lime Silos	15.5	51.0		
BLD_8	1	Fly Ash Silo	18.0	59.0		
BLD_10	1	Lime Silos w / Slurry Tanks	7.3	24.0		
BLD_11	1	Air Compressor Building	6.1	20.0		
BLD_12	1	CEMs Building	6.1	20.0		
BLD_15	1	Material Recovery Bldg	21.3	70.0		
BLD_16	1	Lime Softener Area	13.6	44.6		
BLD17-18	2	Cooling Tower Tier Bottom (18) Top (17)	10.7	35.0	18.3	60.0
BLD_20	1	Warehouse (WTE new)	13.2	43.3		
BLD_21	1	Switchgear Building	6.1	20.0		
BLD_22	1	Turbine Generator Building	10.7	35.0		
BLD_23	1	Administration Building (WTE)	7.4	24.2		
BLD_24	1	Administration Building (WTE additional)	7.1	23.2		
BLD_26	1	Administrative Building (SWO)	12.4	40.7		
BLD_28	1	HEC3 Storage (new)	12.0	39.4		
BLD_29	1	HEC3 Office (new)	9.6	31.4		
BLD_30	1	Maintenance Building (WTE)	6.1	20.0		
BLD_31	1	Maintenance Office Building (SWO)	8.9	29.3		
BLD_32	1	Maintenance Storage Building (SWO)	11.2	36.8		
BLD_33	1	Scales	10.7	35.0		
BLD_34	1	Landfill Contractor Building	12.0	39.4		
BLD_35	1	Hand Unload	12.8	42.1		
BLD_36	1	Truck Wash	11.6	38.2		
BLD_37	1	Shower Locker Facility	8.4	27.5		
BLD_38	1	WTP Facility All	14.6	48.0		

Figure 3 Plot Plan of PCWEF and Buildings in BPIP-PRIME Analysis

There are two SO_2 monitoring stations in Pinellas County that are near the PCRRF and are representative of the air quality in the vicinity of the PCRRF as shown on Figure 4. One monitoring site is located at the PCRRF, approximately 3500 feet (1070 meters) from the maximum predicted one hour SO_2 concentration, and the other monitoring site is located at Derby Lane, which is approximately 3.6 miles (5800 meters) from the maximum predicted one hour SO_2 concentration. The baseline air quality at the PCRRF can be adequately described utilizing the existing SO_2 data from these two SO_2 monitoring stations. Therefore, the County requests a waiver from the preconstruction monitoring requirements on the basis that adequate representative data are already available to describe current conditions.

Table 4 presents the representative SO_2 concentrations, as measured at the two monitoring stations. These SO_2 values were provided by FDEP for the years 2006 through 2010 at the Resource Recovery Facility site, and for 2006 through 2011 at the Derby Lane site, and include the impact from the PCRRF as it operated during those years.

The 1-hr SO_2 concentrations at Derby Lane vary from a maximum of 168 ppb (440 $\mu g/m^3$) in 2007 to a minimum of 20 ppb (52.4 $\mu g/m3$) in 2011(an 88% reduction). The parts per billion (ppb) concentrations have been converted to micrograms per cubic meter ($\mu g/m^3$) by multiplying the ppm by 2.62. AERMOD predicted concentrations are presented in $\mu g/m^3$. The maximum 1-hr SO_2 concentrations at the PCRRF vary from a maximum of 62 ppb (162.4 $\mu g/m^3$) in 2007 to a minimum of 22 ppb (57.6 $\mu g/m^3$) in 2010 (a 65% reduction).

As shown by the monitoring data, over the past few years there has been a significant reduction in the one hour SO_2 levels measured near the PCRRF. There also has been a significant reduction in the one hour design value (the three year average of the 99th percentile annual daily maximum) that is used to demonstrate compliance with the one hour SO_2 standard. These reductions in ambient SO_2 concentrations are likely due to emission reductions at other emissions sources in the area of the PCRRF.

Figure 4 Locations of the SO_2 Ambient Air Quality Monitoring Stations (Yellow Triangles) with Respect to PCRRF (Green Star)

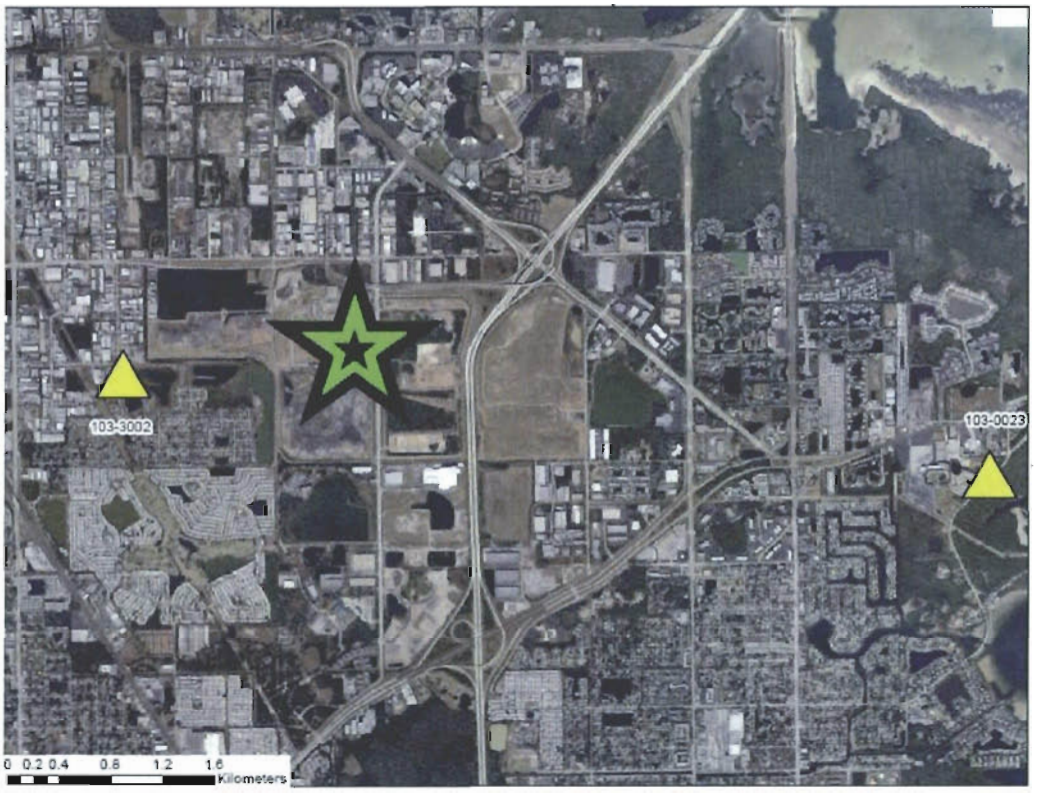


Table 4 SO_2 Concentrations

Sulfur Dioxide (42401) Units: ppb

Site:L1030023 - Derby Lane County:Pinellas AQS Monitor ID:12-103-0023-42401-1

Year	Ranked 1-Hour Averages		Ranked 3-Hour Averages		Ranked 24-Hour Averages		Annual	99th Percentile Values		Design
	1st	2nd	1st	2nd	1st	2nd	Average	Complete Days	Valid	Value
2006	142 (07/21)	133 (09/09)	75 (09/09:09)	70 (09/16:12)	24 (09/16)	19 (09/09)	2.6	109	109	
2007	168 (06/17)	118 (09/16)	79 (06/17:12)	75 (06/17:09)	29 (06/17)	27 (08/21)	3.4	92	92	
2008	119 (06/07)	94 (07/04)	63 (07/04:09)	57 (06/07:09)	22 (10/23)	18 (06/07)	2.4	62	62	88†
2009	101 (02/13)	100 (02/06)	46 (03/13:12)	46 (02/06:12)	10 (03/24)	9 (02/06)	1.5	58	58	71
2010	40 (01/11)	19 (01/09)	32 (01/11:12)	27 (01/11:15)	9 (01/11)	6 (01/09)	1.2	15	15	45
2011	20 (07/05)	16 (06/03)	11 (07/05:03)	10 (06/03:00)	3 (06/09)	3 (06/03)	0.9*	14*	14*	29*

* There was insufficient data to produce a valid average.

† Indicates the standard was exceeded.

Site:L1033002 - Resource Recovery Facility County:Pinellas AQS Monitor ID:12-103-3002-42401-

Year	Ranked 1-Hour Averages		Ranked 3-Hour Averages		Ranked 24-Hour Averages		Annual	99th Percentile Values		Design
	1st	2nd	1st	2nd	1st	2nd	Average	Complete Days	Valid	Value
2006	58 (01/20)	55 (09/16)	41 (09/16:09)	38 (01/20:12)	8 (01/20)	7 (09/16)	1.4	37	37	
2007	62 (08/25)	49 (09/12)	38 (08/25:06)	37 (06/28:03)	13 (06/28)	11 (08/25)	1.8	46	46	
2008	31 (04/10)	28 (06/07)	19 (04/02:09)	19 (04/10:06)	7 (04/10)	4 (04/02)	1.2	22	22	35
2009	23 (03/05)	19 (03/24)	12 (02/26:09)	11 (03/24:06)	3 (03/05)	3 (03/24)	1.1	16	16	28
2010	22 (01/11)	19 (01/03)	12 (01/11:12)	11 (01/03:12)	4 (01/11)	2 (01/10)	1.0*	9*	9*	16*
2011								*	*	

* There was insufficient data to produce a valid average.

The national 3-hour ambient air quality standard for SO_2 is 0.5 ppm. The standard is attained when the number of exceedance is no more than once per calendar year. The 24-hour standard for SO_2 is 0.14 ppm. The standard is attained when the number of exceedance is no more than once per calendar year. The annual standard for SO_2 is 0.03 ppm. The standard is attained when the annual mean is less than the standard. The 1-hour NAAQS standard for SO_2 is met when the design value (3-year average of the 99th percentile annual daily max) is less than or equal to 75 ppb.

3.0 Air Dispersion Modeling

The air quality dispersion modeling analysis for the County's PSD permit modification looked at a single stack with an emission rate based on 24 ppm, even though the CEMS data show a zero or even negative incremental (current actual to future potential emissions) change in 24-hr SO_2 emissions. The modeled ground-level concentrations have been compared to the corresponding significance impact level (SILs) and the ambient air quality standard to determine whether any modeled ground-level concentrations at any receptor location exceed the standard.

3.1 Model Results

The results of the modeling analysis for the 1-hr SO_2 AAQS are summarized in Table 5. Modeling for SO_2 was performed to compare the PCRRF's maximum impacts to the 1-hr average significant impact level and the AAQS. The SO_2 1-hr predicted maximum concentration is 18.15 $\mu g/m^3$ and it occurs approximately 50 m from the PCRRF's southwest fence line, as shown in Figure 5. This concentration occurs with the meteorological data from 2008. The modeled SO_2 concentrations remain above the SIL

of 7.6 µg/m^3 for a distance of 10.2 km west of the PCRRF's western boundary, as show on Figure 6.

Table 5 – Summary of 1-hr SO2 AERMOD Results

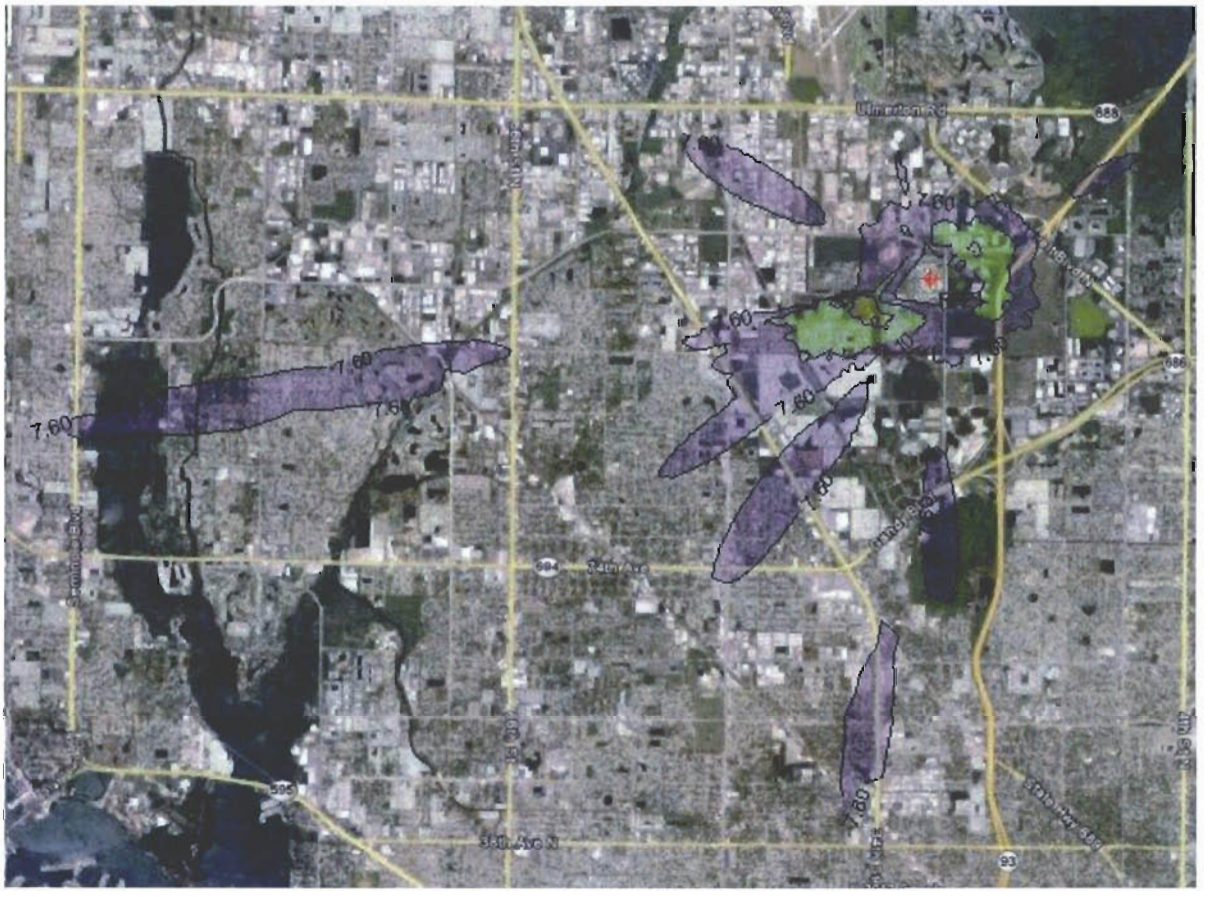
Air Constituent	Average Time	AAQS Primary (µg/m^3)	AAQS Secondary (µg/m^3)	PSD Monitoring Significance (µg/m^3)	Significant Impact Levels (µg/m^3)	PSD Increment Class II Area (µg/m^3)	SO_2 Concentration H1H (µg/m^3)	Exceed SIL?	Exceed AAQS?
SO_2	1-hr	196.5	---	---	7.6	---	18.15	Y	N

H1H (µg/m3)

		2006	2007	2008	2009	2010
SO_2	1-hr	16.99	17.49	18.15	17.83	17.02

Figure 5 Maximum 1-hr SO2 Concentration Location

Figure 6 Extent of 1-hr SO_2 SIL Concentration



3.2 AERMOD Electronic Modeling Files

The computer disk included in this section of the report contains all the air quality dispersion modeling analysis electronic data files used to generate the results presented in this report. These electronic data files include the following and are summarized in Tables 6 through 9 and on the attached CD:

- All AERMOD input, output, and plot data files
- All BPIP-PRIME input and output data files
- Meteorological files

Table 6 AERMOD Electronic Files for the Modeling Analysis

Input Data File Name	Output Data File Name	Plot File Name	Averaging Period /Pollutant	Receptor Grid File
PIN06.INP	PIN06.OUT	PIN06.PLT	1-hr, SO_2	PINELLAS. REC
PIN07.INP	PIN07.OUT	PIN07.PLT	1-hr, SO_2	PINELLAS. REC
PIN08.INP	PIN08.OUT	PIN08.PLT	1-hr, SO_2	PINELLAS. REC
PIN09.INP	PIN09.OUT	PIN09.PLT	1-hr, SO_2	PINELLAS. REC
PIN10.INP	PIN10.OUT	PIN10.PLT	1-hr, SO_2	PINELLAS. REC

Table 7 Electronic Files for Downwash Analyses

Analysis	Input File Name	Output File Name	
AERMOD	PINE2B.BPI	PINE2B.PRO	PINE2B.SUP

Table 8 Meteorological Files Used for the Air Quality Dispersion Modeling Analysis

Meteorological File Name	Year
TPA1M2006.SFC\PLF	2006
TPA1M2007.SFC\PLF	2007
TPA1M2008.SFC\PLF	2008
TPA1M2009.SFC\PLF	2009
TPA1M2010.SFC\PLF	2010

Table 9 AERMAP Files Used for the Receptor Elevations

Meteorological File Name	Description
6368647.TFW	World File for NED Data
6368647.TIF	NED Data
AERMAP-RECEPTORS.INP	AERMAP Input File
AERMAP-SRC.INP	AERMAP Input File for Source
PINELLAS.REC	AERMAP Elevation File

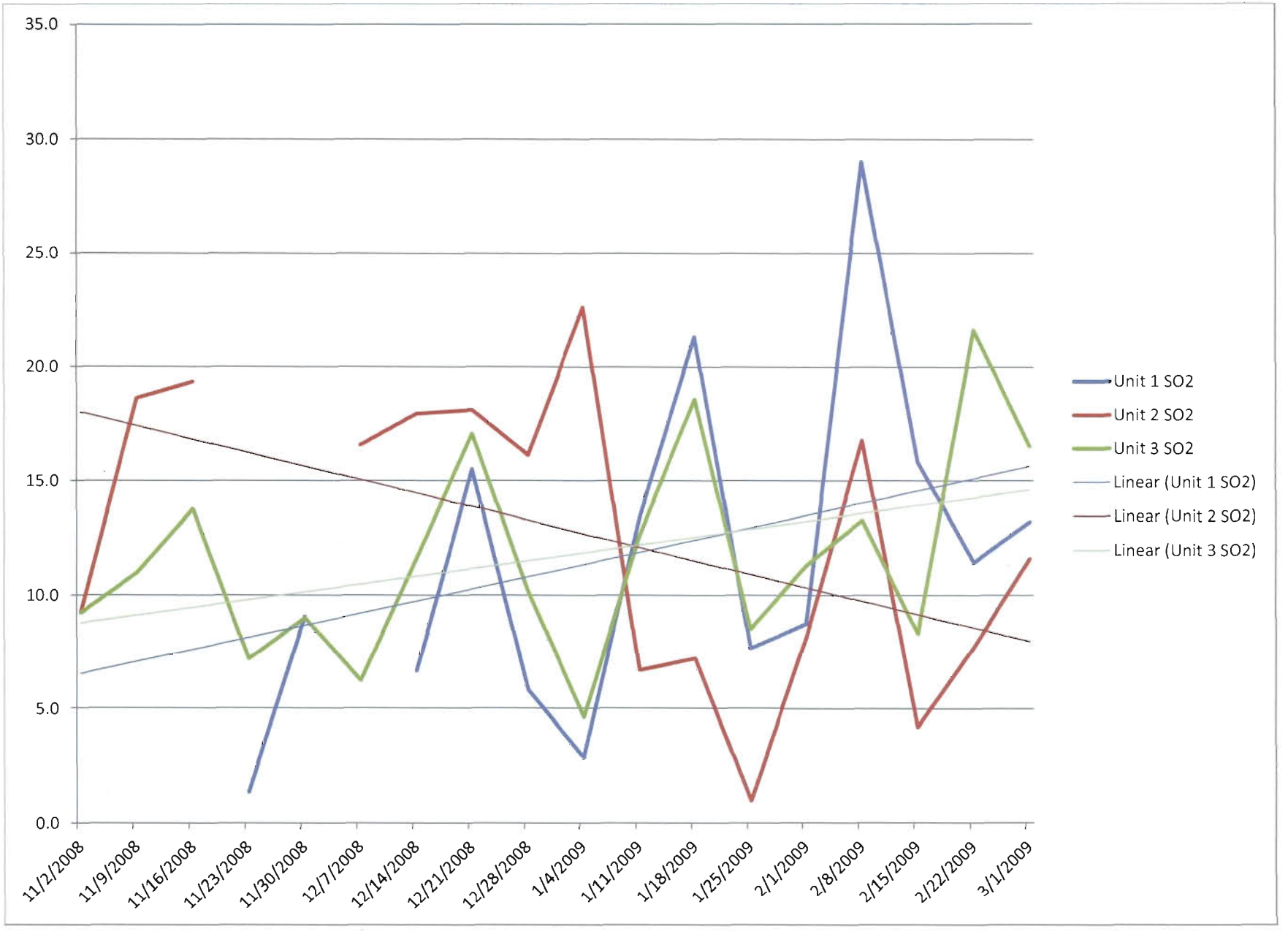
4.1 Conclusions

The modeling results presented in this report demonstrate that the permit modification requested for the PCRRF will not cause or contribute to a violation of the 1 hour AAQS for SO_2. As a practical matter, the permit modification will result in lower SO_2 emission limits for the PCRRF and, accordingly, there should be reductions in the PCRRF's impacts on ambient air quality. Further, the ambient air quality data obtained from two nearby monitoring stations clearly show that the ambient air quality near the PCRRF has improved significantly over the last few years, even with the PCRRF operating at its currently permitted SO_2 emission rate. The monitoring data demonstrate compliance with the SO_2 AAQS by a wide margin.

Attachment 5

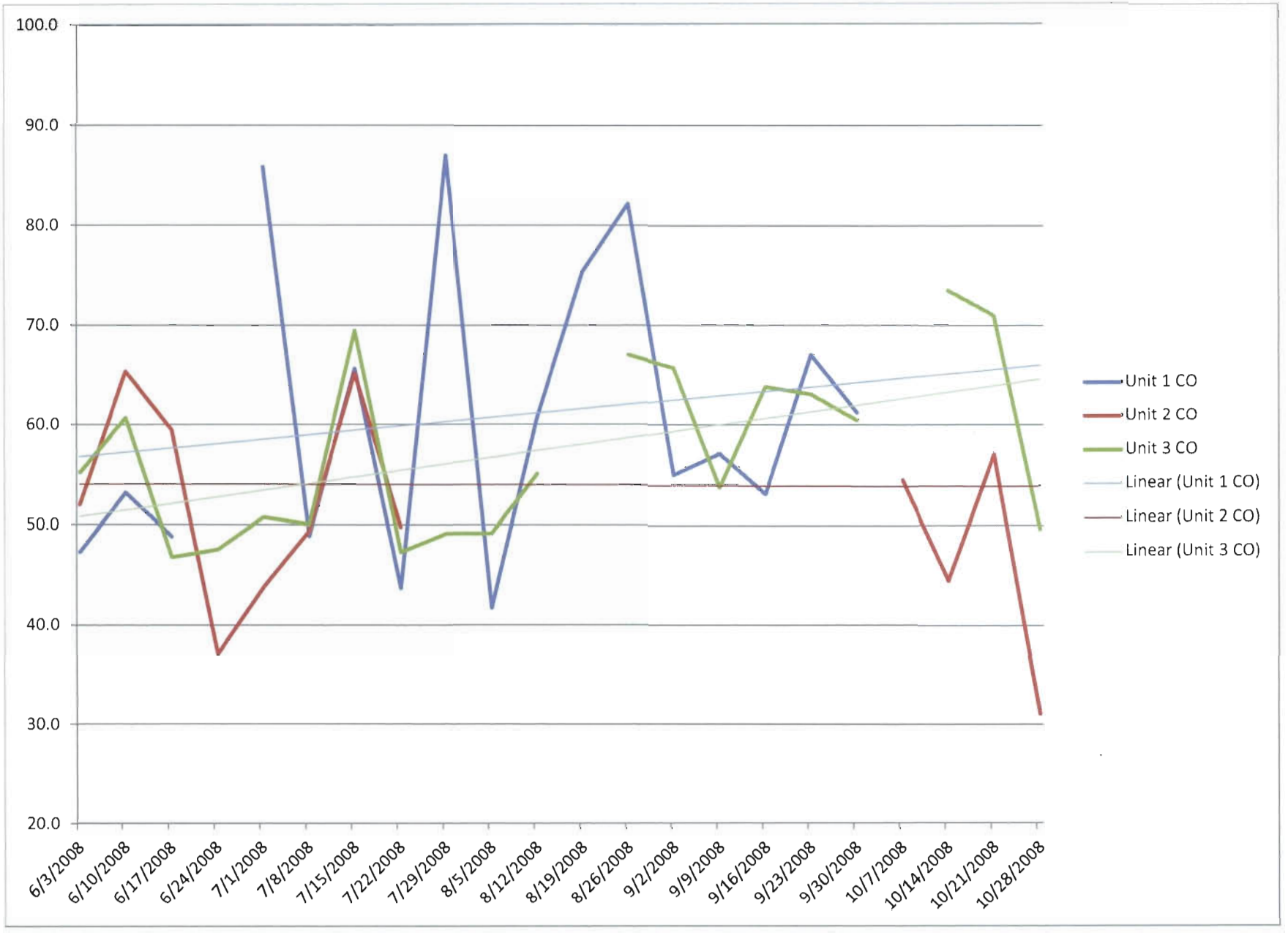
Weekly Average SO2 Concentrations (ppm)

Week ending date	Unit 1 SO2	Unit 2 SO2	Unit 3 SO2	Average
11/2/2008	13.7	9.2	9.2	10.7
11/9/2008		18.6	11.0	14.8
11/16/2008		19.3	13.8	16.6
11/23/2008	1.4		7.2	4.3
11/30/2008	9.1		9.0	9.0
12/7/2008		16.6	6.2	11.4
12/14/2008	6.7	17.9	11.6	12.1
12/21/2008	15.5	18.1	17.1	16.9
12/28/2008	5.8	16.1	10.1	10.7
1/4/2009	2.9	22.6	4.6	10.0
1/11/2009	13.3	6.7	12.6	10.9
1/18/2009	21.3	7.2	18.6	15.7
1/25/2009	7.7	1.0	8.5	5.7
2/1/2009	8.7	8.1	11.3	9.4
2/8/2009	29.0	16.8	13.3	19.7
2/15/2009	15.8	4.2	8.3	9.5
2/22/2009	11.5	7.7	21.6	13.6
3/1/2009	13.2	11.6	16.5	13.8


35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
11/2/2008
11/9/2008
11/16/2008
11/23/2008
11/30/2008
12/7/2008
12/14/2008
12/21/2008
12/28/2008
1/4/2009
1/11/2009
1/18/2009
1/25/2009
2/1/2009
2/8/2009
2/15/2009
2/22/2009
3/1/2009
Unit 1 SO2
Unit 2 SO2
Unit 3 SO2
Linear (Unit 1 SO2)
Linear (Unit 2 SO2)
Linear (Unit 3 SO2)

Weekly Average CO Concentrations (ppm)

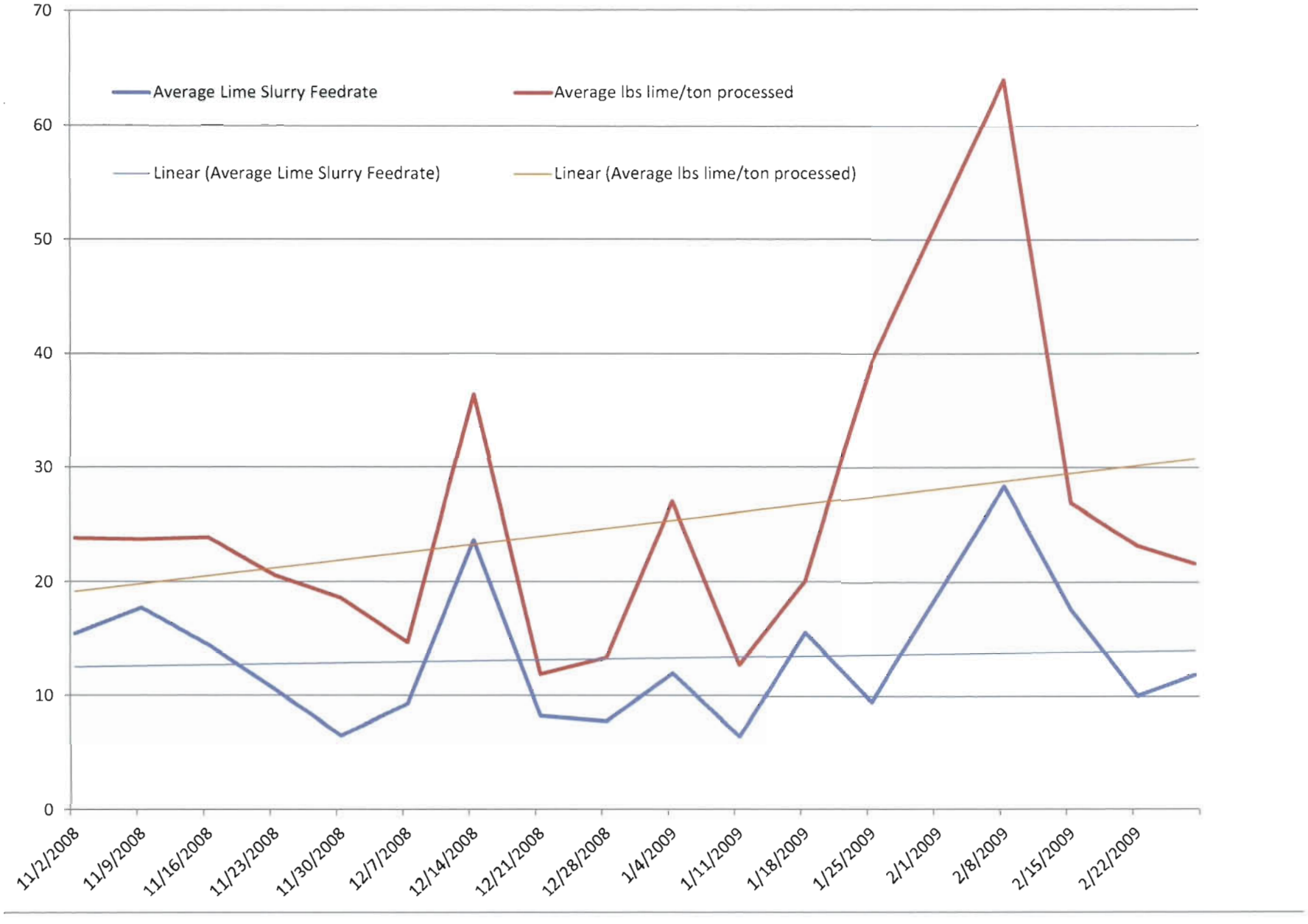
Week ending date	Unit 1 CO	Unit 2 CO	Unit 3 CO	Average
6/3/2008	47.3	52.0	55.2	51.5
6/10/2008	53.2	65.3	60.7	59.8
6/17/2008	48.8	59.5	46.8	51.7
6/24/2008		37.1	47.5	42.3
7/1/2008	85.8	43.8	50.7	60.1
7/8/2008	48.9	49.4	50.0	49.4
7/15/2008	65.6	65.2	69.5	66.8
7/22/2008	43.7	49.8	47.3	46.9
7/29/2008	87.0		49.1	68.1
8/5/2008	41.7		49.1	45.4
8/12/2008	60.8		55.1	57.9
8/19/2008	75.4			75.4
8/26/2008	82.2		67.1	74.6
9/2/2008	55.0		65.7	60.4
9/9/2008	57.1	43.5	53.8	51.5
9/16/2008	53.1		63.9	58.5
9/23/2008	67.0	102.7	63.1	77.6
9/30/2008	61.3		60.5	60.9
10/7/2008		54.5		54.5
10/14/2008	66.3	44.5	73.5	61.4
10/21/2008		57.1	71.0	64.0
10/28/2008	62.0	31.2	49.6	47.6


100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
6/3/2008
6/10/2008
6/17/2008
6/24/2008
7/1/2008
7/8/2008
7/15/2008
7/22/2008
7/29/2008
8/5/2008
8/12/2008
8/19/2008
8/26/2008
9/2/2008
9/9/2008
9/16/2008
9/23/2008
9/30/2008
10/7/2008
10/14/2008
10/21/2008
10/28/2008
Unit 1 CO
Unit 2 CO
Unit 3 CO
Linear (Unit 1 CO)
Linear (Unit 2 CO)
Linear (Unit 3 CO)

Pinellas County Resource Recovery Facility

Weekly Average Lime Usage Rates in Gallons per minute (gpm)

Week Ending Date	Lime Slurry Feedrate (gpm)			Average Lime Slurry Feedrate	Average lbs lime/ton processed
	Boiler #1	Boiler #2	Boiler #3		
11/2/2008		14.02	16.90	15.46	23.84
11/9/2008		19.03	16.43	17.73	23.74
11/16/2008		10.59	18.30	14.45	23.89
11/23/2008	10.00		11.12	10.56	20.57
11/30/2008	7.40	1.86	10.32	6.53	18.58
12/7/2008		5.31	13.29	9.30	14.66
12/14/2008	36.32	23.02	11.63	23.66	36.44
12/21/2008	7.91	8.14	8.66	8.24	11.88
12/28/2008	5.20	13.12	5.03	7.78	13.34
1/4/2009	30.80	3.43	1.62	11.95	27.00
1/11/2009	7.60	2.76	8.90	6.42	12.69
1/18/2009	39.80	3.80	2.93	15.51	20.06
1/25/2009	21.02	2.64	4.88	9.51	39.27
2/8/2009	9.71	43.86	31.57	28.38	64.07
2/15/2009	32.04	7.03	13.67	17.58	26.90
2/22/2009	20.14	6.29	3.76	10.06	23.21
2/28/2009	22.35	8.87	4.33	11.85	21.65


70
60
50
40
30
20
10
0
Average Lime Slurry Feedrate
Average lbs lime/ton processed
Linear (Average Lime Slurry Feedrate)
Linear (Average lbs lime/ton processed)
11/2/2008
11/9/2008
11/16/2008
11/23/2008
11/30/2008
12/7/2008
12/14/2008
12/21/2008
12/28/2008
1/4/2009
1/11/2009
1/18/2009
1/25/2009
2/1/2009
2/8/2009
2/15/2009
2/22/2009

Attachment 6

Veolia ES Pinellas
St. Petersburg, Florida

SDA OPTIMIZATION
PINELLAS UNIT Nos. 1, 2 & 3
GAS FLOW MODEL STUDY

Veolia ES Pinellas P.O. 59675
NCS Project No. P096.10

NELS CONSULTING SERVICES INC.
ST. CATHARINES, ONTARIO, CANADA
(905) 682-2969

SEPTEMBER 2011

ABSTRACT

This report presents the results of a 1/8-scale gas flow model study conducted for Veolia ES Pinellas of a typical spray dryer absorber tower (SDA) at the Pinellas County facility for Unit Nos. 1, 2 and 3.

The objectives of the model studies were to develop modifications to minimize the following problems in the SDA installations:

1) Gas velocity and flow distributions within the system

2) Minimize deposits in the SDA vessel and outlet ductwork

3) Minimize pressure loss through the SDA vessel

4) Minimize corrosion in the SDA vessel

TABLE OF CONTENTS

ABSTRACT ii
TABLE OF CONTENTS iii
LIST OF TABLES v
LIST OF PLATES vi
LIST OF PHOTOGRAPHS xix

1 INTRODUCTION 1
1.1 General Introduction 1
1.2 Terms of Reference 1

2 SUMMARY OF MODEL STUDY 2
2.1 Existing Configuration 2
2.2 Proposed Configuration 3

3 DESCRIPTION OF FULL SIZE INSTALLATION 4

4 MODEL DESIGN AND CONSTRUCTION 5
4.1 Similitude 5
4.2 Model Construction 6

5 INSTRUMENTATION 7

6 TEST LOCATIONS AND PROCEDURES 8
6.1 Test Locations 8
6.2 Test Procedures 8

TABLE OF CONTENTS

7 MODEL STUDY TEST RESULTS 10

7.1 Unit No. 1 10

7.1.1 Existing Configuration 10

7.1.2 Proposed 11

7.2 Unit No. 2 12

7.2.1 Existing Configuration 12

7.2.2 Proposed 13

7.3 Unit No. 3 14

7.3.1 Existing Configuration 14

7.3.2 Proposed 15

8 DISCUSSION AND RECOMMENDATIONS 17

TABLES

PLATES

PHOTOGRAPHS

APPENDIX A – Fabrication Drawings

LIST OF TABLES

Number	Title
1	List of Drawings
2	Full Size Gas Flow
3	Comparison between Full Size and Model
4	Summary of Gas Phase Scaling Parameters
5	Description of Test Locations
6	Summary of Flows and Pressures - Unit No. 1 Existing
7	Summary of Flows and Pressures - Unit No. 1 Final
8	Summary of Flows and Pressures - Unit No. 2 Existing
9	Summary of Flows and Pressures - Unit No. 2 Final
10	Summary of Flows and Pressures - Unit No. 3 Existing
11	Summary of Flows and Pressures - Unit No. 3 Final
12	Summary of Flows and Pressures - Unit Nos. 1 to 3
13	Summary of RMS Deviations - Unit Nos. 1 to 3

LIST OF PLATES

Number	Title
1	General Arrangement Existing SDA Installation Unit Nos. 1, 2, and 3 Plan, Elevation & Section Views
2	General Arrangement Existing SDA Installation Unit Nos. 1, 2, and 3 Plan View
3	General Arrangement & Test Locations Plan and Elevation Views
4	General Arrangement & Details Sections C-C & D-D Proposed SDA Modifications
5	General Arrangement & Details Sections C-C & D-D Proposed SDA Chevron Modifications
Unit No. 1	
6	Normalized Velocity Distribution Test Location: T1N Unit No. 1 - Existing
7	Normalized Velocity Distribution Test Location: T1S Unit No. 1 - Existing
8	Normalized Velocity Distribution Test Location: T2N Unit No. 1 - Existing
9	Normalized Velocity Distribution Test Location: T2S Unit No. 1 - Existing
10	Normalized Velocity Distribution Test Location: T3N Unit No. 1 - Existing

LIST OF PLATES

Number	Title
11	Normalized Velocity Distribution Test Location: T3N Unit No. 1 - Existing
12	Normalized Velocity Distribution Test Location: T3S Unit No. 1 - Existing
13	Normalized Velocity Distribution Test Location: T3S Unit No. 1 - Existing
14	Normalized Velocity Distribution Test Location: T4 Unit No. 1 - Existing
15	Normalized Velocity Distribution Test Location: T4 Unit No. 1 - Existing
16	Normalized Velocity Distribution Test Location: T5 Unit No. 1 - Existing
17	Normalized Velocity Distribution Test Location: T5 Unit No. 1 - Existing
18	Normalized Velocity Distribution Test Location: T6 Unit No. 1 - Existing
19	Normalized Velocity Distribution Test Location: T6 Unit No. 1 - Existing
20	Normalized Velocity Distribution Test Location: T7 Unit No. 1 - Existing
21	Normalized Velocity Distribution Test Location: T7 Unit No. 1 - Existing

LIST OF PLATES

Number	Title
22	Normalized Velocity Distribution Test Location: T8 Unit No. 1 - Existing
23	Normalized Velocity Distribution Test Location: T8 Unit No. 1 - Existing
24	Normalized Velocity Distribution Test Location: T9 Unit No. 1 - Existing
25	Normalized Velocity Distribution Test Location: T9 Unit No. 1 - Existing
26	Normalized Velocity Distribution Test Location: T10 Unit No. 1 - Existing
27	Normalized Velocity Distribution Test Location: TV Unit No. 1 - Existing
28	Normalized Velocity Distribution Test Location: T1N Unit No. 1 - Final
29	Normalized Velocity Distribution Test Location: T1S Unit No. 1 - Final
30	Normalized Velocity Distribution Test Location: T2N Unit No. 1 - Final
31	Normalized Velocity Distribution Test Location: T2S Unit No. 1 - Final
32	Normalized Velocity Distribution Test Location: T3N Unit No. 1 - Final

LIST OF PLATES

Number	Title
33	Normalized Velocity Distribution Test Location: T3N Unit No. 1 - Final
34	Normalized Velocity Distribution Test Location: T3S Unit No. 1 - Final
35	Normalized Velocity Distribution Test Location: T3S Unit No. 1 - Final
36	Normalized Velocity Distribution Test Location: T4 Unit No. 1 - Final
37	Normalized Velocity Distribution Test Location: T4 Unit No. 1 - Final
38	Normalized Velocity Distribution Test Location: T5 Unit No. 1 - Final
39	Normalized Velocity Distribution Test Location: T5 Unit No. 1 - Final
40	Normalized Velocity Distribution Test Location: T6 Unit No. 1 - Final
41	Normalized Velocity Distribution Test Location: T6 Unit No. 1 - Final
42	Normalized Velocity Distribution Test Location: T7 Unit No. 1 - Final
43	Normalized Velocity Distribution Test Location: T7 Unit No. 1 - Final

LIST OF PLATES

Number	Title
44	Normalized Velocity Distribution Test Location: T8 Unit No. 1 - Final
45	Normalized Velocity Distribution Test Location: T8 Unit No. 1 - Final
46	Normalized Velocity Distribution Test Location: T9 Unit No. 1 - Final
47	Normalized Velocity Distribution Test Location: T9 Unit No. 1 - Final
48	Normalized Velocity Distribution Test Location: T10 Unit No. 1 - Final
49	Normalized Velocity Distribution Test Location: TV Unit No. 1 - Final
Unit No. 2	
50	Normalized Velocity Distribution Test Location: T1N Unit No. 2 - Existing
51	Normalized Velocity Distribution Test Location: T1S Unit No. 2 - Existing
52	Normalized Velocity Distribution Test Location: T2N Unit No. 2 - Existing
53	Normalized Velocity Distribution Test Location: T2S Unit No. 2 - Existing

LIST OF PLATES

Number	Title
54	Normalized Velocity Distribution Test Location: T3N Unit No. 2 - Existing
55	Normalized Velocity Distribution Test Location: T3N Unit No. 2 - Existing
56	Normalized Velocity Distribution Test Location: T3S Unit No. 2 - Existing
57	Normalized Velocity Distribution Test Location: T3S Unit No. 2 - Existing
58	Normalized Velocity Distribution Test Location: T4 Unit No. 2 - Existing
59	Normalized Velocity Distribution Test Location: T4 Unit No. 2 - Existing
60	Normalized Velocity Distribution Test Location: T5 Unit No. 2 - Existing
61	Normalized Velocity Distribution Test Location: T5 Unit No. 2 - Existing
62	Normalized Velocity Distribution Test Location: T6 Unit No. 2 - Existing
63	Normalized Velocity Distribution Test Location: T6 Unit No. 2 - Existing
64	Normalized Velocity Distribution Test Location: T7 Unit No. 2 - Existing

LIST OF PLATES

Number	Title
65	Normalized Velocity Distribution Test Location: T7 Unit No. 2 - Existing
66	Normalized Velocity Distribution Test Location: T8 Unit No. 2 - Existing
67	Normalized Velocity Distribution Test Location: T8 Unit No. 2 - Existing
68	Normalized Velocity Distribution Test Location: T9 Unit No. 2 - Existing
69	Normalized Velocity Distribution Test Location: T9 Unit No. 2 - Existing
70	Normalized Velocity Distribution Test Location: T10 Unit No. 2 - Existing
71	Normalized Velocity Distribution Test Location: TV Unit No. 2 - Existing
72	Normalized Velocity Distribution Test Location: T1N Unit No. 2 - Final
73	Normalized Velocity Distribution Test Location: T1S Unit No. 2 - Final
74	Normalized Velocity Distribution Test Location: T2N Unit No. 2 - Final
75	Normalized Velocity Distribution Test Location: T2S Unit No. 2 - Final

LIST OF PLATES

Number	Title
76	Normalized Velocity Distribution Test Location: T3N Unit No. 2 – Final
77	Normalized Velocity Distribution Test Location: T3N Unit No. 2 - Final
78	Normalized Velocity Distribution Test Location: T3S Unit No. 2 - Final
79	Normalized Velocity Distribution Test Location: T3S Unit No. 2 - Final
80	Normalized Velocity Distribution Test Location: T4 Unit No. 2 - Final
81	Normalized Velocity Distribution Test Location: T4 Unit No. 2 - Final
82	Normalized Velocity Distribution Test Location: T5 Unit No. 2 - Final
83	Normalized Velocity Distribution Test Location: T5 Unit No. 2 - Final
84	Normalized Velocity Distribution Test Location: T6 Unit No. 2 - Final
85	Normalized Velocity Distribution Test Location: T6 Unit No. 2 - Final
86	Normalized Velocity Distribution Test Location: T7 Unit No. 2 - Final

LIST OF PLATES

Number	Title
87	Normalized Velocity Distribution Test Location: T7 Unit No. 2 – Final
88	Normalized Velocity Distribution Test Location: T8 Unit No. 2 - Final
89	Normalized Velocity Distribution Test Location: T8 Unit No. 2 - Final
90	Normalized Velocity Distribution Test Location: T9 Unit No. 2 - Final
91	Normalized Velocity Distribution Test Location: T9 Unit No. 2 - Final
92	Normalized Velocity Distribution Test Location: T10 Unit No. 2 - Final
93	Normalized Velocity Distribution Test Location: TV Unit No. 2 - Final
Unit No. 3	
94	Normalized Velocity Distribution Test Location: T1N Unit No. 3 - Existing
95	Normalized Velocity Distribution Test Location: T1S Unit No. 3 - Existing
96	Normalized Velocity Distribution Test Location: T2N Unit No. 3 - Existing

LIST OF PLATES

Number	Title
97	Normalized Velocity Distribution Test Location: T2S Unit No. 3 - Existing
98	Normalized Velocity Distribution Test Location: T3N Unit No. 3 - Existing
99	Normalized Velocity Distribution Test Location: T3N Unit No. 3 - Existing
100	Normalized Velocity Distribution Test Location: T3S Unit No. 3 - Existing
101	Normalized Velocity Distribution Test Location: T3S Unit No. 3 - Existing
102	Normalized Velocity Distribution Test Location: T4 Unit No. 3 - Existing
103	Normalized Velocity Distribution Test Location: T4 Unit No. 3 - Existing
104	Normalized Velocity Distribution Test Location: T5 Unit No. 3 - Existing
105	Normalized Velocity Distribution Test Location: T5 Unit No. 3 - Existing
106	Normalized Velocity Distribution Test Location: T6 Unit No. 3 - Existing
107	Normalized Velocity Distribution Test Location: T6 Unit No. 3 - Existing

LIST OF PLATES

Number	Title
108	Normalized Velocity Distribution Test Location: T7 Unit No. 3 - Existing
109	Normalized Velocity Distribution Test Location: T7 Unit No. 3 - Existing
110	Normalized Velocity Distribution Test Location: T8 Unit No. 3 - Existing
111	Normalized Velocity Distribution Test Location: T8 Unit No. 3 - Existing
112	Normalized Velocity Distribution Test Location: T9 Unit No. 3 - Existing
113	Normalized Velocity Distribution Test Location: T9 Unit No. 3 - Existing
114	Normalized Velocity Distribution Test Location: T10 Unit No. 3 - Existing
115	Normalized Velocity Distribution Test Location: TV Unit No. 3 - Existing
116	Normalized Velocity Distribution Test Location: T1N Unit No. 3 - Final
117	Normalized Velocity Distribution Test Location: T1S Unit No. 3 - Final
118	Normalized Velocity Distribution Test Location: T2N Unit No. 3 - Final

LIST OF PLATES

Number	Title
119	Normalized Velocity Distribution Test Location: T2S Unit No. 3 - Final
120	Normalized Velocity Distribution Test Location: T3N Unit No. 3 – Final
121	Normalized Velocity Distribution Test Location: T3N Unit No. 3 - Final
122	Normalized Velocity Distribution Test Location: T3S Unit No. 3 - Final
123	Normalized Velocity Distribution Test Location: T3S Unit No. 3 - Final
124	Normalized Velocity Distribution Test Location: T4 Unit No. 3 - Final
125	Normalized Velocity Distribution Test Location: T4 Unit No. 3 - Final
126	Normalized Velocity Distribution Test Location: T5 Unit No. 3 - Final
127	Normalized Velocity Distribution Test Location: T5 Unit No. 3 - Final
128	Normalized Velocity Distribution Test Location: T6 Unit No. 3 - Final
129	Normalized Velocity Distribution Test Location: T6 Unit No. 3 - Final

LIST OF PLATES

Number	Title
130	Normalized Velocity Distribution Test Location: T7 Unit No. 3 - Final
131	Normalized Velocity Distribution Test Location: T7 Unit No. 3 – Final
132	Normalized Velocity Distribution Test Location: T8 Unit No. 3 - Final
133	Normalized Velocity Distribution Test Location: T8 Unit No. 3 - Final
134	Normalized Velocity Distribution Test Location: T9 Unit No. 3 - Final
135	Normalized Velocity Distribution Test Location: T9 Unit No. 3 - Final
136	Normalized Velocity Distribution Test Location: T10 Unit No. 3 - Final
137	Normalized Velocity Distribution Test Location: TV Unit No. 3 - Final

LIST OF PHOTOGRAPHS

Number	Title
A	General Model Arrangement
B	SDA Inlet Ductwork and Top of SDA
C	Inlet Ductwork
D	Outlet Ductwork
E	Proposed Chevron Modifications
F	Proposed – SDA Outlet Ductwork Modifications

1 INTRODUCTION

1.1 General Introduction

This report presents the results of a 1/8-scale gas flow model study conducted for Veolia ES Pinellas of a typical spray dryer absorber (SDA) installation at the Pinellas County facility for Unit Nos. 1, 2 and 3, as shown on Plates 1 to 3.

A 1/8 linear scale model of the SDA vessel and associated inlet and outlet ductwork was constructed and tested to achieve the desired flow conditions through the system.

