Quarterly Results for the 2017-2018 Air Monitoring Program: July 16, 2018 - October 15, 2018

Prepared for

PCC Structurals, Inc.

December 2018

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Contents

Acronyms and Abbreviations

AB	ambient field blank
ARA	ARA Instruments
As	arsenic
ASTM	ASTM International
Be	beryllium
CH2M	CH2M HILL Engineers, Inc.
Cd	cadmium
Co	cobalt
Cr	chromium
Cr^{6+}	hexavalent chromium
EPA	U.S. Environmental Protection Agency
ICP/MS	inductively coupled plasma mass spectrometry
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
Mn	manganese
MS/MSD	matrix spike/matrix spike duplicate
NFG	National Functional Guidelines
Ni	nickel
NIST	National Institute of Standards and Technology
Pb	lead
QC	quality control
RL	reporting limit
RPD	relative percent difference
SDG	sample delivery group
Se	selenium

SECTION 1

Introduction

CH2M HILL Engineers, Inc. (CH2M) is performing air monitoring for PCC Structurals, Inc., at one location in Portland, Oregon. Samples are being collected with two ARA Instruments (ARA) N-FRM sampling and monitoring devices every 3 days according to the U.S. Environmental Protection Agency (EPA) sampling schedule. One ARA sampler is equipped to collect filter samples for metals, the other ARA sampler is configured with a sampling cane and filter cartridge to collect hexavalent chromium (Cr6+). Samples are collected for a duration of 24 hours. Filter samples are analyzed for the following metals by ALS Laboratories: arsenic (As), beryllium (Be), cadmium(Cd), total chromium (Cr), cobalt (Co), lead (Pb), manganese (Mn), nickel (Ni), and selenium (Se). Filter cartridge samples are analyzed for Cr6+ by CHESTER LabNet.

This report summarizes the quarterly results and quality assurance activities performed between July 16, 2018, and October 15, 2018. The monitoring location is shown on Figure 1.

SECTION 2

Data

CH2M conducted 31 sampling events during this reporting period. Data completeness goals for metals and Cr6+ exceeded the project goal of 80 percent (see Table 1). The 10/5/18 CrV1 sample did not run. Complete results are presented in Appendix A.

Table 1. 24-hour Average Data Completeness for July 16, 2018, through October 15, 2018
Quarterly Results for the 2017-2018 Air Monitoring Program: July 16, 2018 - October 15, 2018

Period	Valid Readings (Days)	Possible Readings (Days)	Data Completeness (Percent)
M1- Metals	31	31	100
M2-Cr6+	30	31	97
Total	61	62	99

SECTION 3

Field Data Quality

3.1 Field Quality Assurance and Quality Control Activities

3.1.1 Monthly Flow Verifications

The ARA N-FRM instrument's temperature, pressure, and flow rate are verified against a National Institute of Standards and Technology (NIST) traceable flowmeter at least once per month. None of the results exceeded the measurement quality objective of +/- 6 percent. Results from monthly flow verifications are presented in Appendix B.

3.1.2 Quarterly Audits

At least once per quarter, the ARA N-FRM instrument's pressure and flow rate are verified against a secondary NIST traceable flowmeter. None of the results exceeded the measurement quality objective of +/- 6 percent. Results from the quarterly audit are presented in Appendix C.

3.2 Corrective Actions July- October 2018

None.

SECTION 4

Analytical Data Quality

This quarterly report covers 61 air monitoring samples. These samples were reported under six sample delivery groups (SDGs) by the laboratories in this reporting period. Two methods were used to analyze the environmental samples and are listed in Table 2. The analyses were performed by ALS Laboratories in Salt Lake City, Utah, and CHESTER LabNet in Tigard, Oregon. Samples were collected and delivered by commercial carrier to the laboratories.

Table 2. Analytical Parameters by Laboratory
Quarterly Results for the 2017-2018 Air Monitoring Program: July 16, 2018 - October 15, 2018

Parameter	Method	Laboratory
Chromium, Hexavalent	ASTM D7614-12	CHESTER LabNet
Metals	ICP-MS	ALS Laboratories

Notes:

ASTM = ASTM International

ICP-MS = inductively coupled plasma mass spectrometry

4.1 Methodology

The SDGs were assessed by reviewing the following: (1) chain-of-custody documentation, including sample cooler temperatures and appropriate sample preservation; (2) holding-time compliance; (3) required quality control samples at the specified frequencies; (4) review of detection limits; (5) review of analytical blanks and field blanks; (6) laboratory control sample/laboratory control sample duplicates (LCS/LCSD) precision and recoveries; (7) matrix spike/matrix spike duplicate (MS/MSD) precision and recoveries; (8) laboratory precision; and (9) additional method-required quality control (QC) samples.

Data flags were assigned according to the National Functional Guidelines (NFG) (EPA, 2016a and 2016b). Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there will only be one final flag. A final flag is applied to the data and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags utilized are those listed in the NFG. The data flags are defined as follows:

- J1 = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample due to concentrations between the detection limit and quantitation limit.
- J2 = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample due to flags applied during the validation process.
- R = The sample result was rejected because of deficiencies in the ability to analyze the sample and meet the QC criteria. The presence or absence of the analyte could not be verified. Data flagged “R” should not be used in a decision-making process.
- U = The analyte was analyzed for but was not detected above the reported sample quantitation limit or a detection in the samples was changed to a nondetected result and flagged “U” due to blank contamination.

- UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

4.2 Findings

The overall summaries of the data validation are contained in the following sections. Qualified data are listed in Appendix D.

4.2.1 Holding Time/Preservation

All method-recommended holding time and preservation criteria were met.

4.2.2 Laboratory QC Samples

4.2.2.1 Method Blanks

A method blank is a clean matrix and is carried through the same analytical procedures as the environmental samples. Method blank samples are used to monitor each preparation or analytical batch for contamination throughout the entire analytical process. Method blank samples were analyzed at the required frequency and were generally free of contamination, with the following exceptions:

- Beryllium and manganese were detected below the RL in one laboratory method blank (LB). A total of 18 associated detected sample results were less than or equal to five times the blank concentrations and were qualified as not detected and flagged “U.”

4.2.2.2 Field Blanks

A field, or ambient, blank is a sample collected to evaluate the ambient air conditions at the site. It uses the same sample collection techniques as the environmental samples. Field blank samples were analyzed at the required frequency and were generally free of contamination, with the following exceptions:

- Cadmium, chromium, lead, or manganese were detected below the RL in one or more ambient field blank (AB). A total of 29 associated detected sample results were less than or equal to five times the blank concentrations and were qualified as not detected and flagged “U.”
- Chromium was detected above the RL in one or more ABs. A total of 12 associated detected sample results were less than or equal to five times the blank concentrations and were qualified as not detected and flagged “U.”

4.2.2.3 Laboratory Control Samples

LCS samples were analyzed to assess accuracy of the analytical method in the absence of matrix effects and all acceptance criteria were met.

4.2.2.4 Matrix Spike

MS samples were analyzed as required by the analytical methods to assess accuracy and to identify possible matrix effects associated with the samples. Only the “parent” samples are qualified for MS issues, but data users should take into consideration low spike recoveries when evaluating other sample locations. In some cases, other laboratory samples were used to fulfill the laboratory’s QC batch requirements. When samples from the site were selected for MS analyses, all acceptance criteria were met.

4.2.2.5 Laboratory Duplicates

Laboratory duplicates were performed as required by the analytical methods to assess precision of the method. In some cases, other laboratory samples were used to fulfill the laboratory's QC batch requirements. When samples from the site were used, all precision criteria were met.

4.2.3 Chain of Custody

Required procedures were followed and were generally free of errors.

4.3 Overall Assessment

The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected and the resulting analytical data can be used to support the decision-making process. The following summary highlights the precision, accuracy, representativeness, comparability, and completeness findings for the above-defined events:

- Precision of the data was verified through the review of the laboratory data quality indicators that include LCS and laboratory duplicate RPDs. Precision was acceptable.
- Accuracy of the data was verified through the review of the LCS and MS recoveries, as well as the evaluation of method and field blank data. Accuracy was acceptable. Method and field blanks were generally free of contamination with the exception of several metal compounds that were qualified as not detected due to method and field blank contamination. Data users should consider the impact to any result that is qualified as estimated as it may contain a bias that could affect the decision-making process.
- Representativeness of the data was verified through the sample's collection, storage, and preservation procedures and the verification of holding-time compliance. Data were reported from analyses within the recommended holding time.
- Comparability of the data was verified through the use of standard EPA analytical procedures and standard units for reporting. Results obtained are comparable to industry standards in that the collection and analytical techniques followed approved, documented procedures.
- Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements compared to planned measurements. Valid data are defined as all data that are not rejected for project use. All data were considered valid.

SECTION 5

Summary

This report summarizes data collected for the fourth monitoring quarter: July 16, 2018, through October 15, 2018. Field and laboratory quality assurance procedures were acceptable during this monitoring period.

SECTION 6

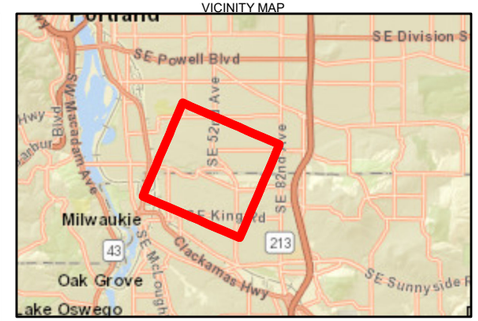
References

U.S. Environmental Protection Agency (EPA). 2016a. *National Functional Guidelines for Superfund Organic Methods Data Review.* September.

U.S. Environmental Protection Agency (EPA). 2016b. *National Functional Guidelines for Superfund Inorganic Methods Data Review.* September.

Figure

VICINITY MAP



Legend

- Air Monitoring Station

N

0 1,200 Feet

Figure 1. Monitoring Location

ch2m

Appendix A
Complete Results

Expanded Quarterly Report – Cumulative Air Quality Monitoring Results - July 16th, 2018 to October 15th, 2018

Springwater Corridor

Data quality key

Flag	Description
J1	Estimated value. Below the quantitation limit and above the detection limit.
J2	Estimated value. Flags applied during the validation process.
NA	No sample collected
R	Data of unacceptable quality

Comparison Values for Metals in Air

	Arsenic, Total (ng/m³)	Beryllium, Total (ng/m³)	Cadmium, Total (ng/m³)	Chromium, Total (ng/m³)	Cobalt, Total (ng/m³)	Hexavalent Chromium Cr(VI) (ng/m³)	Lead, Total (ng/m³)	Manganese, Total (ng/m³)	Nickel, Total (ng/m³)	Selenium, Total (ng/m³)
Urban Background from NATTS sites	0.2 - 1.4	< MDL	0.04 - 0.5	1.6 - 4	0.05 - 0.3	0.01 - 0.08	2 - 10	3.2 - 19.5	0.8 - 2.8	0.1 - 1
DEQ Ambient Benchmark	0.2	0.4	0.6	NA	100	0.08	150	90	4	NA
Risk Based Concentrations (RBC) acute	200	20	30	NA	NA	300	150	300	200	2,000

Statistics of Daily Values

	Arsenic, Total (ng/m³)	Beryllium, Total (ng/m³)	Cadmium, Total (ng/m³)	Chromium, Total (ng/m³)	Cobalt, Total (ng/m³)	Hexavalent Chromium Cr(VI) (ng/m³)	Lead, Total (ng/m³)	Manganese, Total (ng/m³)	Nickel, Total (ng/m³)	Selenium, Total (ng/m³)
Minimum Detected Amount	0.17	0.16	0.17	6.9	0.16	0.0208	0.21	0.55	1.6	NA
Maximum Detected Amount	11	0.19	2.8	51	2.5	0.4620	9.1	21	6.4	NA
Average[1]	0.6	NA	0.38	4.52	0.32	0.0314	1.01	6.20	2.13	NA
Standard Deviation[1]	0.64	NA	1.16	4.93	0.19	0.0299	0.74	6.86	0.89	NA
Times above the RBC acute	0	0	0	0	0	0	0	0	0	NA

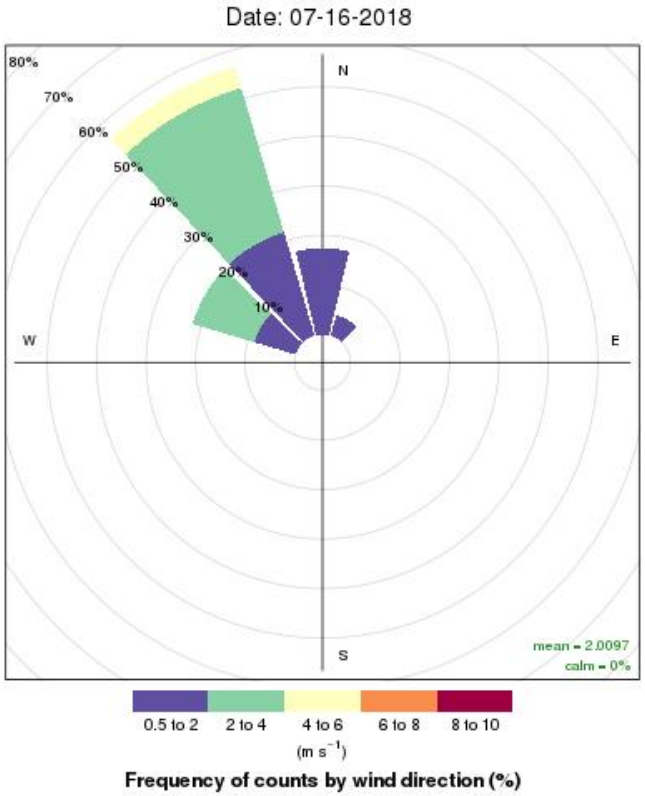
1 Calculated by using ProUCL 5, Kaplan Meier method with non-detects