1.2 Terms of Reference

The objectives of the model study were to develop modifications to minimize the following problems in the SDA installations:

- Gas velocity and flow distributions within the system
- Minimize deposits in the SDA vessel and outlet ductwork
- Minimize pressure loss through the SDA vessel
- Minimize corrosion in the SDA vessel

2 SUMMARY OF MODEL STUDY

The 1/8 scale model study test results have indicated the following for the existing and final configurations, as shown on Plates 1 to 5 and summarized in Tables 6 to 13:

2.1 Existing Configuration

- The average predicted pressure loss from the SDA Inlet Duct (T1) to SDA Outlet (T10) was 1.25"H_2O, as shown on Table 12.
- The average predicted pressure loss from the SDA Inlet Duct (T5) to the Outlet Duct (T9) was 0.79"H_2O, as shown on Table 12.
- The RMS deviation in the upper section of the SDA cylindrical section 1 (T6) was 47.6% of the theoretical mean, as shown on Table 13.
- The RMS deviation of the SDA cylindrical section ½ the distance from the top (T7) was 38.0% of the theoretical mean, as shown on Table 13.
- The RMS deviation at the lower section of the SDA (T8) was 32.8% of the theoretical mean, as shown on Table 13.
- The RMS deviations at the two SDA Outlet test locations (T9 and T10) were 45.9% and 31.7% of the theoretical mean, respectively, as shown on Table 13.

From the testing completed the following problematic areas were determined:

- High flow areas adjacent to the inlet elbow and along the sides of the SDA vessel.
- Lower flows in the center of the SDA vessel and immediately below the inlet ductwork.
- Significant low flow or eddies at the lower section of the SDA outlet ductwork.

2.2 Proposed Configuration

- The average predicted pressure loss from the SDA Inlet Duct (T1) to SDA Outlet (T10) was 1.36"H_2O, as shown on Table 12.
- The average predicted pressure loss from the SDA Inlet Duct (T5) to the Outlet Duct (T9) was 0.88"H_2O , as shown on Table 12.
- The average RMS deviation in the upper section of the SDA cylindrical section 1 (T6) was 14.8% of the theoretical mean, as shown on Table 13.
- The average RMS deviation of the SDA cylindrical section ½ the distance from the top (T7) was 12.8% of the theoretical mean, as shown on Table 13.
- The average RMS deviation at the lower section of the SDA (T8) was 10.3% of the theoretical mean, as shown on Table 13.
- The average RMS deviations at the two SDA Outlet test locations (T9 and T10) was 21.3 and 20.8% of the theoretical mean, respectively, as shown on Table 13.

Based on the test completed the flow typically spread across the entire vessel and went straight down. The RMS deviations for the existing and final configurations indicate improvements in the RMS deviations, especially in the SDA vessel and outlet ductwork. The water spray confirmed that there is no turbulent flow in the area below the inlet ductwork. The cork dust illustrated that there was uniform distribution of dust within the SDA vessel. The proposed configuration offered the best straight flow distribution through the SDA vessel and no reverse flow in the outlet ductwork with a manageable increase in the predicted pressure loss.

3 DESCRIPTION OF FULL SIZE INSTALLATION

The spray dryer absorber (SDA) tower scrubs boiler exhaust flue gas with atomized lime slurry, reducing the acidic components such as SO_2 while simultaneously controlling the gas temperature entering the baghouse. The Wheelabrator Air Pollution Control (WAPC) designed SDA vessel utilizes 5 air atomized nozzles in the upper section of the SDA. Veolia ES Pinellas provided the details of the Pinellas County SDA Unit Nos. 1, 2 and 3 on the drawings listed in Table 1.

The operating parameters for the installation are listed in Table 2 as provided by Veolia ES Pinellas for the 'normal' gas flow condition as well as data measurement on site during a field test program.

4 MODEL DESIGN AND CONSTRUCTION

4.1 Similitude

In gas flow modeling, it is theoretically necessary to simultaneously maintain geometric, kinematic and dynamic similarity. However, such a condition is not possible under modeling conditions. Therefore, this gas flow model study was conducted using a geometric linear scale factor of 1/8 with a velocity scale of 1/1. These particular scaling factors were chosen based on the following rationale:

1. When a sufficiently large geometric scaling factor is used the most critical aspect of geometric similarity is satisfied and the reliability of measurement can be ensured. A linear scale of 1/8 was determined to be sufficient to satisfy this criterion and yet economic to build and test.

2. Kinematic similarity is dependent upon the Reynolds Number (Re) and has no significant influence if this number is maintained above an approximate value of 20 000 (i.e., the minimum Re to ensure fully turbulent flow conditions). Based on the velocities used in the system the typical Reynolds Numbers for the full size installation and the 1/8-scaled model were 1.35×10^6 and 4.29×10^5, respectively, thus satisfying the above criterion. As fully turbulent flow conditions were maintained in this study, velocity distributions and pressure losses can be accurately measured in the model and predictions made for the full size installation.

3. As this particular model study was based upon uniform air density, the forces of gravity are negligible in comparison with inertia forces. Therefore, it was not essential to maintain dynamic similarity.

A comparison between the full size installation and the models is detailed in Table 3 and the necessary scaling parameters listed in Table 4.

4.2 Model Construction

The 1/8-scale model, geometrically similar to the full size unit, as detailed on Plates 1 to 3 and Photographs A to F, had ductwork constructed from 1/4 inch thick Plexiglas and the SDA vessel from 1/8 inch thick Plexiglas. The model extends from the economizer outlet through the inlet ductwork, inlet transition, SDA vessel and outlet ductwork to the baghouse inlet flange.

Internal flow distribution devices such as turning vanes were fabricated from sheet metal. All structural members greater than 3 inches in diameter and significant to the gas flow were also included in the model. The model was operated under negative pressure by a single inlet centrifugal fan driven by a 30-hp motor.

All three unit configurations, as shown on Plate 2, were tested for the existing and final configurations. The difference between the three was the angle of the inlet duct going to the SDA vessel. The angle difference was 9 degrees between Unit No. 1 and 3.

5 INSTRUMENTATION

The air flow velocities and pressures in the model were measured using the following equipment:

(a) Ductwork Velocities

Pitot static tube (AMCA Std. 210-74, ASHRAE Std. 5175) or 'S' type Pitot tube 15 inches long by 2.3 mm diameter, with an Airflow Testing Mark 5 inclined manometer, range 0 to 0.5, 1, 2, 10 and 20 inches of water.

(b) SDA Vessel Velocities

A 4" Vane Type Anemometer, Model EDRA 5

(c) Total Pressures

Total pressure hole of the Pitot static tube and inclined manometer as in (a) above.

(d) Static Pressures

¼" brass wall taps, Static pressure holes of the Pitot static tube and inclined manometer as in (a) above.

(e) Volume Flow

The volume flow through the model section was monitored using test location TV, which had a sufficiently uniform velocity distribution as indicated by a Root Mean Square Deviation (RMS) of less than 15% of the mean velocity.

(f) Air Flow Patterns

The airflow patterns in the model were identified with:

- Powermist Turbo Smoke Generator
- Cotton tufts
- #40/80 Granulated Cork Dust
- Air atomized water spray using air atomized nozzles

6 TEST LOCATIONS AND PROCEDURES

6.1 Test Locations

The test locations used in the model study are described in Table 5 and shown on Plate 3. The velocity and total pressure distribution was measured at each test location within the model. These test positions were selected such that the flow patterns within the ductwork could be accurately evaluated and the associated pressure losses calculated.

6.2 Test Procedures

The models were operated under negative pressure at velocities equal to those in the operating installation to ensure that representative flow patterns were maintained (i.e. Reynolds Number greater than 20 000). Air velocities and total pressures were measured at the centers of equal areas across each duct section where the minimum number of measurements was determined by,

$$No.\ Of\ Test\ Points = 1.5\ (A)^{\wedge 0.5}$$

Where A = cross section area (ft^2) of duct (full size dimensions)

The velocity and total pressures in the ductwork were measured using the pitot static tube and manometer described in Section 5 (a) where as the air velocities in the SDA vessel were measured using the vane type anemometer described in Section 5 (b). The total pressure data from the inlet and outlet ductwork were used to measure the predicted pressure loss from the inlet ductwork to the vessel and then from the vessel to the outlet ductwork. This was done to better estimate field pressure drops due to the change in temperature in the full scale system.

Flow visualization tests using injected smoke, cotton tufts, granulated cork dust and air atomized water sprays were performed and recorded to identify areas of turbulence, reverse flow, and flow separation within the SDA vessel.

The data at each test section in presented in a matrix of numbers shown in the location and orientation in which they were recorded, all viewed in the direction of flow. The RMS deviation from the mean was calculated and used as a measure of the uniformity at these locations.

The velocity distributions in the ductwork were normalized by the mean velocity for each test section. The velocity distributions in the SDA vessel were normalized by the mean velocity based on the theoretical volume flow for each test location.

Flow direction in the SDA vessel, as viewed perpendicular to the sidewall, was determined by a thin thread attached to the end of a metal rod. An SDA flow angle reference number, similar to the hour positions on a clock dial, was ascribed to the flow at each measuring point to numerically characterize the flow patterns in the vessel.

For viewing, the smoke generator described in Section 5 (f) was used to show the flow patterns at which the air is introduced into the vessel. Granulated cork dust was injected into the inlet ductwork to show the gas flow patterns entering the top of the SDA and swirling near the sidewall. The air atomized spray nozzle was operated to view the effect of various modifications and interaction of the water droplets and airflow.

7 MODEL STUDY TEST RESULTS

7.1 Unit No. 1

7.1.1 Existing Configuration

The 1/8-scale model was set up in the existing configuration as shown on Plates 1 to 3, and tested to evaluate the flow patterns in the full-scale installation. The results from existing Unit No. 1 tests are summarized in Table 6 and shown on Plates 6 to 27. The results indicated an area of high velocity gas flow around the perimeter of the vessel adjacent to the inlet elbow with low flow areas in the middle. The SDA flow angle reference numbers for test location T6, as shown on Plate 19, illustrate that the flow near the walls directly below the inlet duct had some areas or turbulent flow as compared to the other areas tested at the same plane. The SDA vessel velocity distributions measured at test locations T6, T7, and T8 had RMS deviations of 46.8, 32.2, and 27.0% of the theoretical mean velocity, respectively, as shown on Plates 18 to 23. The SDA outlet duct for the existing configuration indicated high flows in the upper section of the duct with low flows in the lower section of the duct. The velocity distributions measured at T9 and T10 are shown on Plates 24 to 26.

The predicted system pressure loss was 1.26" H_2O from the SDA Inlet Duct (T1) to the SDA outlet (T10), as shown on Tables 6 and 12. The predicted pressure loss from the SDA Inlet Duct (T1) to the SDA Inlet (T5) was 0.45"H_2O. The predicted pressure loss from the SDA Inlet (T5) to the SDA Outlet (T9) was 0.82"H_2O. The inlet and outlet gas flow conditions are separated to account for the temperature difference between the inlet and outlet ductwork in the full size installation. Total pressures at test locations T1 to T6 were corrected using the SDA inlet correction factor to predict the full-scale pressures (527°F temperature zone). The predicted total pressures at test location T6 to TV in the model were corrected using the SDA outlet correction factor to predict the full-scale pressure (311°F temperature zone).

The visual tests completed on the system using water sprays and cork dust verified the test results summarized in Table 6. The visual tests indicated that there

was high flow adjacent to the elbow (inlet) in the vessel and low flow in the center of the SDA vessel.

7.1.2 Proposed

The Unit No. 1, 1/8-scale model was modified from the existing configuration. Modifications were completed to the upper and lower chevrons and the SDA outlet duct, as shown on Plates 4 and 5, and tested to evaluate the flow patterns inside the SDA. The results from this test are summarized in Table 7 and shown on Plates 28 to 49. The results illustrated a more uniform flow through the SDA vessel. The SDA flow angle reference numbers for test location T6, as shown on Plate 41, illustrate that the turbulent flow below the inlet duct has been eliminated. The SDA vessel velocity distributions measured at test locations T6, T7, and T8 had RMS deviations of 14.8, 12.8, and 10.2% of the theoretical mean velocity, respectively, as shown on Plates 40 to 45. The SDA outlet duct flows for the proposed configuration improved when compared to the existing configuration. The velocity distributions measured at T9 and T10 are shown on Plates 46 to 48.

The predicted system pressure loss was 1.35" H_2O from the SDA Inlet Duct (T1) to the SDA outlet (T10), as shown on Tables 6 and 12. The predicted pressure loss from the SDA Inlet Duct (T1) to the SDA Inlet (T5) was 0.45"H_2O. The predicted pressure loss from the SDA Inlet (T5) to the SDA Outlet (T9) was 0.89"H_2O. The inlet and outlet gas flow conditions are separated to account for the temperature difference between the inlet and outlet ductwork in the full size installation. Total pressures at test locations T1 to T6 were corrected using the SDA inlet correction factor to predict the full-scale pressures (527°F temperature zone). The predicted total pressures at test location T6 to TV in the model were corrected using the SDA outlet correction factor to predict the full-scale pressure (311°F temperature zone).

The visual tests completed on the system using water sprays and cork dust verified the test results summarized in Table 7. Based on the test completed the flow typically spread across the entire vessel and went straight down. The water spray confirmed that there is no turbulent flow in the area below the inlet ductwork.

The cork dust illustrated that there was uniform distribution of dust within the SDA vessel. The proposed configuration offered the best straight flow distribution through the SDA vessel and no reverse flow in the outlet ductwork with a manageable increase in the predicted pressure loss.

7.2 Unit No. 2

7.2.1 Existing Configuration

The 1/8-scale model was set up in the existing configuration as shown on Plates 1 to 3, and tested to evaluate the flow patterns in the full-scale installation. The results from existing Unit No. 2 tests are summarized in Table 8 and shown on Plates 50 to 71. The results indicated an area of high velocity gas flow around the perimeter of the vessel adjacent to the inlet elbow with low flow areas in the middle. The SDA flow angle reference numbers for test location T7, as shown on Plate 65, illustrate that the flow near the walls directly below the inlet duct had some areas or turbulent flow as compared to the other areas tested at the same plane. The area of turbulent flow was lower in the SDA vessel than Unit No. 1. The SDA vessel velocity distributions measured at test locations T6, T7, and T8 had RMS deviations of 49.2, 41.4, and 36.2% of the theoretical mean velocity, respectively, as shown on Plates 62 to 67. The SDA outlet duct for the existing configuration indicated high flows in the upper section of the duct with low flows in the lower section of the duct, the velocity distributions measured at T9 and T10 are shown on Plates 68 to 70.

The predicted system pressure loss was 1.22" H_2O from the SDA Inlet Duct (T1) to the SDA outlet (T10), as shown on Tables 8 and 12. The predicted pressure loss from the SDA Inlet Duct (T1) to the SDA Inlet (T5) was 0.43"H_2O. The predicted pressure loss from the SDA Inlet (T5) to the SDA Outlet (T9) was 0.76"H_2O. The inlet and outlet gas flow conditions are separated to account for the temperature difference between the inlet and outlet ductwork in the full size installation. Total pressures at test locations T1 to T6 were corrected using the SDA inlet correction factor to predict the full-scale pressures (527°F temperature zone). The predicted

total pressures at test location T6 to TV in the model were corrected using the SDA outlet correction factor to predict the full-scale pressure (311°F temperature zone).

The visual tests completed on the system using water sprays and cork dust verified the test results summarized in Table 8. The visual tests indicated that there was high flow adjacent to the elbow (inlet) in the vessel and low flow in the center of the SDA vessel; the existing test results were very similar to the Unit No. 1 test results.

7.2.2 Proposed

The Unit No. 2, 1/8-scale model was modified from the existing configuration. Modifications were completed to the upper and lower chevrons and the SDA outlet duct, as shown on Plates 4 and 5, and tested to evaluate the flow patterns inside the SDA. The results from this test are summarized in Table 9 and shown on Plates 72 to 93. The results illustrated a more uniform flow through the SDA vessel. The SDA flow angle reference numbers for test location T7, as shown on Plate 87, illustrate that the turbulent flow below the inlet duct has been eliminated. The SDA vessel velocity distributions measured at test locations T6, T7, and T8 had RMS deviations of 14.7, 12.1, and 10.8% of the theoretical mean velocity, respectively, as shown on Plates 84 to 89. In the SDA outlet duct flows for the proposed configuration were improved when compared to the existing configuration. The velocity distributions measured at T9 and T10 are shown on Plates 90 to 92.

The predicted system pressure loss was 1.32" H_2O from the SDA Inlet Duct (T1) to the SDA outlet (T10), as shown on Tables 9 and 12. The predicted pressure loss from the SDA Inlet Duct (T1) to the SDA Inlet (T5) was 0.46"H_2O. The predicted pressure loss from the SDA Inlet (T5) to the SDA Outlet (T9) was 0.84"H_2O. The inlet and outlet gas flow conditions are separated to account for the temperature difference between the inlet and outlet ductwork in the full size installation. Total pressures at test locations T1 to T6 were corrected using the SDA inlet correction factor to predict the full-scale pressures (527°F temperature zone). The predicted total pressures at test location T6 to TV in the model were corrected using the SDA outlet correction factor to predict the full-scale pressure (311°F temperature zone).

The visual tests completed on the system using water sprays and cork dust verified the test results summarized in Table 9. The results are comparable to Unit No. 1 final configuration. Based on the test completed the flow typically spread across the entire vessel and went straight down. The water spray confirmed that there is no turbulent flow in the area below the inlet ductwork. The cork dust illustrated that there was uniform distribution of dust within the SDA vessel. The proposed configuration offered the best straight flow distribution through the SDA vessel and no reverse flow in the outlet ductwork with a manageable increase in the predicted pressure loss.

7.3 Unit No. 3

7.3.1 Existing Configuration

The 1/8-scale model was setup in the existing configuration as shown on Plates 1 to 3, and tested to evaluate the flow patterns in the full-scale installation. The results from existing Unit No. 3 tests are summarized in Table 10 and shown on Plates 94 to 115. The results indicated an area of high velocity gas flow around the perimeter of the vessel adjacent to the inlet elbow with low flow areas in the middle. The SDA flow angle reference numbers for test location T6, as shown on Plate 107, illustrate that the flow near the walls directly below the inlet duct had some areas or turbulent flow as compared to the other areas tested at the same plane. The area of turbulent flow was similar to the test results from Unit Nos. 1 and 2. The SDA vessel velocity distributions measured at test locations T6, T7, and T8 had RMS deviations of 46.7, 40.4, and 35.3% of the theoretical mean velocity, respectively, as shown on Plates 106 to 111. The SDA outlet duct for the existing configuration indicated high flows in the upper section of the duct with low flows in the lower section of the duct. The velocity distributions measured at T9 and T10 are shown on Plates 112 to 114.

The predicted system pressure loss was 1.26" H_2O from the SDA Inlet Duct (T1) to the SDA outlet (T10), as shown on Tables 10 and 12. The predicted pressure loss from the SDA Inlet Duct (T1) to the SDA Inlet (T5) was 0.46"H_2O. The predicted

pressure loss from the SDA Inlet (T5) to the SDA Outlet (T9) was 0.80"H_2O. The inlet and outlet gas flow conditions are separated to account for the temperature difference between the inlet and outlet ductwork in the full size installation. Total pressures at test locations T1 to T6 were corrected using the SDA inlet correction factor to predict the full-scale pressures (527°F temperature zone). The predicted total pressures at test location T6 to TV in the model were corrected using the SDA outlet correction factor to predict the full-scale pressure (311°F temperature zone).

The visual tests completed on the system using water sprays and cork dust verified the test results summarized in Table 10. The visual tests indicated that there was high flow adjacent to the elbow (inlet) in the vessel and low flow in the center of the SDA vessel; the existing test results were very similar to the Unit Nos. 1 and 2 test results.

7.3.2 Proposed

The Unit No. 3, 1/8-scale model was modified from the existing configuration. Modifications were completed to the upper and lower chevrons and the SDA outlet duct, as shown on Plates 4 and 5, and tested to evaluate the flow patterns inside the SDA. The modifications were identical to Unit Nos. 1 and 2 proposed modifications. The results from this test are summarized in Table 11 and shown on Plates 116 to 137. The results illustrated a more uniform flow through the SDA vessel. The SDA flow angle reference numbers for test location T6, as shown on Plate 129, illustrate that the turbulent flow below the inlet duct has been eliminated. The SDA vessel velocity distributions measured at test locations T6, T7, and T8 had RMS deviations of 14.9, 13.3, and 9.9% of the theoretical mean velocity, respectively, as shown on Plates 128 to 133. In the SDA outlet duct flows for the proposed configuration were improved when compared to the existing configuration. The velocity distributions measured at T9 and T10 are shown on Plates 134 to 136.

The predicted system pressure loss was 1.40" H_2O from the SDA Inlet Duct (T1) to the SDA outlet (T10), as shown on Tables 11 and 12. The predicted pressure loss from the SDA Inlet Duct (T1) to the SDA Inlet (T5) was 0.52"H_2O. The predicted pressure loss from the SDA Inlet (T5) to the SDA Outlet (T9) was 0.90"H_2O. The

inlet and outlet gas flow conditions are separated to account for the temperature difference between the inlet and outlet ductwork in the full size installation. Total pressures at test locations T1 to T6 were corrected using the SDA inlet correction factor to predict the full-scale pressures (527°F temperature zone). The predicted total pressures at test location T6 to TV in the model were corrected using the SDA outlet correction factor to predict the full-scale pressure (311°F temperature zone).

The visual tests completed on the system using water sprays and cork dust verified the test results summarized in Table 11. The results are comparable to Unit Nos. 1 and 2 final configurations. Based on the test completed the flow typically spread across the entire vessel and went straight down. The water spray confirmed that there is no turbulent flow in the area below the inlet ductwork. The cork dust illustrated that there was uniform distribution of dust within the SDA vessel. The proposed configuration offered the best straight flow distribution through the SDA vessel and no reverse flow in the outlet ductwork with a manageable increase in the predicted pressure loss.

8 DISCUSSION AND RECOMMENDATIONS

The primary problem in the existing installation would appear to be a significantly high flow area adjacent to the inlet elbow ductwork and lower flows in middle section of the SDA vessel. The higher flow can cause accelerated erosion and corrosion issues within the SDA ductwork and vessel. The proposed configurations re-distributed the flow more uniformly through the SDA with the installation of additional blockage on the upper and lower chevrons of the inlet transition. The proposed configuration would increase the systems overall predicted pressure loss by 0.11"H_2O when compared to the existing configuration.

The proposed SDA outlet duct modifications would re-distribute the flow evenly across the duct to reduce the low flow zone in the bottom section. No significant increase in the pressure drop was measured. In the actual duct the dust build-ups would be eliminated and the overall pressure drop across this area will remain constant. This will also reduce maintenance times for clean up during scheduled outages.

Pinellas County has been supplied fabrication drawings for the final configuration recommended by NCS, as detailed in Appendix A, for the Pinellas Unit Nos. 1, 2 and 3.

TABLES

Table 1: List of Drawings

Drawing No.	Rev.	Title	Source
Drawings Received by Email on June 3, 2010			
3798-9-110E	0	32' Dia. Spray Dryer Vessel Elevation	Wheelabrator Air Pollution Control
3798-9-117E	1	32'-0 Dia. Spray Dryer Chevron Assemblies Plans	WAPC
Drawings Received via Email on September 14th, 2010			
06464-S-802-1-E		Inlet Duct Plan Sections & Details (Sheet 1)	Stone & Webster Engineering Co.
06464-S-803-5-E		Inlet Duct Sections & Details (Sheet 2)	Stone & Webster Engineering Co.
06464-S-804-3-E		Inlet Duct Section & Detail (Sheet 3)	Stone & Webster Engineering Co.
06464-8504	2	Inlet Duct Panel Details	WAPC
06464-8505	2	Inlet Duct Panel Details	WAPC
06464-8506	2	Inlet Duct Panel Details	WAPC
06464-8507	2	Inlet Duct Panel Details	WAPC
06464-8518	2	Inlet Duct Panel Details	WAPC
06464-8519	1	Inlet Duct Panel Details	WAPC
3798-9-4018		Fabric Filter Inlet Plenum Duct Detail	WAPC
3978-9-4017	2	Fabric Filter Inlet Plenum Duct Detail	WAPC
Drawings Received by Email on October 6th 2010			
3978-9-401E	0	Fabric Filter Inlet Plenum Plan & Elevation	WAPC
3978-9-402E	0	Fabric Filter Inlet Plenum Sections & Elevation	
Drawings Recevied by Email on October 15thth 2010			
3978-9-110E		32'-0" Dia. Spray Dryer Vessel – Elevation	WAPC
3978-9-112E	1	32'0"Dia. Spray Dryer Orientation Plan & Typical Splice Details	WAPC
3978-9-113E	0	32'0" Dia. Spray Dryer Hopper & Support Ring Girder. Plans, Sections & Details	WAPC
3979-9-117E	1	32'0" Dia. Spray Dryer Chevron Assemblies Plans	WAPC
Drawings Received by Email on October 17th 2011			
3978-9-118E	2	32'0" Spray Dryer Chevron Assemblies Sections & Details	WAPC

Table 2: Full Size Gas Flow

Design MCR

SECTION	UNITS	Design Load
Flue Gas to SDA :		
Gas Flow	acfm	270,109 *
Temp	°F	527 *
Density	lb/ft^3	0.0413
Scrubbed Gas Exiting the SDA:		
Gas Flow	acfm	216,931
Temp	°F	311 *
Density	lb/ft^3	0.051

Notes: * Based on actual field test

Table 3: Comparison Between Full Size and Model

Parameter	Full Size Installation	Model (typical)
Construction:		
Geometric Linear Scale	1	1/8
Gas Flow:		
SDA Inlet Duct (acfm)	270,109	4,220
Velocity Scale	1	1
Gas Temperature (°F)	527	70
Gas Density (lb/ft^3)	0.0413	0.075

Table 4: Summary of Gas Phase Scaling Parameters

1. Reynolds Number, Re: $\mathrm{Re} = \frac{V \quad D}{\nu}$

Where: V = velocity

D = characteristic length

ν = kinematic viscosity

Calculations for Design Flow Conditions

Full Size Installation

V = 57.3 ft/s (SDA Inlet)

D = 10.0 ft

ν = 4.25 x 10^{-4} ft^2/s

$$\mathrm{Re}_{Full\ Size} = \frac{57.3\ x\ 10.0}{0.000425} = 1.35\ x\ 10^6$$

Model (1/8 scale)

V = 57.3 ft/s (SDA Inlet)

D = 1.25 ft

ν = 1.67 x 10^{-4} ft^2/s

$$\mathrm{Re}_{Model} = \frac{57.3\ x\ 1.25}{0.000167} = 4.29\ x\ 10^5$$

The model Reynolds Number is above the minimum required value (20,000) for fully turbulent flow.

2. Conversion of Model to Full Size Pressures

$$P_{Full\ Size} = P_{Model}\ x \left(\frac{Q_{Full\ Size}}{Q_{Model}}\right)^2 x \frac{\rho_{Gas_{Full\ Size}}}{\rho_{Air_{Model}}}$$

Table 5: Description of Test Locations

SDA	
Test Location	**Description**
T1 N&S, T2 N&S, T3 N&S	Economizer Outlet Ductwork
T4, T5	SDA Inlet Ductwork
T6	Top Section of SDA
T7	Middle Section of SDA
T8	Bottom Section of SDA
T9	SDA Outlet
T10	SDA Transition Outlet
TV	Model Volume Control

TABLE 6
SUMMARY OF FLOWS AND PRESSURES
UNIT No. 1 - EXISTING

JOB No.: P096.10
TEST DATE: 060111A

Test Location	MODEL DATA			FULL SIZE DATA		
	Velocity	RMS	Total Pressure	Duct Area	Volume Flowrate	Total Pressure
	(fpm)	(%)	("H_2O)	(ft^2)	(acfm)	("H_2O)
T1N	2232	12.4	-0.30	60.000	133896	-0.16
T2N	2270	74.8	-0.64	60.000	136217	-0.34
T3N	3115	11.6	-0.57	44.179	137637	-0.30
T1S	2205	12.9	-0.29	60.000	132273	-0.15
T2S	2229	76.1	-0.62	60.000	133766	-0.33
T3S	3099	13.0	-0.54	44.179	136896	-0.29
T4	3396	4.9	-0.63	78.540	266731	-0.33
T5	3403	9.7	-0.87	78.540	267291	-0.46
T6	329	46.8	-2.03	746.674	245676	-1.08
T7	343	32.2	-1.84	746.674	255965	-0.74
T8	350	27.0	-1.84	746.674	260987	-0.74
T9	3333	47.4	-2.55	85.904	286327	-1.02
T10	3360	33.3	-2.52	83.168	279486	-1.01
TV	3311	7.6	-2.50	83.168	275374	-1.00

PRESSURE DROP DATA				
TEST LOCATION			MODEL	FULL SIZE
			("H_2O)	("H_2O)
T1N	to	T2N	0.34	0.18
T2N	to	T3N	-0.07	-0.04
	to			
T1S	to	T2S	0.33	0.17
T2S	to	T3S	-0.07	-0.04
AVG T3S & N	to	T4	0.07	0.04
T4	to	T5	0.24	0.13
T5	to	T6	1.16	0.62
T6	to	T7	-0.19	-0.08
T7	to	T8	0.00	0.00
T8	to	T9	0.71	0.28
T9	to	T10	-0.03	-0.01

Pressure Drop

Inlet Ductwork	T1	to	T5	0.45	"H_2O
SDA	T5	to	T9	0.82	"H_2O
Outlet Ductwork	T8	to	T10	0.27	"H_2O
Overall System	T1	to	T10	1.26	"H_2O

Model to Full Size Pressure Conversion T1 to T5 SDA Inlet

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}} \right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{270109}{275374} \right)^2 \times \frac{0.0413}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.531$$

$Q_{Full\ Size}$ = 270,109 *acfm*
$T_{Full\ Size}$ = 527 *°F*
$\rho_{Full\ Size}$ = 0.0413 *lb/ft³*

Model to Full Size Pressure Conversion T6 to TV

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}} \right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{210997}{275374} \right)^2 \times \frac{0.0511}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.401$$

$Q_{Full\ Size}$ = 210,997 *acfm*
$T_{Full\ Size}$ = 311 *°F*
$\rho_{Full\ Size}$ = 0.0511 *lb/ft³*

TABLE 7
SUMMARY OF FLOWS AND PRESSURES
UNIT No. 1 - FINAL

JOB No.: P096.10
TEST DATE: 170511A

Test Location	MODEL DATA			FULL SIZE DATA		
	Velocity	RMS	Total Pressure	Duct Area	Volume Flowrate	Total Pressure
	(fpm)	(%)	("H_2O)	(ft^2)	(acfm)	("H_2O)
T1N	2195	12.8	-0.28	60.00	131729	-0.16
T2N	2204	76.0	-0.62	60.00	132239	-0.36
T3N	3039	13.6	-0.53	44.18	134281	-0.30
T1S	2140	13.7	-0.28	60.00	128376	-0.16
T2S	2207	74.6	-0.61	60.00	132425	-0.35
T3S	3071	12.0	-0.53	44.18	135662	-0.31
T4	3304	4.9	-0.59	78.54	259516	-0.34
T5	3338	9.6	-0.82	78.54	262190	-0.47
T6	321	14.8	-2.03	746.67	239429	-1.17
T7	321	12.8	-2.04	746.67	239552	-0.89
T8	317	10.2	-2.04	746.67	236903	-0.89
T9	3299	22.0	-2.46	85.90	283421	-1.07
T10	3245	21.4	-2.47	83.17	269853	-1.08
TV	3174	10.6	-2.49	83.17	263981	-1.09

PRESSURE DROP DATA				
TEST LOCATION			MODEL	FULL SIZE
			("H_2O)	("H_2O)
T1N	to	T2N	0.34	0.20
T2N	to	T3N	-0.09	-0.05
	to			
T1S	to	T2S	0.33	0.19
T2S	to	T3S	-0.08	-0.05
AVG T3S & N	to	T4	0.07	0.04
T4	to	T5	0.22	0.13
T5	to	T6	1.21	0.70
T6	to	T7	0.01	0.00
T7	to	T8	0.01	0.00
T8	to	T9	0.42	0.18
T9	to	T10	0.01	0.00

Pressure Drop

Inlet Ductwork	T1	to	T5	0.45	"H_2O
SDA	T5	to	T9	0.89	"H_2O
Outlet Ductwork	T8	to	T10	0.19	"H_2O
Overall System	T1	to	T10	1.35	"H_2O

Model to Full Size Pressure Conversion T1 to T5 SDA Inlet

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}}\right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{270109}{263981}\right)^2 \times \frac{0.0413}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.578$$

$Q_{Full\ Size}$ = 270,109 *acfm*
$T_{Full\ Size}$ = 527 *°F*
$\rho_{Full\ Size}$ = 0.0413 *lb/ft³*

Model to Full Size Pressure Conversion T6 to TV

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}}\right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{210997}{263981}\right)^2 \times \frac{0.0511}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.436$$

$Q_{Full\ Size}$ = 210,997 *acfm*
$T_{Full\ Size}$ = 311 *°F*
$\rho_{Full\ Size}$ = 0.0511 *lb/ft³*

TABLE 8
SUMMARY OF FLOWS AND PRESSURES
UNIT No. 2 - EXISTING

JOB No.: P096.10
TEST DATE: 190511A

Test Location	MODEL DATA			FULL SIZE DATA		
	Velocity	RMS	Total Pressure	Duct Area	Volume Flowrate	Total Pressure
	(fpm)	(%)	("H_2O)	(ft^2)	(acfm)	("H_2O)
T1N	2209	13.4	-0.29	60.00	132533	-0.16
T2N	2250	74.3	-0.63	60.00	135020	-0.34
T3N	3091	12.1	-0.54	44.18	136570	-0.29
T1S	2197	13.6	-0.29	60.00	131833	-0.16
T2S	2283	71.0	-0.60	60.00	136996	-0.33
T3S	3079	12.1	-0.49	44.18	136023	-0.27
T4	3351	4.9	-0.62	78.54	263209	-0.34
T5	3331	9.6	-0.85	78.54	261636	-0.46
T6	328	49.2	-2.03	746.67	245033	-1.11
T7	336	41.4	-1.82	746.67	250729	-0.75
T8	324	36.2	-1.83	746.67	242225	-0.75
T9	3405	45.2	-2.30	85.90	292473	-0.95
T10	3332	29.3	-2.39	83.17	277114	-0.99
TV	3266	5.9	-2.35	83.17	271651	-0.97

PRESSURE DROP DATA				
TEST LOCATION			MODEL	FULL SIZE
			("H_2O)	("H_2O)
T1N	to	T2N	0.34	0.19
T2N	to	T3N	-0.09	-0.05
	to			
T1S	to	T2S	0.31	0.17
T2S	to	T3S	-0.11	-0.06
AVG T3S & N	to	T4	0.10	0.05
T4	to	T5	0.24	0.13
T5	to	T6	1.18	0.64
T6	to	T7	-0.20	-0.08
T7	to	T8	0.01	0.00
T8	to	T9	0.47	0.19
T9	to	T10	0.09	0.04

Pressure Drop

Inlet Ductwork	T1	to	T5	0.43	"H_2O
SDA	T5	to	T9	0.76	"H_2O
Outlet Ductwork	T8	to	T10	0.23	"H_2O
Overall System	T1	to	T10	1.22	"H_2O

Model to Full Size Pressure Conversion T1 to T5 SDA Inlet

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}}\right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{270109}{271651}\right)^2 \times \frac{0.0413}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.546$$

$Q_{Full\ Size}$ = 270,109 *acfm*
$T_{Full\ Size}$ = 527 *°F*
$\rho_{Full\ Size}$ = 0.0413 *lb/ft³*

Model to Full Size Pressure Conversion T6 to TV

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}}\right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{210997}{271651}\right)^2 \times \frac{0.0511}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.412$$

$Q_{Full\ Size}$ = 210,997 *acfm*
$T_{Full\ Size}$ = 311 *°F*
$\rho_{Full\ Size}$ = 0.0511 *lb/ft³*

TABLE 9
SUMMARY OF FLOWS AND PRESSURES
UNIT No. 2 - FINAL

JOB No.: P096.10
TEST DATE: 180511A

Test Location	MODEL DATA			FULL SIZE DATA		
	Velocity	RMS	Total Pressure	Duct Area	Volume Flowrate	Total Pressure
	(fpm)	(%)	("H_2O)	(ft^2)	(acfm)	("H_2O)
T1N	2181	12.8	-0.27	60.00	130888	-0.16
T2N	2092	78.6	-0.66	60.00	125490	-0.37
T3N	3060	11.7	-0.52	44.18	135206	-0.30
T1S	2172	12.9	-0.28	60.00	130345	-0.16
T2S	2194	75.6	-0.61	60.00	131618	-0.35
T3S	3108	12.5	-0.52	44.18	137314	-0.30
T4	3329	4.2	-0.60	78.54	261445	-0.34
T5	3300	9.8	-0.83	78.54	259206	-0.47
T6	327	14.7	-2.03	746.67	243992	-1.15
T7	321	12.1	-2.02	746.67	239736	-0.87
T8	317	10.8	-2.03	746.67	236765	-0.87
T9	3355	21.0	-2.41	85.90	288223	-1.04
T10	3262	20.9	-2.46	83.17	271324	-1.06
TV	3198	10.4	-2.48	83.17	265956	-1.07

PRESSURE DROP DATA				
TEST LOCATION			MODEL	FULL SIZE
			("H_2O)	("H_2O)
T1N	to	T2N	0.38	0.22
T2N	to	T3N	-0.14	-0.08
	to			
T1S	to	T2S	0.34	0.19
T2S	to	T3S	-0.09	-0.05
AVG T3S & N	to	T4	0.08	0.05
T4	to	T5	0.23	0.13
T5	to	T6	1.20	0.68
T6	to	T7	-0.01	0.00
T7	to	T8	0.01	0.00
T8	to	T9	0.37	0.16
T9	to	T10	0.05	0.02

Pressure Drop

Inlet Ductwork	T1	to	T5	0.46	"H_2O
SDA	T5	to	T9	0.84	"H_2O
Outlet Ductwork	T8	to	T10	0.18	"H_2O
Overall System	T1	to	T10	1.32	"H_2O

Model to Full Size Pressure Conversion T1 to T5 SDA Inlet

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}}\right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{270109}{265956}\right)^2 \times \frac{0.0413}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.569$$

$Q_{Full\ Size}$ = 270,109 *acfm*
$T_{Full\ Size}$ = 527 *°F*
$\rho_{Full\ Size}$ = 0.0413 *lb/ft³*

Model to Full Size Pressure Conversion T6 to TV

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}}\right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{210997}{265956}\right)^2 \times \frac{0.0511}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.430$$

$Q_{Full\ Size}$ = 210,997 *acfm*
$T_{Full\ Size}$ = 311 *°F*
$\rho_{Full\ Size}$ = 0.0511 *lb/ft³*

TABLE 10
SUMMARY OF FLOWS AND PRESSURES
UNIT No. 3 - EXISTING

JOB No.: P096.10
TEST DATE: 090511A

Test Location	MODEL DATA			FULL SIZE DATA		
	Velocity	RMS	Total Pressure	Duct Area	Volume Flowrate	Total Pressure
	(fpm)	(%)	("H_2O)	(ft^2)	(acfm)	("H_2O)
T1N	1950	9.7	-0.27	60.00	116992	-0.15
T2N	2242	73.3	-0.61	60.00	134490	-0.33
T3N	3112	14.2	-0.55	44.18	137489	-0.30
T1S	1924	9.6	-0.29	60.00	115416	-0.15
T2S	2183	79.5	-0.61	60.00	130990	-0.32
T3S	3190	12.2	-0.55	44.18	140934	-0.30
T4	3408	5.2	-0.64	78.54	267645	-0.34
T5	3334	10.1	-0.87	78.54	261891	-0.47
T6	332	46.7	-2.03	746.67	248248	-1.09
T7	317	40.4	-1.84	746.67	236490	-0.74
T8	321	35.3	-1.84	746.67	240011	-0.75
T9	3411	45.2	-2.49	85.90	293037	-1.01
T10	3331	32.5	-2.46	83.17	277064	-1.00
TV	3298	6.8	-2.43	83.17	274305	-0.98

PRESSURE DROP DATA				
TEST LOCATION			MODEL	FULL SIZE
			("H_2O)	("H_2O)
T1N	to	T2N	0.34	0.18
T2N	to	T3N	-0.06	-0.03
	to			
T1S	to	T2S	0.32	0.17
T2S	to	T3S	-0.05	-0.03
AVG T3S & N	to	T4	0.09	0.05
T4	to	T5	0.23	0.12
T5	to	T6	1.16	0.62
T6	to	T7	-0.19	-0.08
T7	to	T8	0.01	0.00
T8	to	T9	0.65	0.26
T9	to	T10	-0.03	-0.01

Pressure Drop

Inlet Ductwork	T1	to	T5	0.46	"H_2O
SDA	T5	to	T9	0.80	"H_2O
Outlet Ductwork	T8	to	T10	0.25	"H_2O
Overall System	T1	to	T10	1.26	"H_2O

Model to Full Size Pressure Conversion T1 to T5 SDA Inlet

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}} \right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{270109}{274305} \right)^2 \times \frac{0.0413}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.535$$

$Q_{Full\ Size}$ = 270,109 *acfm*
$T_{Full\ Size}$ = 527 *°F*
$\rho_{Full\ Size}$ = 0.0413 *lb/ft³*

Model to Full Size Pressure Conversion T6 to TV

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}} \right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{210997}{274305} \right)^2 \times \frac{0.0511}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.404$$

$Q_{Full\ Size}$ = 210,997 *acfm*
$T_{Full\ Size}$ = 311 *°F*
$\rho_{Full\ Size}$ = 0.0511 *lb/ft³*

TABLE 11
SUMMARY OF FLOWS AND PRESSURES
UNIT No. 3 - FINAL

JOB No.: P096.10
TEST DATE: 160511A

Test Location	MODEL DATA			FULL SIZE DATA		
	Velocity	RMS	Total Pressure	Duct Area	Volume Flowrate	Total Pressure
	(fpm)	(%)	("H_2O)	(ft^2)	(acfm)	("H_2O)
T1N	2181	13.2	-0.27	60.00	130834	-0.16
T2N	2197	75.1	-0.59	60.00	131820	-0.36
T3N	2946	21.1	-0.61	44.18	130161	-0.36
T1S	2150	13.3	-0.28	60.00	129005	-0.17
T2S	2219	72.9	-0.59	60.00	133112	-0.36
T3S	3046	13.4	-0.54	44.18	134563	-0.32
T4	3325	4.9	-0.61	78.54	261125	-0.36
T5	3265	8.9	-0.85	78.54	256464	-0.51
T6	331	14.9	-2.03	746.67	246993	-1.22
T7	324	13.3	-2.04	746.67	242063	-0.92
T8	319	9.9	-2.04	746.67	238204	-0.92
T9	3280	21.1	-2.47	85.90	281746	-1.12
T10	3246	20.1	-2.42	83.17	269928	-1.09
TV	3117	11.4	-2.49	83.17	259244	-1.13

PRESSURE DROP DATA				
TEST LOCATION			MODEL	FULL SIZE
			("H_2O)	("H_2O)
T1N	to	T2N	0.32	0.19
T2N	to	T3N	0.01	0.01
	to			
T1S	to	T2S	0.31	0.19
T2S	to	T3S	-0.05	-0.03
AVG T3S & N	to	T4	0.03	0.02
T4	to	T5	0.24	0.15
T5	to	T6	1.18	0.71
T6	to	T7	0.01	0.00
T7	to	T8	0.00	0.00
T8	to	T9	0.43	0.19
T9	to	T10	-0.05	-0.02

Pressure Drop

Inlet Ductwork	T1	to	T5	0.52	"H_2O
SDA	T5	to	T9	0.90	"H_2O
Outlet Ductwork	T8	to	T10	0.17	"H_2O
Overall System	T1	to	T10	1.40	"H_2O

Model to Full Size Pressure Conversion T1 to T5 SDA Inlet

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}} \right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{270109}{259244} \right)^2 \times \frac{0.0413}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.599$$

$Q_{Full\ Size}$ = 270,109 *acfm*
$T_{Full\ Size}$ = 527 *°F*
$\rho_{Full\ Size}$ = 0.0413 *lb/ft³*

Model to Full Size Pressure Conversion T6 to TV

$$P_{Full\ Size} = P_{Model} \times \left(\frac{Q_{Full\ Size}}{Q_{Model}} \right)^2 \times \frac{\rho_{Full\ Size}}{\rho_{Model}}$$

$$P_{Full\ Size} = P_{Model} \times \left(\frac{210997}{259244} \right)^2 \times \frac{0.0511}{0.0748}$$

$$P_{Full\ Size} = P_{Model} \times 0.452$$

$Q_{Full\ Size}$ = 210,997 *acfm*
$T_{Full\ Size}$ = 311 *°F*
$\rho_{Full\ Size}$ = 0.0511 *lb/ft³*

TABLE 12

SUMMARY OF FLOWS AND PRESSURES

Unit Nos. 1 to 3

Existing Configuration

Location	Pressure Drop "H_20			
	Unit No. 1	Unit No. 2	Unit No. 3	**Average**
Inlet Ductwork, T1 to T5	0.45	0.43	0.46	**0.45**
SDA, T5 to T9	0.82	0.76	0.80	**0.79**
Outlet Ductwork, T8 to T10	0.27	0.23	0.25	**0.25**
Overall System, T1 to T10	1.26	1.22	1.26	**1.25**

Final Configuration

Location	Pressure Drop "H_20				Pressure Drop Increase, Initial to Final
	Unit No. 1	Unit No. 2	Unit No. 3	**Average**	"H2O
Inlet Ductwork, T1 to T5	0.45	0.46	0.52	**0.48**	0.03
SDA, T5 to T9	0.89	0.84	0.90	**0.88**	0.09
Outlet Ductwork, T8 to T10	0.19	0.18	0.17	**0.18**	-0.07
Overall System, T1 to T10	1.35	1.32	1.40	**1.36**	0.11

TABLE 13

SUMMARY OF RMS DEVIATIONS

Unit Nos. 1 to 3

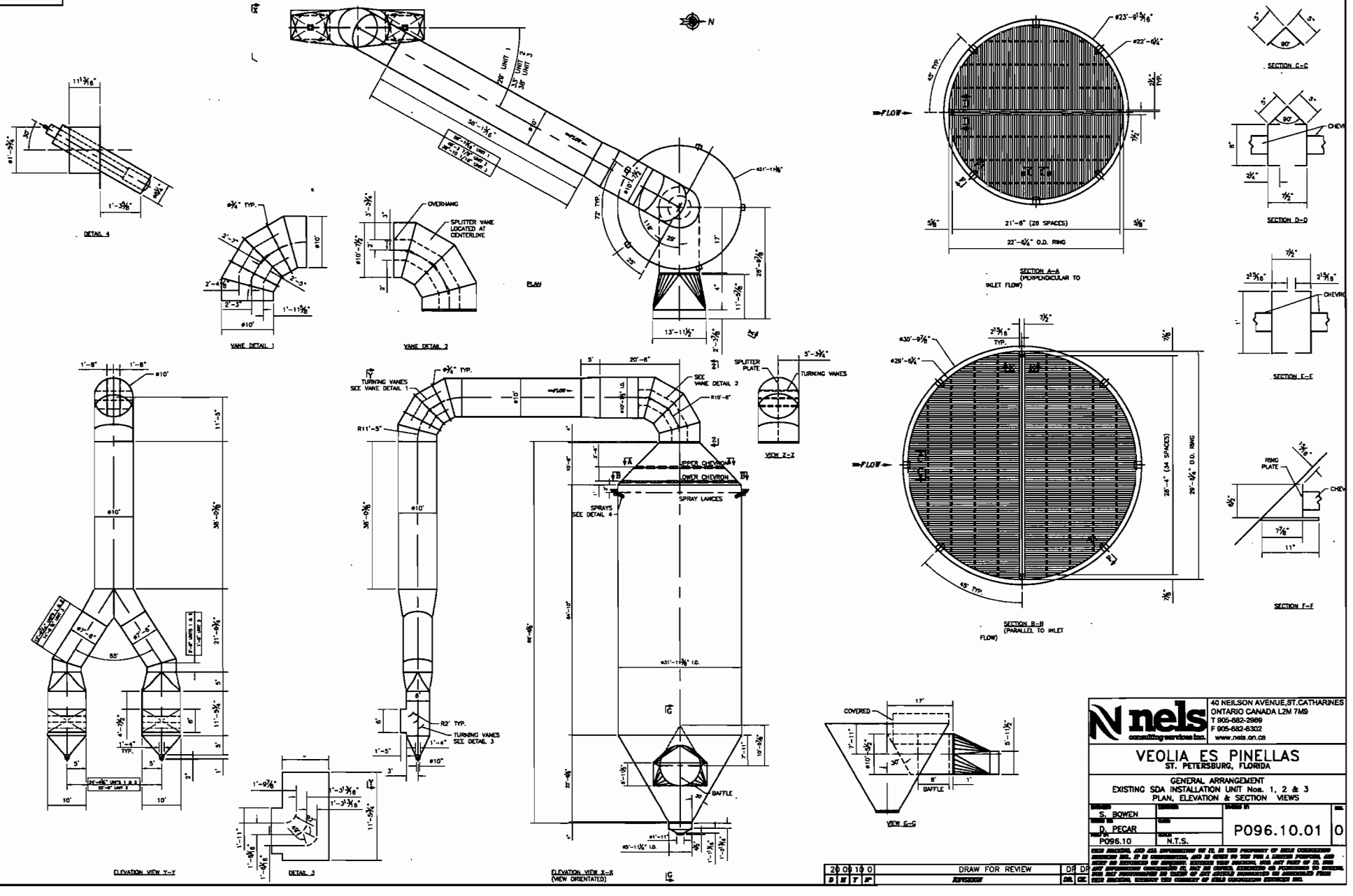
Existing Configuration

Test Location	RMS Deviation, % of Mean Velocity				
	Unit No. 1	Unit No. 2	Unit No. 3	Average	
T1N	12.4	13.4	9.7	11.9	INLET DUCTWORK
T2N	74.8	74.3	73.3	74.1	
T3N	11.6	12.1	14.2	12.6	
T1S	12.9	13.6	9.6	12.0	
T2S	76.1	71.0	79.5	75.5	
T3S	13.0	12.1	12.2	12.4	
T4	4.9	4.9	5.2	5.0	
T5	9.7	9.6	10.1	9.8	
T6	46.8	49.2	46.7	47.6	SDA
T7	32.2	41.4	40.4	38.0	
T8	27.0	36.2	35.3	32.8	
T9	47.4	45.2	45.2	45.9	OUTLET DUCTWORK
T10	33.3	29.3	32.5	31.7	
TV	7.6	5.9	6.8	6.8	

Final Configuration

Test Location	RMS Deviation, % of Mean Velocity				
	Unit No. 1	Unit No. 2	Unit No. 3	Average	
T1N	12.8	12.8	13.2	12.9	INLET DUCTWORK
T2N	76.0	78.6	75.1	76.6	
T3N	13.6	11.7	21.1	15.5	
T1S	13.7	12.9	13.3	13.3	
T2S	74.6	75.6	72.9	74.4	
T3S	12.0	12.5	13.4	12.6	
T4	4.9	4.2	4.9	4.7	
T5	9.6	9.8	8.9	9.4	
T6	14.8	14.7	14.9	14.8	SDA
T7	12.8	12.1	13.3	12.8	
T8	10.2	10.8	9.9	10.3	
T9	22.0	21.0	21.1	21.3	OUTLET DUCTWORK
T10	21.4	20.9	20.1	20.8	
TV	10.6	10.4	11.4	10.8	

P096.10.001



20 09 10 0	DRAW FOR REVIEW	DR	DR
D M Y N°	REVISION	DR.	CK.

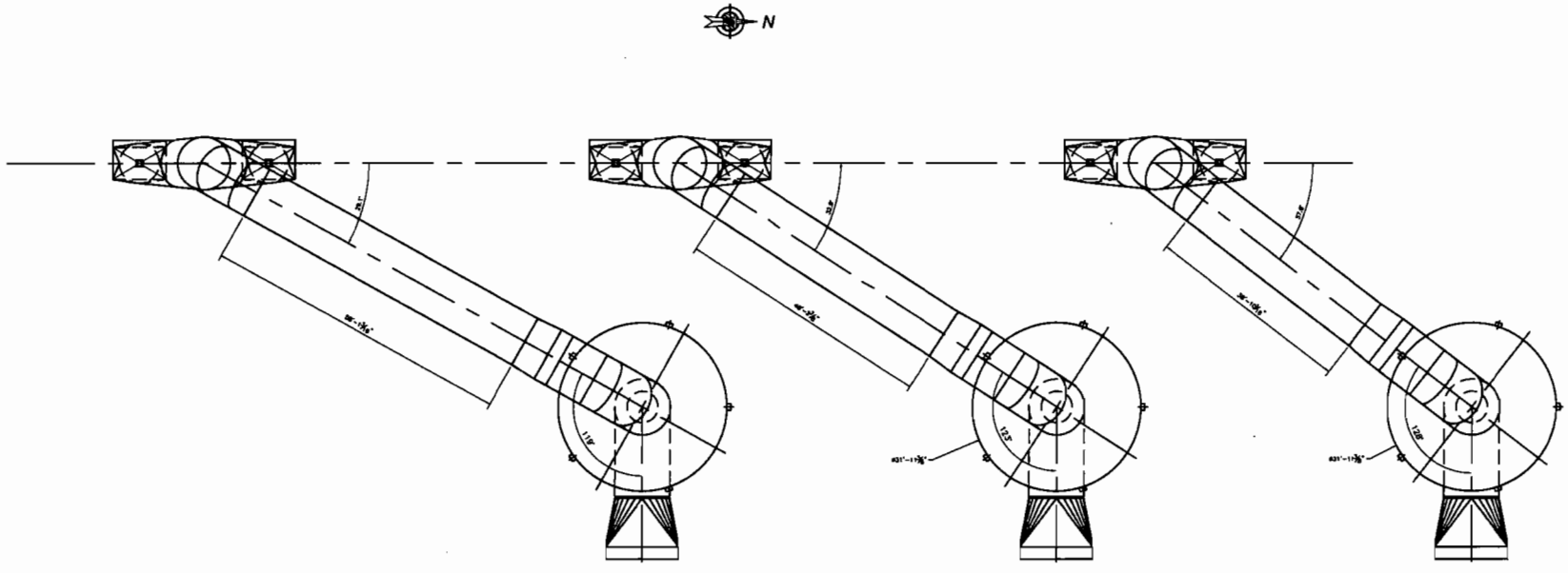
nels consulting services inc.
40 NEILSON AVENUE, ST. CATHARINES
ONTARIO CANADA L2M 7M9
T 905-682-2969
F 905-682-6302
www.nels.on.ca

VEOLIA ES PINELLAS
ST. PETERSBURG, FLORIDA

GENERAL ARRANGEMENT
EXISTING SDA INSTALLATION UNIT Nos. 1, 2 & 3
PLAN, ELEVATION & SECTION VIEWS

S. BOWEN		P096.10.01	0
D. PECAR			
P096.10	N.T.S.		

P096.10.002



PLAN

nels consulting services inc.
40 NEILSON AVENUE,ST.CATHARINES
ONTARIO CANADA L2M 7M9
T 905-682-2989
F 905-682-6302
www.nels.on.ca

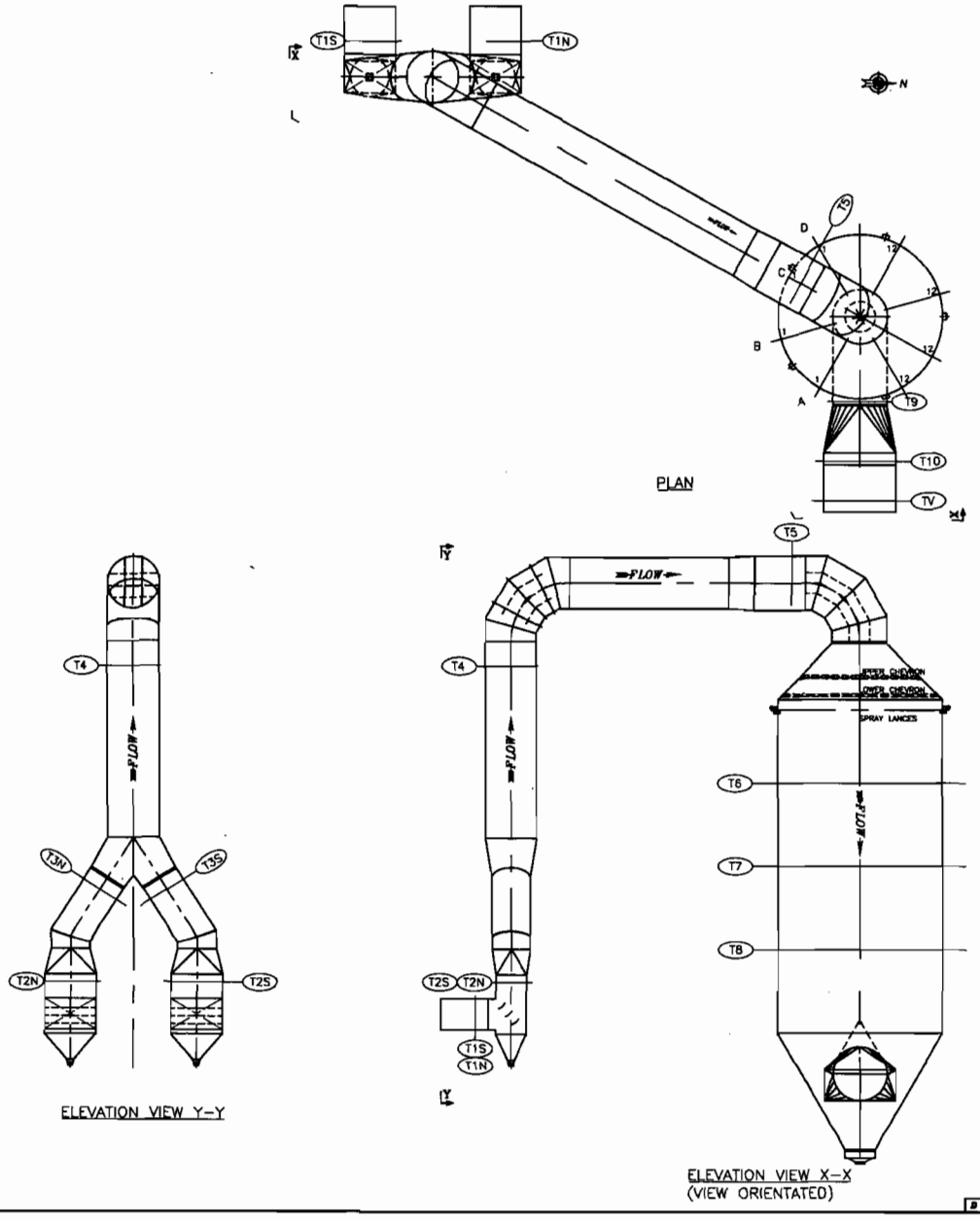
VEOLIA ES PINELLAS
ST. PETERSBURG, FLORIDA

GENERAL ARRANGEMENT
EXISTING SDA INSTALLATION UNIT Nos. 1, 2 & 3
PLAN VIEW

S. BOWEN		P096.10.02	0
D. PECAR			
P096.10	N.T.S.		

D	M	Y	N°	REVISION	DR.	CK.
20	09	10	0	DRAW FOR REVIEW	DP	DP

P096.10.003



nels consulting services inc.
40 NEILSON AVENUE,ST.CATHARINES
ONTARIO CANADA L2M 7M9
T 905-682-2989
F 905-682-8302
www.nels.on.ca

VEOLIA ES PINELLAS
ST. PETERSBURG, FLORIDA

GENERAL ARRANGEMENT
& TEST LOCATIONS
PLAN & ELEVATION VIEWS

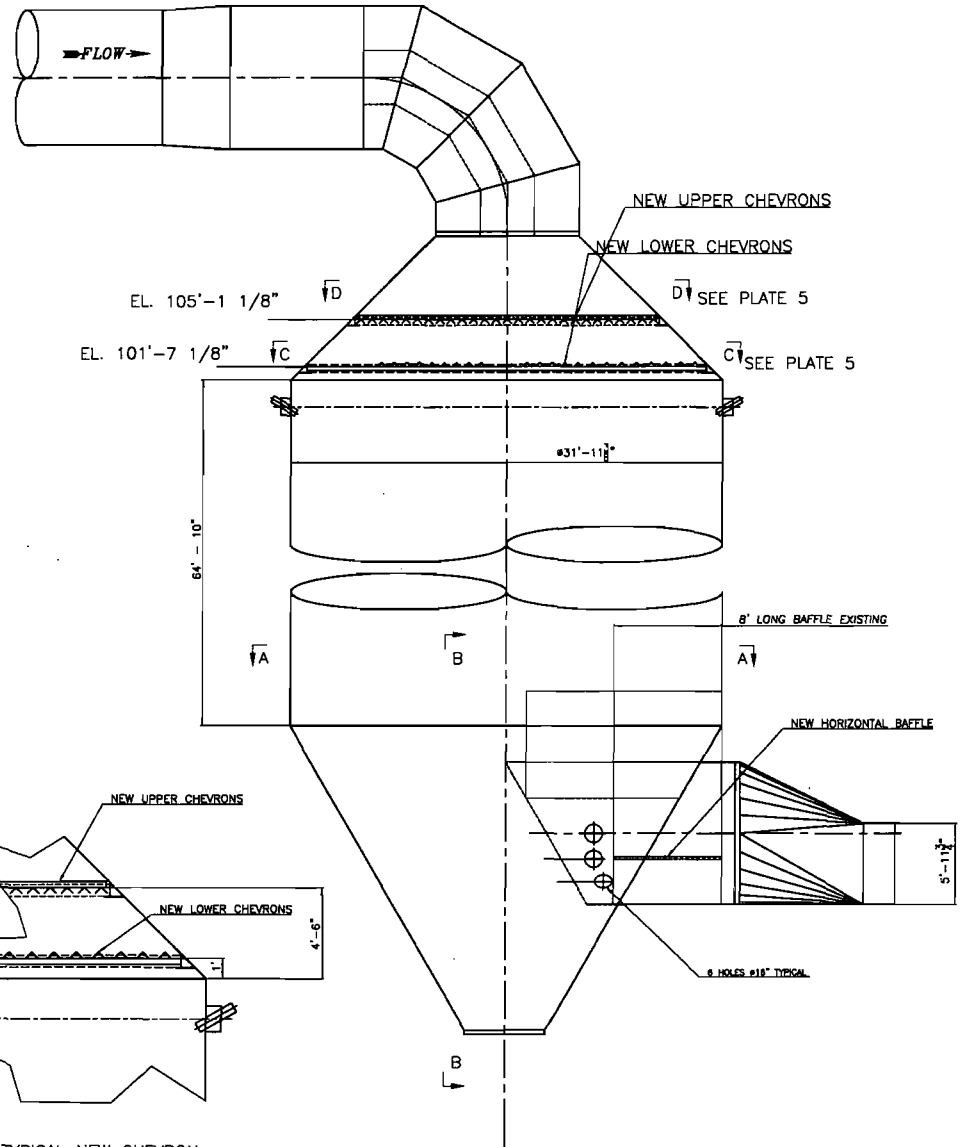
A. GACNIK

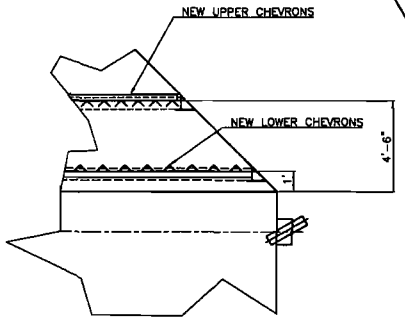
A. GACNIK

P096.10

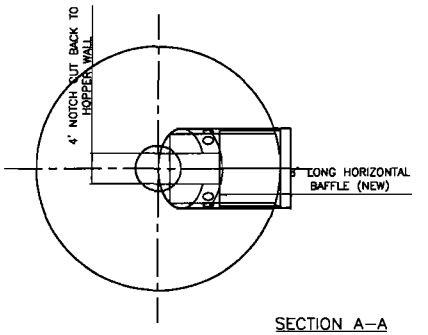
P096.10.003 | 0

P096.10.004

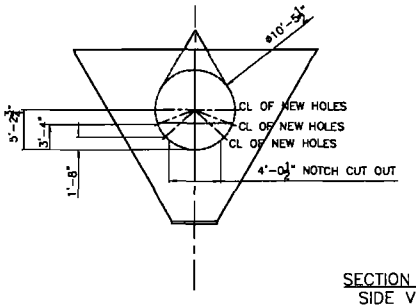




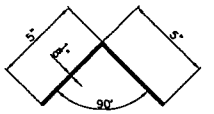
TYPICAL NEW CHEVRON ELEVATION



SECTION A–A
PLAN VIEW
SDA OUTLET DUCT MODIFICATION



SECTION B–B
SIDE VIEW
SDA OUTLET DUCT MODIFICATION



TYPICAL NEW CHEVRON DETAIL

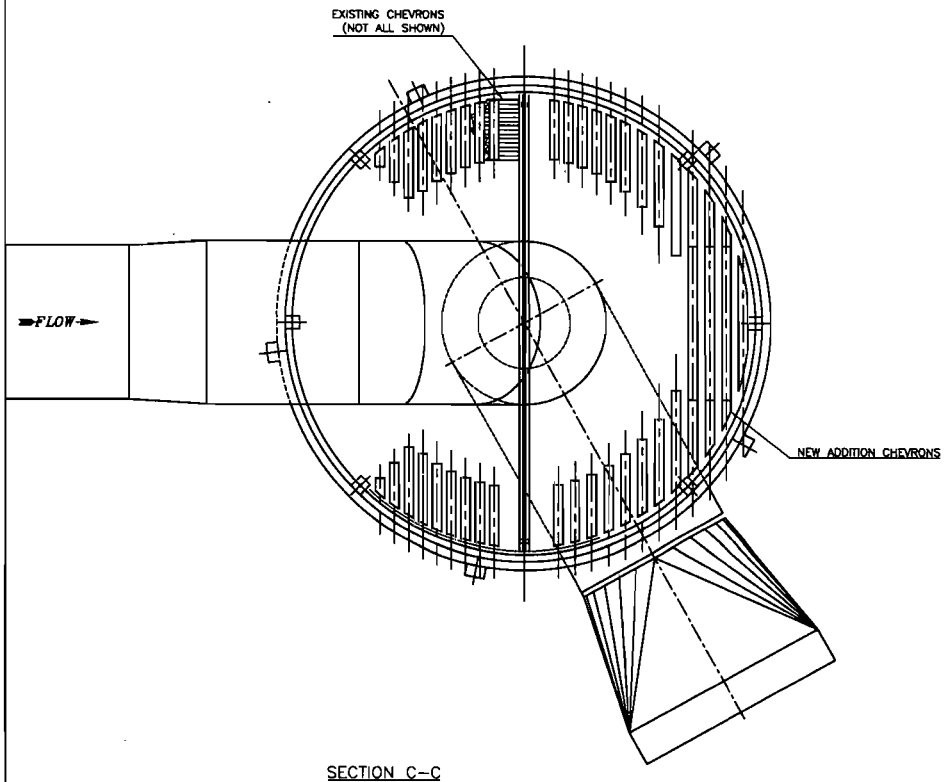
nels consulting services inc.
40 NEILSON AVENUE,ST.CATHARINES
ONTARIO CANADA L2M 7M9
T 905-682-2969
F 905-682-8302
www.nels.on.ca

VEOLIA ES PINELLAS
ST. PETERSBURG, FLORIDA

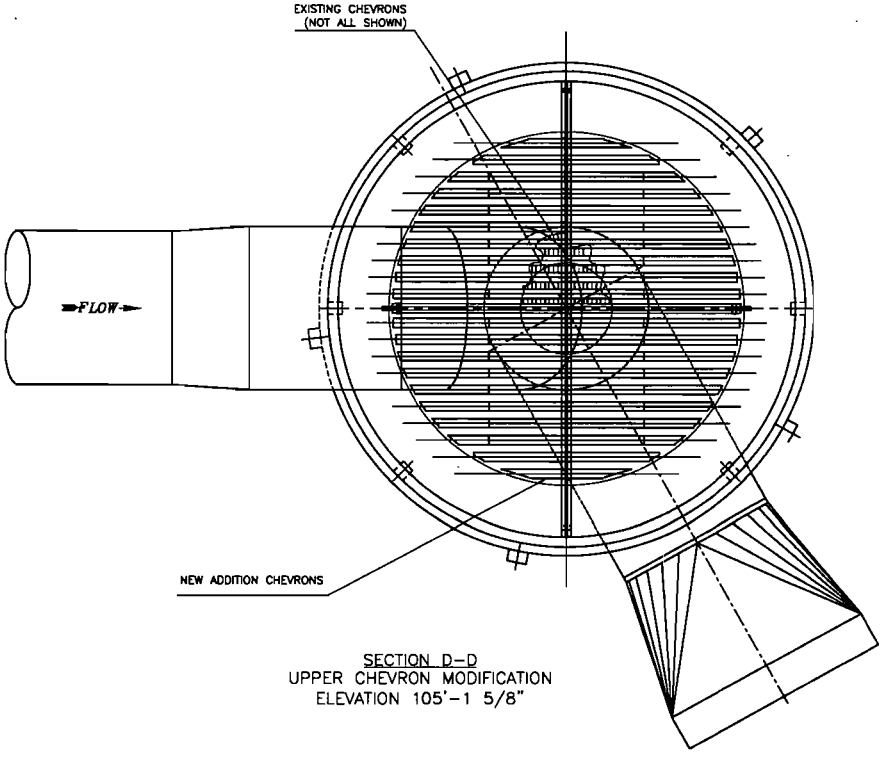
GENERAL ARRANGEMENT & DETAILS
SECTIONS C–C & D–D
PROPOSED SDA MODIFICATIONS

	A. GACNIK		
A. GACNIK		P096.10.004	0
P096.10			

P096.10.005



SECTION C–C
LOWER CHEVRON MODIFICATION
ELEVATION 101'–7 1/8"



SECTION D–D
UPPER CHEVRON MODIFICATION
ELEVATION 105'–1 5/8"

nels consulting services inc.
40 NEILSON AVENUE,ST.CATHARINES
ONTARIO CANADA L2M 7M9
T 905-682-2989
F 905-682-8302
www.nels.on.ca

VEOLIA ES PINELLAS
ST. PETERSBURG, FLORIDA

GENERAL ARRANGEMENT & DETAILS
SECTIONS C–C & D–D
PROPOSED SDA CHEVRON MODIFICATIONS

A. GACNIK	A. GACNIK	P096.10.005	0
P096.10			

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	89	87	83	89	84	*86*
2	102	117	117	112	89	*108*
3	109	112	115	116	111	*113*
4	96	92	83	99	95	*93*
COL AVG	*99*	*102*	*100*	*104*	*95*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.36	-0.37	-0.40	-0.33	-0.40
2	-0.27	-0.19	-0.21	-0.22	-0.36
3	-0.25	-0.19	-0.23	-0.22	-0.24
4	-0.25	-0.36	-0.41	-0.34	-0.34

MEAN VELOCITY=	**2232**	**FPM**
MEAN VELOCITY PRESSURE=	**0.31**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.30**	**" H_2O**
RMS DEVIATION=	**12.4**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**65.5**	**°F**
PITOT CAL FACTOR=	**.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS		***DATE***
ST. PETERSBURG, FLORIDA		***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION		*T1N*
UNITS 1, 2 & 3		
AIRFLOW MODEL STUDY		
NCS Inc.	***NORMALIZED VELOCITY DISTRIBUTION***	***PLATE No.***
P096.10	***TEST LOCATION T1N***	*6*
060111A	***UNIT No. 1 -EXISTING***	

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	90	88	85	85	90	*88*
2	85	111	115	118	101	*106*
3	95	121	121	121	103	*112*
4	102	88	92	98	90	*94*
COL AVG	*93*	*102*	*103*	*105*	*96*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.40	-0.33	-0.37	-0.36	-0.34
2	-0.36	-0.22	-0.18	-0.18	-0.31
3	-0.25	-0.18	-0.18	-0.17	-0.26
4	-0.30	-0.36	-0.36	-0.32	-0.36

MEAN VELOCITY=	**2205**	**FPM**
MEAN VELOCITY PRESSURE=	**0.30**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.29**	**" H_2O**
RMS DEVIATION=	**12.9**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**65.5**	**°F**
PITOT CAL FACTOR=	**.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T1S*
NCS Inc. ***P096.10*** ***060111A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1S*** ***UNIT No. 1 -EXISTING***	***PLATE No.*** *7*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-21	-29	-57	-29	0	*-27*
2	154	155	136	156	154	*151*
3	145	153	156	155	136	*149*
4	122	126	127	134	125	*127*
COL AVG	*100*	*101*	*91*	*104*	*104*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.32	-1.32	-1.36	-1.34	-1.30
2	-0.62	-0.44	-0.58	-0.52	-0.42
3	-0.36	-0.30	-0.30	-0.25	-0.41
4	-0.38	-0.37	-0.38	-0.34	-0.40

MEAN VELOCITY=	**2270**	**FPM**
MEAN VELOCITY PRESSURE=	**0.50**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.64**	**" H_2O**
RMS DEVIATION=	**74.8**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=		**°F**
PITOT CAL FACTOR=		

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T2N*
NCS Inc. ***P096.10*** ***060111A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T2N*** ***UNIT No. 1 -EXISTING***	***PLATE No.*** *8*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-21	-33	-47	-36	-15	*-31*
2	150	150	146	155	158	*152*
3	136	147	153	152	144	*147*
4	135	135	135	131	125	*132*
COL AVG	*100*	*100*	*97*	*100*	*103*	

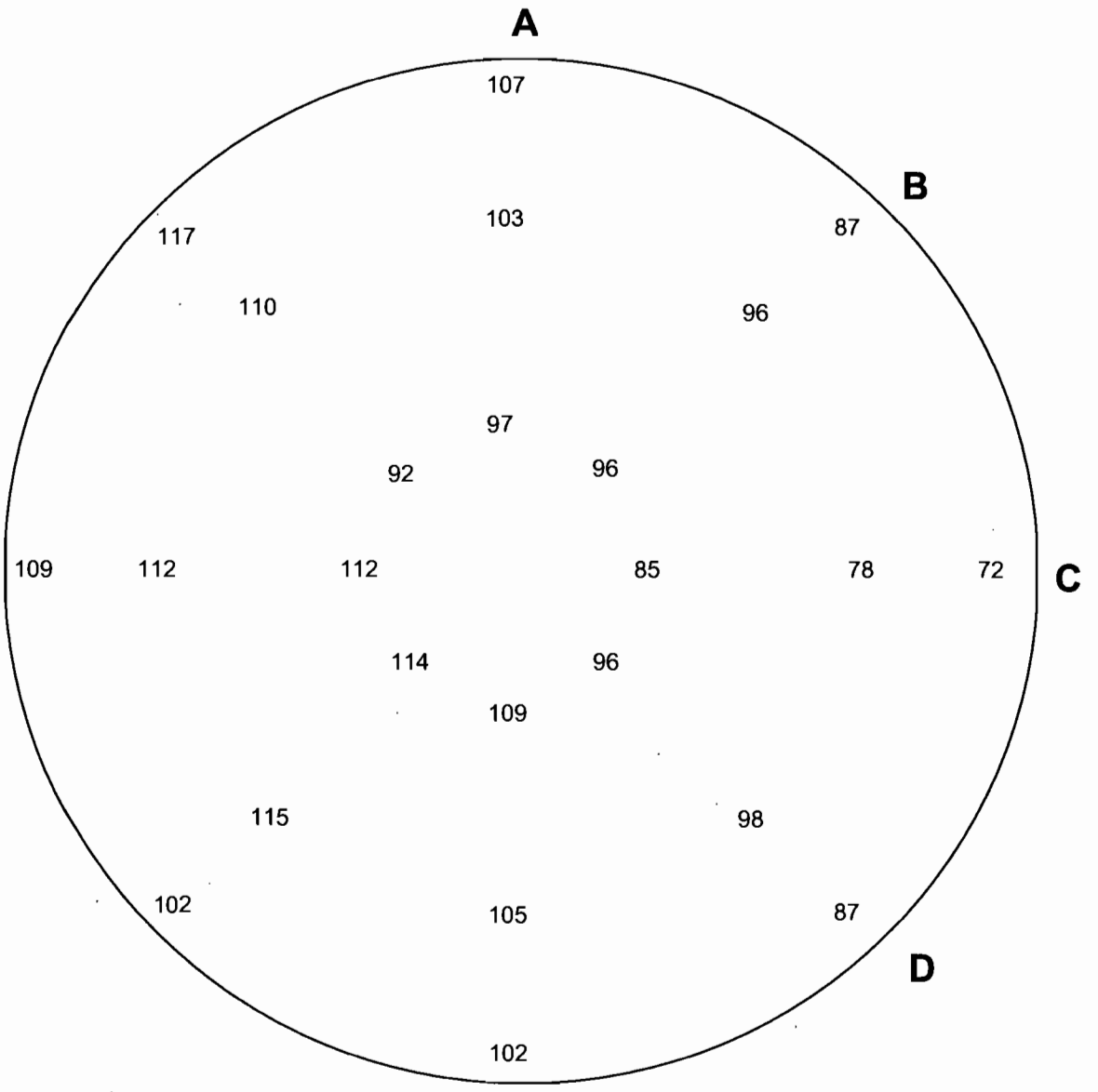
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.24	-1.26	-1.32	-1.31	-1.32
2	-0.41	-0.46	-0.54	-0.44	-0.44
3	-0.40	-0.34	-0.26	-0.32	-0.43
4	-0.36	-0.34	-0.37	-0.37	-0.41

MEAN VELOCITY=	**2229**	**FPM**
MEAN VELOCITY PRESSURE=	**0.48**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.62**	**" H_2O**
RMS DEVIATION=	**76.1**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**65.5**	**°F**
PITOT CAL FACTOR=	**.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS		***DATE***
ST. PETERSBURG, FLORIDA		***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION		*T2S*
UNITS 1, 2 & 3		
AIRFLOW MODEL STUDY		
NCS Inc.	***NORMALIZED VELOCITY DISTRIBUTION***	***PLATE No.***
P096.10	***TEST LOCATION T2S***	*9*
060111A	***UNIT No. 1 -EXISTING***	



MEAN VELOCITY=	**3115 FPM**
MEAN VELOCITY PRESSURE=	**0.61 " H_2O**
MEAN TOTAL PRESSURE=	**-0.57 " H_2O**
RMS DEVIATION=	**11.6 % OF MEAN VELOCITY**
GAS TEMPERATURE=	**66 °F**
PITOT CAL FACTOR=	**.83**

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T3N*
NCS Inc. ***P096.10*** ***060111A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T3N*** ***UNIT No. 1 -EXISTING***	***PLATE No.*** *10*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	107	103	97	109	105	102
B	87	96	96	114	115	102
C	72	78	85	112	112	109
D	87	98	96	92	110	117

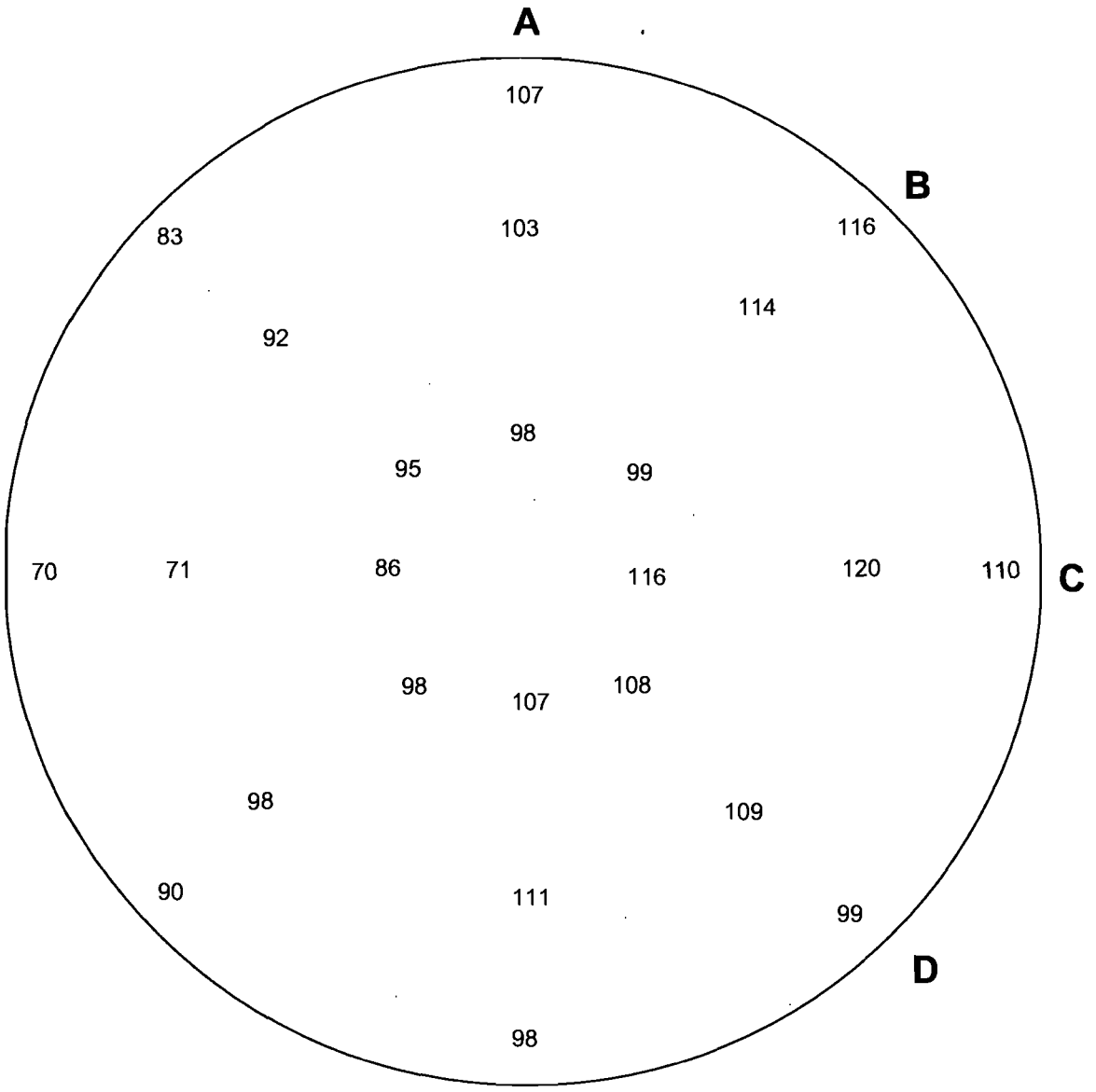
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.48	-0.58	-0.69	-0.46	-0.42	-0.50
B	-0.70	-0.68	-0.72	-0.54	-0.44	-0.42
C	-0.82	-0.81	-0.74	-0.73	-0.36	-0.32
D	-0.58	-0.56	-0.64	-0.66	-0.44	-0.36

MEAN VELOCITY=	3115	FPM
MEAN VELOCITY PRESSURE=	0.61	" H_2O
MEAN TOTAL PRESSURE=	-0.57	" H_2O
RMS DEVIATION=	11.6	% OF MEAN VELOCITY
GAS TEMPERATURE=	65.5	°F
PITOT CAL FACTOR=	.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3N*
NCS Inc. *P096.10* *060111A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3N* *UNIT No. 1 -EXISTING*	*PLATE No.* *11*



MEAN VELOCITY=	3099 FPM
MEAN VELOCITY PRESSURE=	0.60 " H_2O
MEAN TOTAL PRESSURE=	-0.54 " H_2O
RMS DEVIATION=	13.0 % OF MEAN VELOCITY
GAS TEMPERATURE=	66 °F
PITOT CAL FACTOR=	.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3S*
NCS Inc. *P096.10* *060111A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3S* *UNIT No. 1 -EXISTING*	*PLATE No.* *12*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	107	103	98	107	111	98
B	116	114	99	98	98	90
C	110	120	116	86	71	70
D	99	109	108	95	92	83

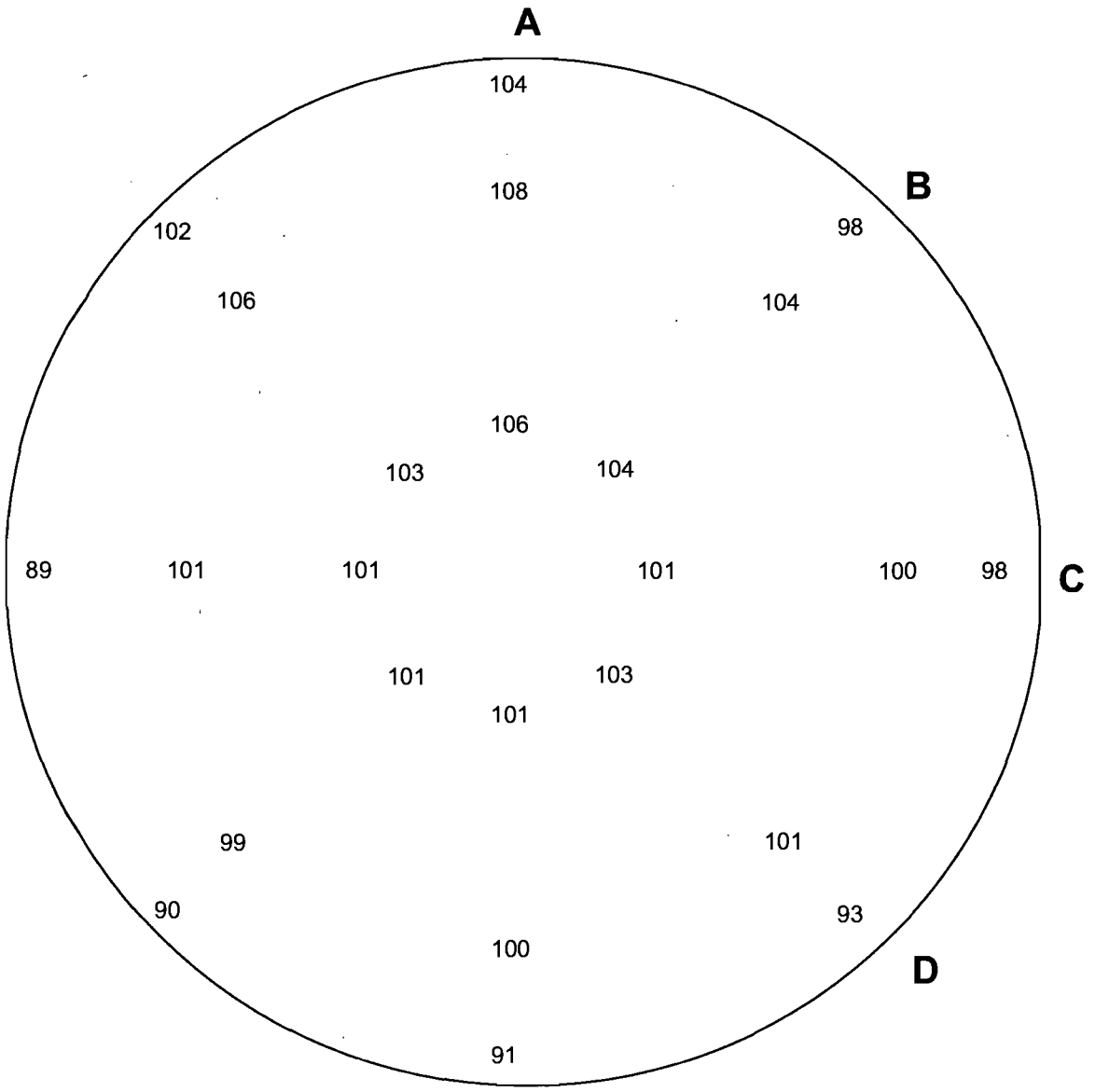
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.51	-0.54	-0.64	-0.49	-0.42	-0.44
B	-0.36	-0.38	-0.60	-0.57	-0.54	-0.61
C	-0.32	-0.37	-0.38	-0.77	-0.84	-0.86
D	-0.46	-0.42	-0.47	-0.67	-0.67	-0.74

MEAN VELOCITY=	3099	FPM
MEAN VELOCITY PRESSURE=	0.60	" H_2O
MEAN TOTAL PRESSURE=	-0.54	" H_2O
RMS DEVIATION=	13.0	% OF MEAN VELOCITY
GAS TEMPERATURE=	65.5	°F
PITOT CAL FACTOR=	.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3S*
NCS Inc. *P096.10* *060111A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3S* *UNIT No. 1 -EXISTING*	*PLATE No.* *13*



MEAN VELOCITY=	3396	FPM
MEAN VELOCITY PRESSURE=	0.71	" H_2O
MEAN TOTAL PRESSURE=	-0.63	" H_2O
RMS DEVIATION=	4.9	% OF MEAN VELOCITY
GAS TEMPERATURE=	66	°F
PITOT CAL FACTOR=	.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T4*
NCS Inc. *P096.10* *060111A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T4* *UNIT No. 1 -EXISTING*	*PLATE No.* *14*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	104	108	106	101	100	91
B	98	104	104	101	99	90
C	98	100	101	101	101	89
D	93	101	103	103	106	102

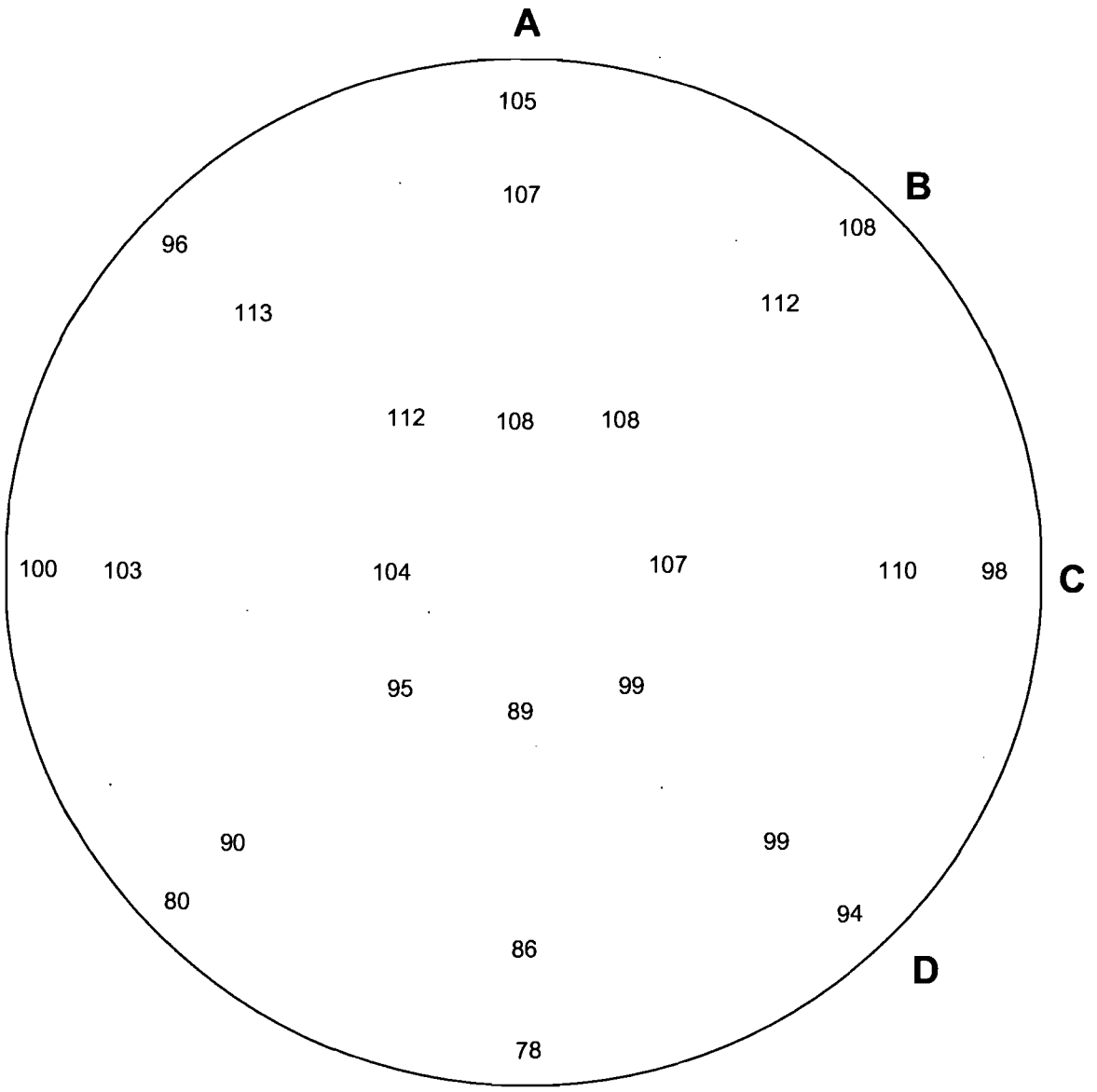
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.54	-0.55	-0.54	-0.62	-0.62	-0.66
B	-0.64	-0.60	-0.56	-0.62	-0.61	-0.70
C	-0.71	-0.64	-0.66	-0.65	-0.62	-0.74
D	-0.68	-0.64	-0.64	-0.62	-0.56	-0.60

MEAN VELOCITY=	**3396**	**FPM**
MEAN VELOCITY PRESSURE=	**0.71**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.63**	**" H_2O**
RMS DEVIATION=	**4.9**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**65.5**	**°F**
PITOT CAL FACTOR=	**.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T4*
NCS Inc. ***P096.10*** ***060111A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T4*** ***UNIT No. 1 -EXISTING***	***PLATE No.*** *15*



MEAN VELOCITY=	3403	FPM
MEAN VELOCITY PRESSURE=	0.72	" H_2O
MEAN TOTAL PRESSURE=	-0.87	" H_2O
RMS DEVIATION=	9.7	% OF MEAN VELOCITY
GAS TEMPERATURE=	66	°F
PITOT CAL FACTOR=	.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T5*
NCS Inc. *P096.10* *060111A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *UNIT No. 1 -EXISTING*	*PLATE No.* *16*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	105	107	108	89	86	78
B	108	112	108	95	90	80
C	98	110	107	104	103	100
D	94	99	99	112	113	96

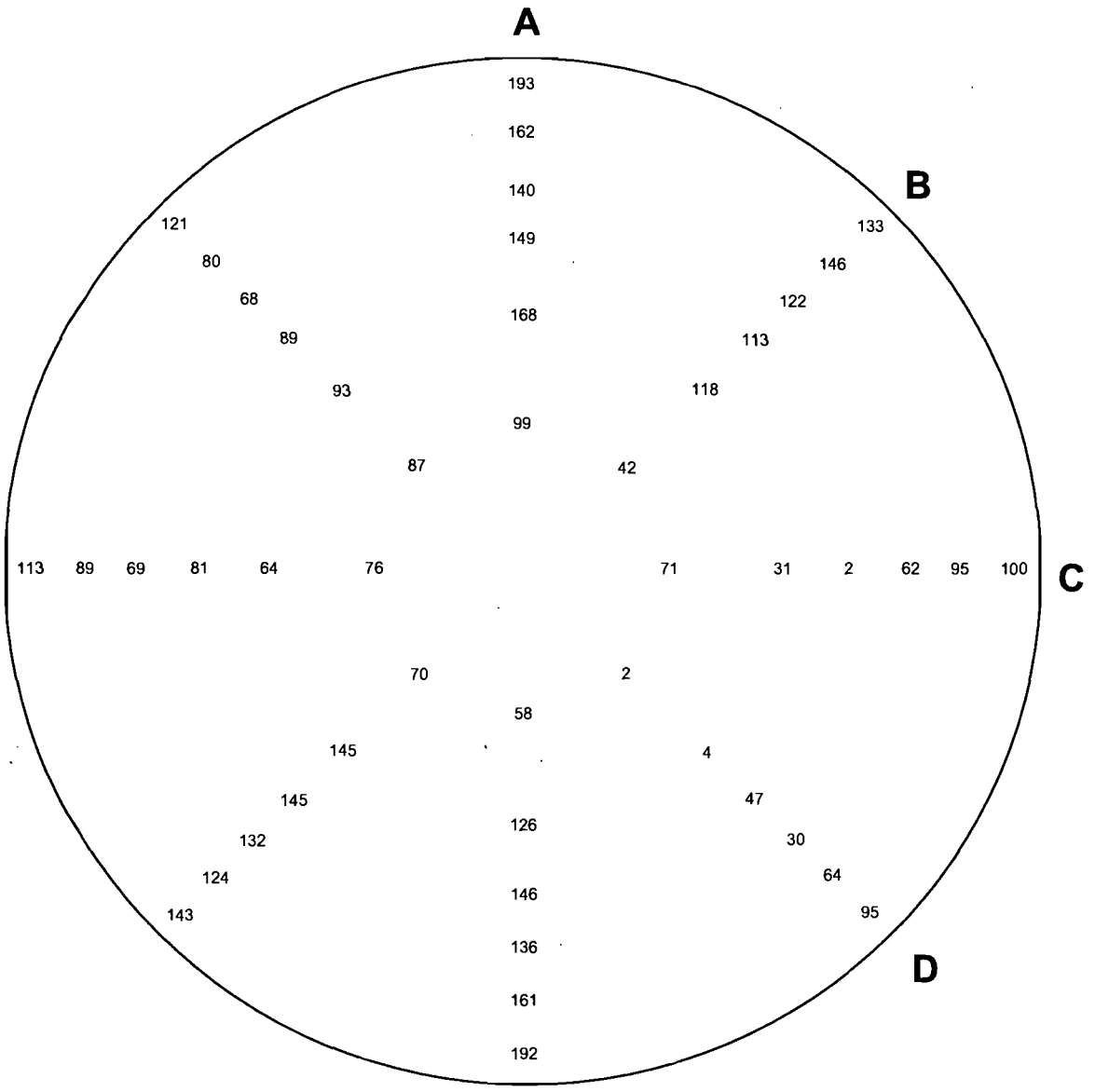
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.81	-0.74	-0.72	-1.00	-1.06	-1.14
B	-0.80	-0.74	-0.74	-0.94	-0.97	-1.06
C	-0.82	-0.76	-0.78	-0.80	-0.78	-0.82
D	-1.06	-0.93	-0.92	-0.74	-0.74	-0.98

MEAN VELOCITY=	3403	FPM
MEAN VELOCITY PRESSURE=	0.72	" H_2O
MEAN TOTAL PRESSURE=	-0.87	" H_2O
RMS DEVIATION=	9.7	% OF MEAN VELOCITY
GAS TEMPERATURE=	65.5	°F
PITOT CAL FACTOR=	.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T5*
NCS Inc. *P096.10* *060111A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *UNIT No. 1 -EXISTING*	*PLATE No.* *17*



MEAN WEIGHTED VELOCITY=	**317 FPM**
MEAN TOTAL PRESSURE=	**-1.84 " H_2O**
RMS DEVIATION=	**46.8 % OF MEAN VELOCITY**
GAS TEMPERATURE=	**73 °F**
PITOT CAL FACTOR=	**1.00**

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS		***DATE***
ST. PETERSBURG, FLORIDA		*SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION		*T6*
UNITS 1, 2 & 3		*Weighted*
AIRFLOW MODEL STUDY		
NCS Inc.	***NORMALIZED VELOCITY DISTRIBUTION***	***PLATE No.***
P096.10	***TEST LOCATION T6***	*18*
060111A	***UNIT No. 1 -EXISTING***	

NORMALIZED VELOCITY (%)