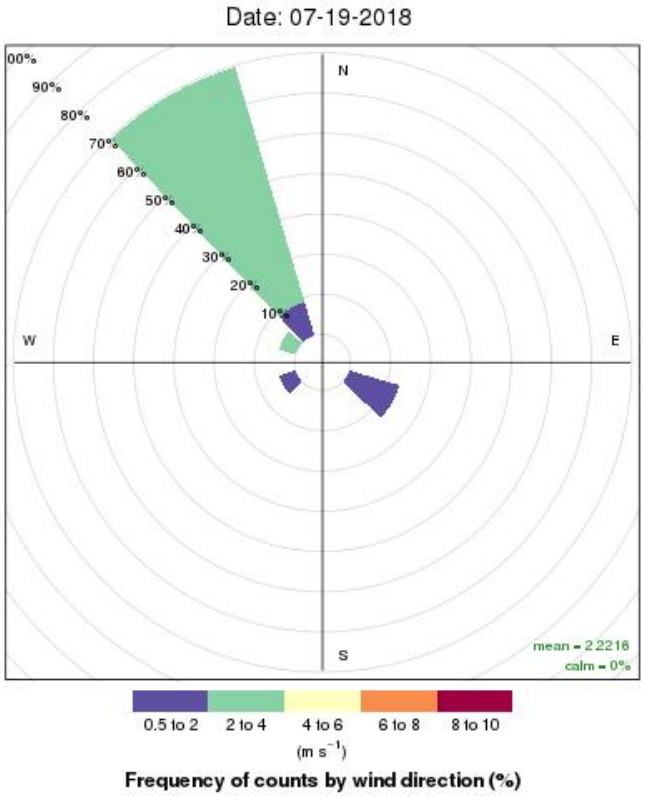
Daily Data

Sampled	Type	Arsenic, Total (ng/m^3)	Beryllium, Total (ng/m^3)	Cadmium, Total (ng/m^3)	Chromium, Total (ng/m^3)	Cobalt, Total (ng/m^3)	Hexavalent Chromium Cr(VI) (ng/m^3)	Lead, Total (ng/m^3)	Manganese, Total (ng/m^3)	Nickel, Total (ng/m^3)	Selenium, Total (ng/m^3)
07/16/2018	24 hr	0.26 J1	<0.16	<0.16	<1.6	0.23 J1	<0.0208	1.2	10	<1.6	<6.2
07/19/2018	24 hr	0.21 J1	<0.16	<0.16	<1.6	0.3 J1	<0.0208	1.1	15	2.7 J1	<6.2
07/22/2018	24 hr	0.27 J1	<0.16	<0.16	<1.6	0.21 J1	<0.0208	1.6	13	<1.6	<6.2
07/25/2018	24 hr	0.21 J1	<0.16	<0.16	<1.6	0.26 J1	0.0243 J1	1.7	12	<1.6	<6.2
07/28/2018	24 hr	0.24 J1	<0.16	<0.16	<1.6	0.18 J1	<0.0208	2	7	<1.6	<6.2
07/31/2018	24 hr	<0.16	<0.16	<0.16	<1.6	0.18 J1	<0.0208	1.1	9.7	<1.6	<6.2
08/03/2018	24 hr	<0.16	<0.16	<0.16	<1.6	0.28 J1	<0.0208	1	5	<1.6	<6.2
08/06/2018	24 hr	0.20 J1	<0.16	<0.16	<1.6	0.38 J1	0.0236 J1	1.6	15	<1.6	<6.2
08/09/2018	24 hr	0.29 J1	<0.16	<0.16	<1.6	0.37 J1	<0.0208	1.8	21	2.2 J1	<6.2
08/12/2018	24 hr	0.28 J1	<0.16	<0.16	<1.6	<0.16	<0.0208	1.7	7	<1.6	<6.2
08/15/2018	24 hr	0.34 J1	<0.16	<0.16	<1.6	0.37 J1	0.0396 J1	1.9	17	2.1 J1	<6.2
8/18/2018	24 hr	1	<0.16	0.18 J1	9.1	0.19 J1	<0.0208	2.2	<0.16	<1.6	<6.2
8/21/2018	24 hr	0.45 J1	<0.16	0.28 J1	16	1	0.0646 J1	2.2	<0.16	5.2	<6.2
8/24/2018	24 hr	0.33 J1	<0.16	<0.16	11	0.28 J1	<0.0208	0.94	<0.16	<1.6	<6.2
8/27/2018	24 hr	0.49 J1	<0.16	<0.16	15	0.32 J1	<0.0208	2.2	<0.16	<1.6	<6.2
8/30/2018	24 hr	<0.16	<0.16	<0.16	<1.6	<0.16	<0.0208	0.35 J1	<0.16	<1.6	<6.2
9/2/2018	24 hr	0.18 J1	<0.16	<0.16	8.4	<0.16	<0.0208	0.52	<0.16	<1.6	<6.2
9/5/2018	24 hr	0.20 J1	<0.16	<0.16	8.3	0.17 J1	<0.0208	0.50 J1	<0.16	<1.6	<6.2
9/8/2018	24 hr	0.46 J1	<0.16	<0.16	18	0.74	<0.0208	1.8	<0.16	2.3 J1	<6.2
9/11/2018	24 hr	0.31 J1	<0.16	<0.16	10	0.21 J1	<0.0208	1.2	<0.16	<1.6	<6.2
9/14/2018	24 hr	2	<0.16	<0.16	9	0.27 J1	0.0535 J1	1.1	<0.16	<1.6	<6.2
09/17/2018	24 hr	0.26 J1	<0.16	<0.16	<1.6	0.53	0.0722 J1	<0.16	<0.16	3.4 J1	<6.2
09/20/2018	24 hr	0.93	<0.16	<0.16	<1.6	0.26 J1	<0.0208	<0.16	14	2.6 J1	<6.2
09/23/2018	24 hr	0.63	<0.16	<0.16	<1.6	0.26 J1	<0.0208	<0.16	<0.16	2.3 J1	<6.2
09/26/2018	24 hr	0.9	<0.16	<0.16	<1.6	0.26 J1	0.0278 J1	<0.16	<0.16	2.7 J1	<6.2
09/29/2018	24 hr	2.8	<0.16	6.7	<1.6	0.58	<0.0208	<0.16	<0.16	2.2 J1	<6.2
10/02/2018	24 hr	0.49 J1	<0.16	<0.16	<1.6	0.38 J1	<0.0208	<0.16	15	1.7 J1	<6.2
10/05/2018	24 hr	0.81	<0.16	<0.16	<1.6	<0.16	NA	<0.16	<0.16	<1.6	<6.2
10/08/2018	24 hr	2.3	<0.16	<0.16	<1.6	<0.16	<0.0208	<0.16	<0.16	1.8 J1	<6.2
10/11/2018	24 hr	0.96	<0.16	<0.16	<1.6	0.33 J1	0.0222 J1	<0.16	14	2.8 J1	<6.2
10/14/2018	24 hr	0.31 J1	<0.16	<0.16	<1.6	0.7	0.1760	<0.16	15	4.8 J1	<6.2

Wind Roses

Wind speed and direction data are collected in the Oregon DEQ air quality monitoring station located in SE Lafayette in SE Portland.





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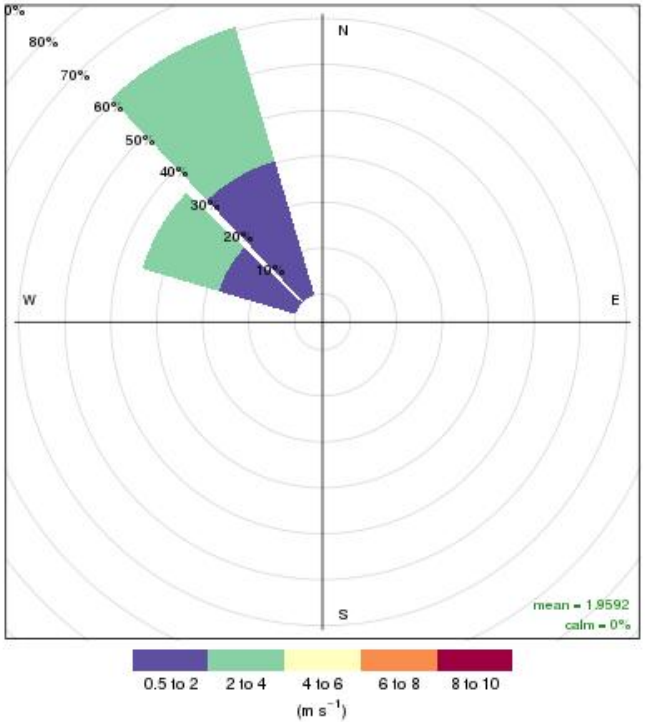
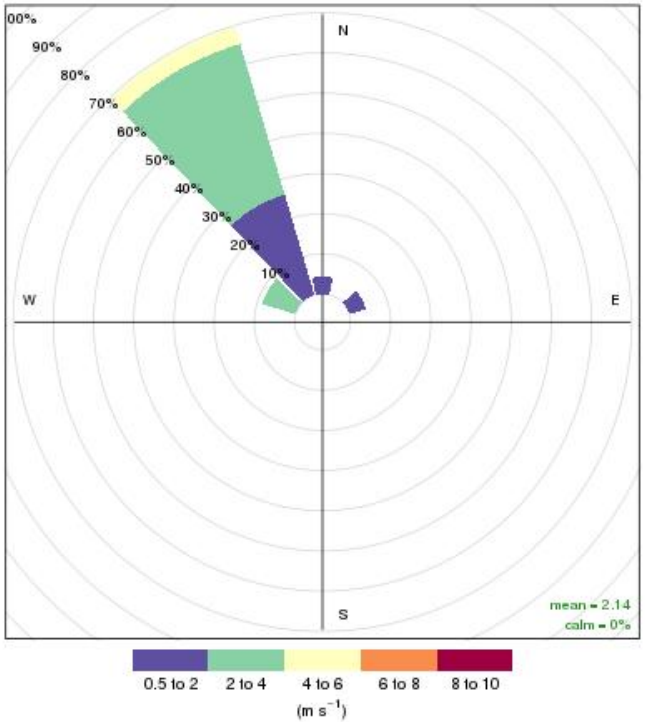