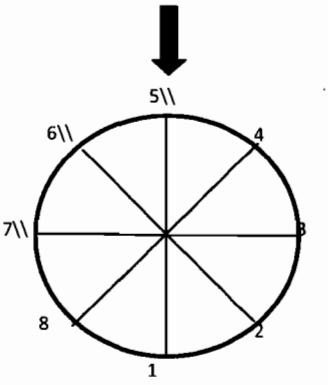
	1	2	3	4	5	6	7	8	9	10	11	12
A	193	162	140	149	168	99	58	126	146	136	161	192
B	133	146	122	113	118	42	70	145	145	132	124	143
C	100	95	62	2	31	71	76	64	81	69	89	113
D	95	64	30	47	4	2	87	93	89	68	80	121

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-1.83	-1.84	-1.84	-1.84	-1.84	-1.84	-1.85	-1.85	-1.84	-1.84	-1.84	-1.84
B	-1.83	-1.84	-1.85	-1.85	-1.85	-1.86	-1.86	-1.84	-1.85	-1.84	-1.84	-1.83
C	-1.84	-1.84	-1.86	-1.85	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84
D	-1.84	-1.85	-1.85	-1.84	-1.85	-1.85	-1.84	-1.84	-1.84	-1.84	-1.85	-1.84

COTTON TUFT DIRECTIONAL ANGLES

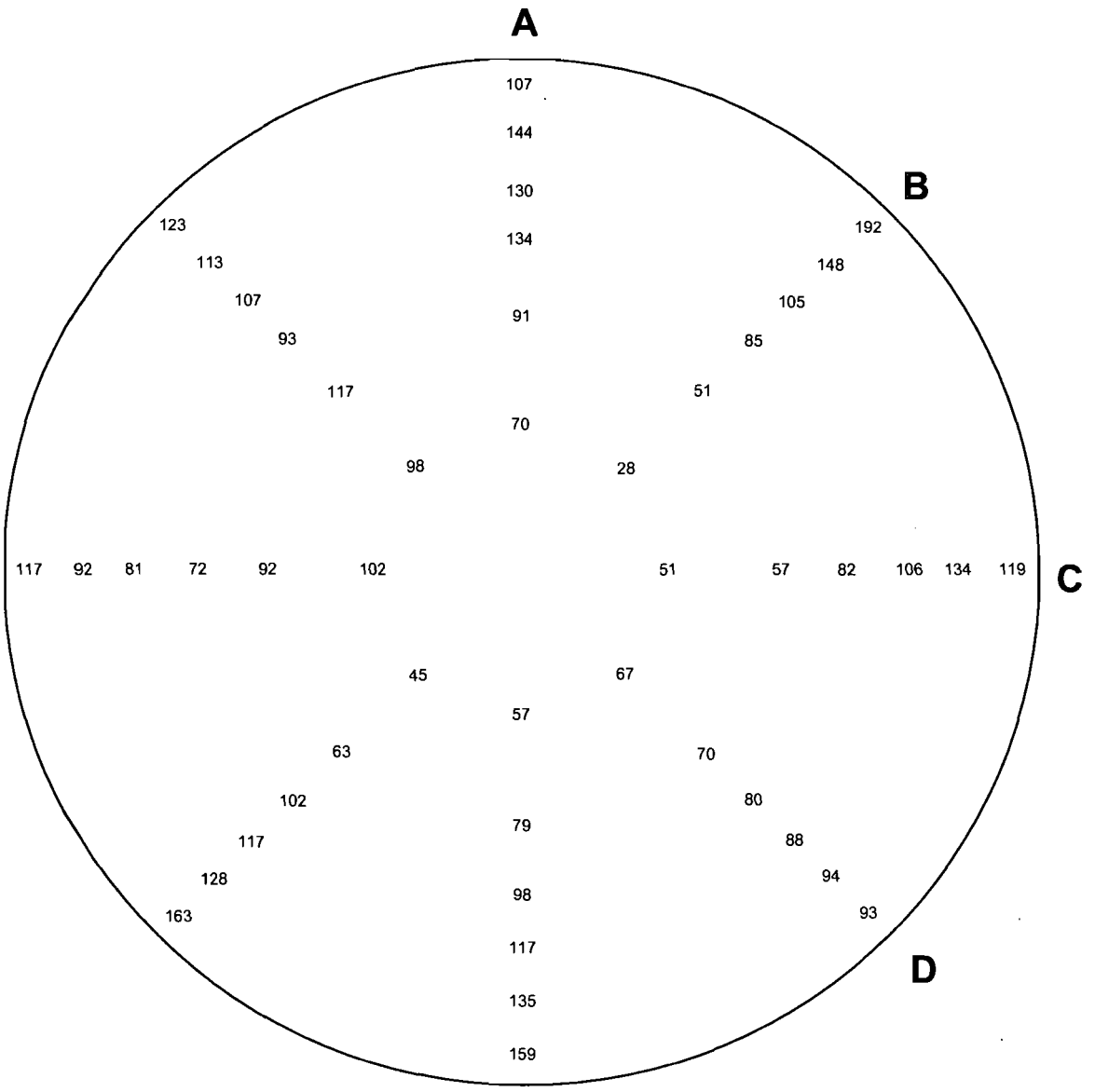
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	T	1	1	1	1	1	1	1	1	1	1	1
C	8	1	1	1	2	1	1	1	1	1	1	1
D	2	2	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**317**	**FPM**
MEAN TOTAL PRESSURE=	**-1.84**	**" H_2O**
RMS DEVIATION=	**46.8**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**73**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T6 Weighted*
NCS Inc. ***P096.10*** ***060111A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T6*** ***UNIT No. 1 -EXISTING***	***PLATE No.*** *19*



MEAN WEIGHTED VELOCITY=	**341 FPM**
MEAN TOTAL PRESSURE=	**-1.84 " H_2O**
RMS DEVIATION=	**32.2 % OF MEAN VELOCITY**
GAS TEMPERATURE=	**73 °F**
PITOT CAL FACTOR=	**1.00**

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T7 Weighted*
NCS Inc. ***P096.10*** ***060111A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T7*** ***UNIT No. 1 -EXISTING***	***PLATE No.*** *20*

NORMALIZED VELOCITY (%)

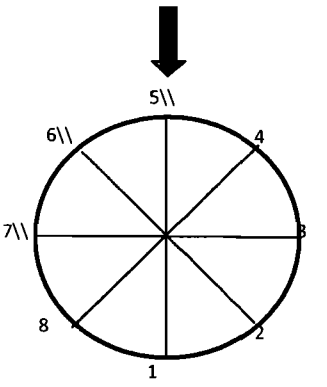
	1	2	3	4	5	6	7	8	9	10	11	12
A	107	144	130	134	91	70	57	79	98	117	135	159
B	192	148	105	85	51	28	45	63	102	117	128	163
C	119	134	106	82	57	51	102	92	72	81	92	117
D	93	94	88	80	70	67	98	117	93	107	113	123

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-1.82	-1.83	-1.84	-1.84	-1.84	-1.84	-1.85	-1.84	-1.84	-1.82	-1.83	-1.82
B	-1.81	-1.83	-1.83	-1.84	-1.84	-1.85	-1.85	-1.84	-1.85	-1.84	-1.84	-1.84
C	-1.84	-1.83	-1.84	-1.84	-1.85	-1.84	-1.85	-1.84	-1.85	-1.84	-1.84	-1.83
D	-1.84	-1.84	-1.86	-1.86	-1.85	-1.84	-1.85	-1.86	-1.84	-1.84	-1.84	-1.84

COTTON TUFT DIRECTIONAL ANGLES

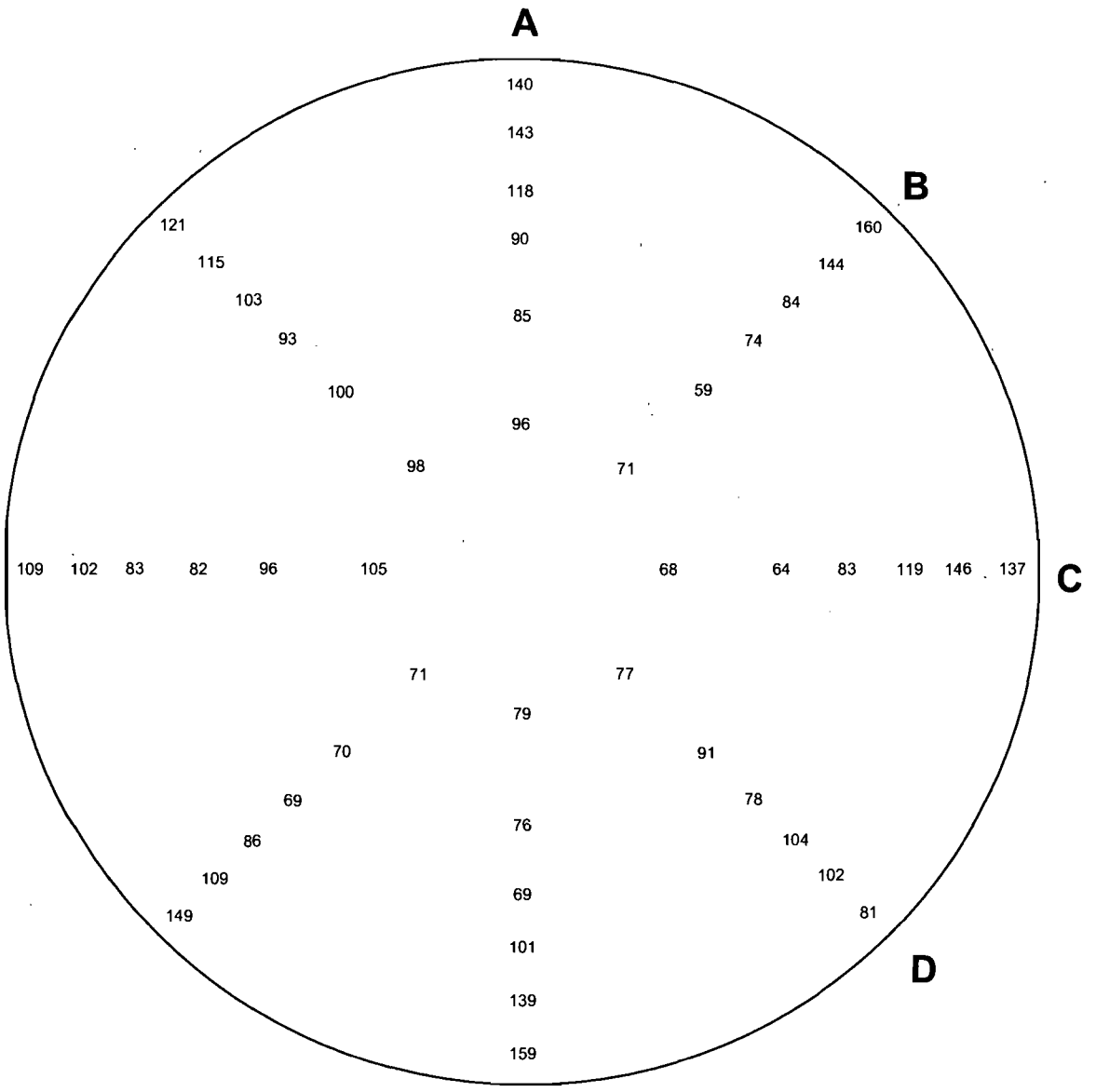
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	2	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	341	FPM
MEAN TOTAL PRESSURE=	-1.84	" H_2O
RMS DEVIATION=	32.2	% OF MEAN VELOCITY
GAS TEMPERATURE=	73	°F
PITOT CAL FACTOR=	1.00	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T7* *Weighted*
NCS Inc. *P096.10* *060111A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T7* *UNIT No. 1 -EXISTING*	*PLATE No.* *21*



MEAN WEIGHTED VELOCITY=	350 FPM
MEAN TOTAL PRESSURE=	-1.84 " H_2O
RMS DEVIATION=	27.0 % OF MEAN VELOCITY
GAS TEMPERATURE=	73 °F
PITOT CAL FACTOR=	1.00

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T8* *Weighted*
NCS Inc. *P096.10* *060111A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T8* *UNIT No. 1 -EXISTING*	*PLATE No.* 22

NORMALIZED VELOCITY (%)

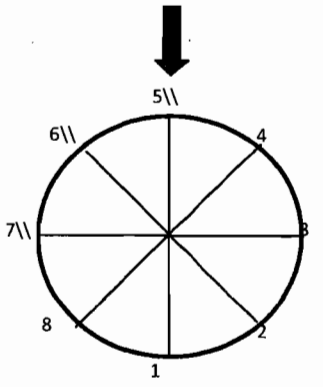
	1	2	3	4	5	6	7	8	9	10	11	12
A	140	143	118	90	85	96	79	76	69	101	139	159
B	160	144	84	74	59	71	71	70	69	86	109	149
C	137	146	119	83	64	68	105	96	82	83	102	109
D	81	102	104	78	91	77	98	100	93	103	115	121

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-1.84	-1.82	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84
B	-1.84	-1.84	-1.84	-1.84	-1.83	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84
C	-1.85	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84
D	-1.85	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84

COTTON TUFT DIRECTIONAL ANGLES

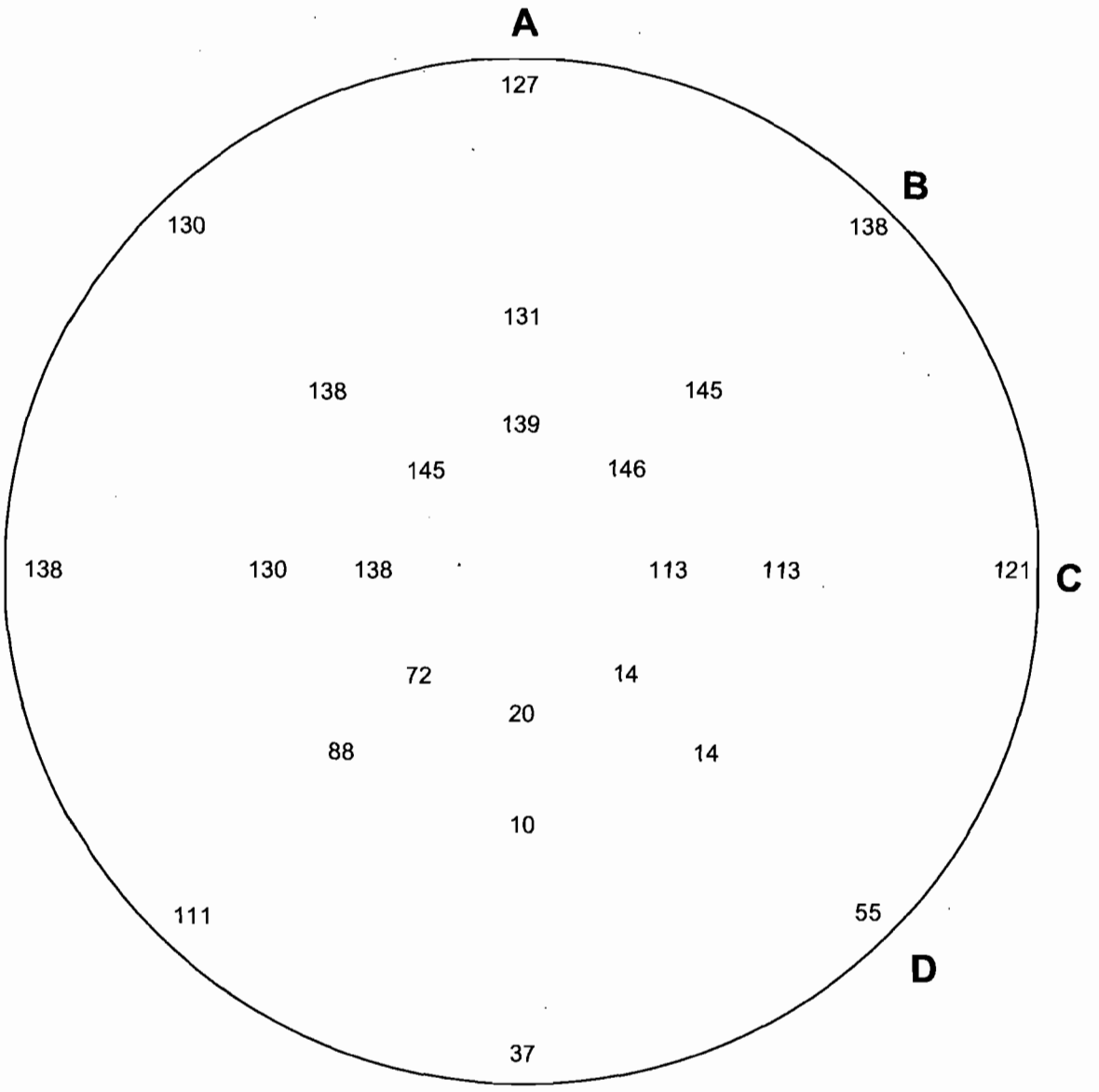
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**350**	**FPM**
MEAN TOTAL PRESSURE=	**-1.84**	**" H_2O**
RMS DEVIATION=	**27.0**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**73**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS	***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION	***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T8* *Weighted*
NCS Inc. ***P096.10*** ***060111A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T8*** ***UNIT No. 1 -EXISTING***	***PLATE No.*** 23



MEAN VELOCITY=	3333 FPM
MEAN VELOCITY PRESSURE=	0.84 " H_2O
MEAN TOTAL PRESSURE=	-2.55 " H_2O
RMS DEVIATION=	47.4 % OF MEAN VELOCITY
GAS TEMPERATURE=	66 °F
PITOT CAL FACTOR=	.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T9*
NCS Inc. *P096.10* *060111A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T9* *UNIT No. 1 -EXISTING*	*PLATE No.* *24*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	127	131	139	20	10	37
B	138	145	146	72	88	111
C	121	113	99	138	130	138
D	55	14	14	145	138	130

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-1.92	-1.90	-2.10	-3.44	-3.61	-3.56
B	-1.96	-2.00	-1.92	-3.30	-2.94	-2.71
C	-2.46	-2.46	-2.84	-2.00	-2.04	-1.94
D	-3.44	-3.54	-3.54	-1.90	-1.80	-1.84

MEAN VELOCITY=	**3333**	**FPM**
MEAN VELOCITY PRESSURE=	**0.84**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.55**	**" H_2O**
RMS DEVIATION=	**47.4**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**65.5**	**°F**
PITOT CAL FACTOR=	**.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T9*
NCS Inc. ***P096.10*** ***060111A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T9*** ***UNIT No. 1 -EXISTING***	***PLATE No.*** *25*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	*ROW AVG*
1	132	141	143	137	144	143	138	*140*
2	118	122	119	109	117	123	125	*119*
3	101	78	65	63	64	88	106	*81*
4	79	63	44	37	51	78	72	*61*
COL AVG	*107*	*101*	*93*	*87*	*94*	*108*	*110*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-2.00	-1.94	-1.95	-2.00	-1.94	-1.94	-2.00
2	-2.26	-2.24	-2.40	-2.50	-2.54	-2.24	-2.24
3	-2.47	-2.86	-3.10	-3.06	-3.06	-2.74	-2.35
4	-2.82	-3.06	-3.12	-3.20	-3.08	-2.90	-2.60

MEAN VELOCITY=	**3360**	**FPM**
MEAN VELOCITY PRESSURE=	**0.78**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.52**	**" H_2O**
RMS DEVIATION=	**33.3**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**65.5**	**°F**
PITOT CAL FACTOR=	**.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T10*
NCS Inc. ***P096.10*** ***060111A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T10*** ***UNIT No. 1 -EXISTING***	***PLATE No.*** *26*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	ROW AVG
1	98	104	95	92	96	104	107	99
2	108	104	92	88	92	102	115	100
3	104	101	93	88	94	107	114	100
4	99	104	95	87	106	109	103	100
COL AVG	102	103	94	88	97	106	110	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-2.48	-2.50	-2.59	-2.61	-2.58	-2.46	-2.36
2	-2.39	-2.45	-2.60	-2.66	-2.60	-2.45	-2.20
3	-2.44	-2.46	-2.66	-2.71	-2.58	-2.37	-2.26
4	-2.50	-2.44	-2.64	-2.74	-2.51	-2.34	-2.40

MEAN VELOCITY=	**3311**	**FPM**
MEAN VELOCITY PRESSURE=	**0.67**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.50**	**" H_2O**
RMS DEVIATION=	**7.6**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**65.5**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*TV*
NCS Inc. ***P096.10*** ***060111A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION TV*** ***UNIT No. 1 -EXISTING***	***PLATE No.*** *27*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	91	85	83	93	87	*88*
2	107	117	113	116	93	*109*
3	112	117	117	117	100	*113*
4	102	89	83	87	93	*91*
COL AVG	*103*	*102*	*99*	*103*	*93*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.32	-0.33	-0.38	-0.28	-0.33
2	-0.26	-0.18	-0.19	-0.18	-0.33
3	-0.24	-0.18	-0.20	-0.18	-0.28
4	-0.28	-0.36	-0.38	-0.33	-0.33

MEAN VELOCITY=	**2195**	**FPM**
MEAN VELOCITY PRESSURE=	**0.30**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.28**	**" H_2O**
RMS DEVIATION=	**12.8**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T1N*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1N*** ***Unit No. 1 - FINAL***	***PLATE No.*** *28*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	85	89	92	85	92	*88*
2	90	116	118	117	103	*109*
3	90	120	118	120	109	*111*
4	80	103	85	89	100	*91*
COL AVG	*86*	*107*	*103*	*103*	*101*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.34	-0.32	-0.33	-0.35	-0.33
2	-0.34	-0.18	-0.18	-0.18	-0.26
3	-0.34	-0.17	-0.18	-0.17	-0.23
4	-0.38	-0.30	-0.37	-0.36	-0.30

MEAN VELOCITY=	**2140**	**FPM**
MEAN VELOCITY PRESSURE=	**0.29**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.28**	**" H_2O**
RMS DEVIATION=	**13.7**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T1S*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1S*** ***Unit No. 1 - FINAL***	***PLATE No.*** *29*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-15	-34	-48	-30	-26	*-30*
2	151	158	141	153	154	*151*
3	141	150	150	153	135	*146*
4	126	141	141	133	124	*133*
COL AVG	*101*	*104*	*96*	*102*	*97*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.24	-1.26	-1.28	-1.24	-1.23
2	-0.44	-0.44	-0.66	-0.50	-0.46
3	-0.39	-0.33	-0.29	-0.30	-0.44
4	-0.36	-0.31	-0.38	-0.41	-0.36

MEAN VELOCITY=	**2204**	**FPM**
MEAN VELOCITY PRESSURE=	**0.47**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.62**	**" H_2O**
RMS DEVIATION=	**76.0**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T2N*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T2N*** ***Unit No. 1 - FINAL***	***PLATE No.*** *30*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-21	-34	-50	-34	0	*-28*
2	150	150	134	156	155	*149*
3	136	150	153	149	141	*146*
4	132	141	131	127	134	*133*
COL AVG	*99*	*102*	*92*	*99*	*107*	

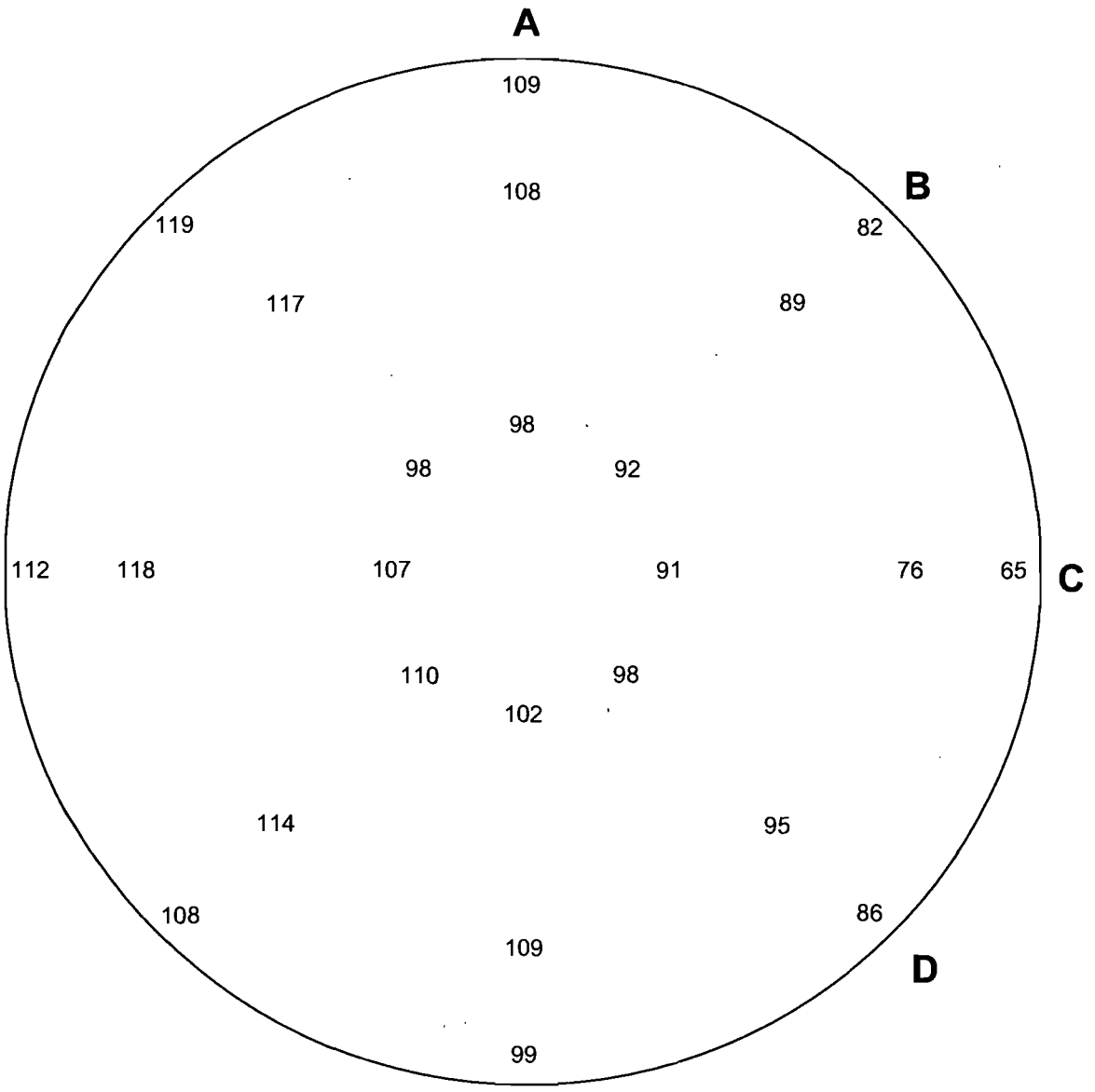
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.20	-1.22	-1.24	-1.20	-1.25
2	-0.43	-0.49	-0.66	-0.46	-0.43
3	-0.40	-0.36	-0.30	-0.36	-0.38
4	-0.33	-0.36	-0.42	-0.37	-0.33

MEAN VELOCITY=	**2207**	**FPM**
MEAN VELOCITY PRESSURE=	**0.47**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.61**	**" H_2O**
RMS DEVIATION=	**74.6**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T2S*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T2S*** ***Unit No. 1 - FINAL***	***PLATE No.*** *31*



MEAN VELOCITY=	3039 FPM
MEAN VELOCITY PRESSURE=	0.58 " H_2O
MEAN TOTAL PRESSURE=	-0.53 " H_2O
RMS DEVIATION=	13.6 % OF MEAN VELOCITY
GAS TEMPERATURE=	67.7 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3N*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3N* *Unit No. 1 - FINAL*	*PLATE No.* *32*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	109	108	98	102	109	99
B	82	89	92	110	114	108
C	65	76	91	107	118	112
D	86	95	98	98	117	119

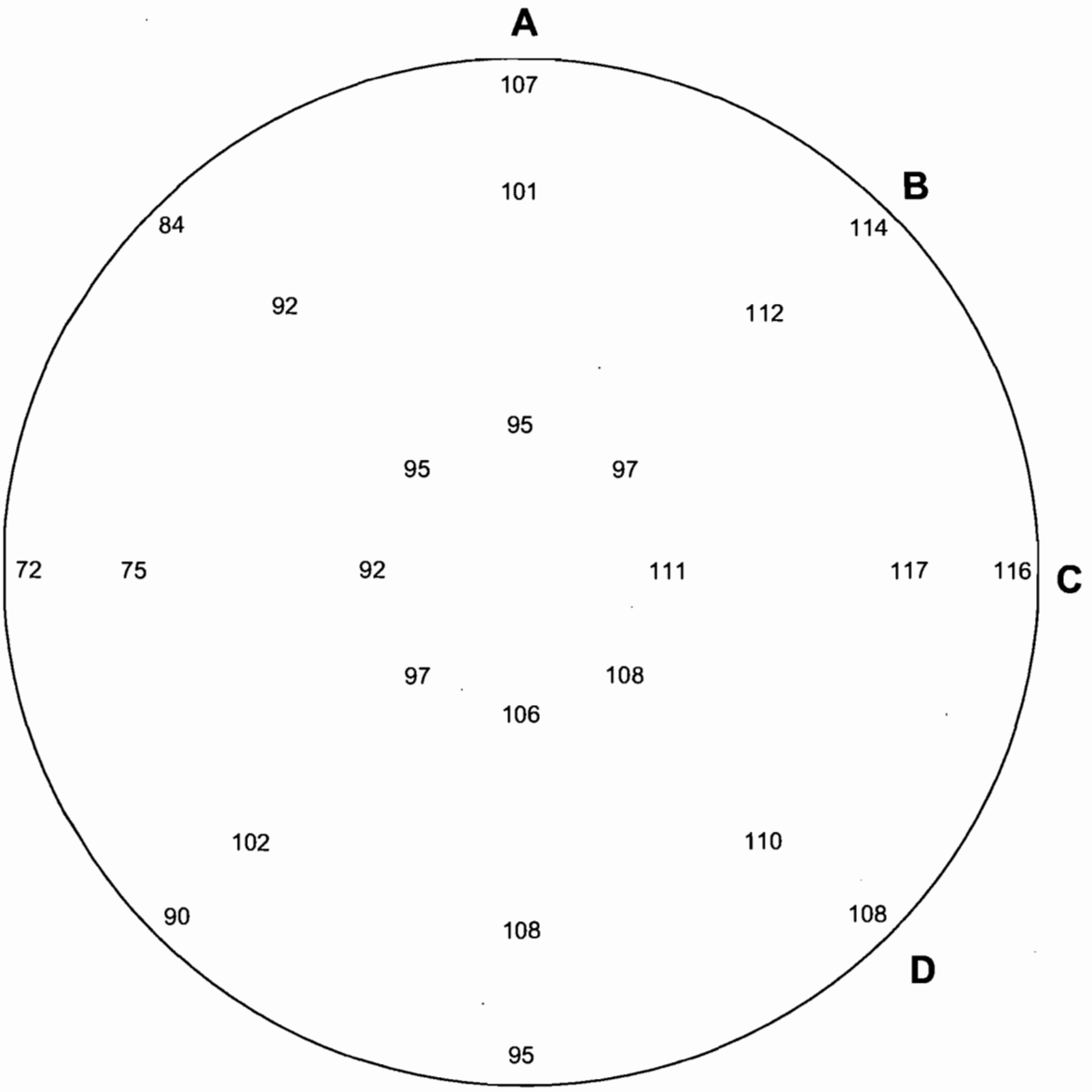
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.44	-0.52	-0.62	-0.50	-0.44	-0.44
B	-0.69	-0.60	-0.71	-0.52	-0.33	-0.33
C	-0.84	-0.80	-0.69	-0.51	-0.31	-0.28
D	-0.61	-0.55	-0.58	-0.60	-0.40	-0.33

MEAN VELOCITY=	3039	FPM
MEAN VELOCITY PRESSURE=	0.58	" H_2O
MEAN TOTAL PRESSURE=	-0.53	" H_2O
RMS DEVIATION=	13.6	% OF MEAN VELOCITY
GAS TEMPERATURE=	67.7	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3N*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3N* *Unit No. 1 - FINAL*	*PLATE No.* *33*



MEAN VELOCITY=	3071	FPM
MEAN VELOCITY PRESSURE=	0.59	" H_2O
MEAN TOTAL PRESSURE=	-0.53	" H_2O
RMS DEVIATION=	12.0	% OF MEAN VELOCITY
GAS TEMPERATURE=	67.7	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3S*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3S* *Unit No. 1 - FINAL*	*PLATE No.* *34*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	107	101	95	106	108	95
B	114	112	97	97	102	90
C	116	117	111	92	75	72
D	108	110	108	95	92	84

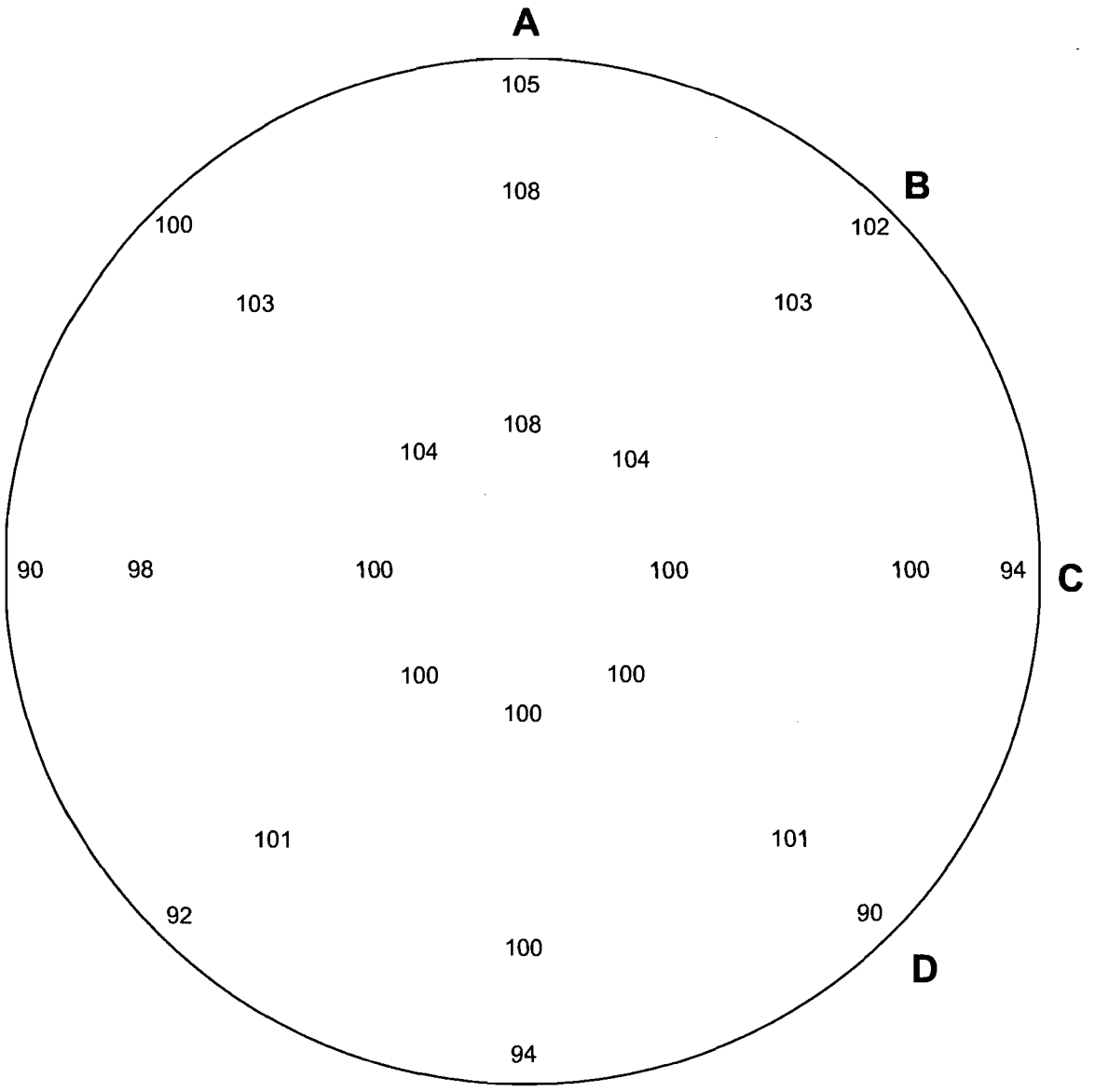
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.44	-0.50	-0.63	-0.50	-0.42	-0.50
B	-0.38	-0.36	-0.60	-0.56	-0.50	-0.61
C	-0.30	-0.33	-0.48	-0.70	-0.78	-0.82
D	-0.44	-0.36	-0.40	-0.66	-0.66	-0.74

MEAN VELOCITY=	3071	FPM
MEAN VELOCITY PRESSURE=	0.59	" H_2O
MEAN TOTAL PRESSURE=	-0.53	" H_2O
RMS DEVIATION=	12.0	% OF MEAN VELOCITY
GAS TEMPERATURE=	67.7	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T3S*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3S* *Unit No. 1 - FINAL*	*PLATE No.* 35



MEAN VELOCITY=	3304	FPM
MEAN VELOCITY PRESSURE=	0.68	" H_2O
MEAN TOTAL PRESSURE=	-0.59	" H_2O
RMS DEVIATION=	4.9	% OF MEAN VELOCITY
GAS TEMPERATURE=	67.7	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T4*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T4* *Unit No. 1 - FINAL*	*PLATE No.* *36*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	105	108	108	100	100	94
B	102	103	104	100	101	92
C	94	100	100	100	98	90
D	90	101	100	104	103	100

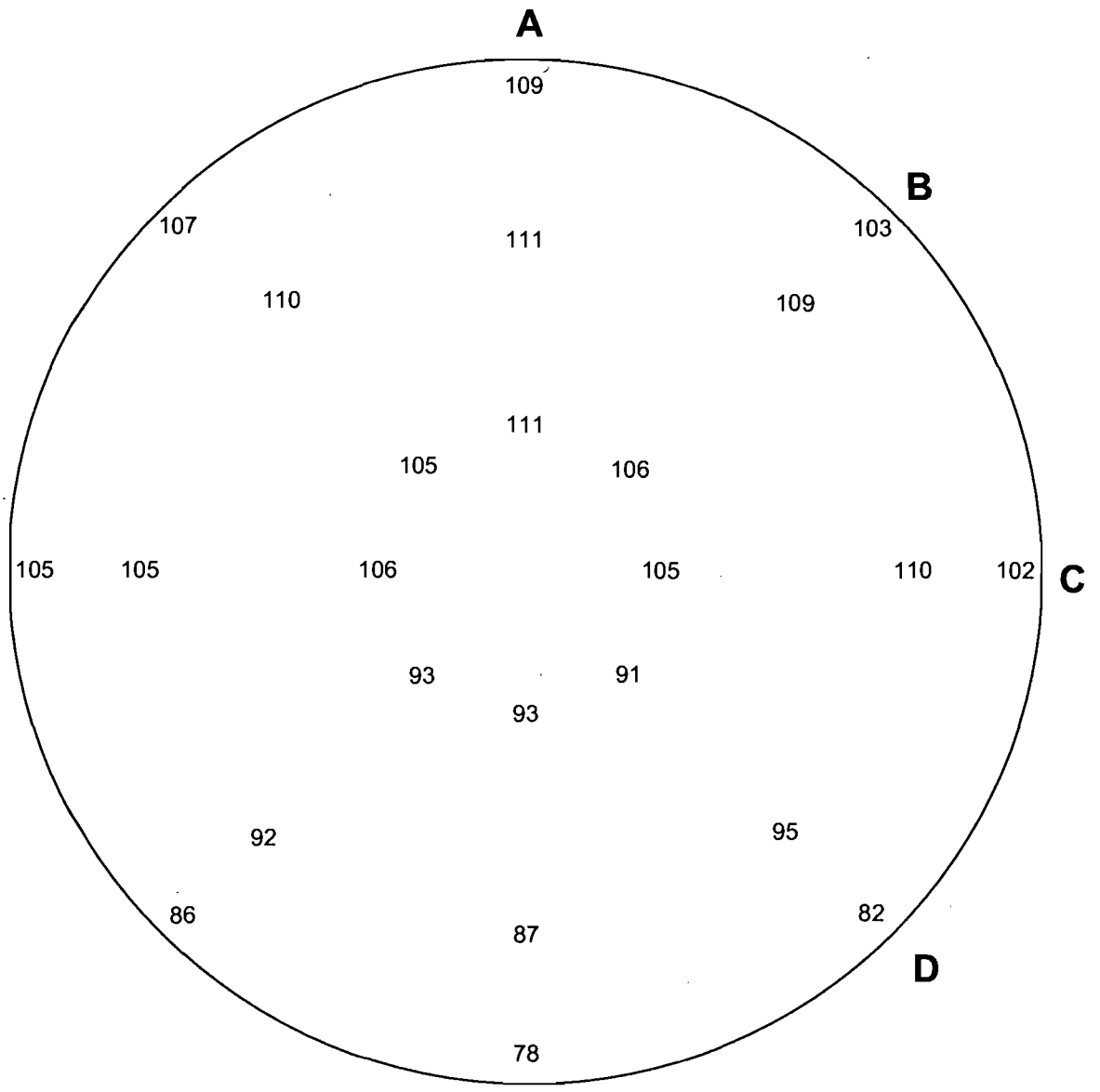
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.52	-0.50	-0.50	-0.61	-0.58	-0.60
B	-0.64	-0.61	-0.56	-0.60	-0.58	-0.61
C	-0.68	-0.60	-0.60	-0.60	-0.57	-0.60
D	-0.66	-0.60	-0.61	-0.58	-0.61	-0.63

MEAN VELOCITY=	3304	FPM
MEAN VELOCITY PRESSURE=	0.68	" H_2O
MEAN TOTAL PRESSURE=	-0.59	" H_2O
RMS DEVIATION=	4.9	% OF MEAN VELOCITY
GAS TEMPERATURE=	67.7	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T4*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T4* *Unit No. 1 - FINAL*	*PLATE No.* *37*



MEAN VELOCITY=	3338 FPM
MEAN VELOCITY PRESSURE=	0.70 " H_2O
MEAN TOTAL PRESSURE=	-0.82 " H_2O
RMS DEVIATION=	9.6 % OF MEAN VELOCITY
GAS TEMPERATURE=	67.7 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T5*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *Unit No. 1 - FINAL*	*PLATE No.* *38*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	109	111	111	93	87	78
B	103	109	106	93	92	86
C	102	110	105	106	105	105
D	82	95	91	105	110	107

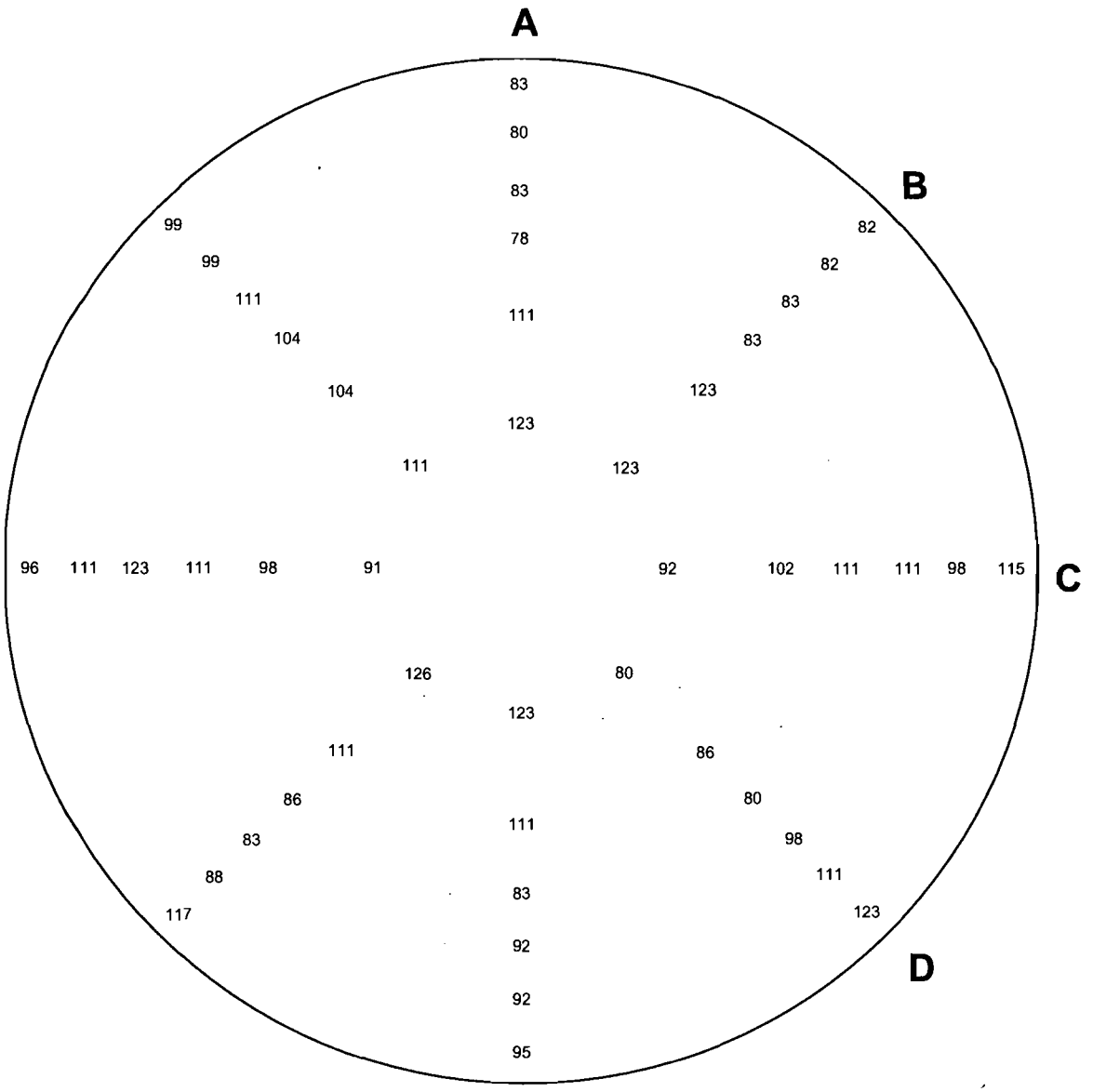
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.77	-0.70	-0.68	-0.98	-1.00	-1.00
B	-0.80	-0.77	-0.70	-0.90	-0.88	-0.96
C	-0.82	-0.70	-0.74	-0.77	-0.73	-0.70
D	-1.00	-0.91	-0.88	-0.73	-0.70	-0.74

MEAN VELOCITY=	3338	FPM
MEAN VELOCITY PRESSURE=	0.70	" H_2O
MEAN TOTAL PRESSURE=	-0.82	" H_2O
RMS DEVIATION=	9.6	% OF MEAN VELOCITY
GAS TEMPERATURE=	67.7	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T5*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *Unit No. 1 - FINAL*	*PLATE No.* *39*



MEAN WEIGHTED VELOCITY=	321 FPM
MEAN TOTAL PRESSURE=	-2.03 " H_2O
RMS DEVIATION=	14.8 % OF MEAN VELOCITY
GAS TEMPERATURE=	67.7 °F
PITOT CAL FACTOR=	1.00

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T6* *Weighted*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T6* *Unit No. 1 - FINAL*	*PLATE No.* *40*

NORMALIZED VELOCITY (%)

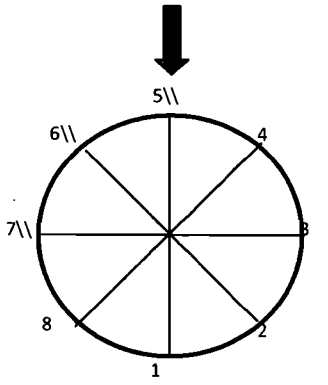
	1	2	3	4	5	6	7	8	9	10	11	12
A	83	80	83	78	111	123	123	111	83	92	92	95
B	82	82	83	83	123	123	126	111	86	83	88	117
C	115	98	111	111	102	92	91	98	111	123	111	96
D	123	111	98	80	86	80	111	104	104	111	99	99

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-2.03	-2.04	-2.04	-2.04	-2.03	-2.00	-2.02	-2.03	-2.04	-2.04	-2.03	-2.03
B	-2.04	-2.03	-2.04	-2.03	-2.03	-2.01	-2.02	-2.04	-2.04	-2.04	-2.03	-2.02
C	-2.02	-2.03	-2.03	-2.03	-2.04	-2.02	-2.00	-2.04	-2.03	-2.04	-2.03	-2.02
D	-2.03	-2.02	-2.03	-2.03	-2.02	-2.04	-2.04	-2.04	-2.02	-2.03	-2.03	-2.03

COTTON TUFT DIRECTIONAL ANGLES

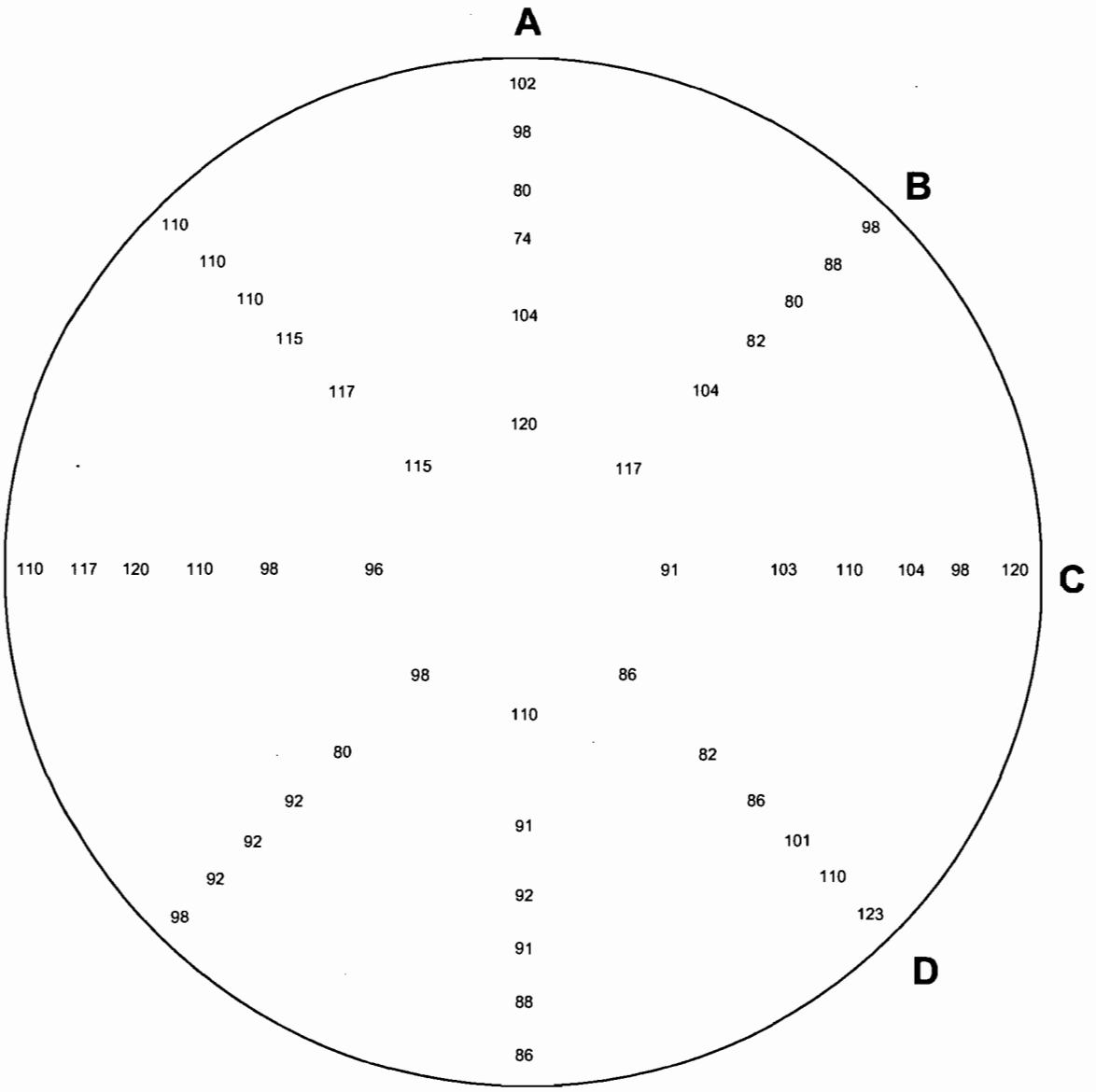
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**321**	**FPM**
MEAN TOTAL PRESSURE=	**-2.03**	**" H_2O**
RMS DEVIATION=	**14.8**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T6 Weighted*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T6*** ***Unit No. 1 - FINAL***	***PLATE No.*** *41*



MEAN WEIGHTED VELOCITY=	**321 FPM**
MEAN TOTAL PRESSURE=	**-2.04 " H_2O**
RMS DEVIATION=	**12.8 % OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7 °F**
PITOT CAL FACTOR=	**1.00**

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T7 Weighted*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T7*** ***Unit No. 1 - FINAL***	***PLATE No.*** *42*

NORMALIZED VELOCITY (%)

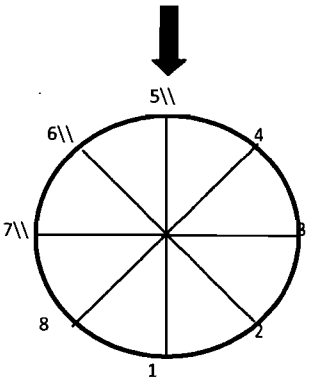
	1	2	3	4	5	6	7	8	9	10	11	12
A	102	98	80	74	104	120	110	91	92	91	88	86
B	98	88	80	82	104	117	98	80	92	92	92	98
C	120	98	104	110	103	91	96	98	110	120	117	110
D	123	110	101	86	82	86	115	117	115	110	110	110

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-2.04	-2.03	-2.04	-2.04	-2.04	-2.02	-2.04	-2.03	-2.04	-2.04	-2.04	-2.03
B	-2.03	-2.04	-2.04	-2.03	-2.03	-2.03	-2.02	-2.03	-2.04	-2.04	-2.04	-2.04
C	-2.04	-2.04	-2.03	-2.03	-2.04	-2.04	-2.04	-2.04	-2.04	-2.04	-2.04	-2.03
D	-2.03	-2.03	-2.04	-2.02	-2.04	-2.04	-2.04	-2.02	-2.04	-2.03	-2.04	-2.03

COTTON TUFT DIRECTIONAL ANGLES

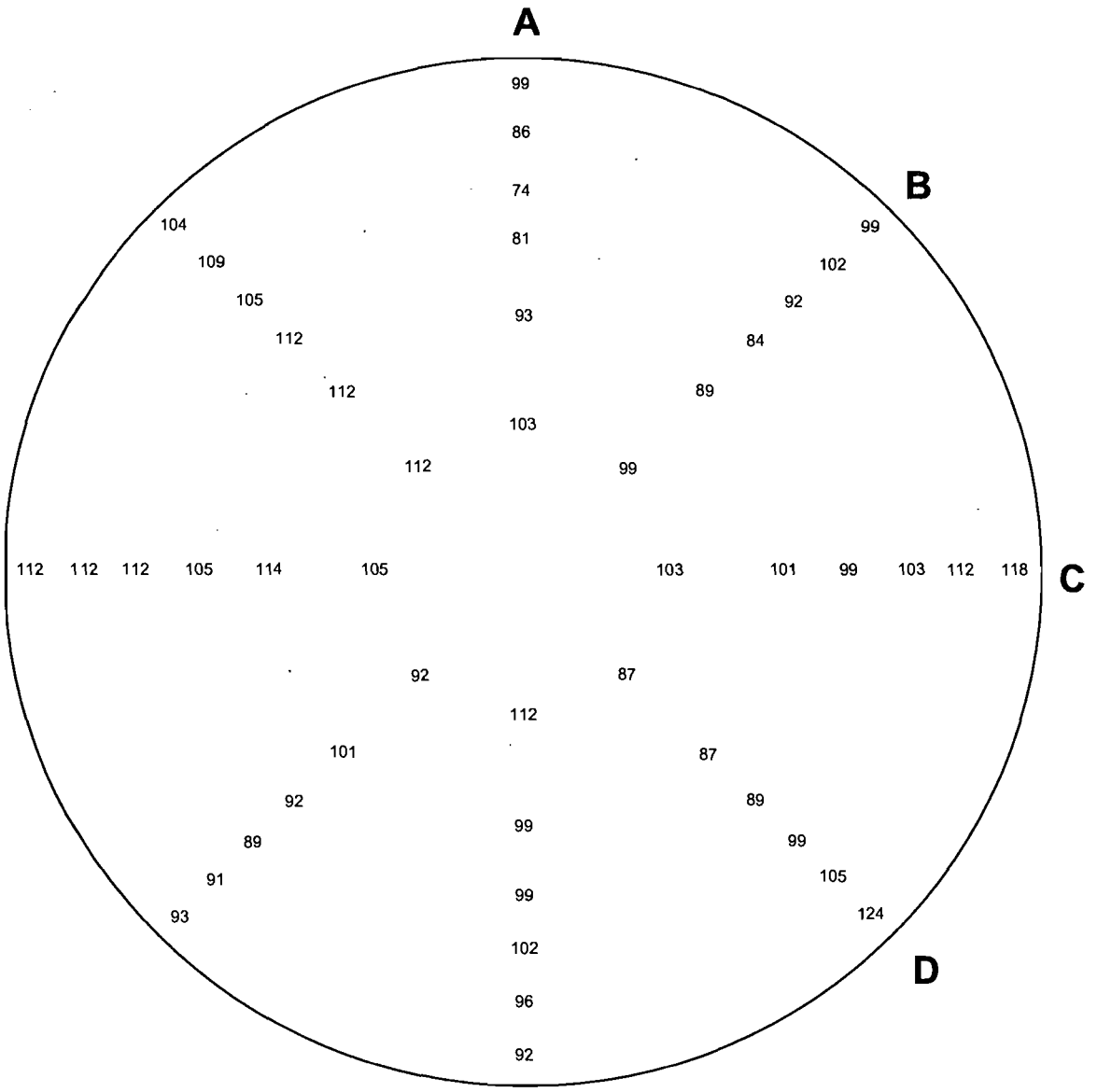
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**321**	**FPM**
MEAN TOTAL PRESSURE=	**-2.04**	**" H_2O**
RMS DEVIATION=	**12.8**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T7 Weighted*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T7*** ***Unit No. 1 - FINAL***	***PLATE No.*** *43*



MEAN WEIGHTED VELOCITY=	**317 FPM**
MEAN TOTAL PRESSURE=	**-2.04 " H_2O**
RMS DEVIATION=	**10.2 % OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7 °F**
PITOT CAL FACTOR=	**1.00**

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T8* *Weighted*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T8*** ***Unit No. 1 - FINAL***	***PLATE No.*** *44*

NORMALIZED VELOCITY (%)

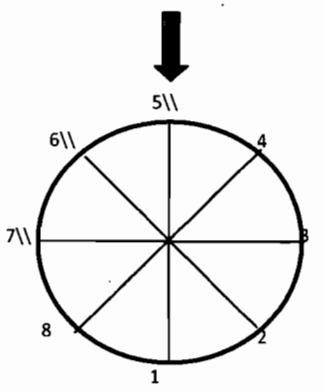
	1	2	3	4	5	6	7	8	9	10	11	12
A	99	86	74	81	93	103	112	99	99	102	96	92
B	99	102	92	84	89	99	92	101	92	89	91	93
C	118	112	103	99	101	103	105	114	105	112	112	112
D	124	105	99	89	87	87	112	112	112	105	109	104

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-2.04	-2.04	-2.03	-2.02	-2.04	-2.03	-2.04	-2.04	-2.04	-2.04	-2.04	-2.04
B	-2.04	-2.05	-2.05	-2.05	-2.04	-2.04	-2.05	-2.06	-2.04	-2.05	-2.05	-2.06
C	-2.04	-2.04	-2.05	-2.04	-2.04	-2.04	-2.04	-2.02	-2.04	-2.04	-2.04	-2.04
D	-2.02	-2.06	-2.05	-2.05	-2.05	-2.04	-2.04	-2.03	-2.04	-2.04	-2.03	-2.02

COTTON TUFT DIRECTIONAL ANGLES

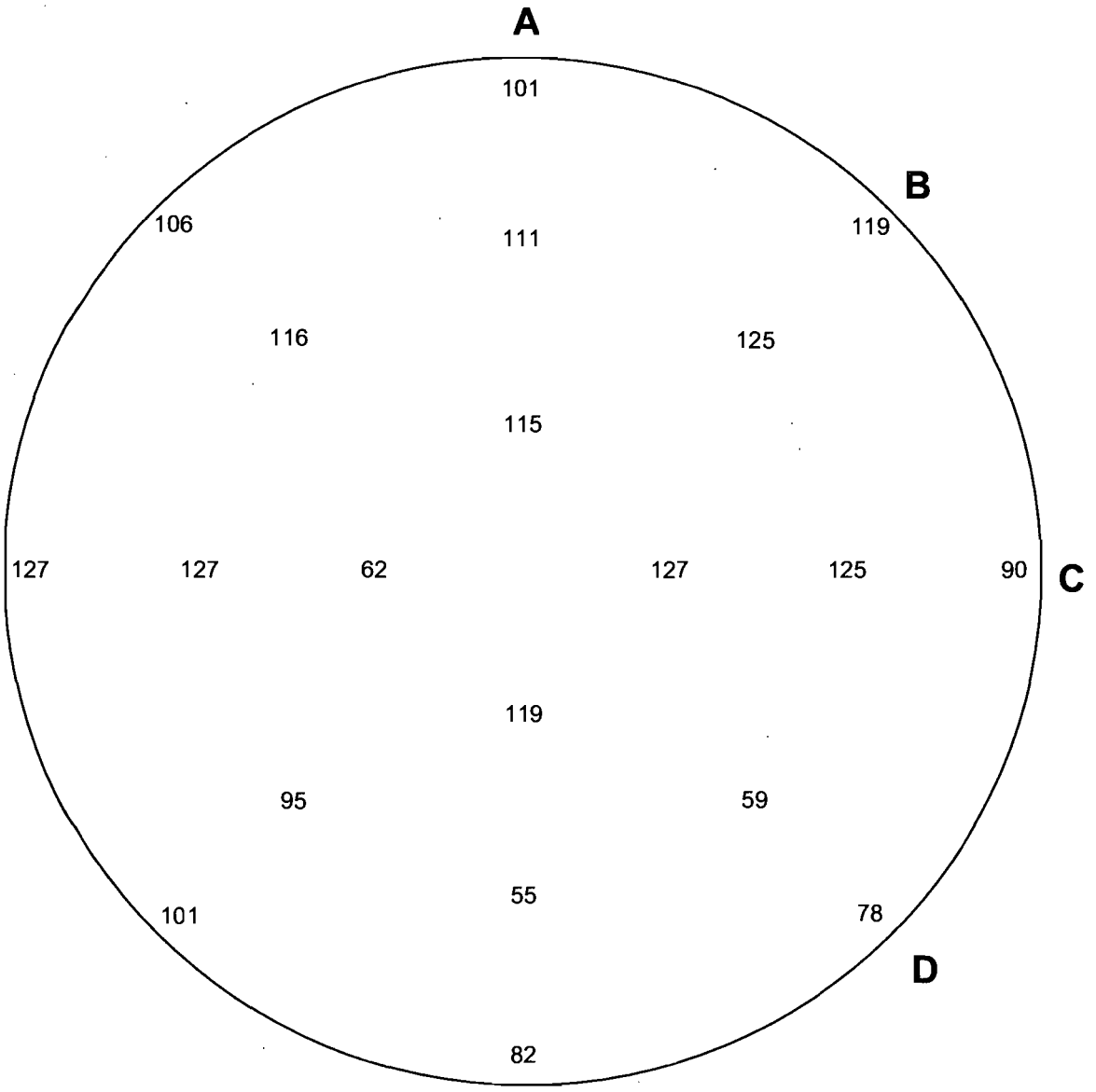
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**317**	**FPM**
MEAN TOTAL PRESSURE=	**-2.04**	**" H_2O**
RMS DEVIATION=	**10.2**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS	***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION	***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T8 Weighted*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T8*** ***Unit No. 1 - FINAL***	***PLATE No.*** *45*



MEAN VELOCITY=	3299 FPM
MEAN VELOCITY PRESSURE=	0.70 " H_2O
MEAN TOTAL PRESSURE=	-2.46 " H_2O
RMS DEVIATION=	22.0 % OF MEAN VELOCITY
GAS TEMPERATURE=	67.7 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T9*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T9* *Unit No. 1 - FINAL*	*PLATE No.* *46*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	101	111	115	119	55	82
B	119	125	127	62	95	101
C	90	91	70	101	127	127
D	78	59	108	115	116	106

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-2.16	-2.09	-2.08	-2.30	-3.18	-2.90
B	-2.10	-2.10	-2.36	-3.02	-2.88	-2.60
C	-2.40	-2.60	-2.96	-2.40	-2.10	-2.10
D	-2.96	-3.12	-2.38	-2.08	-2.12	-2.14

MEAN VELOCITY=	3299	FPM
MEAN VELOCITY PRESSURE=	0.70	" H_2O
MEAN TOTAL PRESSURE=	-2.46	" H_2O
RMS DEVIATION=	22.0	% OF MEAN VELOCITY
GAS TEMPERATURE=	67.7	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T9*
NCS Inc. *P096.10* *170511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T9* *Unit No. 1 - FINAL*	*PLATE No.* *47*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	ROW AVG
1	119	127	125	118	128	129	128	125
2	117	113	92	83	97	113	119	105
3	106	103	79	56	77	100	109	90
4	84	88	69	61	68	92	98	80
COL AVG	107	108	91	80	92	109	114	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-2.10	-2.11	-2.18	-2.28	-2.14	-2.10	-2.12
2	-2.14	-2.40	-2.77	-2.80	-2.66	-2.40	-2.11
3	-2.26	-2.50	-2.80	-3.00	-2.81	-2.44	-2.33
4	-2.50	-2.56	-2.84	-2.99	-2.88	-2.58	-2.41

MEAN VELOCITY=	**3245**	**FPM**
MEAN VELOCITY PRESSURE=	**0.68**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.47**	**" H_2O**
RMS DEVIATION=	**21.4**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T10*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T10*** ***Unit No. 1 - FINAL***	***PLATE No.*** *48*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	*ROW AVG*
1	103	98	87	84	90	101	105	*95*
2	113	94	82	84	83	98	117	*96*
3	115	106	95	91	92	108	108	*102*
4	104	115	109	92	105	117	108	*107*
COL AVG	*108*	*103*	*93*	*88*	*92*	*106*	*109*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-2.40	-2.55	-2.60	-2.62	-2.58	-2.46	-2.44
2	-2.28	-2.60	-2.80	-2.66	-2.70	-2.58	-2.18
3	-2.27	-2.44	-2.66	-2.64	-2.66	-2.44	-2.28
4	-2.40	-2.33	-2.44	-2.62	-2.40	-2.28	-2.44

MEAN VELOCITY=	**3174**	**FPM**
MEAN VELOCITY PRESSURE=	**0.63**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.49**	**" H_2O**
RMS DEVIATION=	**10.6**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**67.7**	**°F**
PITOT CAL FACTOR=	**.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*TV*
NCS Inc. ***P096.10*** ***170511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION TV*** ***Unit No. 1 - FINAL***	***PLATE No.*** *49*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	91	86	86	85	82	*86*
2	107	112	122	114	89	*109*
3	114	116	114	118	106	*114*
4	100	89	84	90	93	*91*
COL AVG	*103*	*101*	*102*	*102*	*92*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.36	-0.33	-0.37	-0.35	-0.36
2	-0.26	-0.18	-0.18	-0.20	-0.35
3	-0.24	-0.18	-0.19	-0.18	-0.29
4	-0.30	-0.36	-0.40	-0.38	-0.33

MEAN VELOCITY=	**2209**	**FPM**
MEAN VELOCITY PRESSURE=	**0.31**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.29**	**" H_2O**
RMS DEVIATION=	**13.4**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.1**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T1N*
NCS Inc. ***P096.10*** ***190511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1N*** ***UNIT No. 2 - EXISTING***	***PLATE No.*** *50*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	87	91	95	83	91	*89*
2	84	117	118	120	107	*109*
3	102	119	117	117	109	*113*
4	85	98	87	84	91	*89*
COL AVG	*90*	*106*	*104*	*101*	*99*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.36	-0.36	-0.29	-0.40	-0.31
2	-0.36	-0.18	-0.18	-0.18	-0.26
3	-0.29	-0.18	-0.18	-0.18	-0.24
4	-0.35	-0.33	-0.39	-0.38	-0.36

MEAN VELOCITY=	**2197**	**FPM**
MEAN VELOCITY PRESSURE=	**0.30**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.29**	**" H_2O**
RMS DEVIATION=	**13.6**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.1**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T1S*
NCS Inc. ***P096.10*** ***190511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1S*** ***UNIT No. 2 - EXISTING***	***PLATE No.*** *51*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-15	-33	-51	-36	0	*-27*
2	152	144	148	150	150	*149*
3	144	148	149	155	141	*147*
4	129	134	134	129	127	*131*
COL AVG	*103*	*98*	*95*	*100*	*104*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.24	-1.30	-1.31	-1.28	-1.24
2	-0.48	-0.57	-0.54	-0.54	-0.44
3	-0.39	-0.36	-0.30	-0.31	-0.40
4	-0.38	-0.38	-0.42	-0.36	-0.36

MEAN VELOCITY=	**2250**	**FPM**
MEAN VELOCITY PRESSURE=	**0.48**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.63**	**" H_2O**
RMS DEVIATION=	**74.3**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.1**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T2N*
NCS Inc. ***P096.10*** ***190511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T2N*** ***UNIT No. 2 - EXISTING***	***PLATE No.*** *52*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-15	-29	-36	-29	0	*-22*
2	150	148	130	152	151	*146*
3	139	145	151	145	139	*144*
4	136	136	136	128	122	*132*
COL AVG	*103*	*100*	*95*	*99*	*103*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.24	-1.22	-1.26	-1.25	-1.24
2	-0.46	-0.44	-0.47	-0.44	-0.44
3	-0.38	-0.36	-0.30	-0.36	-0.38
4	-0.36	-0.36	-0.36	-0.37	-0.33

MEAN VELOCITY=	**2283**	**FPM**
MEAN VELOCITY PRESSURE=	**0.48**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.60**	**" H_2O**
RMS DEVIATION=	**71.0**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.1**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T2S*
NCS Inc. ***P096.10*** ***190511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T2S*** ***UNIT No. 2 - EXISTING***	***PLATE No.*** *53*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	105	102	97	108	105	104
B	86	91	90	107	111	107
C	71	76	89	107	117	118
D	91	96	96	97	114	117

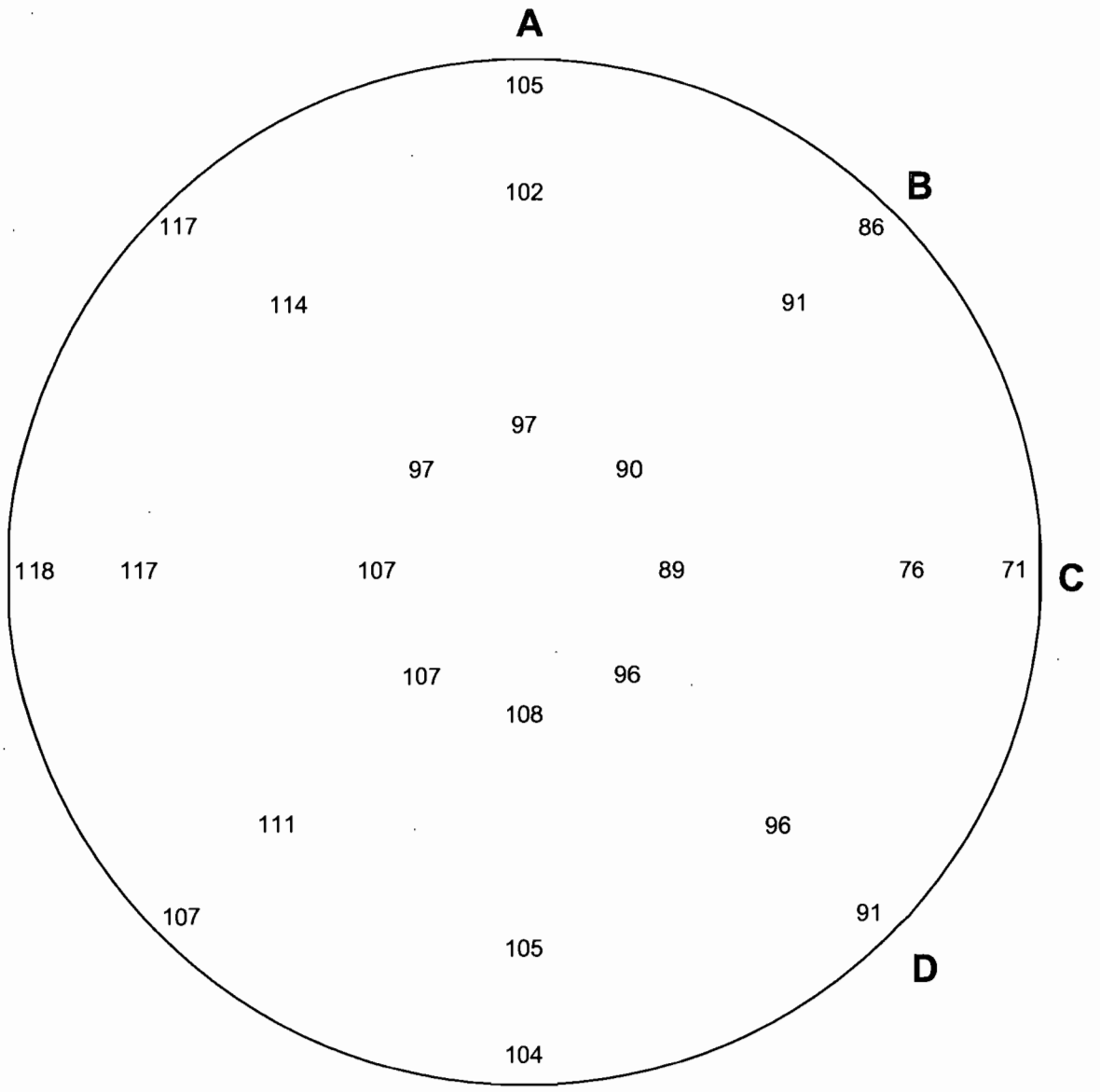
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.47	-0.55	-0.62	-0.50	-0.42	-0.42
B	-0.70	-0.68	-0.70	-0.44	-0.40	-0.36
C	-0.82	-0.80	-0.72	-0.49	-0.31	-0.24
D	-0.60	-0.65	-0.64	-0.64	-0.44	-0.36

MEAN VELOCITY=	3091	FPM
MEAN VELOCITY PRESSURE=	0.60	" H_2O
MEAN TOTAL PRESSURE=	-0.54	" H_2O
RMS DEVIATION=	12.1	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.1	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T3N*
NCS Inc. *P096.10* *190511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3N* *UNIT No. 2 - EXISTING*	*PLATE No.* *55*



MEAN VELOCITY=	3091 FPM
MEAN VELOCITY PRESSURE=	0.60 " H_2O
MEAN TOTAL PRESSURE=	-0.54 " H_2O
RMS DEVIATION=	12.1 % OF MEAN VELOCITY
GAS TEMPERATURE=	69.1 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T3N*
NCS Inc. *P096.10* *190511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3N* *UNIT No. 2 - EXISTING*	*PLATE No.* *54*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	109	110	109	89	87	77
B	105	108	110	96	93	86
C	92	103	102	105	106	105
D	87	93	97	109	112	109

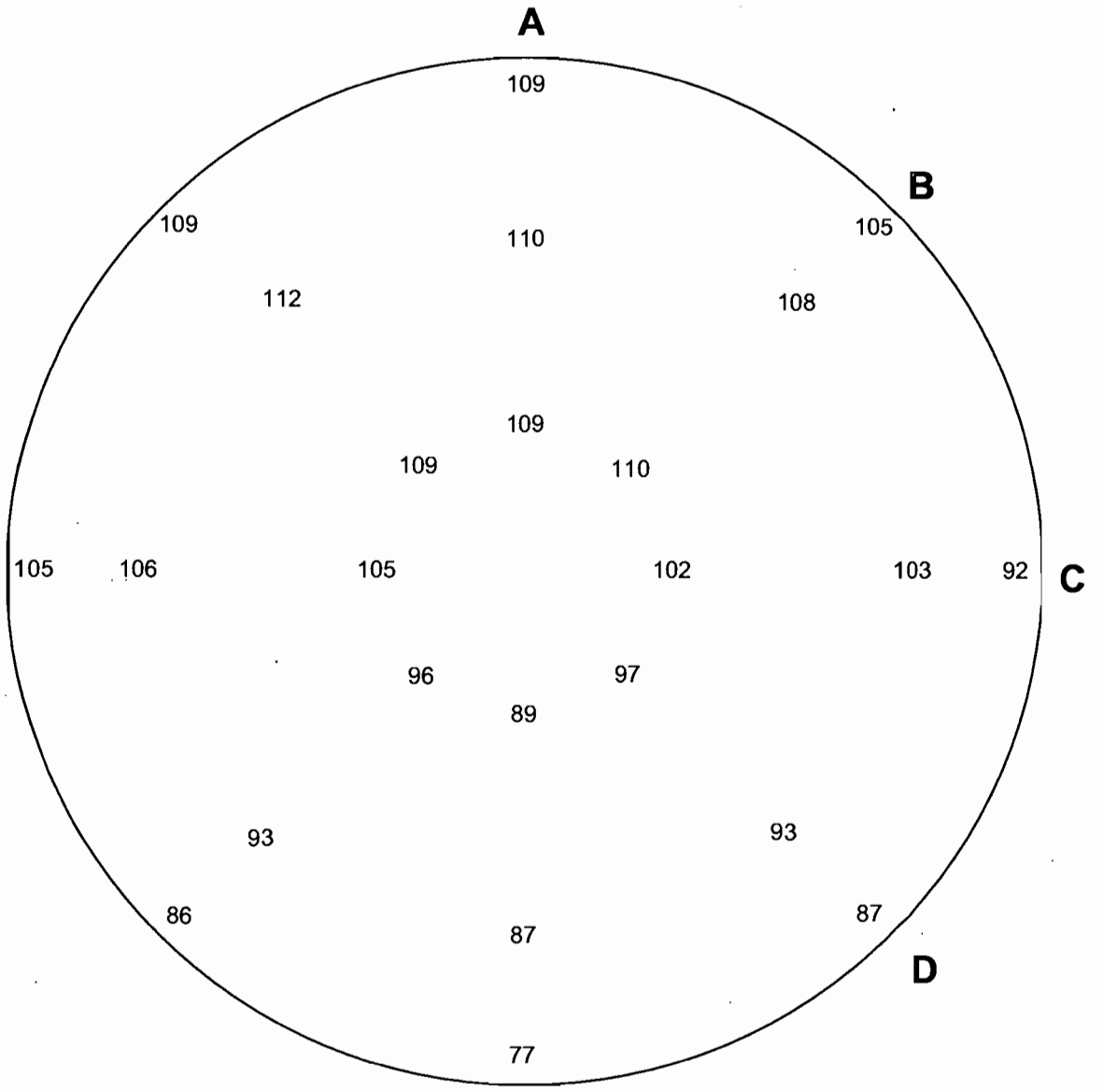
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.72	-0.73	-0.71	-1.00	-1.00	-1.06
B	-0.80	-0.70	-0.72	-0.90	-0.92	-1.02
C	-0.96	-0.80	-0.80	-0.80	-0.76	-0.88
D	-1.00	-0.95	-0.94	-0.76	-0.72	-0.80

MEAN VELOCITY=	3331	FPM
MEAN VELOCITY PRESSURE=	0.69	" H_2O
MEAN TOTAL PRESSURE=	-0.85	" H_2O
RMS DEVIATION=	9.6	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.1	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

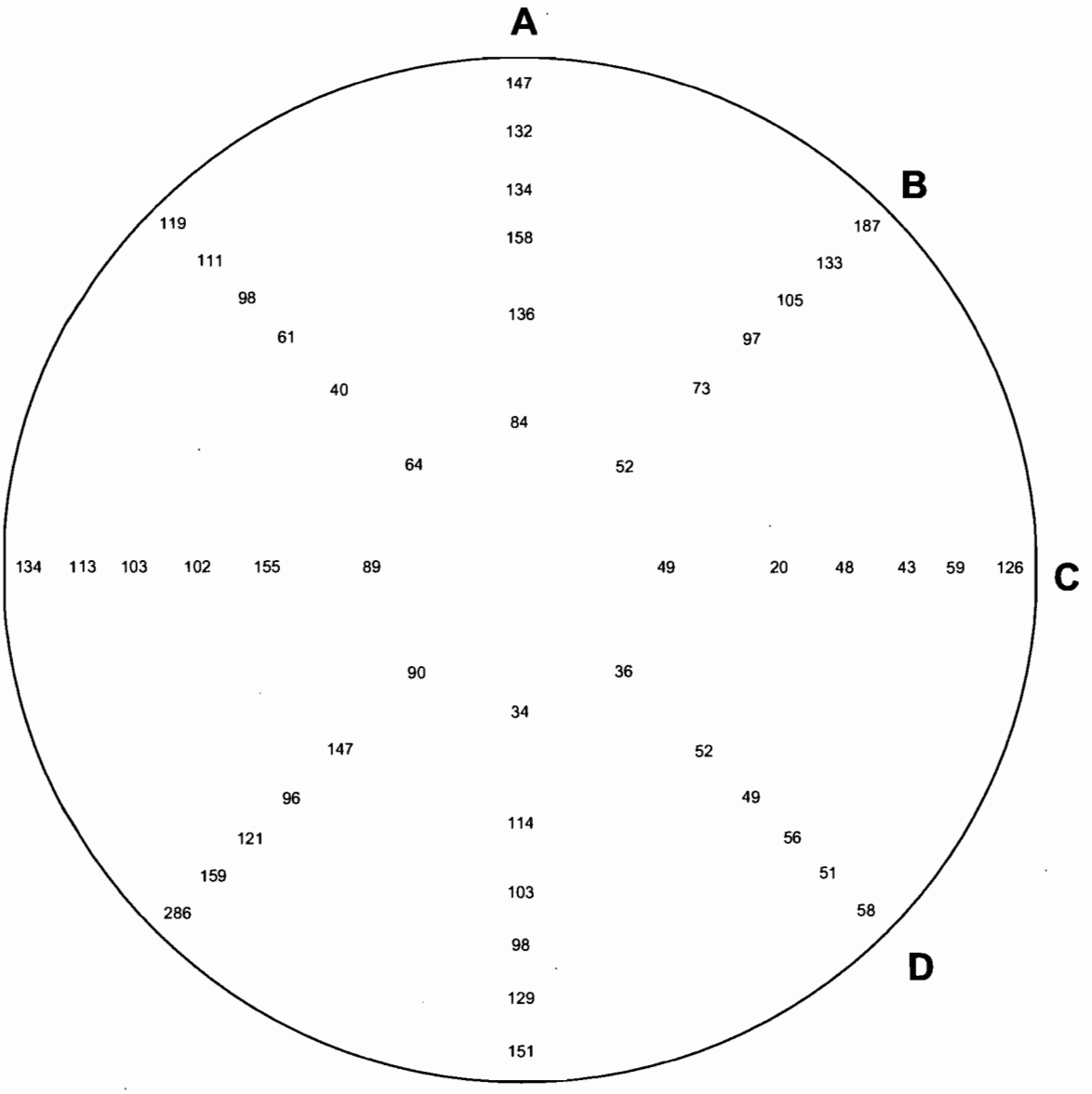
	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T5*
NCS Inc. *P096.10* *190511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *UNIT No. 2 - EXISTING*	*PLATE No.* *61*



MEAN VELOCITY=	3331 FPM
MEAN VELOCITY PRESSURE=	0.69 " H_2O
MEAN TOTAL PRESSURE=	-0.85 " H_2O
RMS DEVIATION=	9.6 % OF MEAN VELOCITY
GAS TEMPERATURE=	69.1 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T5*
NCS Inc. *P096.10* *190511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *UNIT No. 2 - EXISTING*	*PLATE No.* *60*



MEAN WEIGHTED VELOCITY=	**248 FPM**
MEAN TOTAL PRESSURE=	**-1.82 " H_2O**
RMS DEVIATION=	**49.2 % OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.1 °F**
PITOT CAL FACTOR=	**1.00**

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T6 Weighted*
NCS Inc. ***P096.10*** ***190511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T6*** ***UNIT No. 2 - EXISTING***	***PLATE No.*** *62*

NORMALIZED VELOCITY (%)

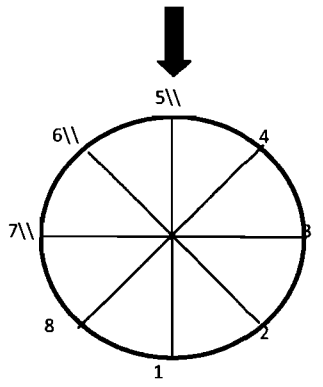
	1	2	3	4	5	6	7	8	9	10	11	12
A	147	132	134	158	136	84	34	114	103	98	129	151
B	187	133	105	97	73	52	90	147	96	121	159	286
C	126	59	43	48	20	49	89	155	102	103	113	134
D	58	51	56	49	52	36	64	40	61	98	111	119

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-1.80	-1.81	-1.82	-1.82	-1.82	-1.82	-1.82	-1.82	-1.82	-1.82	-1.81	-1.81
B	-1.81	-1.81	-1.81	-1.82	-1.82	-1.82	-1.82	-1.82	-1.81	-1.82	-1.82	-1.80
C	-1.80	-1.82	-1.82	-1.80	-1.80	-1.82	-1.80	-1.82	-1.82	-1.80	-1.82	-1.80
D	-1.80	-1.82	-1.83	-1.83	-1.83	-1.83	-1.82	-1.82	-1.82	-1.80	-1.82	-1.82

COTTON TUFT DIRECTIONAL ANGLES

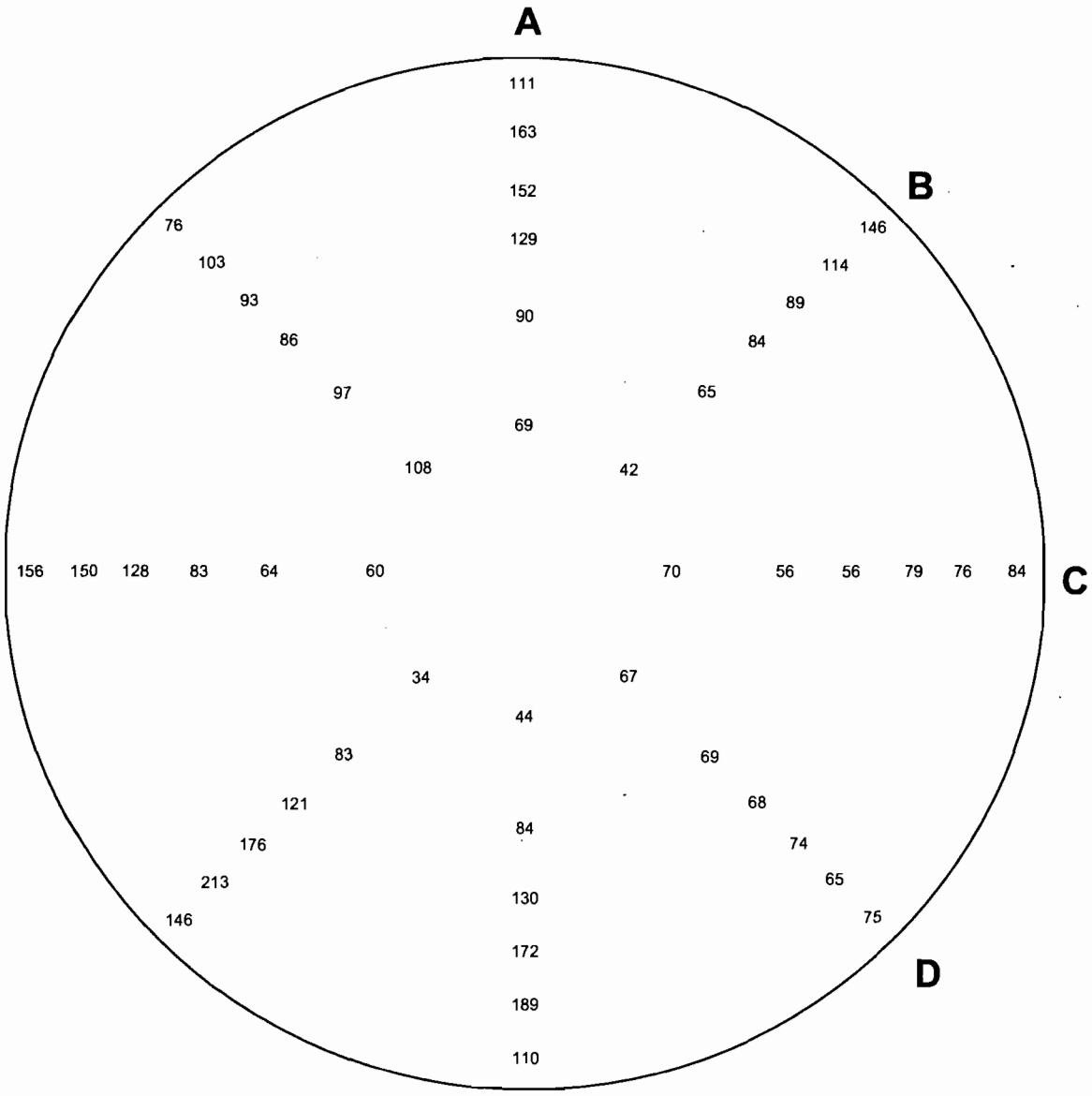
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	248	FPM
MEAN TOTAL PRESSURE=	-1.82	" H_2O
RMS DEVIATION=	49.2	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.1	°F
PITOT CAL FACTOR=	1.00	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T6* *Weighted*
NCS Inc. *P096.10* *190511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T6* *UNIT No. 2 - EXISTING*	*PLATE No.* 63



MEAN WEIGHTED VELOCITY=	**310 FPM**
MEAN TOTAL PRESSURE=	**-1.82 " H_2O**
RMS DEVIATION=	**41.6 % OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.1 °F**
PITOT CAL FACTOR=	**1.00**

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T7* *Weighted*
NCS Inc. ***P096.10*** ***190511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T7*** ***UNIT No. 2 - EXISTING***	***PLATE No.*** *64*

NORMALIZED VELOCITY (%)

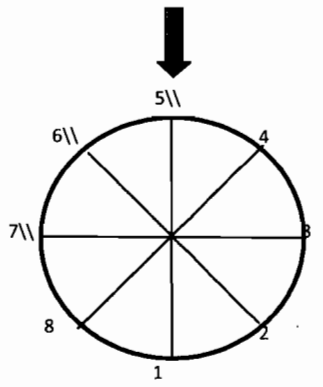
	1	2	3	4	5	6	7	8	9	10	11	12
A	111	163	152	129	90	69	44	84	130	172	189	110
B	146	114	89	84	65	42	34	83	121	176	213	146
C	84	76	79	56	56	70	60	64	83	128	150	156
D	75	65	74	68	69	67	108	97	86	93	103	76

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-1.82	-1.82	-1.82	-1.82	-1.83	-1.83	-1.83	-1.83	-1.83	-1.83	-1.84	-1.84
B	-1.83	-1.82	-1.82	-1.84	-1.83	-1.83	-1.83	-1.83	-1.83	-1.83	-1.83	-1.83
C	-1.82	-1.82	-1.82	-1.83	-1.83	-1.83	-1.82	-1.81	-1.82	-1.80	-1.80	-1.80
D	-1.83	-1.84	-1.83	-1.83	-1.84	-1.84	-1.82	-1.82	-1.80	-1.80	-1.80	-1.82

COTTON TUFT DIRECTIONAL ANGLES

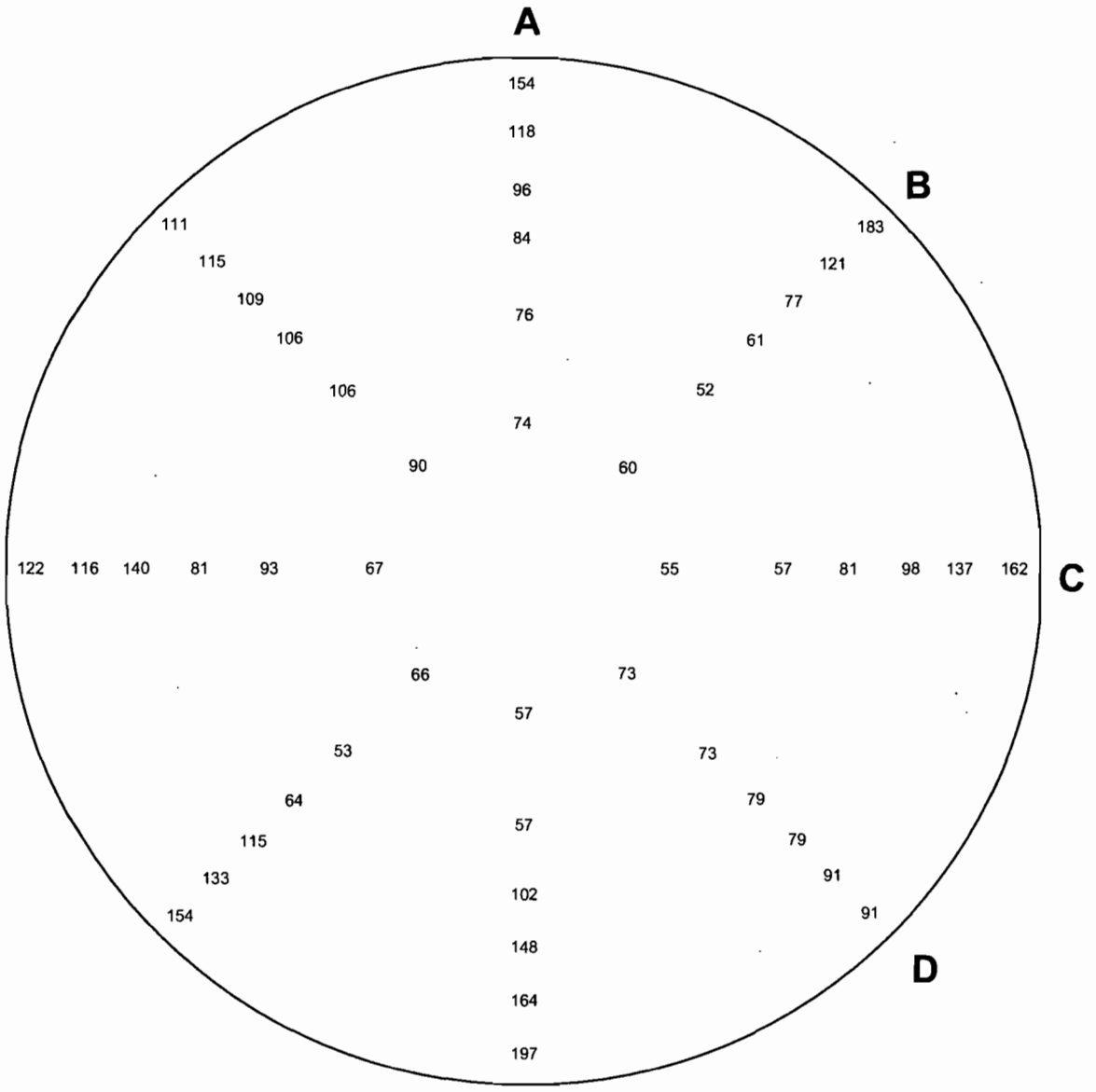
	1	2	3	4	5	6	7	8	9	10	11	12
A	2	1	1	1	1	1	1	1	1	1	1	8
B	2	1	1	1	1	2	2	1	1	1	1	2
C	2	2	1	1	1	1	1	1	1	1	1	1
D	2	2	1	1	1	1	1	1	1	1	1	2



MEAN WEIGHTED VELOCITY=	**310**	**FPM**
MEAN TOTAL PRESSURE=	**-1.82**	**" H_2O**
RMS DEVIATION=	**41.6**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.1**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T7* *Weighted*
NCS Inc. ***P096.10*** ***190511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T7*** ***UNIT No. 2 - EXISTING***	***PLATE No.*** *65*



MEAN WEIGHTED VELOCITY=	324 FPM
MEAN TOTAL PRESSURE=	-1.83 " H_2O
RMS DEVIATION=	36.2 % OF MEAN VELOCITY
GAS TEMPERATURE=	69.1 °F
PITOT CAL FACTOR=	1.00

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T8* *Weighted*
NCS Inc. *P096.10* *190511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T8* *UNIT No. 2 - EXISTING*	*PLATE No.* *66*

NORMALIZED VELOCITY (%)

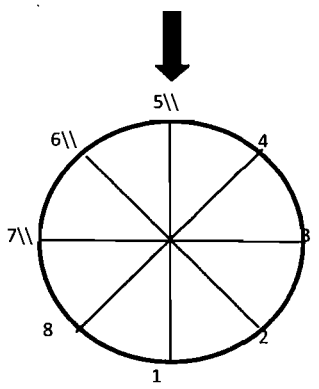
	1	2	3	4	5	6	7	8	9	10	11	12
A	154	118	96	84	76	74	57	57	102	148	164	197
B	183	121	77	61	52	60	66	53	64	115	133	154
C	162	137	98	81	57	55	67	93	81	140	116	122
D	91	91	79	79	73	73	90	106	106	109	115	111

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-1.84	-1.83	-1.83	-1.83	-1.84	-1.83	-1.84	-1.84	-1.83	-1.84	-1.83	-1.84
B	-1.83	-1.83	-1.84	-1.84	-1.84	-1.83	-1.84	-1.83	-1.83	-1.83	-1.83	-1.88
C	-1.83	-1.82	-1.83	-1.83	-1.84	-1.82	-1.83	-1.82	-1.82	-1.80	-1.82	-1.82
D	-1.84	-1.84	-1.83	-1.84	-1.84	-1.84	-1.82	-1.82	-1.83	-1.83	-1.80	-1.82