Frequency of counts by wind direction (%)

Date: 07-25-2018



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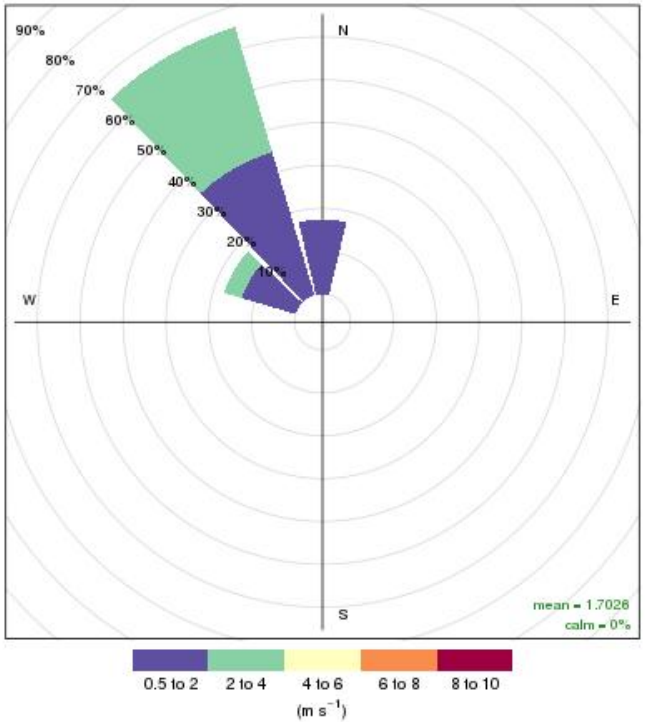

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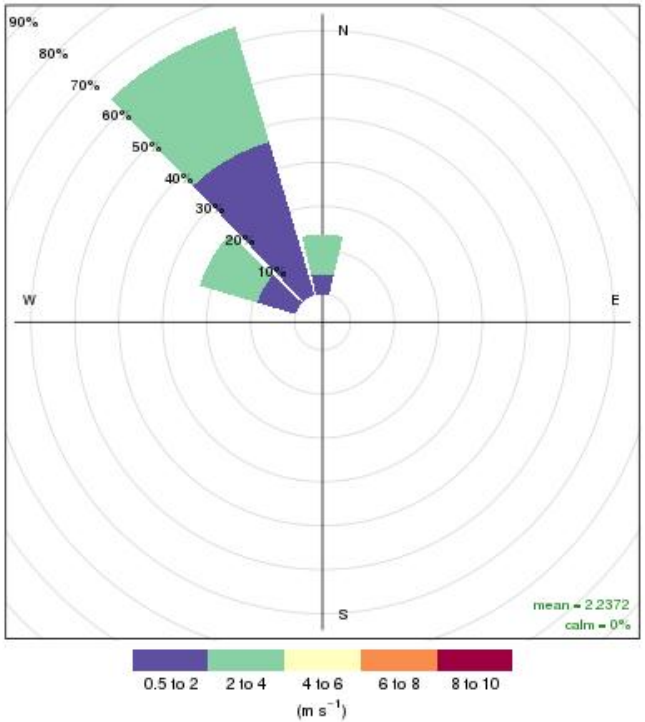

Frequency of counts by wind direction (%)

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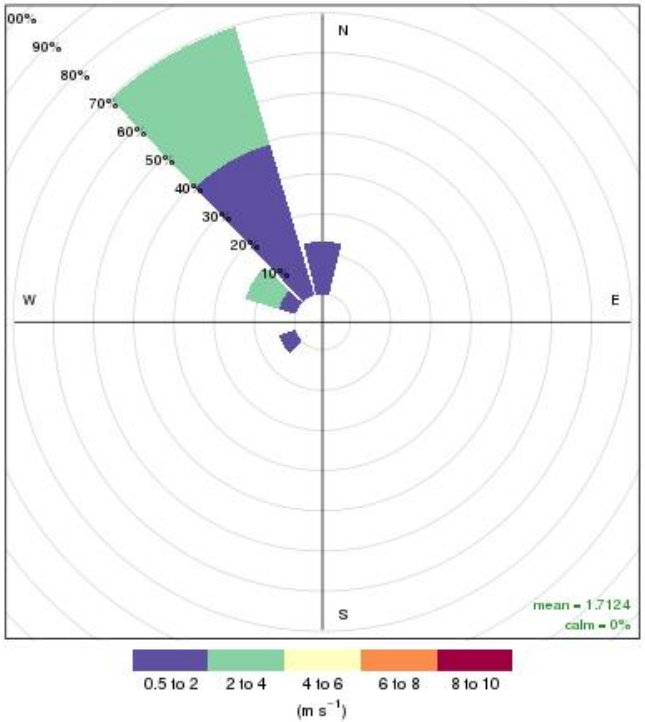

Frequency of counts by wind direction (%)

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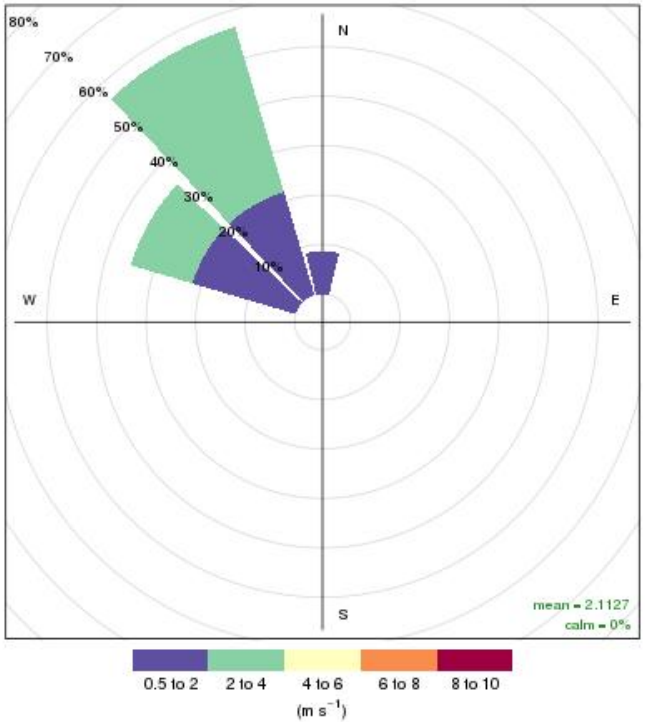
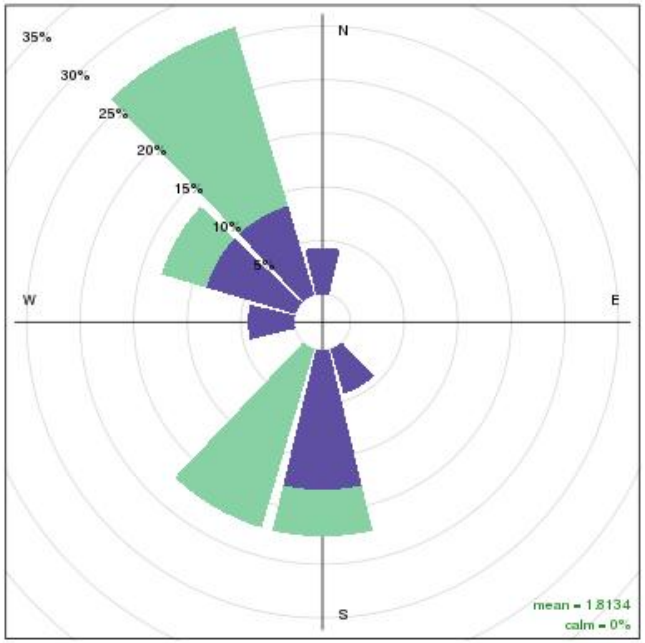
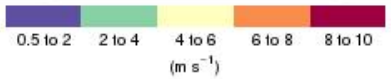