COTTON TUFT DIRECTIONAL ANGLES

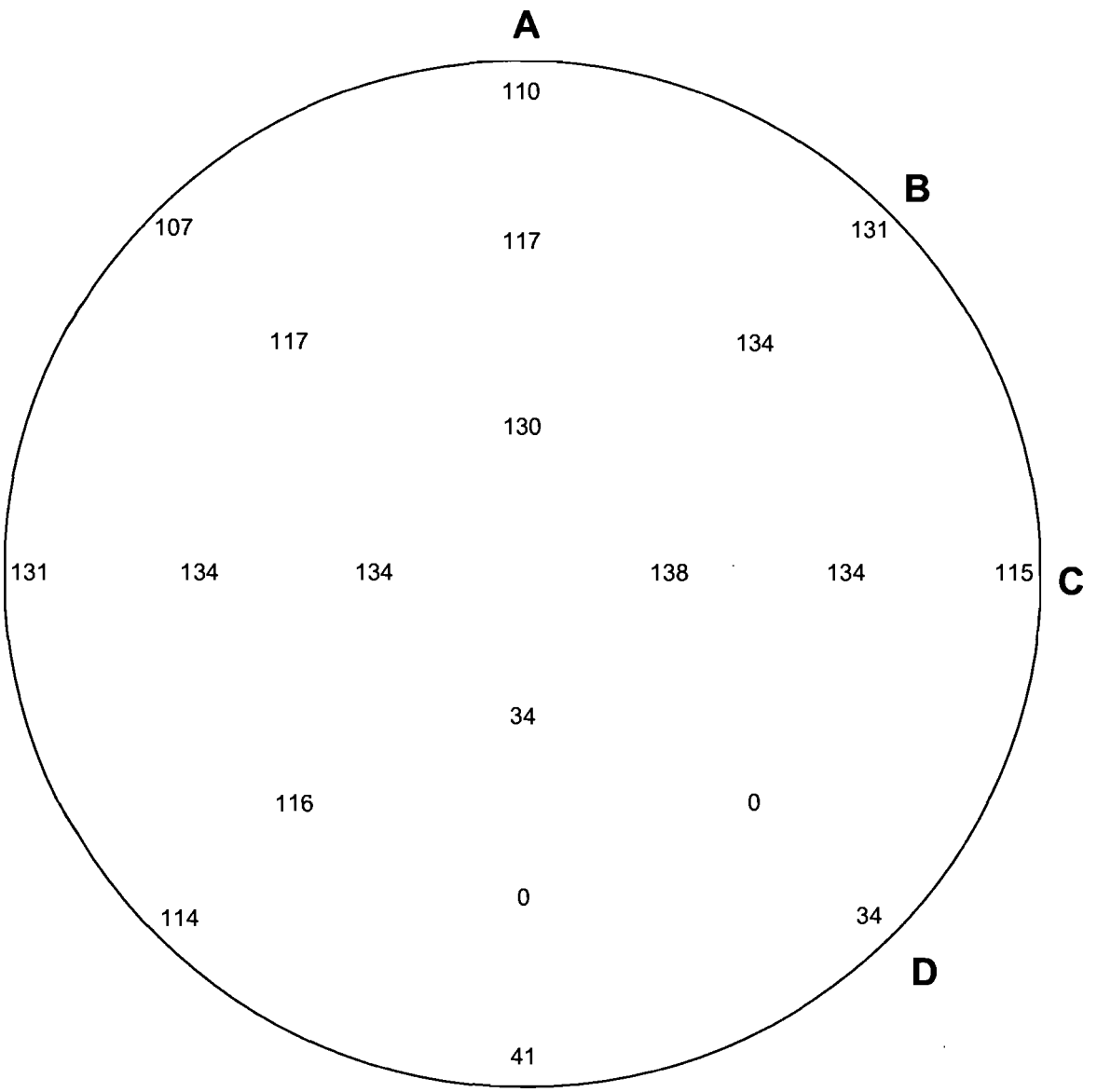
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	324	FPM
MEAN TOTAL PRESSURE=	-1.83	" H_2O
RMS DEVIATION=	36.2	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.1	°F
PITOT CAL FACTOR=	1.00	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T8* *Weighted*
NCS Inc. *P096.10* *190511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T8* *UNIT No. 2 - EXISTING*	*PLATE No.* *67*



MEAN VELOCITY=	3405 FPM
MEAN VELOCITY PRESSURE=	0.86 " H_2O
MEAN TOTAL PRESSURE=	-2.30 " H_2O
RMS DEVIATION=	45.2 % OF MEAN VELOCITY
GAS TEMPERATURE=	69.1 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T9*
NCS Inc. *P096.10* *190511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T9* *UNIT No. 2 - EXISTING*	*PLATE No.* *68*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	110	117	130	34	0	41
B	131	134	138	134	116	114
C	115	127	134	132	134	131
D	34	0	39	131	117	107

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-2.00	-1.80	-1.80	-3.33	-3.44	-3.34
B	-2.10	-1.88	-1.80	-1.96	-1.96	-2.44
C	-2.28	-2.14	-1.80	-1.80	-1.80	-1.88
D	-3.33	-3.40	-3.24	-1.88	-1.88	-2.00

MEAN VELOCITY=	**3405**	**FPM**
MEAN VELOCITY PRESSURE=	**0.86**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.30**	**" H_2O**
RMS DEVIATION=	**45.2**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.1**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T9*
NCS Inc. ***P096.10*** ***190511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T9*** ***UNIT No. 2 - EXISTING***	***PLATE No.*** *69*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	*ROW AVG*
1	118	134	137	130	138	137	126	*131*
2	109	120	118	131	120	121	110	*118*
3	100	89	65	66	77	107	95	*86*
4	81	60	42	40	58	89	81	*65*
COL AVG	*102*	*101*	*90*	*92*	*98*	*114*	*103*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-2.08	-1.90	-1.96	-2.02	-1.90	-1.96	-1.95
2	-2.22	-2.12	-2.30	-2.40	-2.36	-2.00	-2.22
3	-2.33	-2.60	-2.80	-2.88	-2.80	-2.38	-2.38
4	-2.60	-2.88	-3.00	-3.00	-2.88	-2.44	-2.60

MEAN VELOCITY=	**3332**	**FPM**
MEAN VELOCITY PRESSURE=	**0.74**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.39**	**" H_2O**
RMS DEVIATION=	**29.3**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.1**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T10*
NCS Inc. ***P096.10*** ***190511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T10*** ***UNIT No. 2 - EXISTING***	***PLATE No.*** *70*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	ROW AVG
1	100	102	96	92	96	103	103	99
2	111	100	96	92	96	110	112	102
3	105	102	92	90	102	108	100	100
4	104	100	91	97	103	105	99	100
COL AVG	105	101	93	92	99	106	103	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-2.38	-2.40	-2.33	-2.44	-2.40	-2.30	-2.28
2	-2.28	-2.33	-2.41	-2.48	-2.44	-2.18	-2.18
3	-2.22	-2.38	-2.44	-2.51	-2.41	-2.22	-2.36
4	-2.20	-2.33	-2.46	-2.44	-2.33	-2.33	-2.40

MEAN VELOCITY=	3266	FPM
MEAN VELOCITY PRESSURE=	0.66	" H_2O
MEAN TOTAL PRESSURE=	-2.35	" H_2O
RMS DEVIATION=	5.9	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.1	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	***TV***
NCS Inc. ***P096.10*** ***190511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION TV*** ***UNIT No. 2 - EXISTING***	***PLATE No.*** ***71***

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	85	91	83	90	83	*87*
2	108	95	118	118	91	*106*
3	112	118	117	120	103	*114*
4	101	91	90	89	94	*93*
COL AVG	*101*	*99*	*102*	*104*	*93*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.33	-0.30	-0.37	-0.33	-0.36
2	-0.26	-0.18	-0.18	-0.17	-0.30
3	-0.24	-0.18	-0.18	-0.18	-0.27
4	-0.30	-0.33	-0.36	-0.37	-0.30

MEAN VELOCITY=	**2181**	**FPM**
MEAN VELOCITY PRESSURE=	**0.30**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.27**	**" H_2O**
RMS DEVIATION=	**12.8**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T1N*
NCS Inc. ***P096.10*** ***180511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1N*** ***UNIT No. 2 - FINAL***	***PLATE No.*** *72*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	ROW AVG
1	84	92	91	84	91	88
2	89	115	116	114	104	107
3	102	119	119	121	108	113
4	84	102	85	91	94	91
COL AVG	90	107	102	102	99	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.33	-0.33	-0.30	-0.36	-0.31
2	-0.34	-0.18	-0.18	-0.20	-0.24
3	-0.30	-0.18	-0.18	-0.17	-0.24
4	-0.38	-0.30	-0.36	-0.34	-0.33

MEAN VELOCITY=	**2172**	**FPM**
MEAN VELOCITY PRESSURE=	**0.29**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.28**	**" H_2O**
RMS DEVIATION=	**12.9**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T1S*
NCS Inc. ***P096.10*** ***180511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1S*** ***UNIT No. 2 - FINAL***	***PLATE No.*** *73*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-22	-39	-55	-50	0	*-33*
2	162	149	132	105	149	*140*
3	149	156	159	159	142	*153*
4	133	140	135	153	142	*141*
COL AVG	*105*	*102*	*93*	*92*	*108*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.22	-1.24	-1.26	-1.25	-1.24
2	-0.46	-0.68	-0.72	-0.98	-0.69
3	-0.36	-0.35	-0.28	-0.33	-0.44
4	-0.37	-0.36	-0.39	-0.28	-0.26

MEAN VELOCITY=	**2092**	**FPM**
MEAN VELOCITY PRESSURE=	**0.43**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.66**	**" H_2O**
RMS DEVIATION=	**78.6**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T2N*
NCS Inc. ***P096.10*** ***180511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T2N*** ***UNIT No. 2 - FINAL***	***PLATE No.*** *74*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-26	-30	-53	-37	0	*-29*
2	149	152	142	160	156	*152*
3	139	148	152	149	143	*146*
4	136	134	131	134	123	*132*
COL AVG	*99*	*101*	*93*	*101*	*106*	

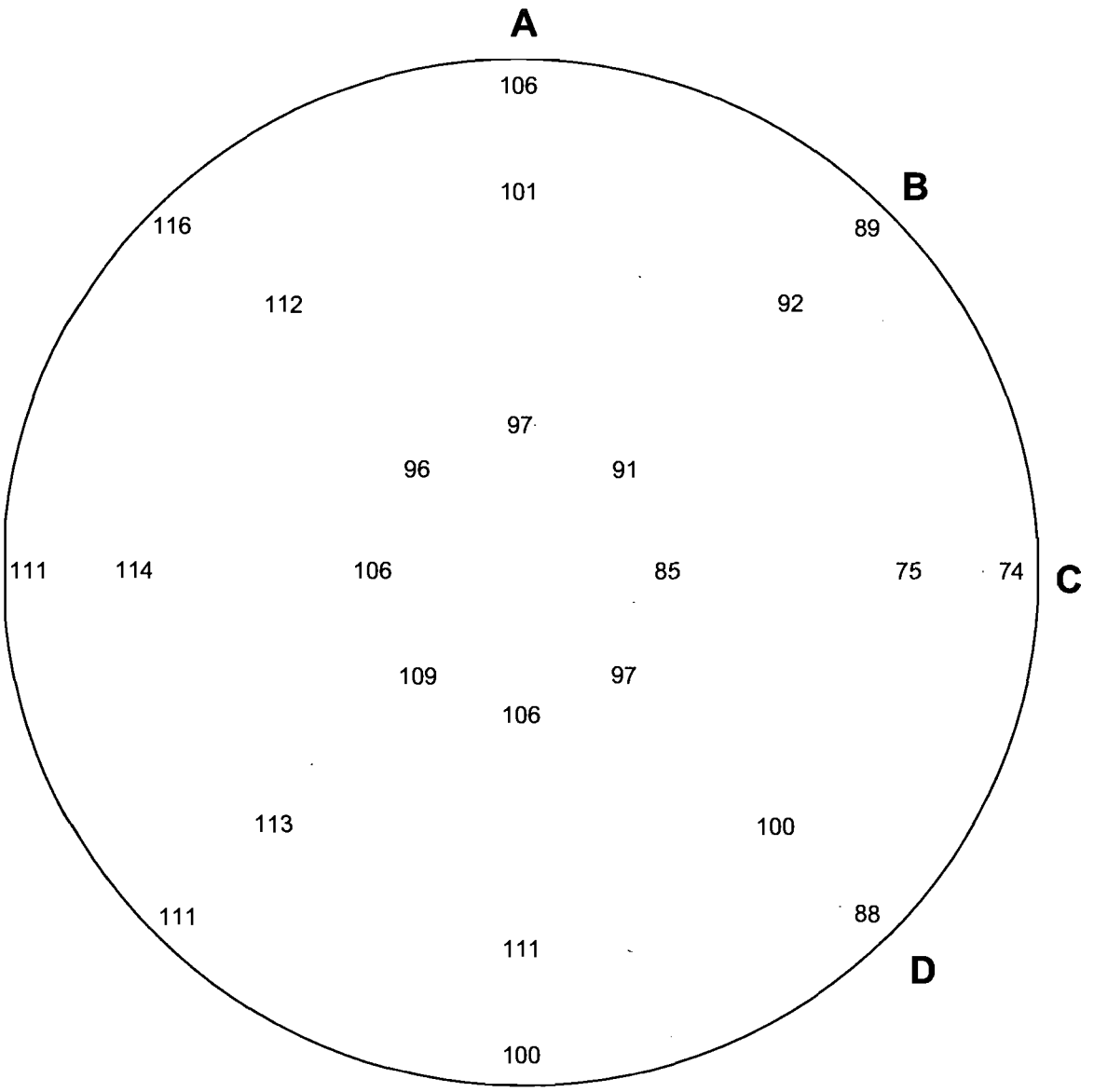
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.18	-1.22	-1.23	-1.22	-1.20
2	-0.44	-0.46	-0.58	-0.47	-0.40
3	-0.38	-0.60	-0.30	-0.35	-0.36
4	-0.33	-0.37	-0.42	-0.37	-0.37

MEAN VELOCITY=	**2194**	**FPM**
MEAN VELOCITY PRESSURE=	**0.46**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.61**	**" H_2O**
RMS DEVIATION=	**75.6**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T2S*
NCS Inc. ***P096.10*** ***180511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T2S*** ***UNIT No. 2 - FINAL***	***PLATE No.*** *75*



MEAN VELOCITY=	3060 FPM
MEAN VELOCITY PRESSURE=	0.58 " H_2O
MEAN TOTAL PRESSURE=	-0.52 " H_2O
RMS DEVIATION=	11.7 % OF MEAN VELOCITY
GAS TEMPERATURE=	69.0 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3N*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3N* *UNIT No. 2 - FINAL*	*PLATE No.* *76*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	106	101	97	106	111	100
B	89	92	91	109	113	111
C	74	75	85	106	114	111
D	88	100	97	96	112	116

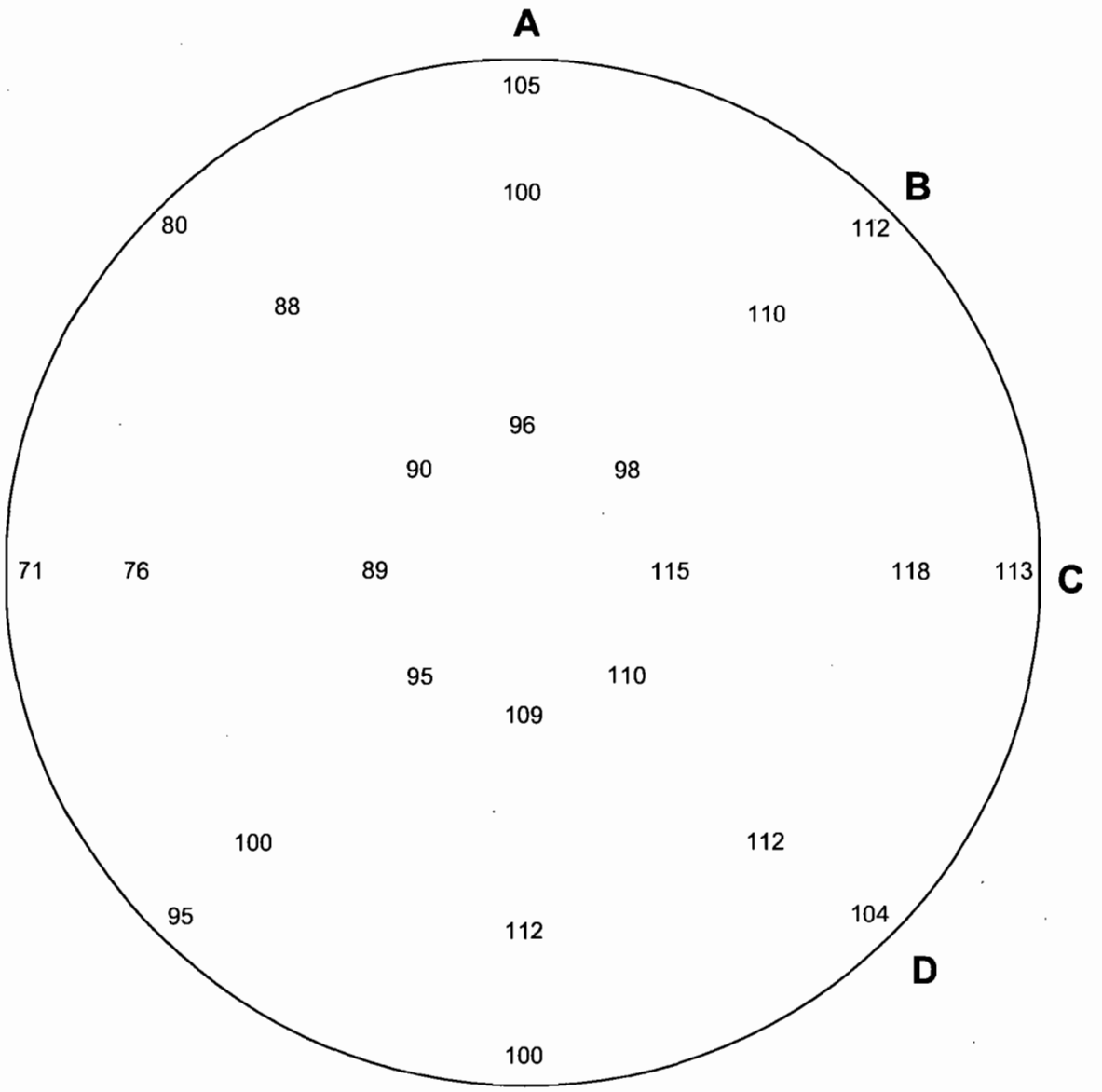
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.46	-0.55	-0.64	-0.47	-0.38	-0.42
B	-0.68	-0.62	-0.68	-0.46	-0.37	-0.35
C	-0.80	-0.78	-0.68	-0.52	-0.30	-0.30
D	-0.60	-0.52	-0.58	-0.58	-0.38	-0.36

MEAN VELOCITY=	3060	FPM
MEAN VELOCITY PRESSURE=	0.58	" H_2O
MEAN TOTAL PRESSURE=	-0.52	" H_2O
RMS DEVIATION=	11.7	% OF MEAN VELOCITY
GAS TEMPERATURE=	69	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3N*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3N* *UNIT No. 2 - FINAL*	*PLATE No.* *77*



MEAN VELOCITY=	3108 FPM
MEAN VELOCITY PRESSURE=	0.60 " H_2O
MEAN TOTAL PRESSURE=	-0.52 " H_2O
RMS DEVIATION=	12.5 % OF MEAN VELOCITY
GAS TEMPERATURE=	69.0 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T3S*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3S* *UNIT No. 2 - FINAL*	*PLATE No.* *78*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	105	100	96	109	112	100
B	112	110	98	95	100	95
C	113	118	115	89	76	71
D	104	112	110	90	88	80

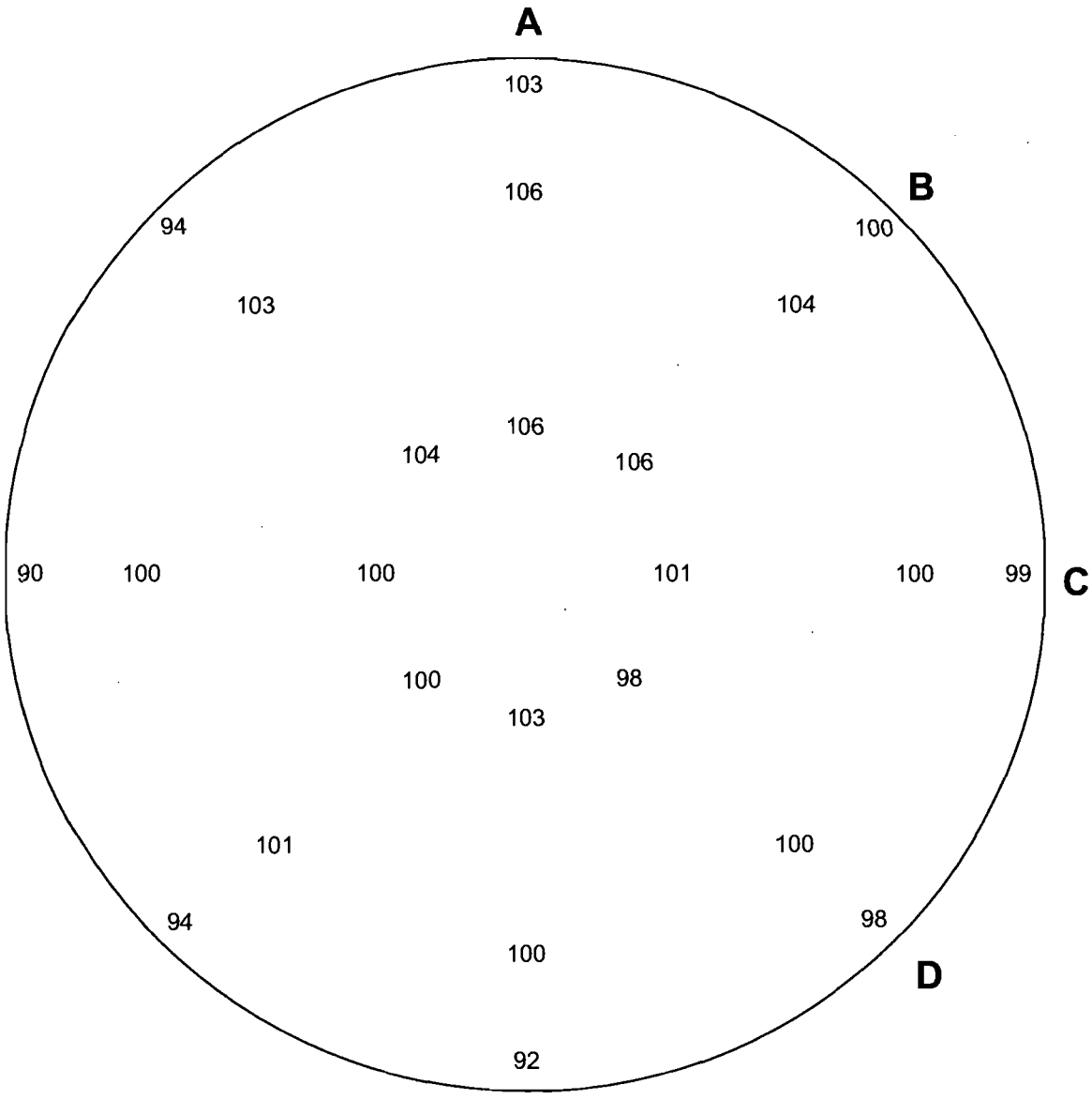
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.48	-0.50	-0.60	-0.52	-0.42	-0.46
B	-0.34	-0.35	-0.55	-0.62	-0.50	-0.52
C	-0.30	-0.33	-0.50	-0.69	-0.79	-0.79
D	-0.38	-0.37	-0.44	-0.68	-0.67	-0.74

MEAN VELOCITY=	3108	FPM
MEAN VELOCITY PRESSURE=	0.60	" H_2O
MEAN TOTAL PRESSURE=	-0.52	" H_2O
RMS DEVIATION=	12.5	% OF MEAN VELOCITY
GAS TEMPERATURE=	69	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3S*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3S* *UNIT No. 2 - FINAL*	*PLATE No.* *79*



MEAN VELOCITY=	3329	FPM
MEAN VELOCITY PRESSURE=	0.68	" H_2O
MEAN TOTAL PRESSURE=	-0.60	" H_2O
RMS DEVIATION=	4.2	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.0	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T4*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T4* *UNIT No. 2 - FINAL*	*PLATE No.* *80*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	103	106	106	103	100	92
B	100	104	106	100	101	94
C	99	100	101	100	100	90
D	98	100	98	104	103	94

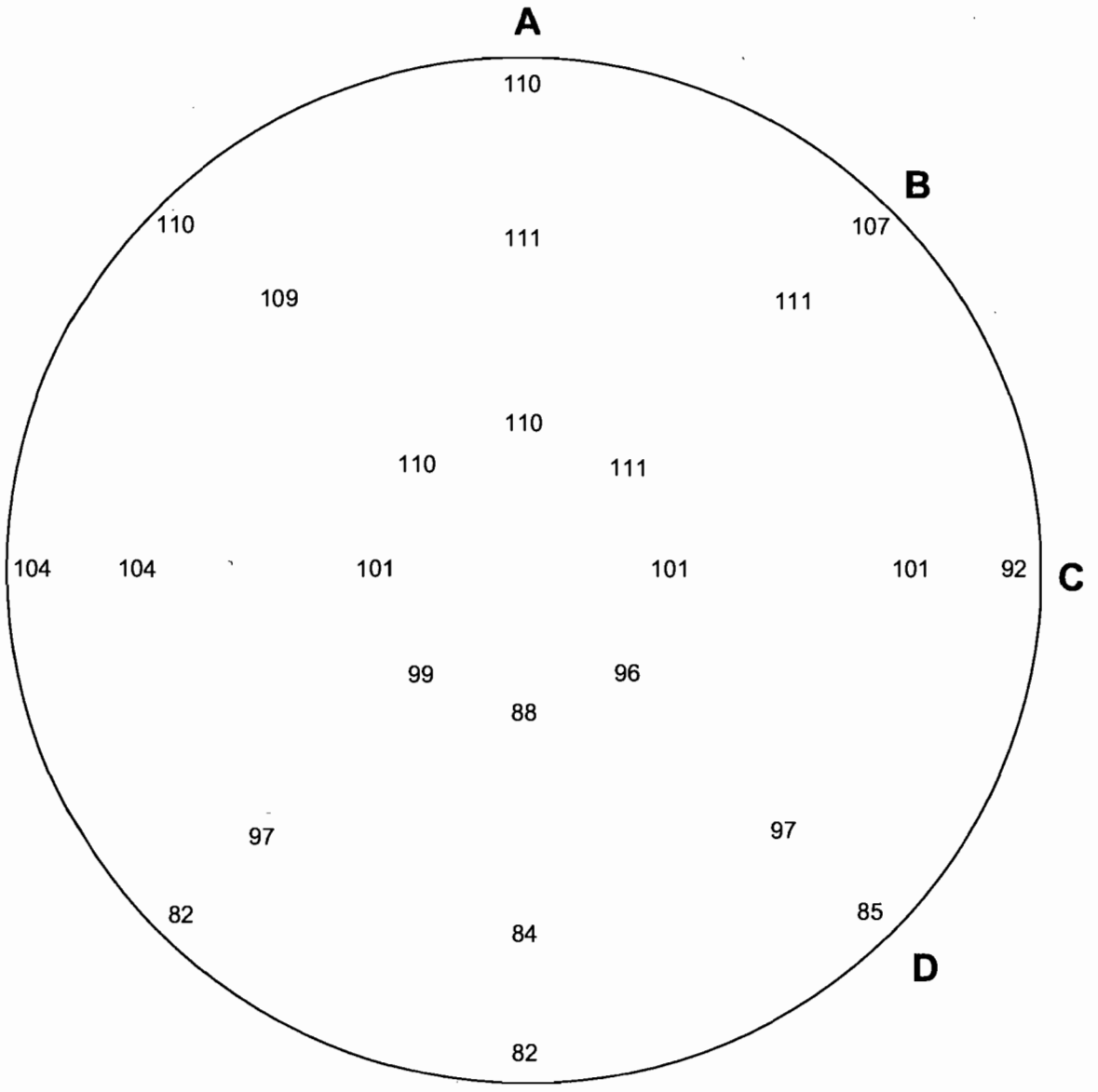
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.66	-0.58	-0.60	-0.54	-0.56	-0.55
B	-0.60	-0.60	-0.56	-0.60	-0.61	-0.60
C	-0.68	-0.58	-0.62	-0.61	-0.58	-0.64
D	-0.64	-0.60	-0.60	-0.57	-0.58	-0.66

MEAN VELOCITY=	3329	FPM
MEAN VELOCITY PRESSURE=	0.68	" H_2O
MEAN TOTAL PRESSURE=	-0.60	" H_2O
RMS DEVIATION=	4.2	% OF MEAN VELOCITY
GAS TEMPERATURE=	69	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T4*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T4* *UNIT No. 2 - FINAL*	*PLATE No.* *81*



MEAN VELOCITY=	3300	FPM
MEAN VELOCITY PRESSURE=	0.67	" H_2O
MEAN TOTAL PRESSURE=	-0.83	" H_2O
RMS DEVIATION=	9.8	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.0	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T5*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *UNIT No. 2 - FINAL*	*PLATE No.* *82*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	110	111	110	88	84	82
B	107	111	111	99	97	82
C	92	101	101	101	104	104
D	85	97	96	110	109	110

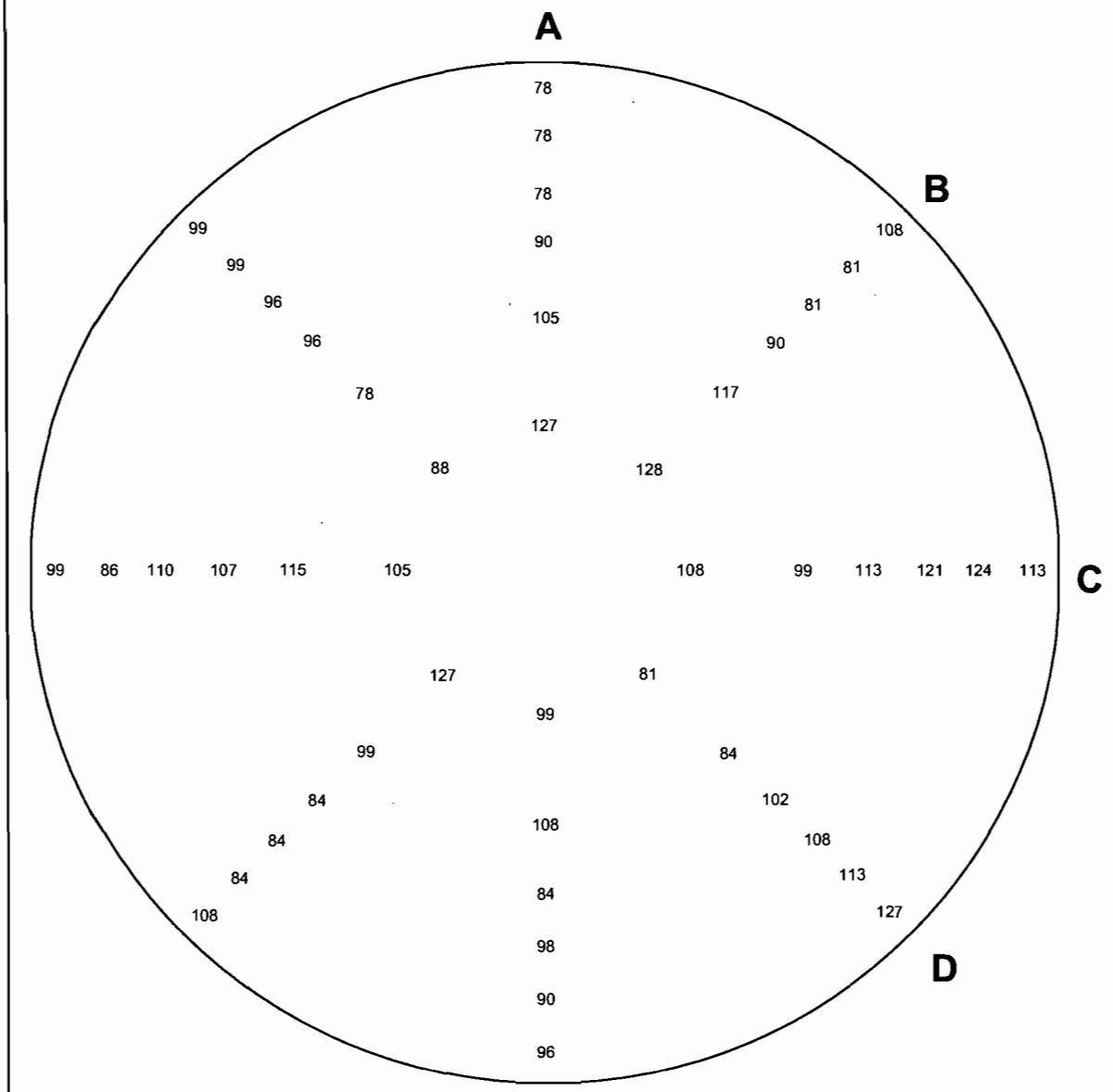
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.77	-0.66	-0.71	-0.96	-1.01	-1.06
B	-0.77	-0.71	-0.73	-0.89	-0.90	-1.00
C	-0.88	-0.77	-0.84	-0.80	-0.77	-0.76
D	-1.00	-0.92	-0.90	-0.72	-0.70	-0.72

MEAN VELOCITY=	3300	FPM
MEAN VELOCITY PRESSURE=	0.67	" H_2O
MEAN TOTAL PRESSURE=	-0.83	" H_2O
RMS DEVIATION=	9.8	% OF MEAN VELOCITY
GAS TEMPERATURE=	69	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T5*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *UNIT No. 2 - FINAL*	*PLATE No.* *83*



MEAN WEIGHTED VELOCITY=	**327 FPM**
MEAN TOTAL PRESSURE=	**-2.01 " H_2O**
RMS DEVIATION=	**14.7 % OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.0 °F**
PITOT CAL FACTOR=	**1.00**

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T6 Weighted*
NCS Inc. ***P096.10*** ***180511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T6*** ***UNIT No. 2 - FINAL***	***PLATE No.*** *84*

NORMALIZED VELOCITY (%)

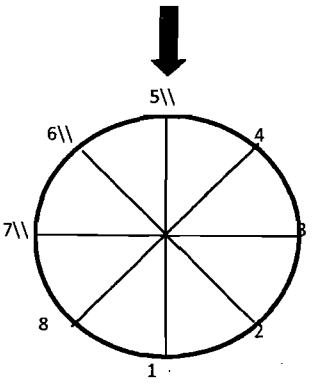
	1	2	3	4	5	6	7	8	9	10	11	12
A	78	78	78	90	105	127	99	108	84	98	90	96
B	108	81	81	90	117	128	127	99	84	84	84	108
C	113	124	121	113	99	108	105	115	107	110	86	99
D	127	113	108	102	84	81	88	78	96	96	99	99

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-2.00	-2.02	-2.02	-2.02	-2.00	-1.99	-2.00	-2.02	-2.00	-2.02	-2.02	-2.02
B	-2.02	-2.02	-2.01	-2.02	-2.02	-2.01	-2.00	-1.99	-2.01	-2.02	-2.02	-2.02
C	-2.02	-2.01	-2.01	-2.02	-2.01	-2.01	-2.00	-2.00	-2.01	-2.01	-2.01	-2.02
D	-2.01	-2.01	-2.01	-2.02	-2.01	-2.01	-2.01	-2.00	-2.01	-2.00	-2.00	-2.01

COTTON TUFT DIRECTIONAL ANGLES

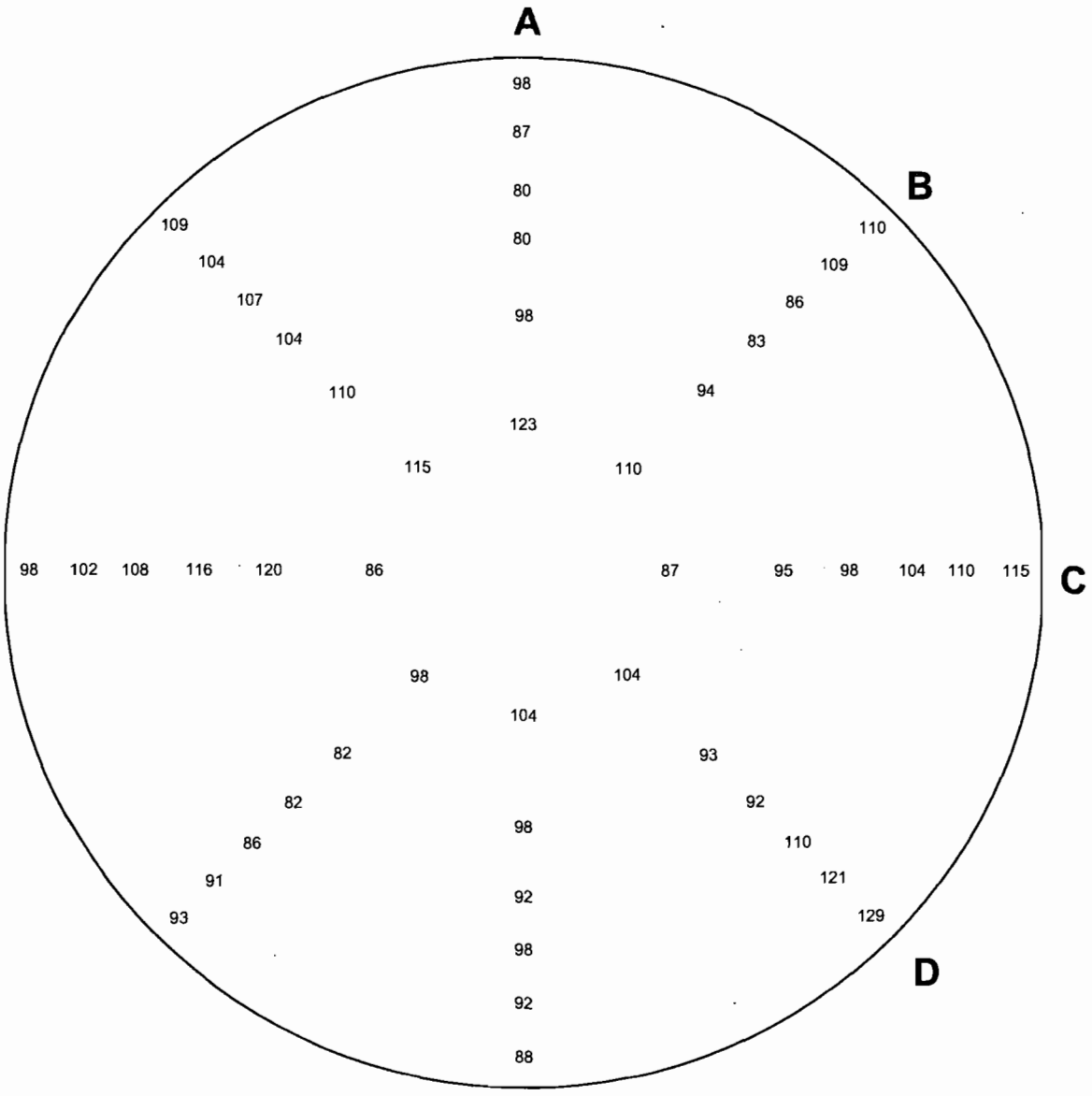
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	327	FPM
MEAN TOTAL PRESSURE=	-2.01	" H_2O
RMS DEVIATION=	14.7	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.0	°F
PITOT CAL FACTOR=	1.00	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T6* *Weighted*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T6* *UNIT No. 2 - FINAL*
	PLATE No. 85



MEAN WEIGHTED VELOCITY=	321 FPM
MEAN TOTAL PRESSURE=	-2.02 " H_2O
RMS DEVIATION=	12.1 % OF MEAN VELOCITY
GAS TEMPERATURE=	69.0 °F
PITOT CAL FACTOR=	1.00

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T7 Weighted*
NCS Inc. ***P096.10*** ***180511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T7*** ***UNIT No. 2 - FINAL***	***PLATE No.*** *86*

NORMALIZED VELOCITY (%)

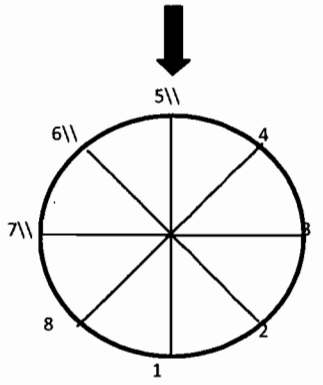
	1	2	3	4	5	6	7	8	9	10	11	12
A	98	87	80	80	98	123	104	98	92	98	92	88
B	110	109	86	83	94	110	98	82	82	86	91	93
C	115	110	104	98	95	87	86	120	116	108	102	98
D	129	121	110	92	93	104	115	110	104	107	104	109

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-2.03	-2.02	-2.03	-2.02	-2.03	-2.02	-2.03	-2.02	-2.03	-2.03	-2.02	-2.02
B	-2.00	-2.02	-2.02	-2.02	-2.02	-2.02	-2.02	-2.03	-2.03	-2.02	-2.02	-2.00
C	-2.02	-2.02	-2.03	-2.03	-2.03	-2.03	-2.02	-2.03	-2.03	-2.03	-2.02	-2.01
D	-2.03	-2.03	-2.03	-2.02	-2.03	-2.01	-2.02	-2.02	-2.03	-2.03	-2.03	-2.02

COTTON TUFT DIRECTIONAL ANGLES

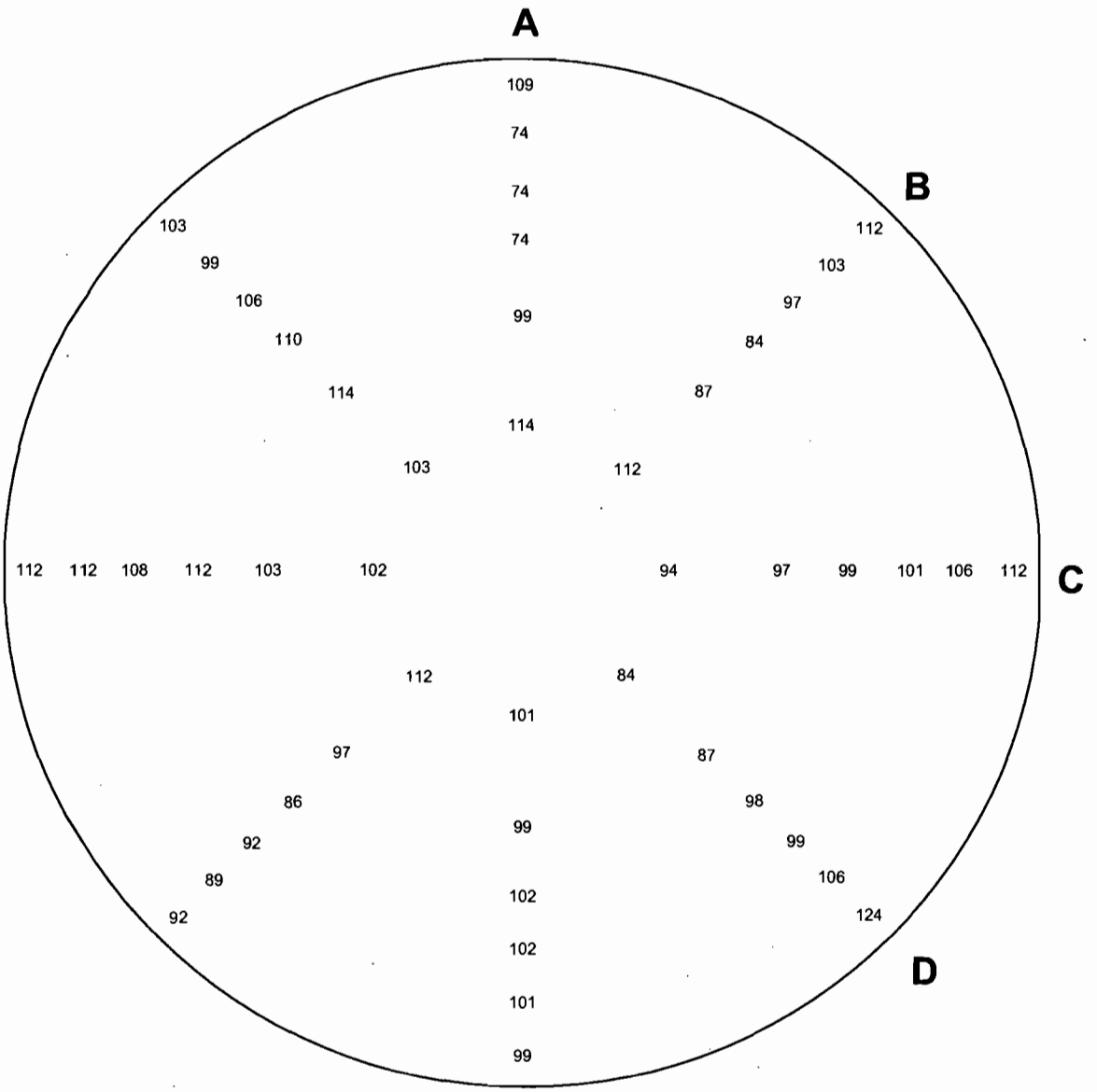
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**321**	**FPM**
MEAN TOTAL PRESSURE=	**-2.02**	**" H_2O**
RMS DEVIATION=	**12.1**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.0**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T7 Weighted*
NCS Inc. ***P096.10*** ***180511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T7*** ***UNIT No. 2 - FINAL***	***PLATE No.*** *87*



MEAN WEIGHTED VELOCITY=	317 FPM
MEAN TOTAL PRESSURE=	-2.03 " H_2O
RMS DEVIATION=	10.8 % OF MEAN VELOCITY
GAS TEMPERATURE=	69.0 °F
PITOT CAL FACTOR=	1.00

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T8* *Weighted*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T8* *UNIT No. 2 - FINAL*	*PLATE No.* *88*

NORMALIZED VELOCITY (%)

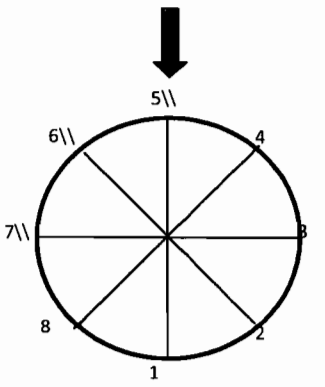
	1	2	3	4	5	6	7	8	9	10	11	12
A	109	74	74	74	99	114	101	99	102	102	101	99
B	112	103	97	84	87	112	112	97	86	92	89	92
C	112	106	101	99	97	94	102	103	112	108	112	112
D	124	106	99	98	87	84	103	114	110	106	99	103

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-2.04	-2.03	-2.03	-2.03	-2.04	-2.02	-2.04	-2.03	-2.04	-2.02	-2.02	-2.03
B	-2.03	-2.02	-2.03	-2.04	-2.04	-2.03	-2.03	-2.04	-2.04	-2.04	-2.03	-2.03
C	-2.03	-2.03	-2.03	-2.03	-2.04	-2.04	-2.04	-2.04	-2.03	-2.04	-2.03	-2.04
D	-2.03	-2.04	-2.04	-2.04	-2.03	-2.04	-2.04	-2.03	-2.04	-2.04	-2.04	-2.03

COTTON TUFT DIRECTIONAL ANGLES

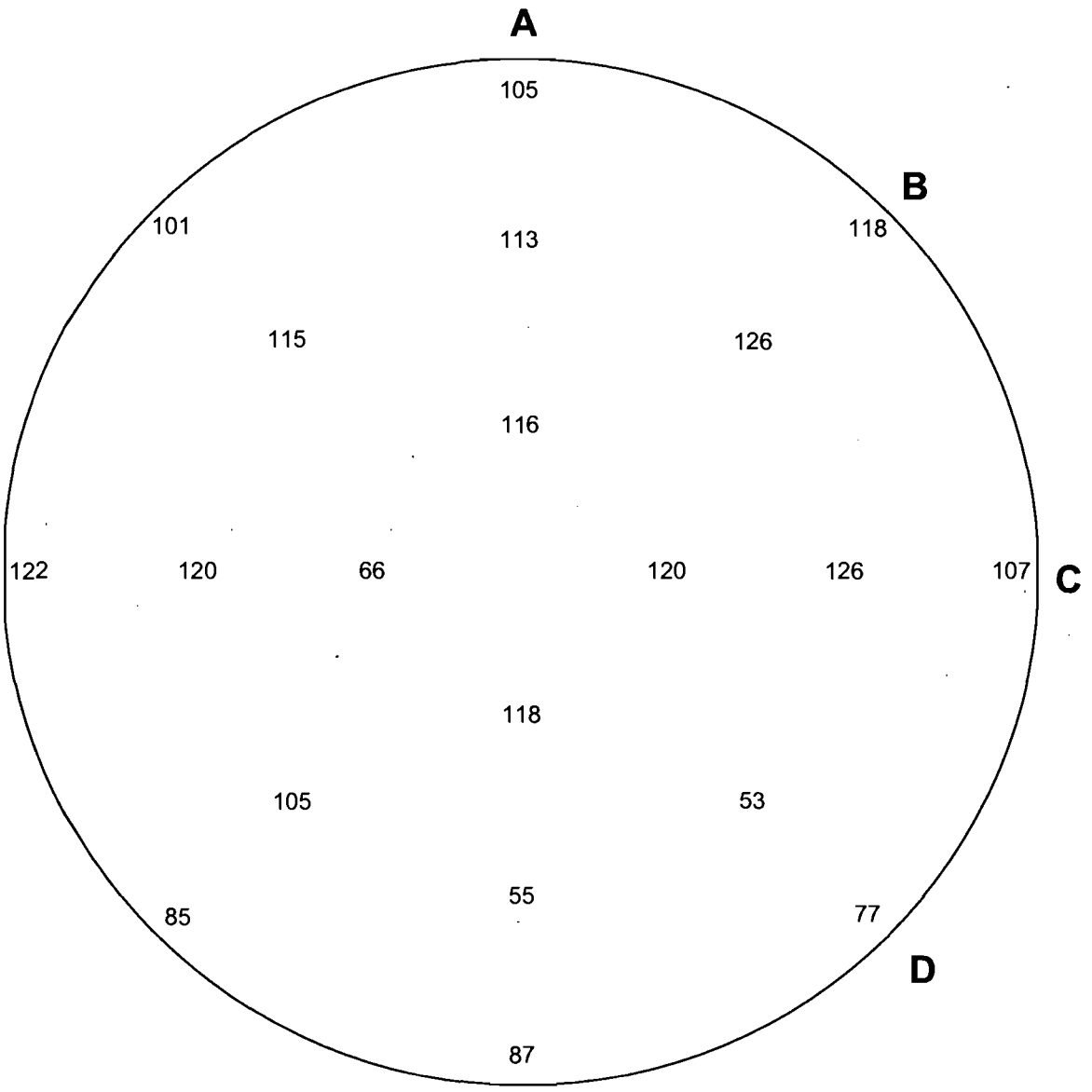
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**317**	**FPM**
MEAN TOTAL PRESSURE=	**-2.03**	**" H_2O**
RMS DEVIATION=	**10.8**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.0**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T8 Weighted*
NCS Inc. ***P096.10*** ***180511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T8*** ***UNIT No. 2 - FINAL***	***PLATE No.*** *89*



MEAN VELOCITY=	3355 FPM
MEAN VELOCITY PRESSURE=	0.72 " H_2O
MEAN TOTAL PRESSURE=	-2.41 " H_2O
RMS DEVIATION=	21.0 % OF MEAN VELOCITY
GAS TEMPERATURE=	69.0 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T9*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T9* *UNIT No. 2 - FINAL*	*PLATE No.* *90*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	105	113	116	118	55	87
B	118	126	120	66	105	85
C	107	88	77	107	120	122
D	77	53	109	112	115	101

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-2.16	-2.04	-2.04	-2.28	-3.18	-2.81
B	-2.10	-2.08	-2.22	-2.99	-2.30	-2.66
C	-2.33	-2.60	-2.81	-2.22	-2.04	-2.10
D	-3.00	-3.08	-2.44	-2.12	-2.04	-2.16

MEAN VELOCITY=	3355	FPM
MEAN VELOCITY PRESSURE=	0.72	" H_2O
MEAN TOTAL PRESSURE=	-2.41	" H_2O
RMS DEVIATION=	21.0	% OF MEAN VELOCITY
GAS TEMPERATURE=	69	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T9*
NCS Inc. *P096.10* *180511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T9* *UNIT No. 2 - FINAL*	*PLATE No.* *91*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	*ROW AVG*
1	123	128	125	119	127	127	119	*124*
2	119	111	96	85	99	116	117	*106*
3	105	97	72	59	83	100	102	*88*
4	89	95	72	56	68	96	95	*81*
COL AVG	*109*	*108*	*91*	*80*	*94*	*110*	*108*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-2.10	-2.16	-2.20	-2.28	-2.22	-2.14	-2.10
2	-2.14	-2.40	-2.66	-2.77	-2.60	-2.38	-2.14
3	-2.22	-2.44	-2.80	-2.96	-2.77	-2.44	-2.33
4	-2.48	-2.56	-2.84	-2.92	-2.80	-2.50	-2.42

MEAN VELOCITY=	**3262**	**FPM**
MEAN VELOCITY PRESSURE=	**0.68**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.46**	**" H_2O**
RMS DEVIATION=	**20.9**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS	***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T10*
NCS Inc. ***P096.10*** ***180511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T10*** ***UNIT No. 2 - FINAL***	***PLATE No.*** *92*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	*ROW AVG*
1	99	98	88	87	87	100	104	*95*
2	112	93	82	85	85	98	118	*96*
3	117	102	96	93	93	106	106	*102*
4	104	112	106	92	114	116	104	*107*
COL AVG	*108*	*101*	*93*	*89*	*95*	*105*	*108*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-2.44	-2.50	-2.66	-2.70	-2.62	-2.44	-2.33
2	-2.28	-2.58	-2.70	-2.70	-2.80	-2.58	-2.22
3	-2.22	-2.44	-2.59	-2.64	-2.60	-2.36	-2.33
4	-2.40	-2.33	-2.44	-2.64	-2.33	-2.30	-2.30

MEAN VELOCITY=	**3198**	**FPM**
MEAN VELOCITY PRESSURE=	**0.63**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.48**	**" H_2O**
RMS DEVIATION=	**10.4**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*TV*
NCS Inc. ***P096.10*** ***180511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION TV*** ***UNIT No. 2 - FINAL***	***PLATE No.*** *93*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	93	93	90	93	91	*92*
2	105	118	113	118	93	*109*
3	103	113	97	118	97	*106*
4	93	93	93	93	94	*93*
COL AVG	*98*	*104*	*98*	*105*	*94*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.33	-0.32	-0.35	-0.28	-0.33
2	-0.24	-0.18	-0.18	-0.18	-0.30
3	-0.22	-0.18	-0.20	-0.18	-0.28
4	-0.30	-0.36	-0.38	-0.33	-0.34

MEAN VELOCITY=	**1950**	**FPM**
MEAN VELOCITY PRESSURE=	**0.24**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.27**	**" H_2O**
RMS DEVIATION=	**9.7**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.8**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T1N*
NCS Inc. ***P096.10*** ***090511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1N*** ***UNIT No. 3 - EXISTING***	***PLATE No.*** *94*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	91	94	94	88	94	*92*
2	91	115	111	106	103	*105*
3	97	117	115	114	103	*109*
4	93	94	96	91	91	*93*
COL AVG	*93*	*105*	*104*	*100*	*98*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.36	-0.30	-0.33	-0.38	-0.30
2	-0.38	-0.18	-0.18	-0.20	-0.28
3	-0.30	-0.18	-0.18	-0.18	-0.24
4	-0.36	-0.31	-0.36	-0.37	-0.36

MEAN VELOCITY=	**1924**	**FPM**
MEAN VELOCITY PRESSURE=	**0.23**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.29**	**" H_2O**
RMS DEVIATION=	**9.6**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.8**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T1S*
NCS Inc. ***P096.10*** ***090511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1S*** ***UNIT No. 3 - EXISTING***	***PLATE No.*** *95*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	0	-33	-49	-30	-15	*-25*
2	148	151	148	148	152	*149*
3	145	152	148	149	139	*147*
4	130	131	129	134	124	*129*
COL AVG	*105*	*100*	*94*	*100*	*100*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.20	-1.27	-1.30	-1.26	-1.25
2	-0.48	-0.50	-0.56	-0.58	-0.44
3	-0.33	-0.28	-0.31	-0.31	-0.42
4	-0.28	-0.30	-0.42	-0.33	-0.36

MEAN VELOCITY=	**2242**	**FPM**
MEAN VELOCITY PRESSURE=	**0.48**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.61**	**" H_2O**
RMS DEVIATION=	**73.3**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.8**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T2N*
NCS Inc. ***P096.10*** ***090511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T2N*** ***UNIT No. 3 - EXISTING***	***PLATE No.*** *96*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-30	-43	-48	-34	-30	*-37*
2	152	152	142	155	158	*152*
3	142	152	155	152	145	*149*
4	133	136	136	134	142	*136*
COL AVG	*99*	*99*	*96*	*102*	*104*	

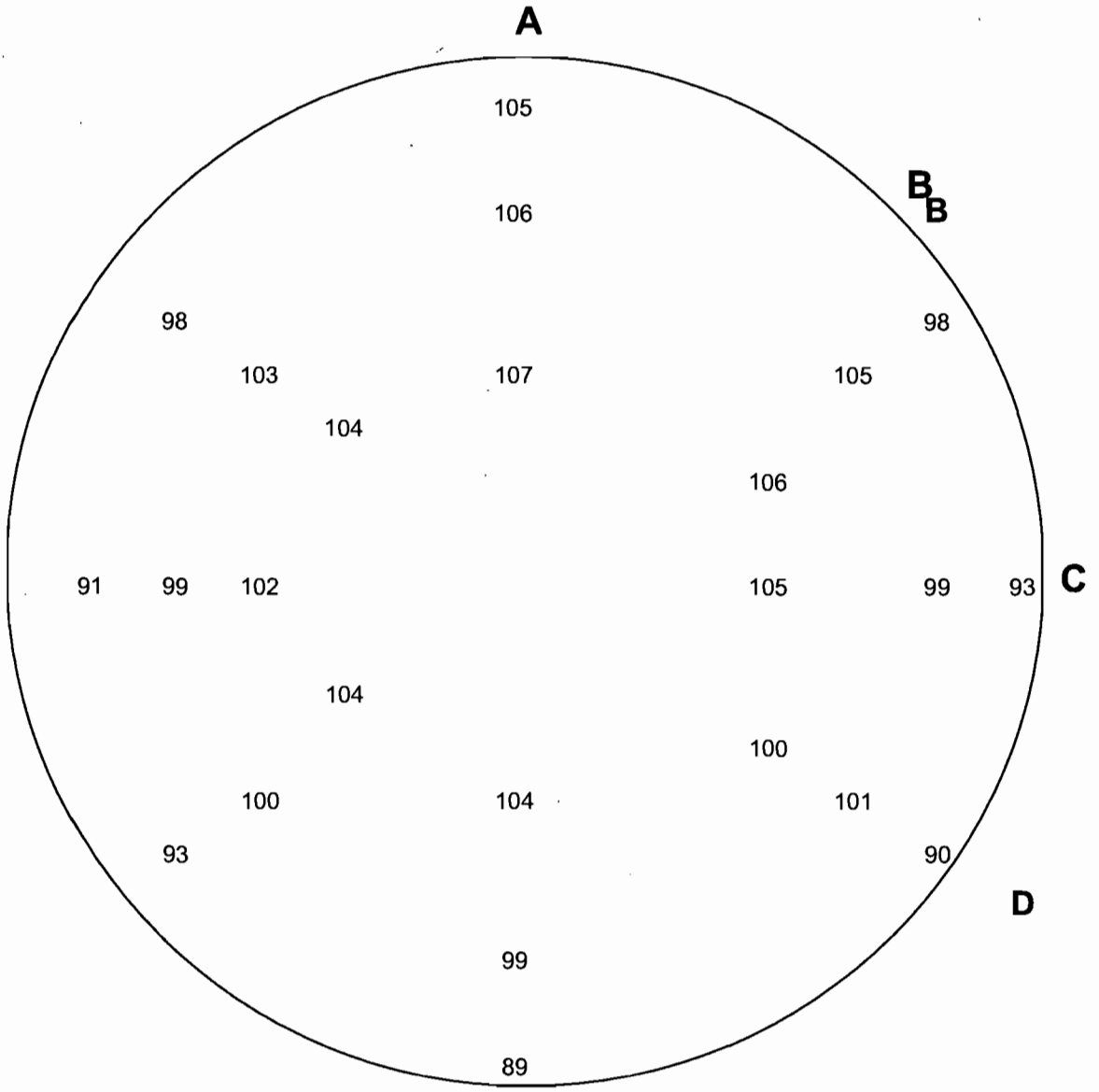
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.22	-1.23	-1.22	-1.26	-1.24
2	-0.44	-0.48	-0.56	-0.48	-0.44
3	-0.43	-0.36	-0.28	-0.36	-0.37
4	-0.33	-0.34	-0.38	-0.35	-0.33

MEAN VELOCITY=	**2183**	**FPM**
MEAN VELOCITY PRESSURE=	**0.48**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.61**	**" H_2O**
RMS DEVIATION=	**79.5**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.8**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS		***DATE***
ST. PETERSBURG, FLORIDA		***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION		*T2S*
UNITS 1, 2 & 3		
AIRFLOW MODEL STUDY		
NCS Inc.	***NORMALIZED VELOCITY DISTRIBUTION***	***PLATE No.***
P096.10	***TEST LOCATION T2S***	*97*
090511A	***UNIT No. 3 - EXISTING***	



MEAN VELOCITY=	3408	FPM
MEAN VELOCITY PRESSURE=	0.72	" H_2O
MEAN TOTAL PRESSURE=	-0.64	" H_2O
RMS DEVIATION=	5.2	% OF MEAN VELOCITY
GAS TEMPERATURE=	70	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T4*
NCS Inc. *P096.10* *090511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T4* *UNIT No. 3 - EXISTING*	*PLATE No.* *102*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	105	106	107	104	99	89
B	98	105	106	104	100	93
C	93	99	105	102	99	91
D	90	101	100	104	103	98

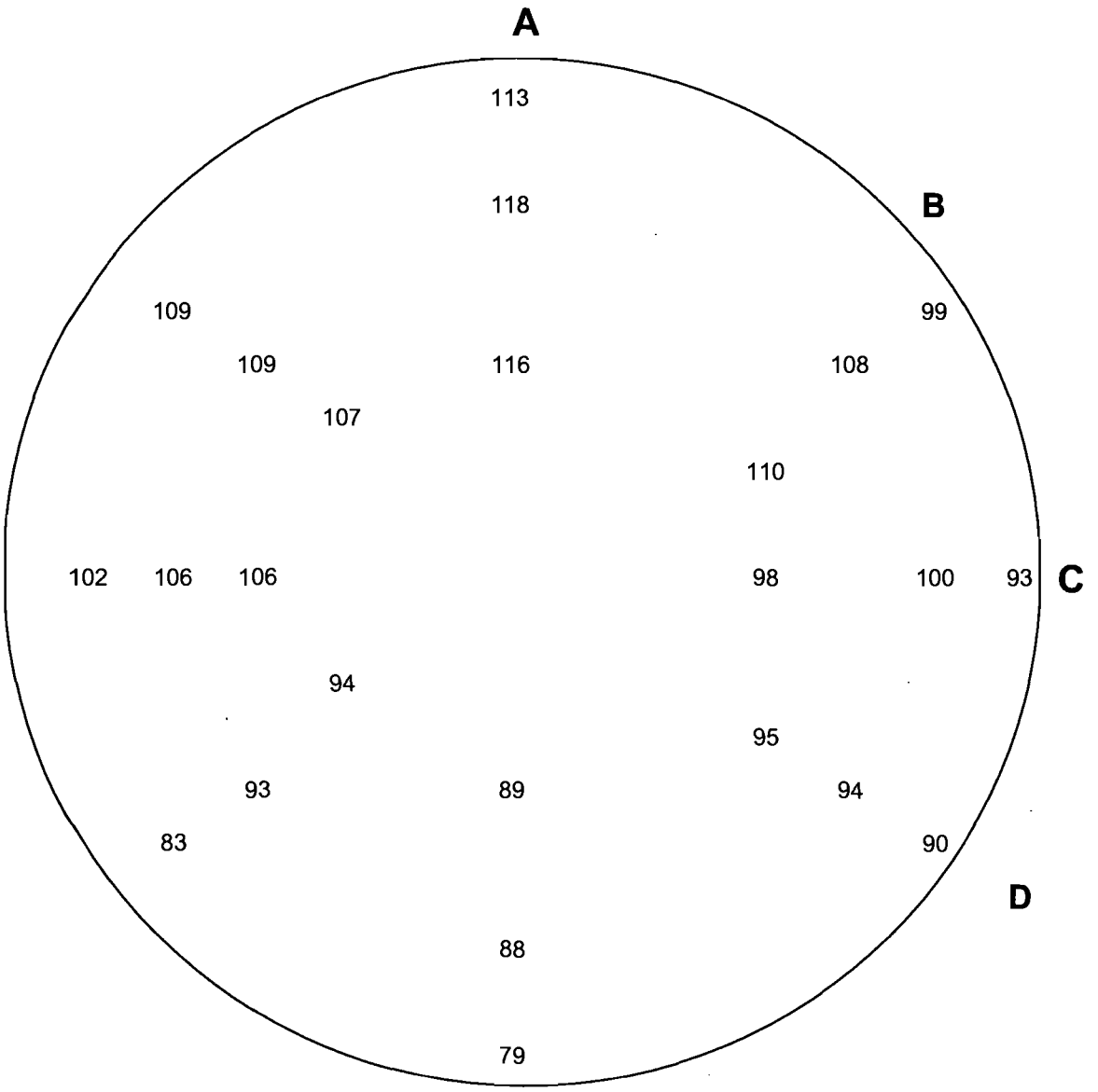
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.58	-0.55	-0.56	-0.64	-0.66	-0.64
B	-0.66	-0.62	-0.58	-0.63	-0.65	-0.64
C	-0.70	-0.66	-0.61	-0.60	-0.64	-0.72
D	-0.73	-0.68	-0.64	-0.60	-0.66	-0.70

MEAN VELOCITY=	3408	FPM
MEAN VELOCITY PRESSURE=	0.72	" H_2O
MEAN TOTAL PRESSURE=	-0.64	" H_2O
RMS DEVIATION=	5.2	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.8	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T4*
NCS Inc. *P096.10* *090511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T4* *UNIT No. 3 - EXISTING*	*PLATE No.* *103*



MEAN VELOCITY=	3334 FPM
MEAN VELOCITY PRESSURE=	0.70 " H_2O
MEAN TOTAL PRESSURE=	-0.87 " H_2O
RMS DEVIATION=	10.1 % OF MEAN VELOCITY
GAS TEMPERATURE=	70 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T5*
NCS Inc. *P096.10* *090511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *UNIT No. 3 - EXISTING*	*PLATE No.* *104*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	113	118	116	89	88	79
B	99	108	110	94	93	83
C	93	100	98	106	106	102
D	90	94	95	107	109	109

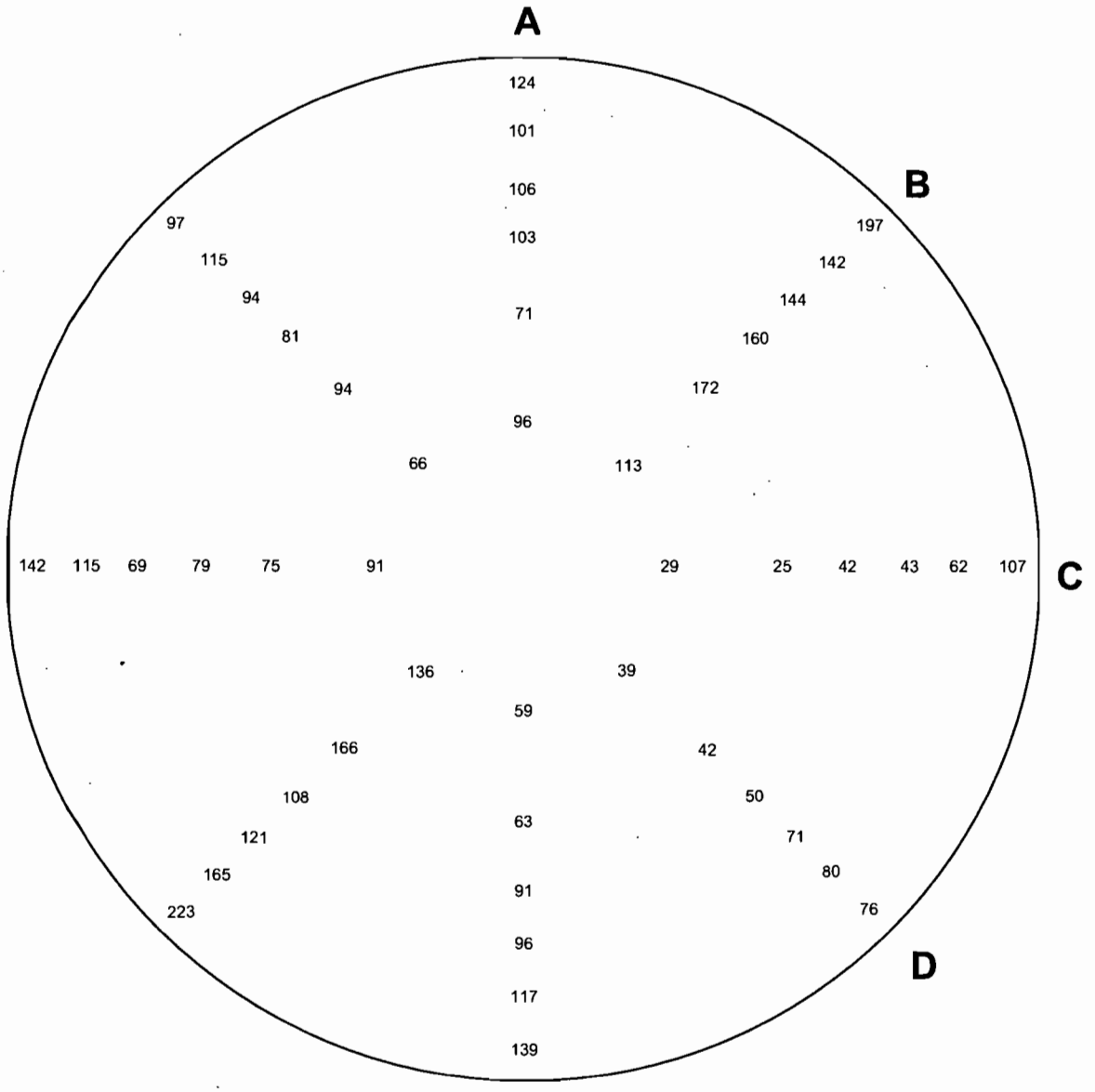
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.80	-0.78	-0.76	-1.00	-1.09	-1.12
B	-0.82	-0.77	-0.74	-0.88	-0.96	-1.00
C	-0.88	-0.82	-0.84	-0.80	-0.78	-0.84
D	-1.04	-0.96	-0.95	-0.78	-0.74	-0.80

MEAN VELOCITY=	3334	FPM
MEAN VELOCITY PRESSURE=	0.70	" H_2O
MEAN TOTAL PRESSURE=	-0.87	" H_2O
RMS DEVIATION=	10.1	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.8	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T5*
NCS Inc. *P096.10* *090511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *UNIT No. 3 - EXISTING*	*PLATE No.* *105*



MEAN WEIGHTED VELOCITY=	261 FPM
MEAN TOTAL PRESSURE=	-1.83 " H_2O
RMS DEVIATION=	46.7 % OF MEAN VELOCITY
GAS TEMPERATURE=	70 °F
PITOT CAL FACTOR=	1.00

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T6* *Weighted*
NCS Inc. *P096.10* *090511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T6* *UNIT No. 3 - EXISTING*	*PLATE No.* *106*

NORMALIZED VELOCITY (%)

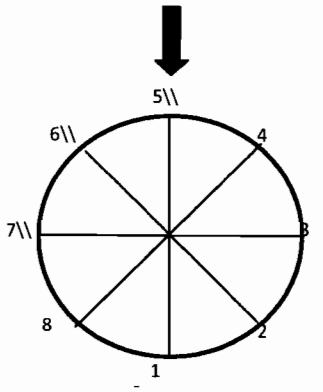
	1	2	3	4	5	6	7	8	9	10	11	12
A	124	101	106	103	71	96	59	63	91	96	117	139
B	197	142	144	160	172	113	136	166	108	121	165	223
C	107	62	43	42	25	29	91	75	79	69	115	142
D	76	80	71	50	42	39	66	94	81	94	115	97

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-1.83	-1.85	-1.84	-1.83	-1.84	-1.84	-1.83	-1.83	-1.84	-1.82	-1.82	-1.82
B	-1.84	-1.84	-1.83	-1.83	-1.83	-1.82	-1.89	-1.84	-1.83	-1.82	-1.82	-1.83
C	-1.84	-1.83	-1.83	-1.84	-1.84	-1.83	-1.89	-1.84	-1.83	-1.83	-1.83	-1.83
D	-1.83	-1.84	-1.83	-1.82	-1.82	-1.84	-1.84	-1.84	-1.83	-1.84	-1.83	-1.83

COTTON TUFT DIRECTIONAL ANGLES

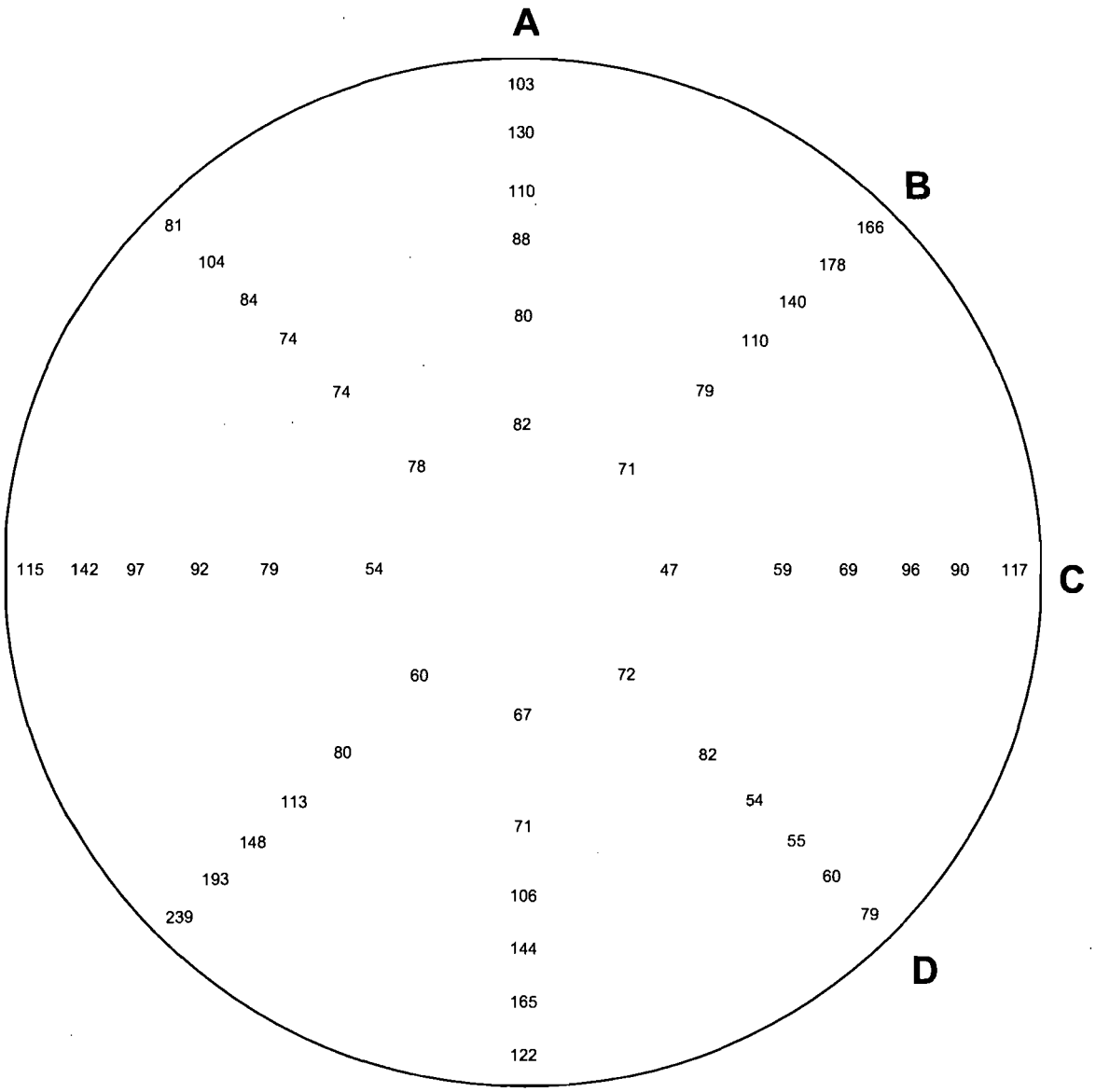
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	T	1	1	1	1	1	1	1	1	1	1	1
C	8	1	1	1	1	1	1	1	1	1	1	1
D	2	2	2	1	2	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**261**	**FPM**
MEAN TOTAL PRESSURE=	**-1.83**	**" H_2O**
RMS DEVIATION=	**46.7**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**70**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T6 Weighted*
NCS Inc. ***P096.10*** ***090511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T6*** ***UNIT No. 3 - EXISTING***	***PLATE No.*** *107*



MEAN WEIGHTED VELOCITY=	**296 FPM**
MEAN TOTAL PRESSURE=	**-1.84 " H_2O**
RMS DEVIATION=	**40.4 % OF MEAN VELOCITY**
GAS TEMPERATURE=	**70 °F**
PITOT CAL FACTOR=	**1.00**

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T7 Weighted*
NCS Inc. ***P096.10*** ***090511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T7*** ***UNIT No. 3 - EXISTING***	***PLATE No.*** *108*

NORMALIZED VELOCITY (%)

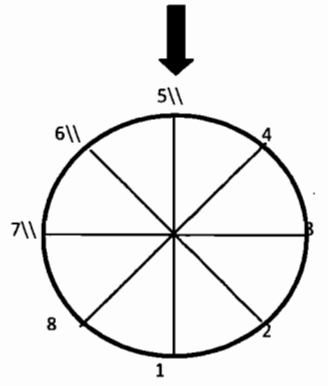
	1	2	3	4	5	6	7	8	9	10	11	12
A	103	130	110	88	80	82	67	71	106	144	165	122
B	166	178	140	110	79	71	60	80	113	148	193	239
C	117	90	96	69	59	47	54	79	92	97	142	115
D	79	60	55	54	82	72	78	74	74	84	104	81

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-1.84	-1.84	-1.85	-1.83	-1.84	-1.84	-1.83	-1.84	-1.83	-1.84	-1.84	-1.83
B	-1.84	-1.83	-1.84	-1.84	-1.84	-1.83	-1.83	-1.84	-1.83	-1.84	-1.83	-1.84
C	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.84	-1.83	-1.83	-1.83	-1.84	-1.84
D	-1.84	-1.85	-1.83	-1.84	-1.83	-1.83	-1.84	-1.84	-1.83	-1.84	-1.84	-1.84

COTTON TUFT DIRECTIONAL ANGLES

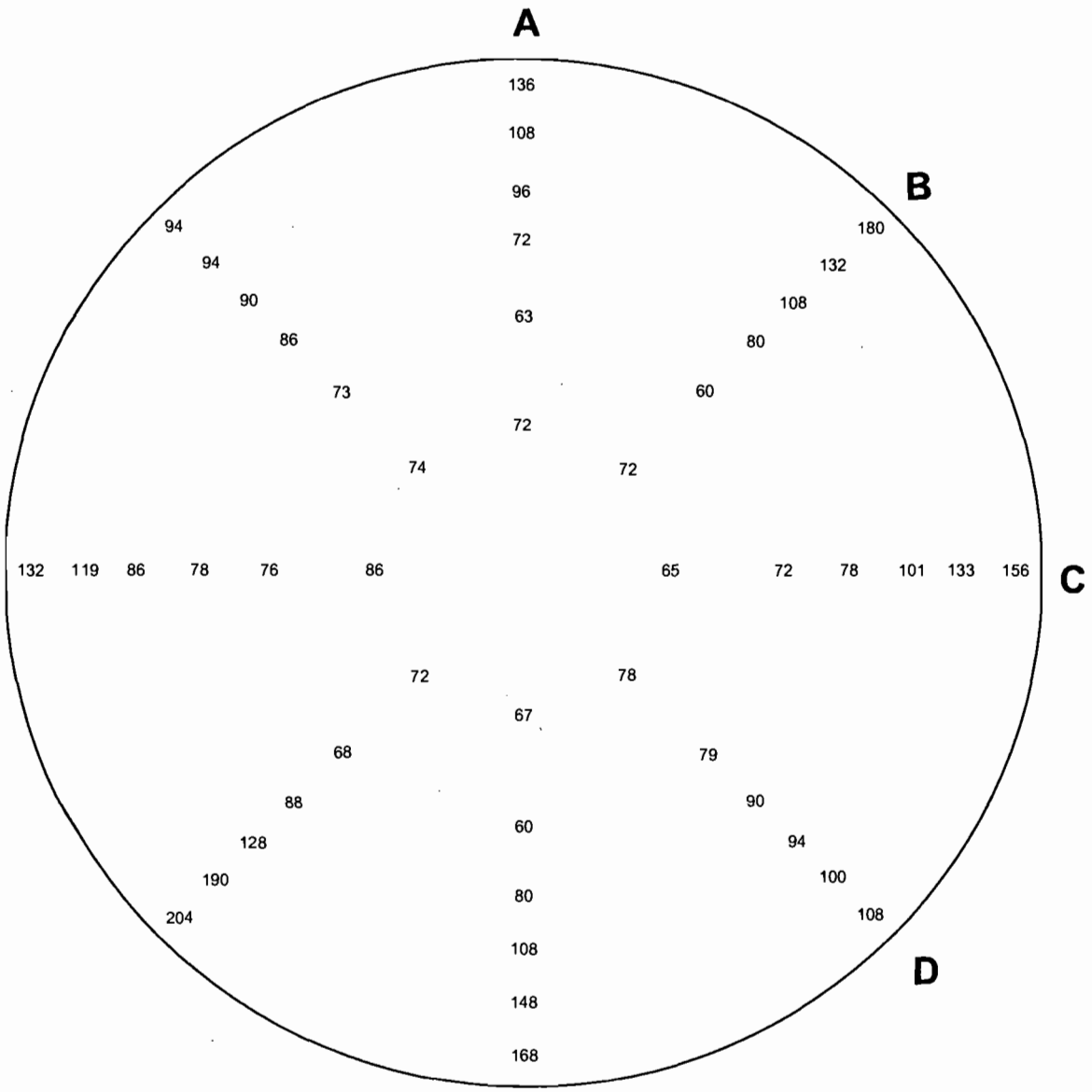
	1	2	3	4	5	6	7	8	9	10	11	12
A	2	1	1	1	1	1	1	1	1	1	1	2
B	2	1	1	1	1	1	1	1	1	1	1	1
C	2	2	1	1	1	2	2	1	1	1	1	2
D	2	2	2	2	1	1	1	1	1	1	1	8



MEAN WEIGHTED VELOCITY=	**296**	**FPM**
MEAN TOTAL PRESSURE=	**-1.84**	**" H_2O**
RMS DEVIATION=	**40.4**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**70**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T7 Weighted*
NCS Inc. ***P096.10*** ***090511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T7*** ***UNIT No. 3 - EXISTING***	***PLATE No.*** *109*



MEAN WEIGHTED VELOCITY=	328 FPM
MEAN TOTAL PRESSURE=	-1.84 " H_2O
RMS DEVIATION=	35.3 % OF MEAN VELOCITY
GAS TEMPERATURE=	70 °F
PITOT CAL FACTOR=	1.00

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T8* *Weighted*
NCS Inc. *P096.10* *090511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T8* *UNIT No. 3 - EXISTING*	*PLATE No.* *110*

NORMALIZED VELOCITY (%)

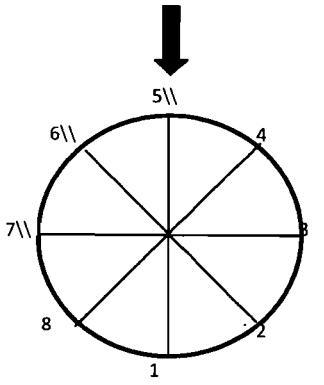
	1	2	3	4	5	6	7	8	9	10	11	12
A	136	108	96	72	63	72	67	60	80	108	148	168
B	180	132	108	80	60	72	72	68	88	128	190	204
C	156	133	101	78	72	65	86	76	78	86	119	132
D	108	100	94	90	79	78	74	73	86	90	94	94

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-1.85	-1.84	-1.83	-1.83	-1.84	-1.85	-1.85	-1.85	-1.84	-1.84	-1.84	-1.85
B	-1.86	-1.85	-1.84	-1.84	-1.84	-1.85	-1.84	-1.85	-1.85	-1.84	-1.85	-1.85
C	-1.85	-1.85	-1.84	-1.85	-1.84	-1.85	-1.85	-1.85	-1.84	-1.84	-1.84	-1.86
D	-1.83	-1.84	-1.85	-1.84	-1.84	-1.83	-1.85	-1.85	-1.84	-1.84	-1.85	-1.85

COTTON TUFT DIRECTIONAL ANGLES

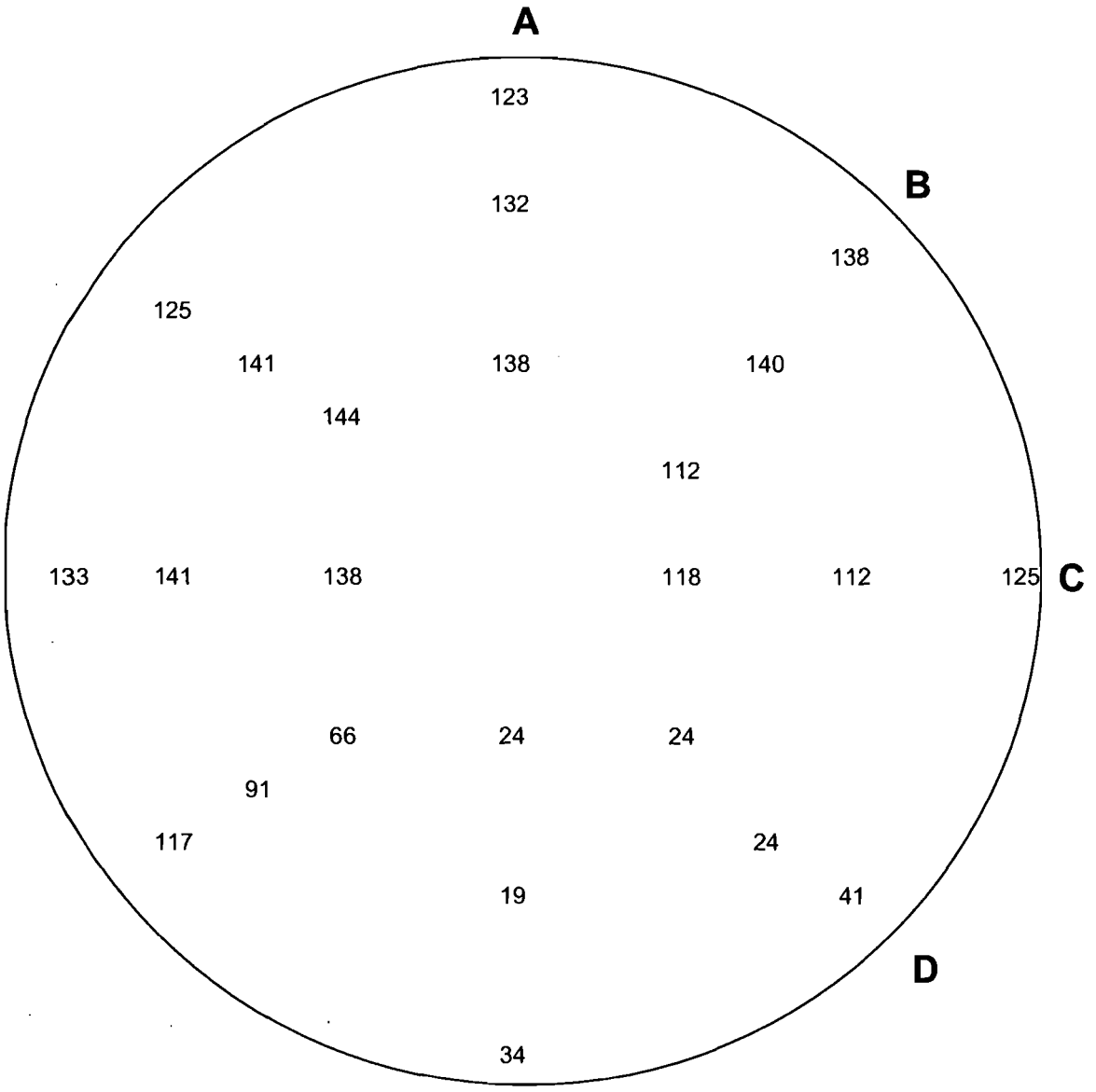
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**328**	**FPM**
MEAN TOTAL PRESSURE=	**-1.84**	**" H_2O**
RMS DEVIATION=	**35.3**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**70**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***		***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***		*T8 Weighted*
NCS Inc. ***P096.10*** ***090511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T8*** ***UNIT No. 3 - EXISTING***	***PLATE No.*** *111*



MEAN VELOCITY=	3411 FPM
MEAN VELOCITY PRESSURE=	0.86 " H_2O
MEAN TOTAL PRESSURE=	-2.49 " H_2O
RMS DEVIATION=	45.2 % OF MEAN VELOCITY
GAS TEMPERATURE=	69.8 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T9*
NCS Inc. *P096.10* *090511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T9* *UNIT No. 3 - EXISTING*	*PLATE No.* *112*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	123	132	138	24	19	34
B	138	140	112	66	91	117
C	125	112	118	138	141	133
D	41	24	24	144	141	125

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-1.80	-1.84	-1.80	-3.44	-3.55	-3.48
B	-2.00	-2.10	-1.98	-3.10	-2.88	-2.55
C	-2.51	-2.44	-2.77	-1.88	-1.80	-1.88
D	-3.44	-3.51	-3.44	-1.81	-1.88	-1.88

MEAN VELOCITY=	3411	FPM
MEAN VELOCITY PRESSURE=	0.86	" H_2O
MEAN TOTAL PRESSURE=	-2.49	" H_2O
RMS DEVIATION=	45.2	% OF MEAN VELOCITY
GAS TEMPERATURE=	69.8	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T9*
NCS Inc. *P096.10* *090511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T9* *UNIT No. 3 - EXISTING*	*PLATE No.* *113*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	ROW AVG
1	129	134	139	137	144	145	137	*138*
2	122	122	116	110	117	128	120	*119*
3	108	81	69	60	68	93	98	*82*
4	69	57	47	37	57	83	74	*61*
COL AVG	*107*	*98*	*93*	*86*	*97*	*112*	*107*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-1.06	-1.88	-1.80	-2.11	-2.00	-1.88	-2.00
2	-2.10	-2.20	-2.44	-2.46	-2.46	-2.33	-2.18
3	-2.40	-2.88	-3.00	-3.08	-3.10	-2.78	-2.40
4	-2.55	-2.88	-3.16	-3.18	-3.12	-2.89	-2.66

MEAN VELOCITY=	**3331**	**FPM**
MEAN VELOCITY PRESSURE=	**0.76**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.46**	**" H_2O**
RMS DEVIATION=	**32.5**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.8**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T10*
NCS Inc. ***P096.10*** ***090511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T10*** ***UNIT No. 3 - EXISTING***	***PLATE No.*** *114*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	*ROW AVG*
1	101	104	100	89	94	102	108	*100*
2	106	104	89	89	90	104	112	*99*
3	107	101	91	92	98	109	103	*100*
4	99	104	95	92	101	110	107	*101*
COL AVG	*103*	*103*	*94*	*91*	*96*	*106*	*107*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-2.38	-2.37	-2.50	-2.50	-2.44	-2.40	-2.22
2	-2.38	-2.37	-2.48	-2.60	-2.56	-2.38	-2.09
3	-2.36	-2.40	-2.55	-2.57	-2.55	-2.39	-2.38
4	-2.44	-2.38	-2.54	-2.55	-2.44	-2.33	-2.40

MEAN VELOCITY=	**3298**	**FPM**
MEAN VELOCITY PRESSURE=	**0.67**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.43**	**" H_2O**
RMS DEVIATION=	**6.8**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**69.8**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*TV*
NCS Inc. ***P096.10*** ***090511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION TV*** ***UNIT No. 3 - EXISTING***	***PLATE No.*** *115*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	ROW AVG
1	91	90	83	89	83	87
2	103	120	118	114	89	109
3	103	124	116	115	101	112
4	96	83	86	96	96	92
COL AVG	99	104	101	104	92	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.33	-0.30	-0.33	-0.33	-0.33
2	-0.28	-0.18	-0.17	-0.20	-0.34
3	-0.22	-0.18	-0.18	-0.18	-0.26
4	-0.33	-0.37	-0.36	-0.30	-0.30

MEAN VELOCITY=	**2181**	**FPM**
MEAN VELOCITY PRESSURE=	**0.30**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.27**	**" H_2O**
RMS DEVIATION=	**13.2**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**68.5**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	***T1N***
NCS Inc. ***P096.10*** ***160511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1N*** ***UNIT No. 3 - FINAL***	***PLATE No.*** ***116***

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	85	93	87	87	89	*88*
2	85	116	116	117	103	*107*
3	95	122	120	120	109	*113*
4	95	98	86	89	90	*92*
COL AVG	*90*	*107*	*102*	*103*	*98*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-0.36	-0.33	-0.32	-0.33	-0.30
2	-0.36	-0.18	-0.20	-0.20	-0.28
3	-0.30	-0.18	-0.18	-0.18	-0.24
4	-0.33	-0.28	-0.38	-0.37	-0.30

MEAN VELOCITY=	**2150**	**FPM**
MEAN VELOCITY PRESSURE=	**0.29**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.28**	**" H_2O**
RMS DEVIATION=	**13.3**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**68.5**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T1S*
NCS Inc. ***P096.10*** ***160511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T1S*** ***UNIT No. 3 - FINAL***	***PLATE No.*** *117*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-21	-26	-48	-26	-21	*-29*
2	151	157	151	156	154	*154*
3	142	150	151	151	135	*146*
4	123	127	134	135	125	*129*
COL AVG	*99*	*102*	*97*	*104*	*98*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.20	-1.24	-1.24	-1.25	-1.20
2	-0.44	-0.44	-0.55	-0.44	-0.44
3	-0.36	-0.30	-0.28	-0.30	-0.40
4	-0.36	-0.36	-0.40	-0.30	-0.38

MEAN VELOCITY=	**2197**	**FPM**
MEAN VELOCITY PRESSURE=	**0.46**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.59**	**" H_2O**
RMS DEVIATION=	**75.1**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**68.5**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T2N*
NCS Inc. ***P096.10*** ***160511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T2N*** ***UNIT No. 3 - FINAL***	***PLATE No.*** *118*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	*ROW AVG*
1	-15	-42	-37	-30	0	*-25*
2	148	150	151	150	154	*151*
3	137	147	147	147	141	*144*
4	122	132	131	134	132	*130*
COL AVG	*98*	*97*	*98*	*100*	*107*	

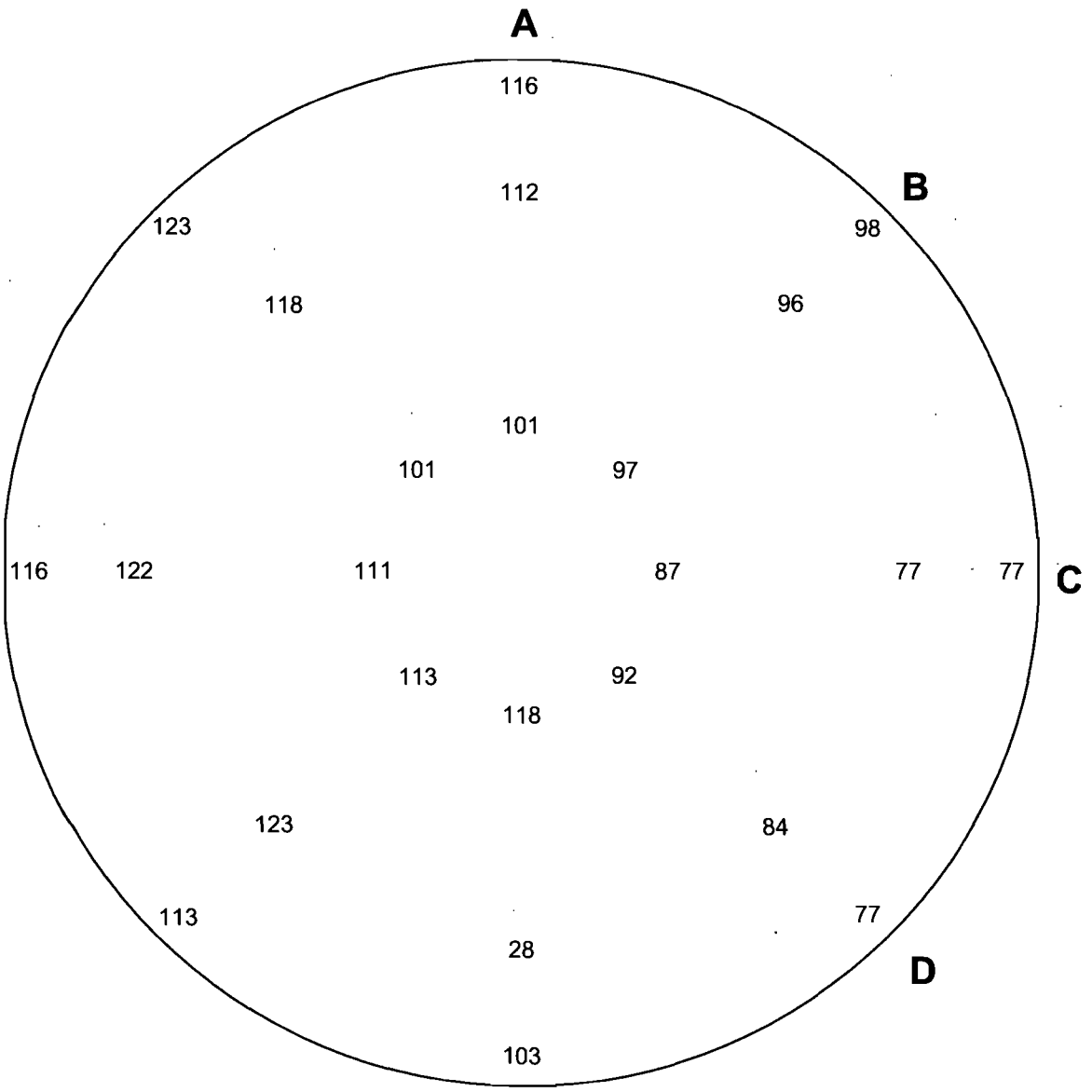
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5
1	-1.20	-1.26	-1.24	-1.24	-1.20
2	-0.40	-0.48	-0.55	-0.44	-0.40
3	-0.42	-0.36	-0.28	-0.33	-0.36
4	-0.36	-0.33	-0.33	-0.36	-0.34

MEAN VELOCITY=	**2219**	**FPM**
MEAN VELOCITY PRESSURE=	**0.46**	**" H_2O**
MEAN TOTAL PRESSURE=	**-0.59**	**" H_2O**
RMS DEVIATION=	**72.9**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**68.5**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T2S*
NCS Inc. ***P096.10*** ***160511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T2S*** ***UNIT No. 3 - FINAL***	***PLATE No.*** *119*



MEAN VELOCITY=	2946	FPM
MEAN VELOCITY PRESSURE=	0.56	" H_2O
MEAN TOTAL PRESSURE=	-0.61	" H_2O
RMS DEVIATION=	21.1	% OF MEAN VELOCITY
GAS TEMPERATURE=	68.5	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3N*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3N* *UNIT No. 3 - FINAL*	*PLATE No.* *120*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	116	112	101	118	28	103
B	98	96	97	113	123	113
C	77	77	87	111	122	116
D	77	84	92	101	118	123