Frequency of counts by wind direction (%)

Date: 08-09-2018





Frequency of counts by wind direction (%)

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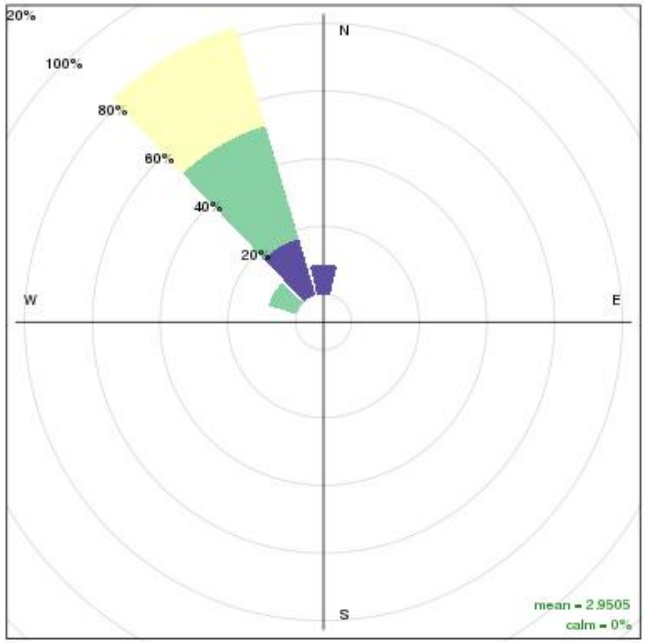
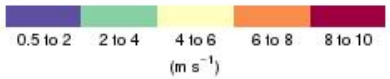
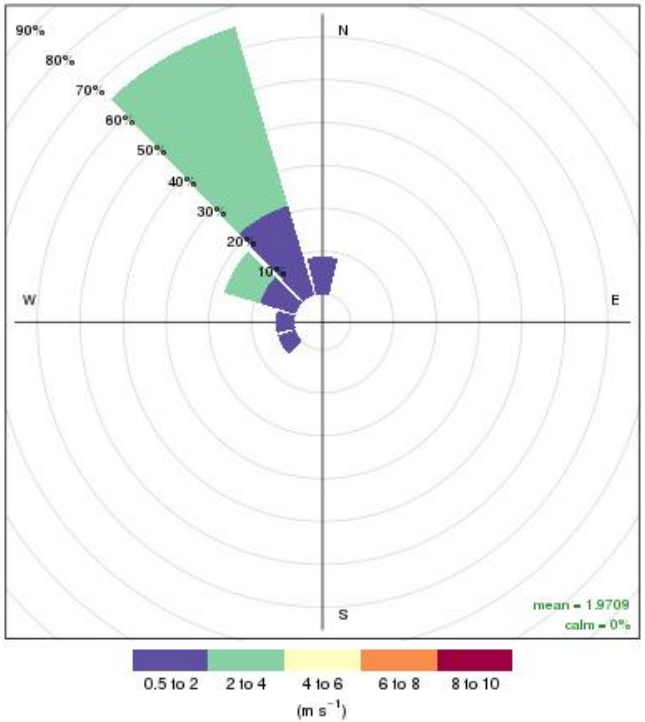




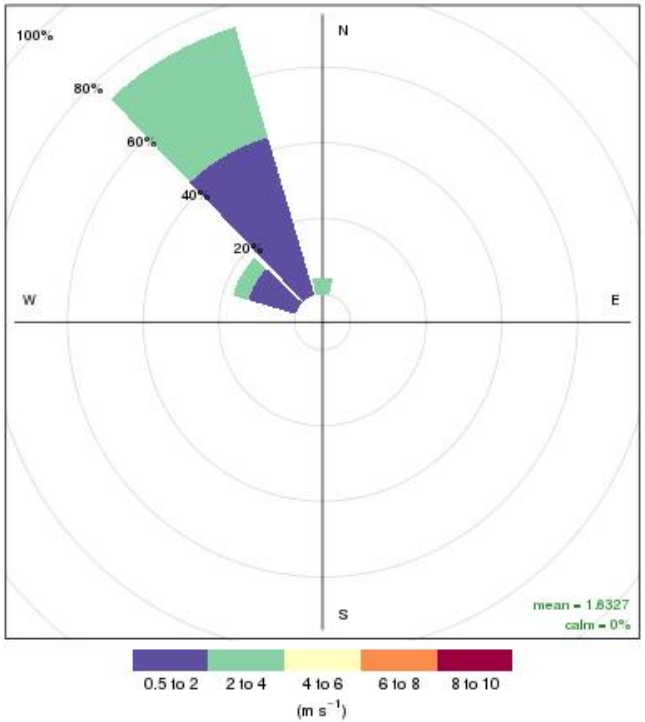
Frequency of counts by wind direction (%)

Date: 08-15-2018



Frequency of counts by wind direction (%)

Date: 08-18-2018



Frequency of counts by wind direction (%)

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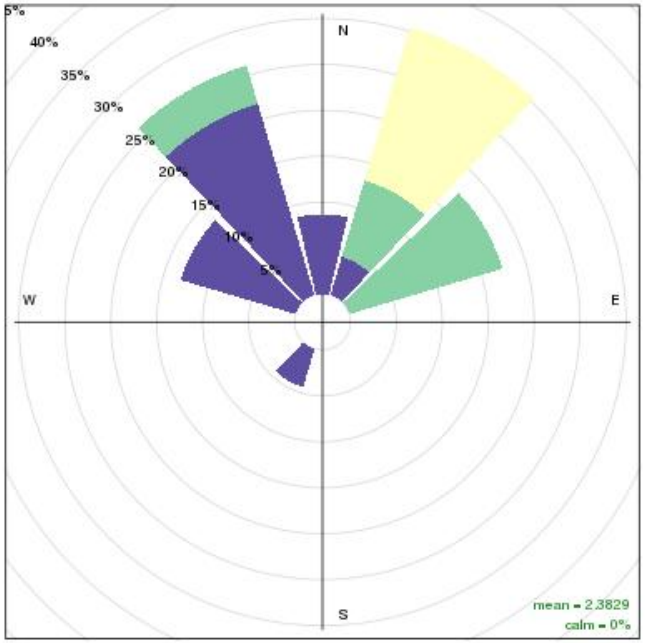

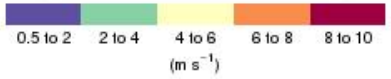

Frequency of counts by wind direction (%)

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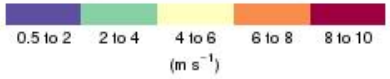

Frequency of counts by wind direction (%)