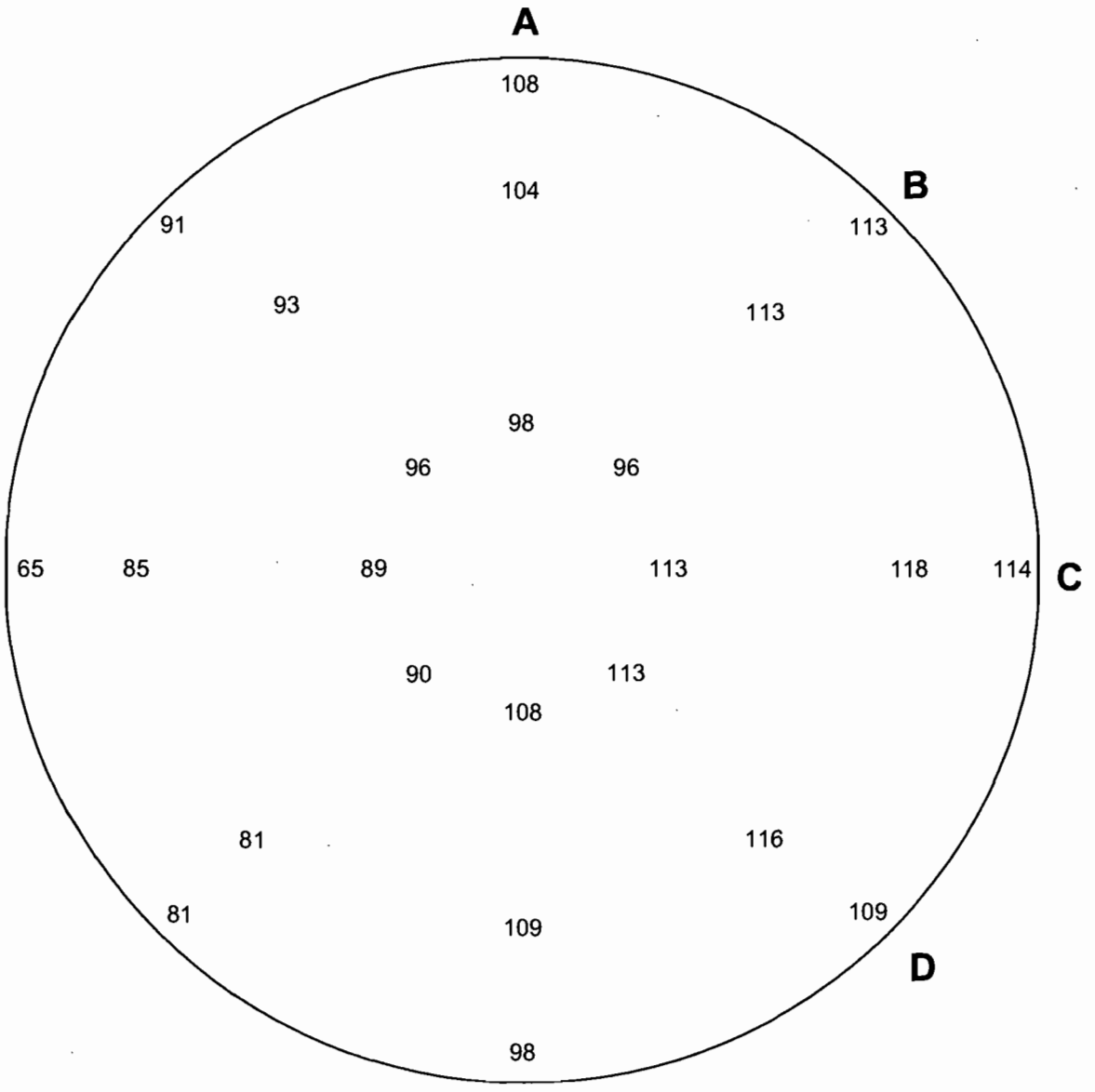
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.42	-0.48	-0.62	-0.44	-0.40	-0.44
B	-0.70	-0.66	-0.70	-0.44	-0.33	-0.34
C	-0.84	-0.78	-0.77	-0.48	-0.33	-0.28
D	-0.70	-0.74	-0.70	-0.62	-0.38	-0.34

MEAN VELOCITY=	2946	FPM
MEAN VELOCITY PRESSURE=	0.56	" H_2O
MEAN TOTAL PRESSURE=	-0.61	" H_2O
RMS DEVIATION=	21.1	% OF MEAN VELOCITY
GAS TEMPERATURE=	68.5	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T3N*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3N* *UNIT No. 3 - FINAL*	*PLATE No.* *121*



MEAN VELOCITY=	3046 FPM
MEAN VELOCITY PRESSURE=	0.58 " H_2O
MEAN TOTAL PRESSURE=	-0.54 " H_2O
RMS DEVIATION=	13.4 % OF MEAN VELOCITY
GAS TEMPERATURE=	68.5 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T3S*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3S* *UNIT No. 3 - FINAL*	*PLATE No.* *122*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	108	104	98	108	109	98
B	113	113	96	90	81	81
C	114	118	113	89	85	65
D	109	116	113	96	93	91

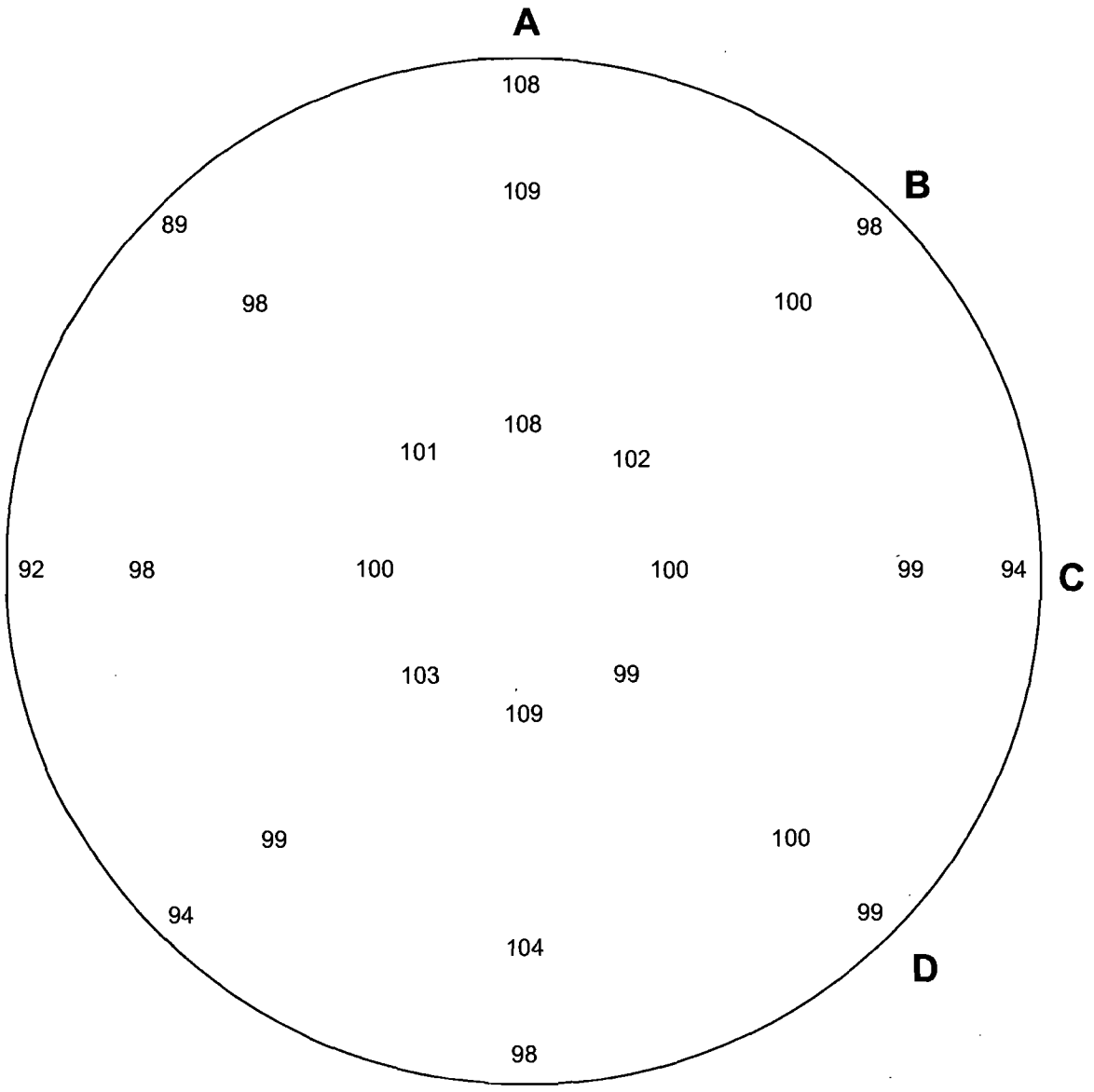
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.44	-0.52	-0.62	-0.48	-0.36	-0.44
B	-0.36	-0.40	-0.66	-0.69	-0.72	-0.66
C	-0.30	-0.33	-0.40	-0.72	-0.80	-0.88
D	-0.38	-0.36	-0.42	-0.70	-0.63	-0.68

MEAN VELOCITY=	3046	FPM
MEAN VELOCITY PRESSURE=	0.58	" H_2O
MEAN TOTAL PRESSURE=	-0.54	" H_2O
RMS DEVIATION=	13.4	% OF MEAN VELOCITY
GAS TEMPERATURE=	68.5	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*		*DATE* *SEPT 2011*
VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*		*T3S*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T3S* *UNIT No. 3 - FINAL*	*PLATE No.* *123*



MEAN VELOCITY=	3325 FPM
MEAN VELOCITY PRESSURE=	0.68 " H_2O
MEAN TOTAL PRESSURE=	-0.61 " H_2O
RMS DEVIATION=	4.9 % OF MEAN VELOCITY
GAS TEMPERATURE=	68.5 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T4*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T4* *UNIT No. 3 - FINAL*	*PLATE No.* *124*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	108	109	108	109	104	98
B	98	100	102	103	99	94
C	94	99	100	100	98	92
D	99	100	99	101	98	89

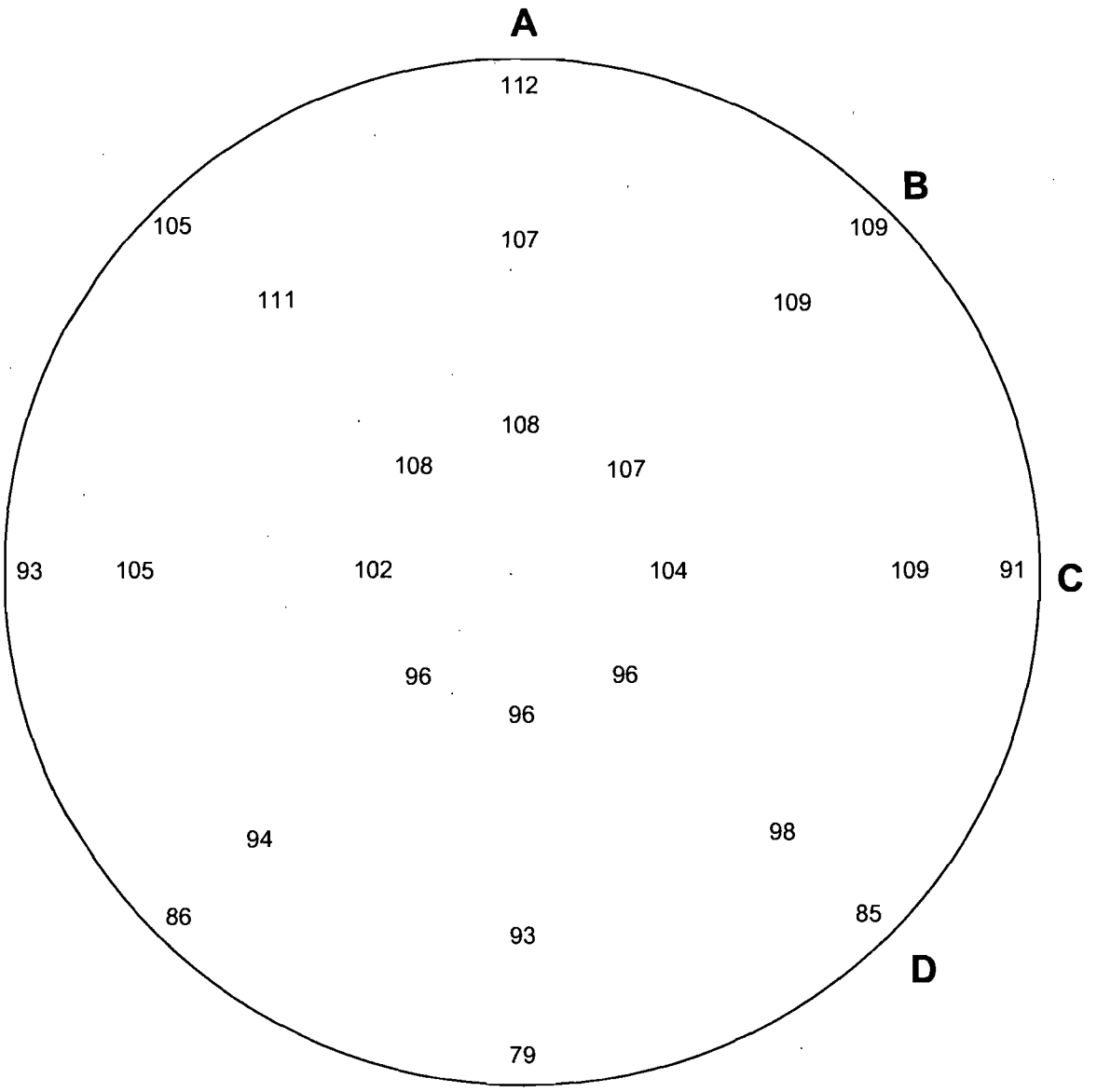
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.55	-0.54	-0.52	-0.50	-0.56	-0.60
B	-0.62	-0.60	-0.60	-0.59	-0.60	-0.67
C	-0.70	-0.66	-0.61	-0.60	-0.62	-0.66
D	-0.70	-0.63	-0.60	-0.59	-0.60	-0.68

MEAN VELOCITY=	3325	FPM
MEAN VELOCITY PRESSURE=	0.68	" H_2O
MEAN TOTAL PRESSURE=	-0.61	" H_2O
RMS DEVIATION=	4.9	% OF MEAN VELOCITY
GAS TEMPERATURE=	68.5	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T4*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T4* *UNIT No. 3 - FINAL*	*PLATE No.* *125*



MEAN VELOCITY=	3265 FPM
MEAN VELOCITY PRESSURE=	0.66 " H_2O
MEAN TOTAL PRESSURE=	-0.85 " H_2O
RMS DEVIATION=	8.9 % OF MEAN VELOCITY
GAS TEMPERATURE=	68.5 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T5*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *UNIT No. 3 - FINAL*	*PLATE No.* *126*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	112	107	108	96	93	79
B	109	109	107	96	94	86
C	91	109	104	102	105	93
D	85	98	96	108	111	105

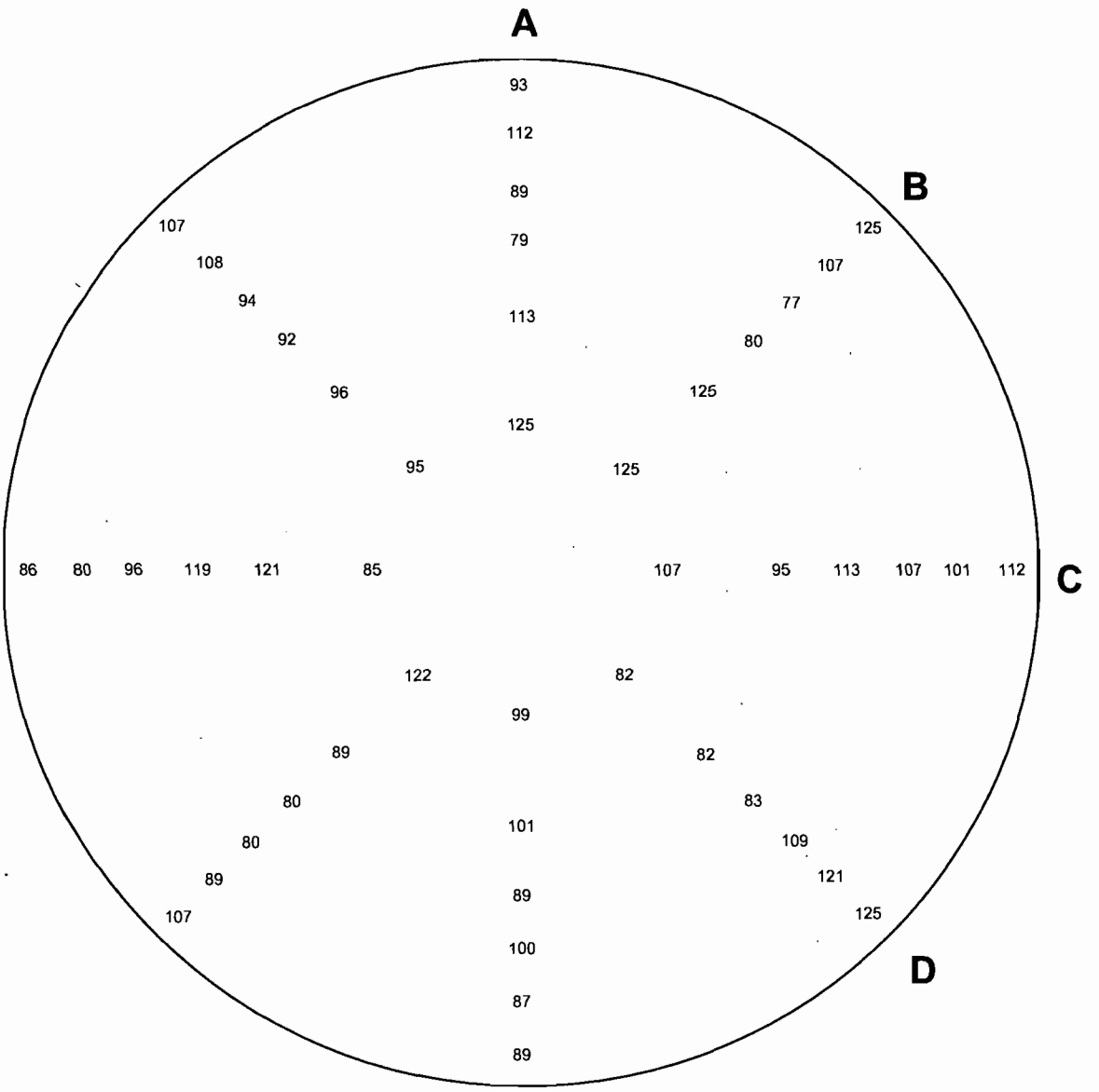
TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-0.78	-0.72	-0.70	-0.96	-1.00	-1.10
B	-0.80	-0.74	-0.73	-0.92	-0.93	-1.00
C	-0.84	-0.77	-0.80	-0.84	-0.76	-0.84
D	-1.06	-0.96	-0.96	-0.77	-0.73	-0.74

MEAN VELOCITY=	3265	FPM
MEAN VELOCITY PRESSURE=	0.66	" H_2O
MEAN TOTAL PRESSURE=	-0.85	" H_2O
RMS DEVIATION=	8.9	% OF MEAN VELOCITY
GAS TEMPERATURE=	68.5	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T5*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T5* *UNIT No. 3 - FINAL*	*PLATE No.* *127*



MEAN WEIGHTED VELOCITY=	331 FPM
MEAN TOTAL PRESSURE=	-2.03 " H_2O
RMS DEVIATION=	14.9 % OF MEAN VELOCITY
GAS TEMPERATURE=	68.5 °F
PITOT CAL FACTOR=	1.00

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T6* *Weighted*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T6* *UNIT No. 3 - FINAL*	*PLATE No.* *128*

NORMALIZED VELOCITY (%)

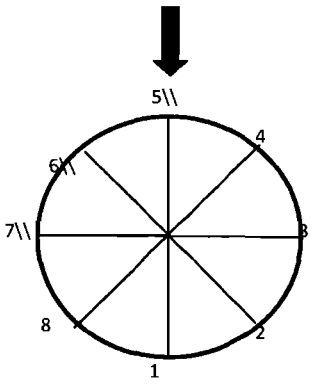
	1	2	3	4	5	6	7	8	9	10	11	12
A	93	112	89	79	113	125	99	101	89	100	87	89
B	125	107	77	80	125	125	122	89	80	80	89	107
C	112	101	107	113	95	107	85	121	119	96	80	86
D	125	121	109	83	82	82	95	96	92	94	108	107

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-2.04	-2.02	-2.04	-2.04	-2.03	-2.04	-2.03	-2.04	-2.04	-2.03	-2.03	-2.04
B	-2.03	-2.02	-2.04	-2.03	-2.03	-2.02	-2.00	-2.03	-2.03	-2.04	-2.05	-2.06
C	-2.00	-2.03	-2.03	-2.04	-2.02	-2.02	-2.03	-2.02	-2.02	-2.02	-2.03	-2.02
D	-2.02	-2.03	-2.03	-2.03	-2.02	-2.04	-2.03	-2.02	-2.03	-2.02	-2.02	-2.02

COTTON TUFT DIRECTIONAL ANGLES

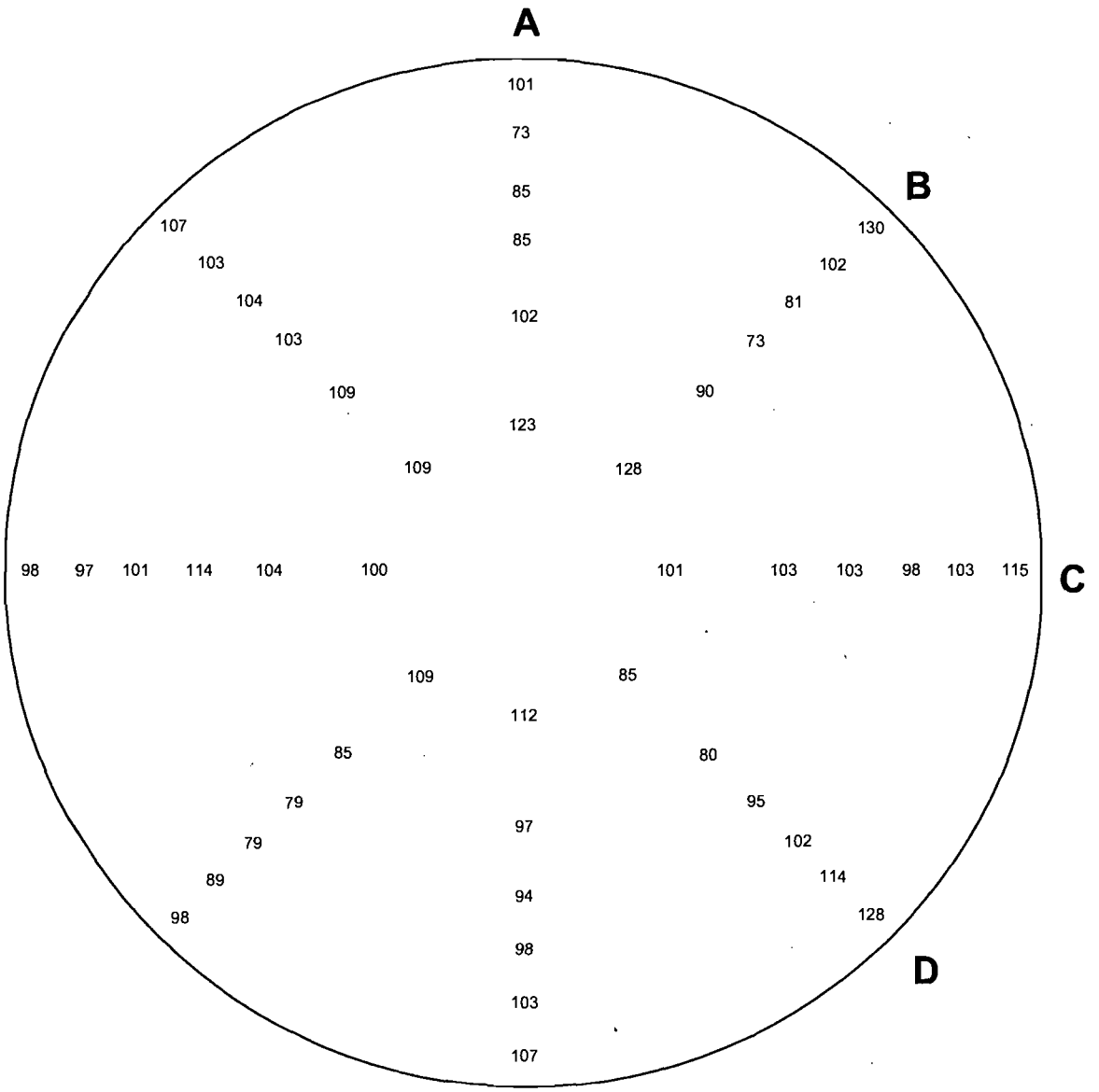
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	331	FPM
MEAN TOTAL PRESSURE=	-2.03	" H_2O
RMS DEVIATION=	14.9	% OF MEAN VELOCITY
GAS TEMPERATURE=	68.5	°F
PITOT CAL FACTOR=	1.00	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T6* *Weighted*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T6* *UNIT No. 3 - FINAL*	*PLATE No.* *129*



MEAN WEIGHTED VELOCITY=	324 FPM
MEAN TOTAL PRESSURE=	-2.04 " H_2O
RMS DEVIATION=	13.3 % OF MEAN VELOCITY
GAS TEMPERATURE=	68.5 °F
PITOT CAL FACTOR=	1.00

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T7* *Weighted*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T7* *UNIT No. 3 - FINAL*	*PLATE No.* *130*

NORMALIZED VELOCITY (%)

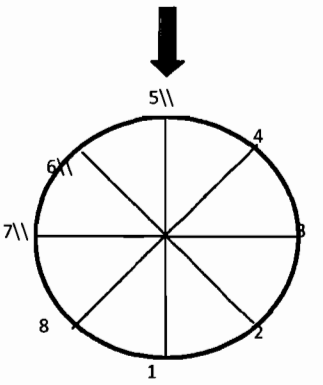
	1	2	3	4	5	6	7	8	9	10	11	12
A	101	73	85	85	102	123	112	97	94	98	103	107
B	130	102	81	73	90	128	109	85	79	79	89	98
C	115	103	98	103	103	101	100	104	114	101	97	98
D	128	114	102	95	80	85	109	109	103	104	103	107

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-2.05	-2.04	-2.03	-2.04	-2.04	-2.03	-2.04	-2.05	-2.04	-2.04	-2.04	-2.03
B	-2.04	-2.04	-2.04	-2.05	-2.05	-2.04	-2.04	-2.04	-2.04	-2.03	-2.02	-2.02
C	-2.03	-2.04	-2.03	-2.04	-2.02	-2.03	-2.04	-2.04	-2.04	-2.03	-2.02	-2.03
D	-2.03	-2.04	-2.04	-2.04	-2.03	-2.02	-2.03	-2.04	-2.04	-2.04	-2.03	-2.02

COTTON TUFT DIRECTIONAL ANGLES

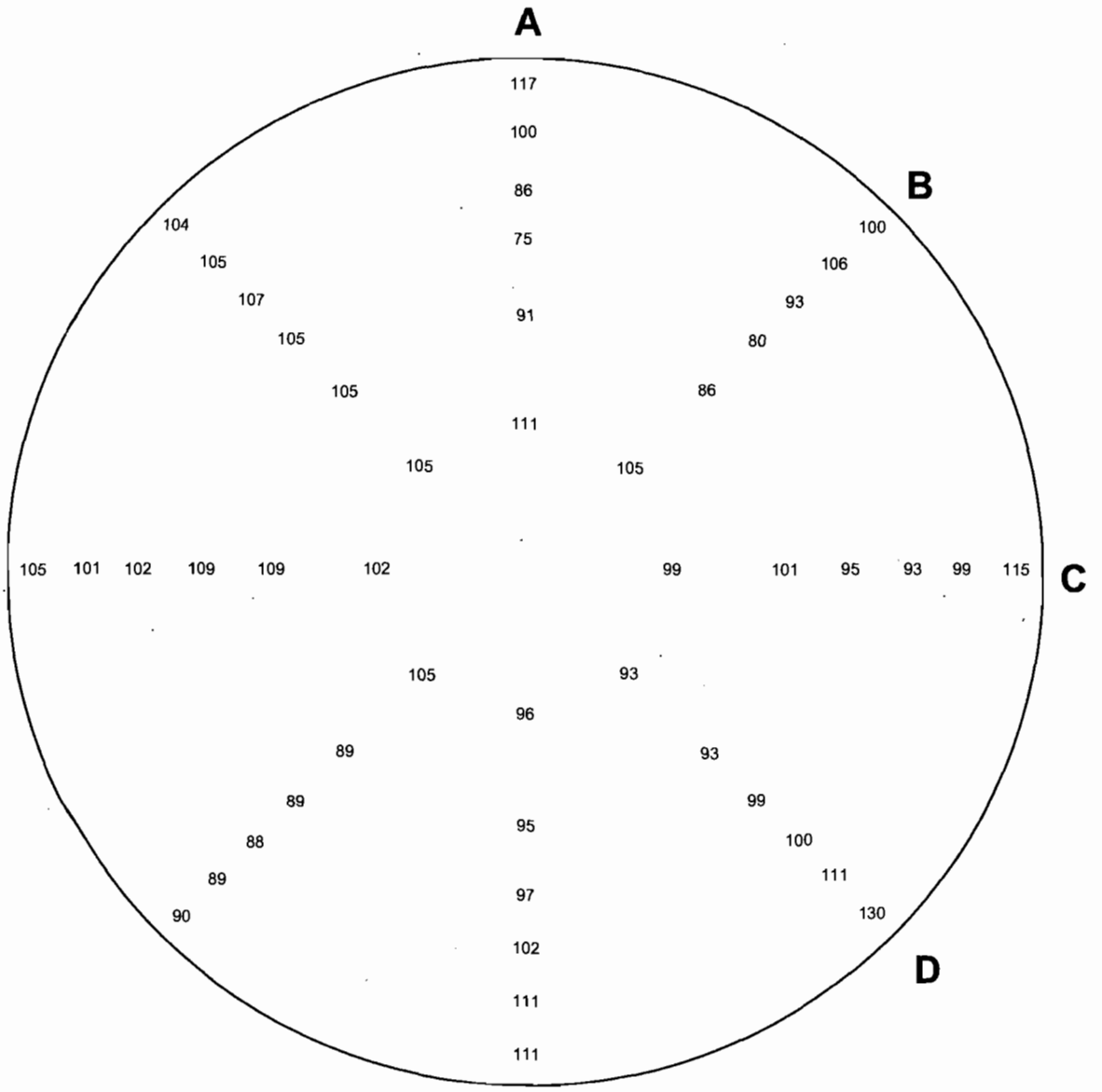
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	2	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**324**	**FPM**
MEAN TOTAL PRESSURE=	**-2.04**	**" H_2O**
RMS DEVIATION=	**13.3**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**68.5**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS	***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION	***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T7* *Weighted*
NCS Inc. ***P096.10*** ***160511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T7*** ***UNIT No. 3 - FINAL***	***PLATE No.*** *131*



MEAN WEIGHTED VELOCITY=	319 FPM
MEAN TOTAL PRESSURE=	-2.04 " H_2O
RMS DEVIATION=	9.9 % OF MEAN VELOCITY
GAS TEMPERATURE=	68.5 °F
PITOT CAL FACTOR=	1.00

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T8* *Weighted*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T8* *UNIT No. 3 - FINAL*	*PLATE No.* *132*

NORMALIZED VELOCITY (%)

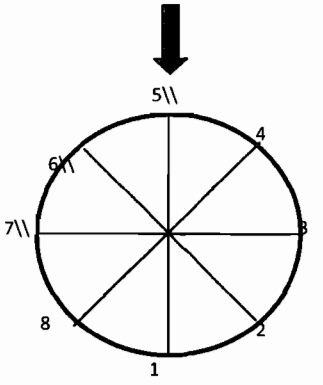
	1	2	3	4	5	6	7	8	9	10	11	12
A	117	100	86	75	91	111	96	95	97	102	111	111
B	100	106	93	80	86	105	105	89	89	88	89	90
C	115	99	93	95	101	99	102	109	109	102	101	105
D	130	111	100	99	93	93	105	105	105	107	105	104

TOTAL PRESSURE (in.H_2O)

	1	2	3	4	5	6	7	8	9	10	11	12
A	-2.06	-2.06	-2.05	-2.06	-2.04	-2.04	-2.03	-2.04	-2.04	-2.04	-2.04	-2.02
B	-2.05	-2.04	-2.04	-2.05	-2.05	-2.04	-2.04	-2.03	-2.03	-2.04	-2.04	-2.02
C	-2.04	-2.04	-2.05	-2.05	-2.02	-2.03	-2.03	-2.04	-2.05	-2.04	-2.04	-2.04
D	-2.03	-2.04	-2.04	-2.04	-2.02	-2.06	-2.06	-2.04	-2.04	-2.04	-2.04	-2.02

COTTON TUFT DIRECTIONAL ANGLES

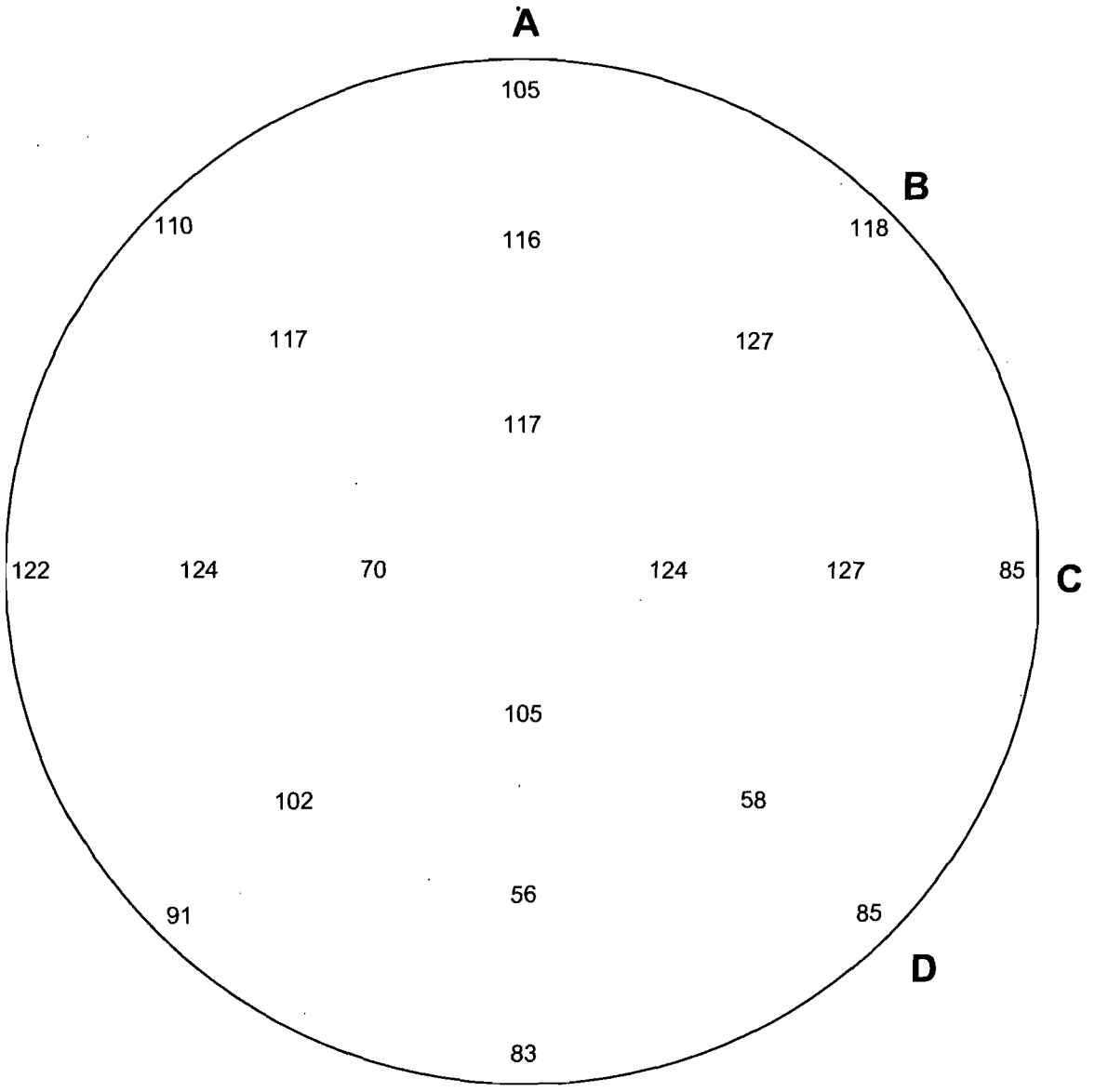
	1	2	3	4	5	6	7	8	9	10	11	12
A	1	1	1	1	1	1	1	1	1	1	1	1
B	1	1	1	1	1	1	1	1	1	1	1	1
C	1	1	1	1	1	1	1	1	1	1	1	1
D	1	1	1	1	1	1	1	1	1	1	1	1



MEAN WEIGHTED VELOCITY=	**319**	**FPM**
MEAN TOTAL PRESSURE=	**-2.04**	**" H_2O**
RMS DEVIATION=	**9.9**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**68.5**	**°F**
PITOT CAL FACTOR=	**1.00**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T8* *Weighted*
NCS Inc. ***P096.10*** ***160511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T8*** ***UNIT No. 3 - FINAL***	***PLATE No.*** *133*



MEAN VELOCITY=	3280 FPM
MEAN VELOCITY PRESSURE=	0.69 " H_2O
MEAN TOTAL PRESSURE=	-2.47 " H_2O
RMS DEVIATION=	21.1 % OF MEAN VELOCITY
GAS TEMPERATURE=	68.5 °F
PITOT CAL FACTOR=	0.83

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T9*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T9* *UNIT No. 3 - FINAL*	*PLATE No.* *134*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6
A	105	116	117	105	56	83
B	118	127	124	70	102	91
C	85	85	70	102	124	122
D	85	58	117	111	117	110

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6
A	-2.06	-2.10	-2.04	-2.48	-3.20	-3.06
B	-2.08	-2.10	-2.22	-3.00	-2.66	-2.77
C	-2.44	-2.66	-3.00	-2.40	-2.10	-2.14
D	-3.08	-3.10	-2.22	-2.10	-2.10	-2.18

MEAN VELOCITY=	3280	FPM
MEAN VELOCITY PRESSURE=	0.69	" H_2O
MEAN TOTAL PRESSURE=	-2.47	" H_2O
RMS DEVIATION=	21.1	% OF MEAN VELOCITY
GAS TEMPERATURE=	68.5	°F
PITOT CAL FACTOR=	0.83	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS *ST. PETERSBURG, FLORIDA*	*DATE* *SEPT 2011*
	VEOLIA PINELLAS SDA INSTALLATION *UNITS 1, 2 & 3* *AIRFLOW MODEL STUDY*	*T9*
NCS Inc. *P096.10* *160511A*	*NORMALIZED VELOCITY DISTRIBUTION* *TEST LOCATION T9* *UNIT No. 3 - FINAL*	*PLATE No.* *135*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	*ROW AVG*
1	112	121	125	116	121	123	117	*119*
2	121	120	103	91	103	112	121	*110*
3	113	96	76	68	85	101	108	*92*
4	92	86	56	59	70	92	92	*78*
COL AVG	*110*	*106*	*90*	*83*	*95*	*107*	*110*	

TOTAL PRESSURE (in.H2O)

	1	2	3	4	5	6	7
1	-2.18	-2.10	-2.10	-2.20	-2.12	-2.10	-2.10
2	-2.11	-2.40	-2.60	-2.61	-2.55	-2.28	-2.14
3	-2.12	-2.44	-2.77	-2.96	-2.70	-2.40	-2.22
4	-2.40	-2.60	-2.88	-2.97	-2.81	-2.49	-2.40

MEAN VELOCITY=	**3246**	**FPM**
MEAN VELOCITY PRESSURE=	**0.67**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.42**	**" H_2O**
RMS DEVIATION=	**20.1**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**68.5**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

	VEOLIA ES PINELLAS ***ST. PETERSBURG, FLORIDA***	***DATE*** ***SEPT 2011***
	VEOLIA PINELLAS SDA INSTALLATION ***UNITS 1, 2 & 3*** ***AIRFLOW MODEL STUDY***	*T10*
NCS Inc. ***P096.10*** ***160511A***	***NORMALIZED VELOCITY DISTRIBUTION*** ***TEST LOCATION T10*** ***UNIT No. 3 - FINAL***	***PLATE No.*** *136*

NORMALIZED VELOCITY (%)

	1	2	3	4	5	6	7	ROW AVG
1	91	96	89	87	91	96	96	92
2	114	98	83	83	83	100	122	98
3	117	99	91	92	90	110	114	102
4	111	113	107	96	111	114	107	108
COL AVG	108	101	92	89	94	105	110	

TOTAL PRESSURE (in.H2O)

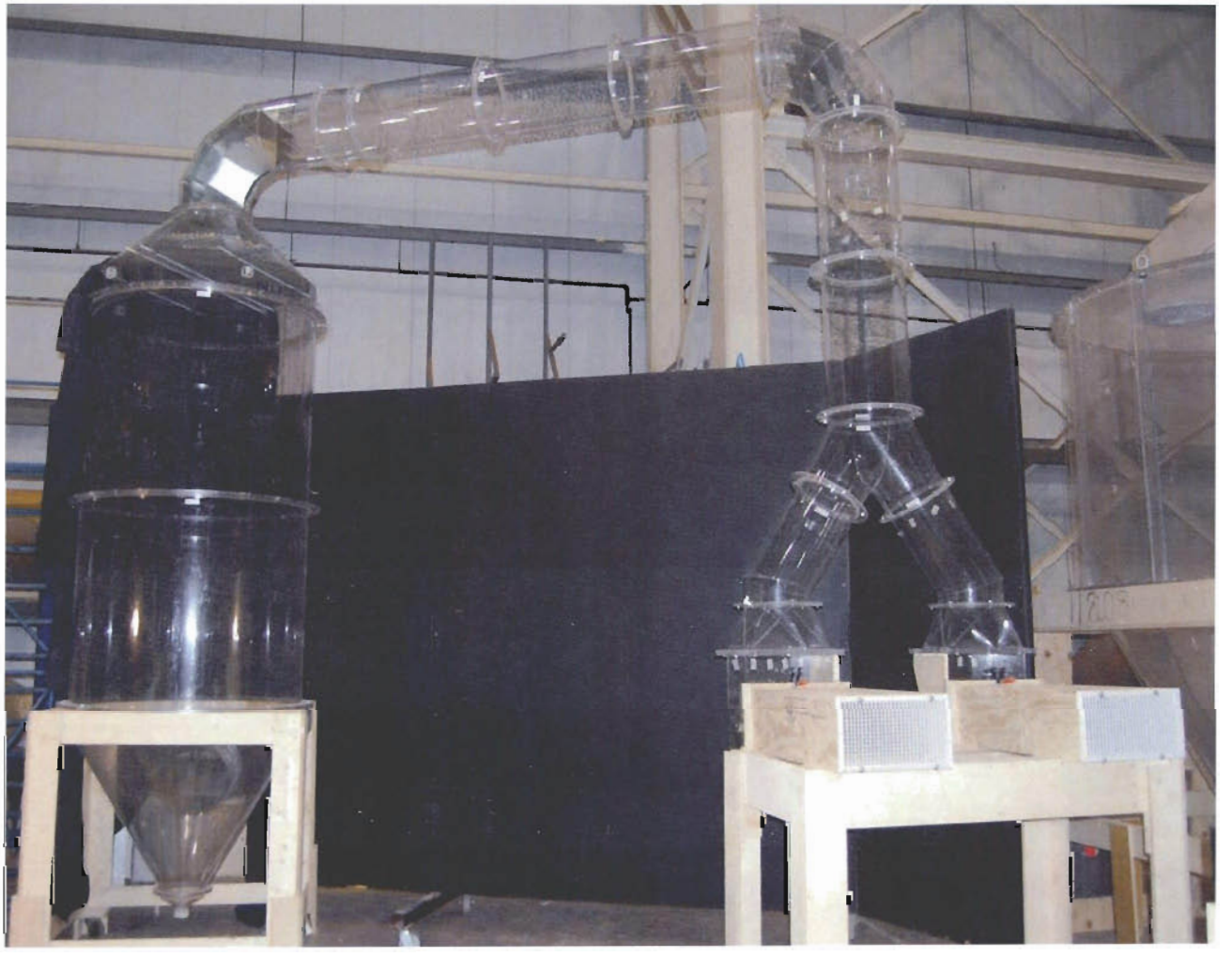
	1	2	3	4	5	6	7
1	-2.48	-2.50	-2.60	-2.66	-2.60	-2.49	-2.44
2	-2.29	-2.55	-2.77	-2.77	-2.70	-2.49	-2.18
3	-2.26	-2.49	-2.64	-2.66	-2.66	-2.40	-2.24
4	-2.40	-2.38	-2.44	-2.60	-2.44	-2.22	-2.40

MEAN VELOCITY=	**3117**	**FPM**
MEAN VELOCITY PRESSURE=	**0.60**	**" H_2O**
MEAN TOTAL PRESSURE=	**-2.49**	**" H_2O**
RMS DEVIATION=	**11.4**	**% OF MEAN VELOCITY**
GAS TEMPERATURE=	**68.5**	**°F**
PITOT CAL FACTOR=	**0.83**	

VELOCITY DISTRIBUTION VIEWED IN DIRECTION OF FLOW
NORMALIZED VELOCITIES EXPRESSED AS A PERCENT OF MEAN

VEOLIA ES PINELLAS		***DATE***
ST. PETERSBURG, FLORIDA		***SEPT 2011***
VEOLIA PINELLAS SDA INSTALLATION		***TV***
UNITS 1, 2 & 3		
AIRFLOW MODEL STUDY		
NCS Inc.	***NORMALIZED VELOCITY DISTRIBUTION***	***PLATE No.***
P096.10	***TEST LOCATION TV***	***137***
160511A	***UNIT No. 3 - FINAL***	

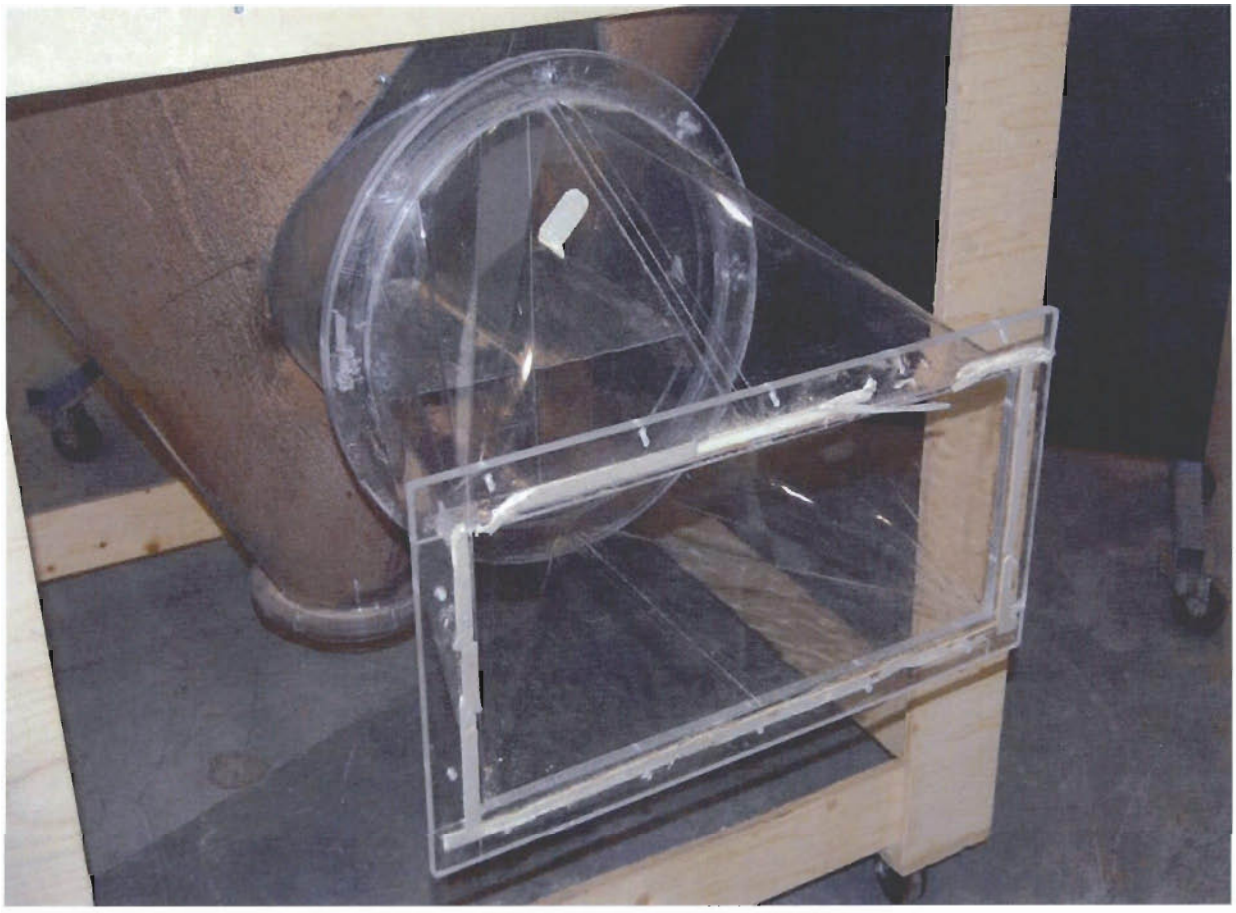
PHOTOGRAPHS



PHOTOGRAPH A
General Model Arrangement

PHOTOGRAPH B
SDA Inlet Ductwork & Top of SDA

PHOTOGRAPH C
Inlet Ductwork



PHOTOGRAPH D
Outlet Ductwork

PHOTOGRAPH E
Proposed Chevron Modifications

PHOTOGRAPH F
Proposed SDA Outlet Ductwork Modifications

APPENDIX A

Fabrication Drawings - Revision 0