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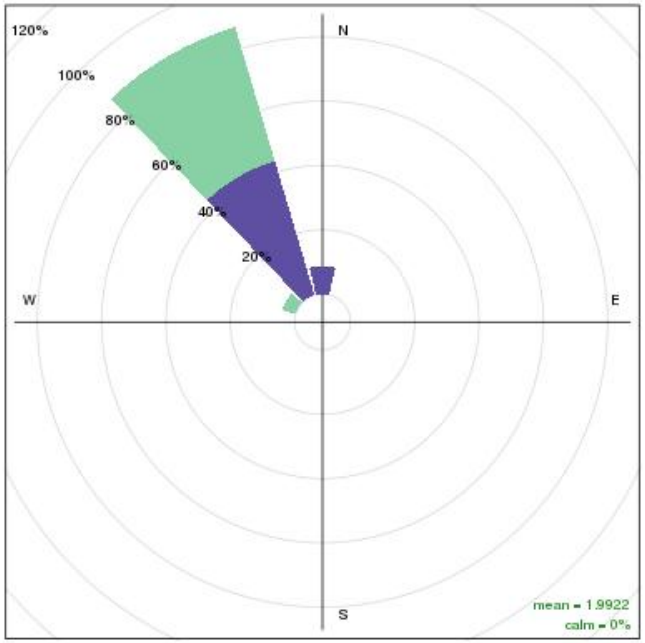
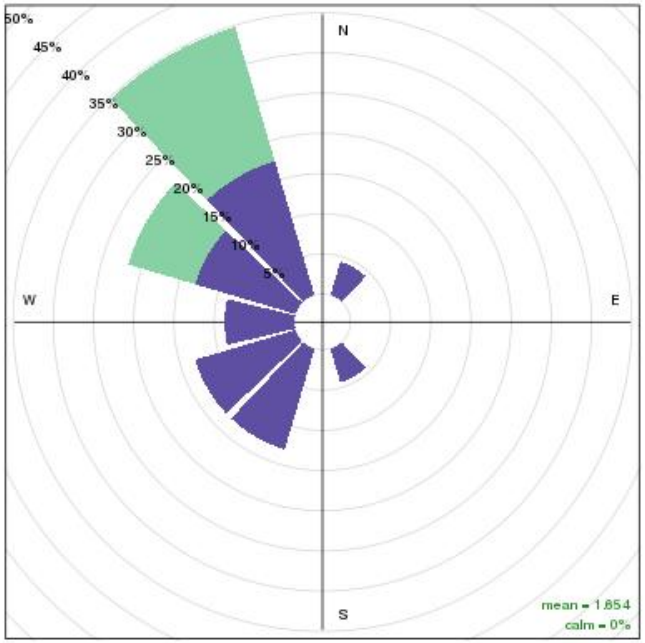


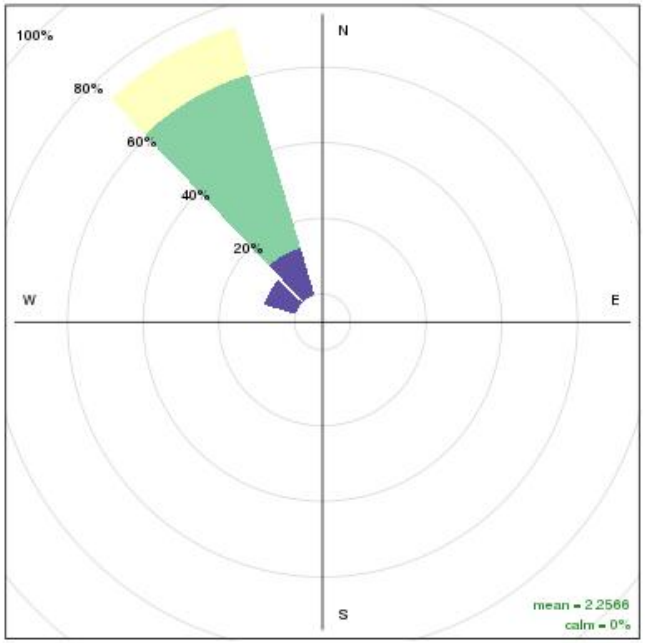
Frequency of counts by wind direction (%)

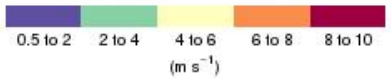
Date: 08-30-2018



Frequency of counts by wind direction (%)

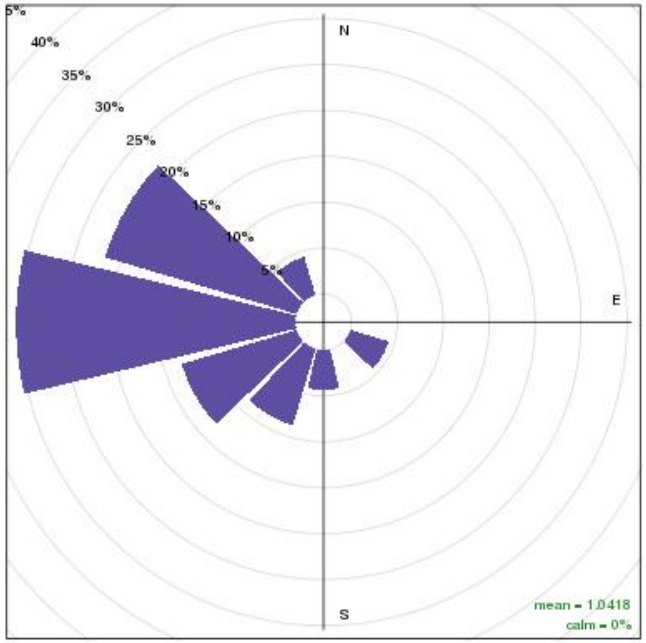
Date: 09-02-2018

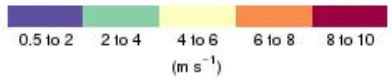




Frequency of counts by wind direction (%)

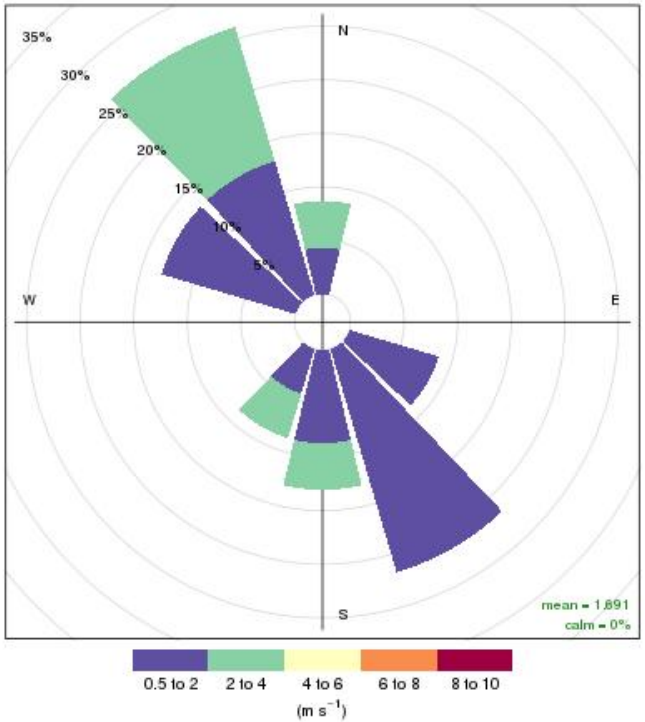
Date: 09-05-2018





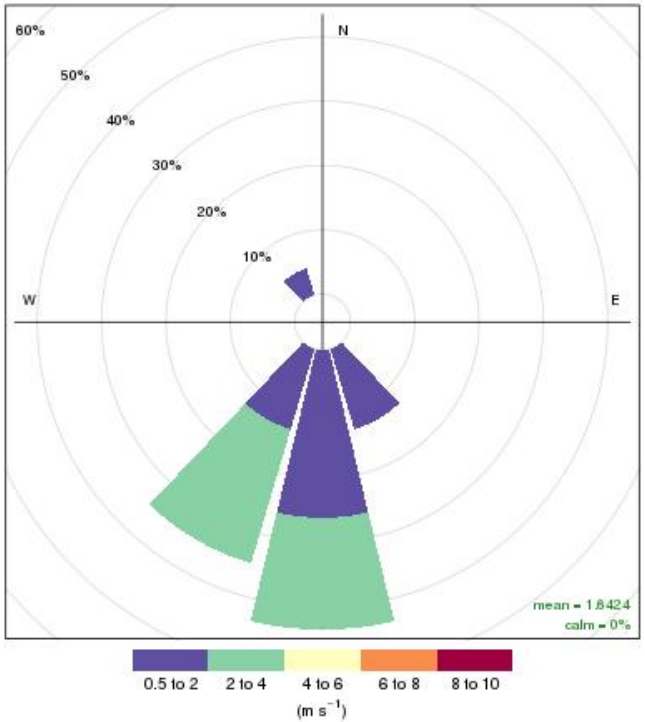
Frequency of counts by wind direction (%)

Date: 09-08-2018



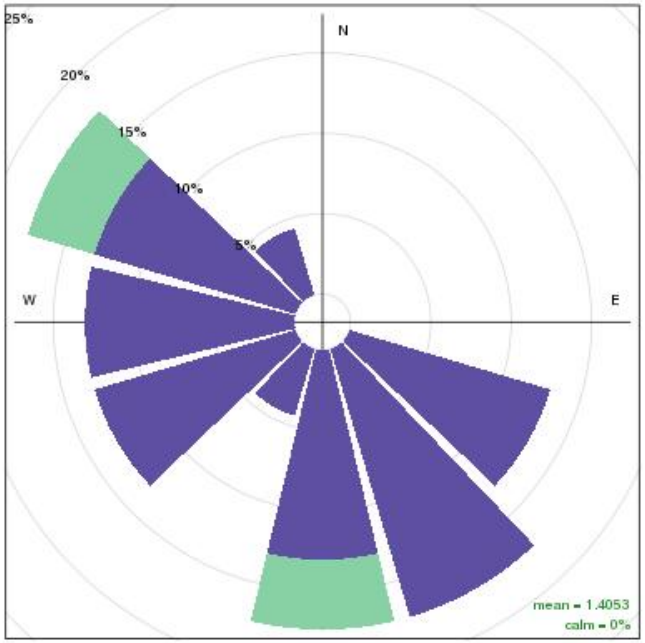
Frequency of counts by wind direction (%)

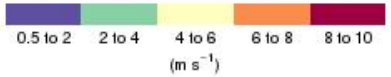
Date: 09-11-2018



Frequency of counts by wind direction (%)

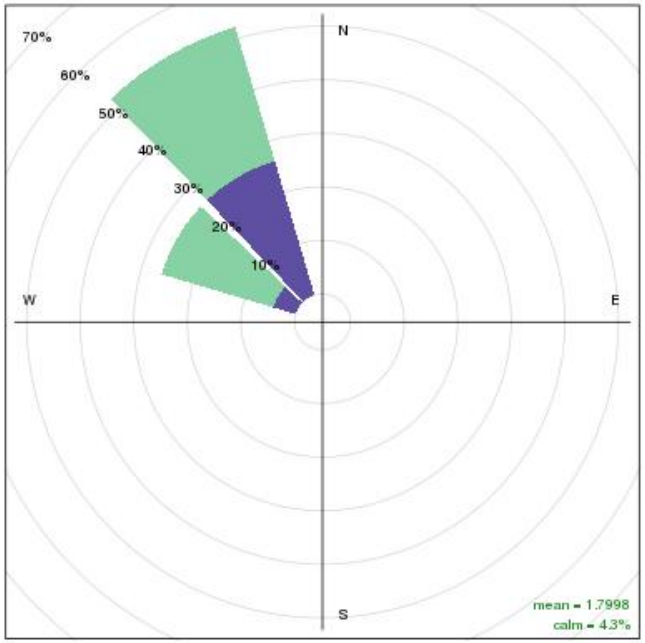
Date: 09-14-2018

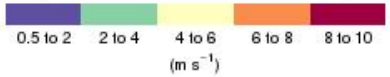




Frequency of counts by wind direction (%)

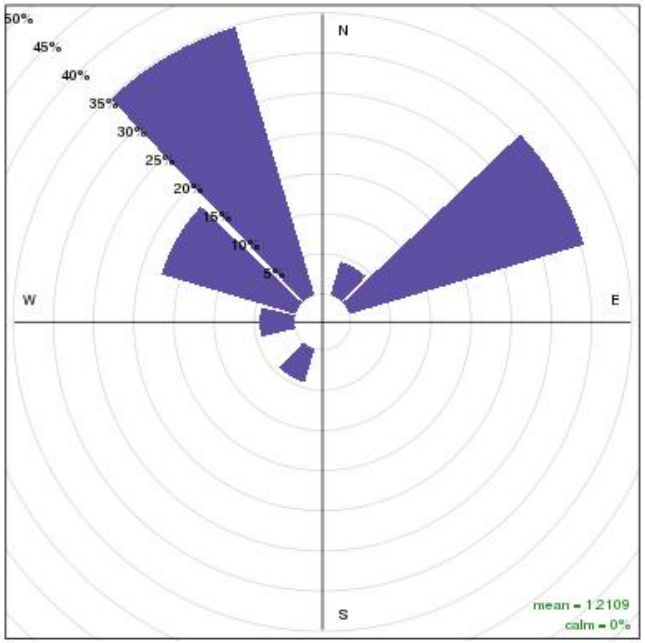
Date: 09-17-2018

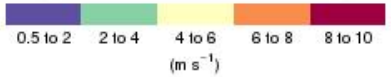




Frequency of counts by wind direction (%)

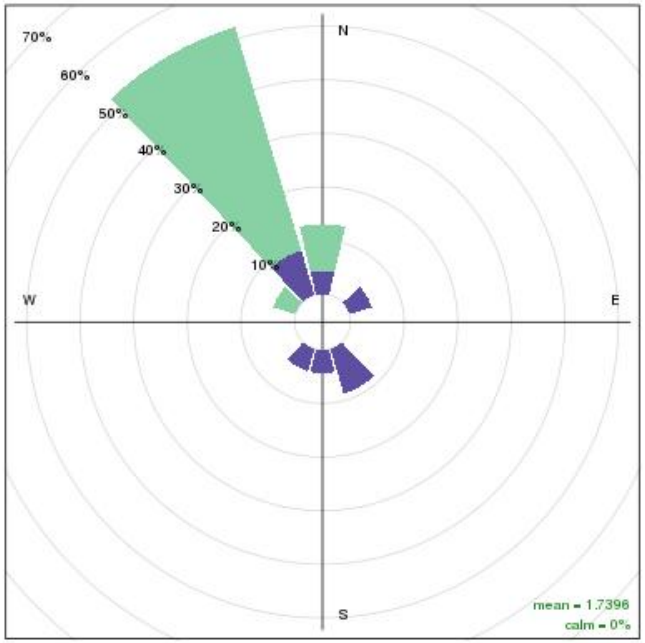
Date: 09-20-2018

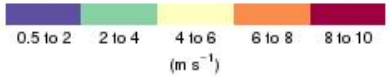




Frequency of counts by wind direction (%)

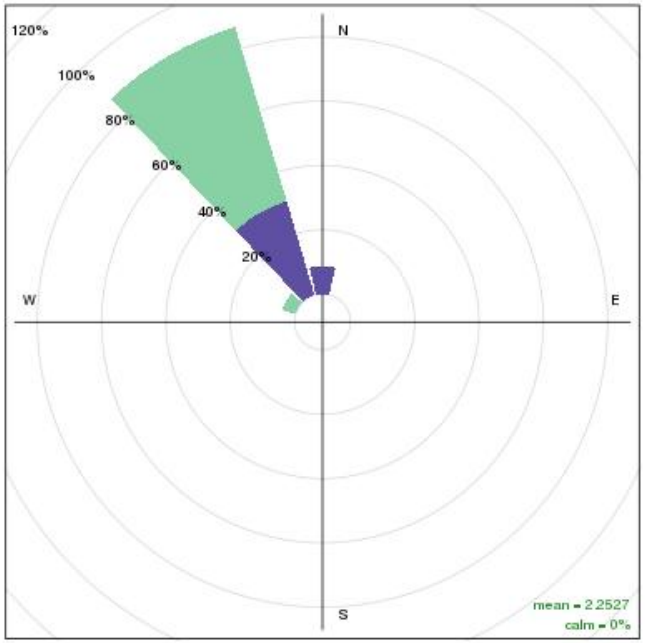
Date: 09-23-2018

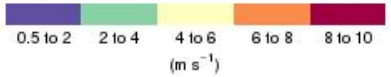




Frequency of counts by wind direction (%)

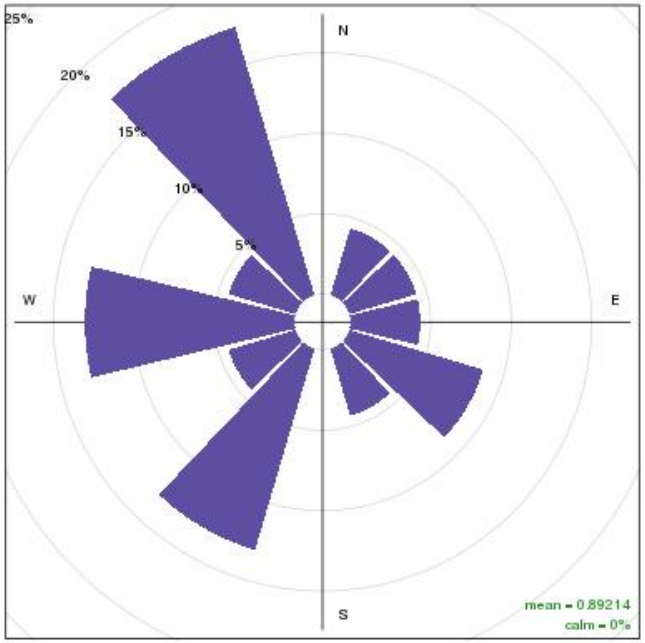
Date: 09-26-2018

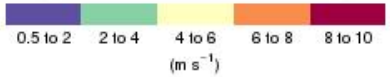




Frequency of counts by wind direction (%)

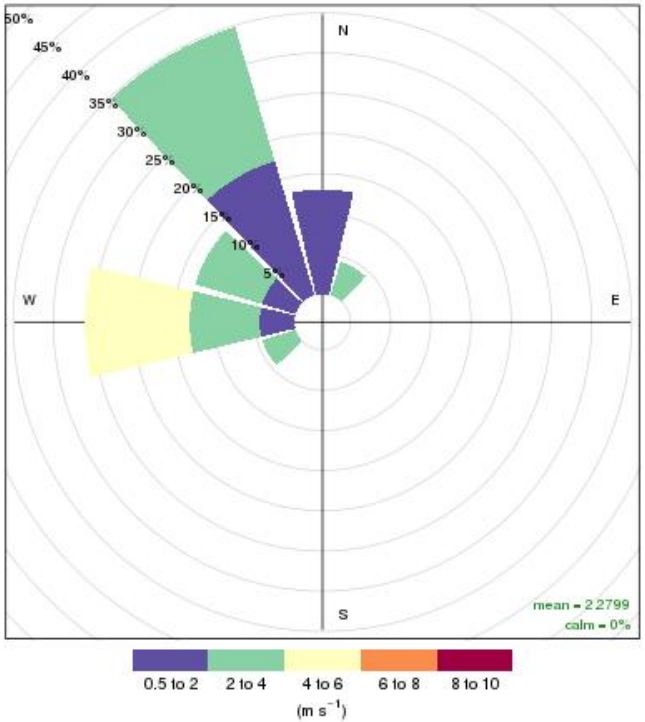
Date: 09-29-2018





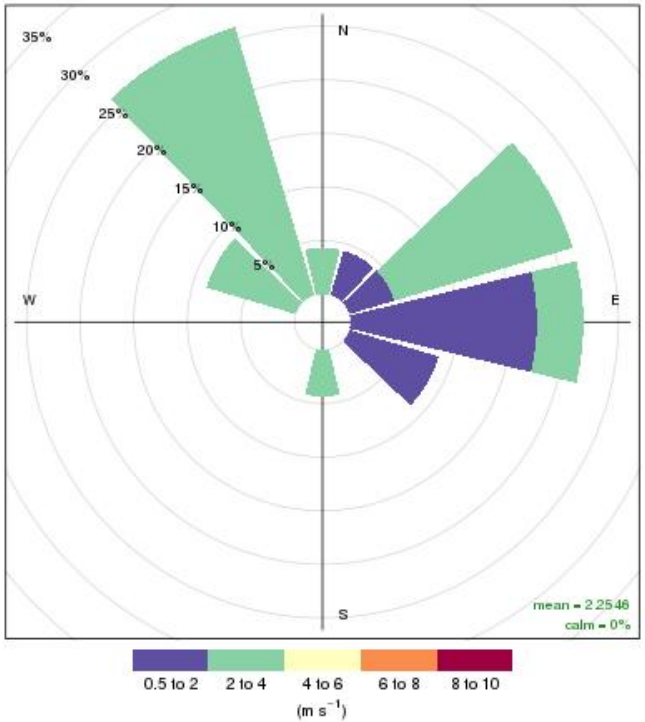
Frequency of counts by wind direction (%)

Date: 10-02-2018



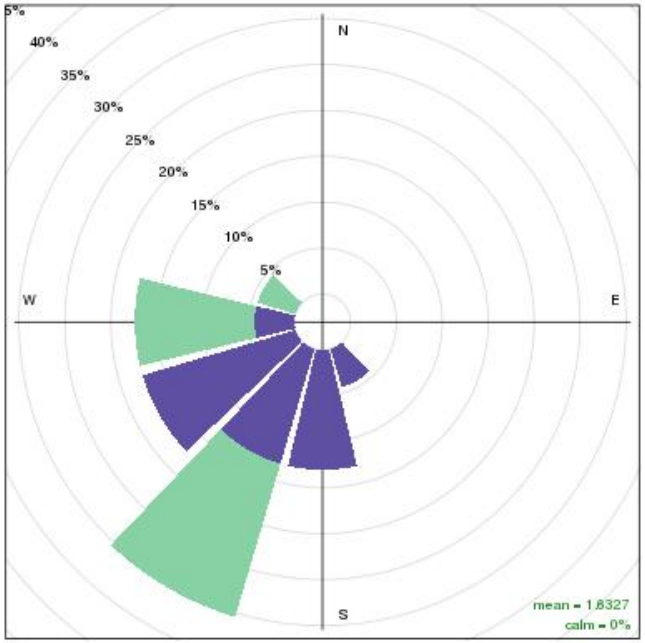
Frequency of counts by wind direction (%)

Date: 10-05-2018



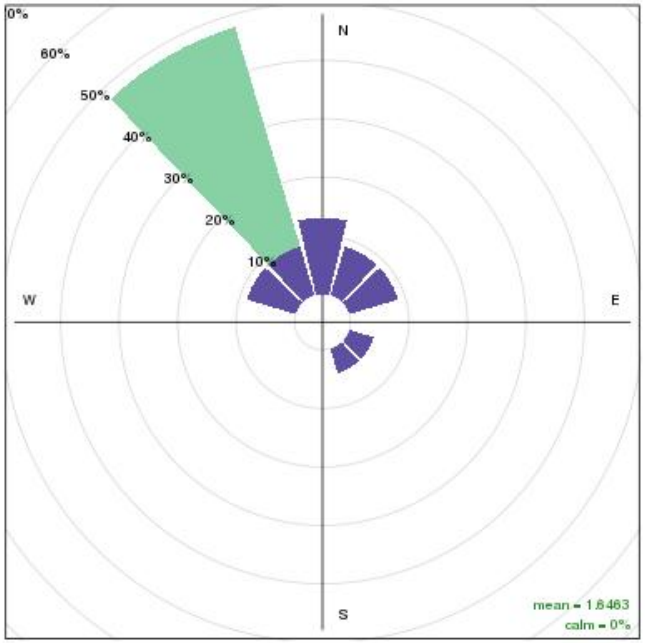
Frequency of counts by wind direction (%)

Date: 10-08-2018



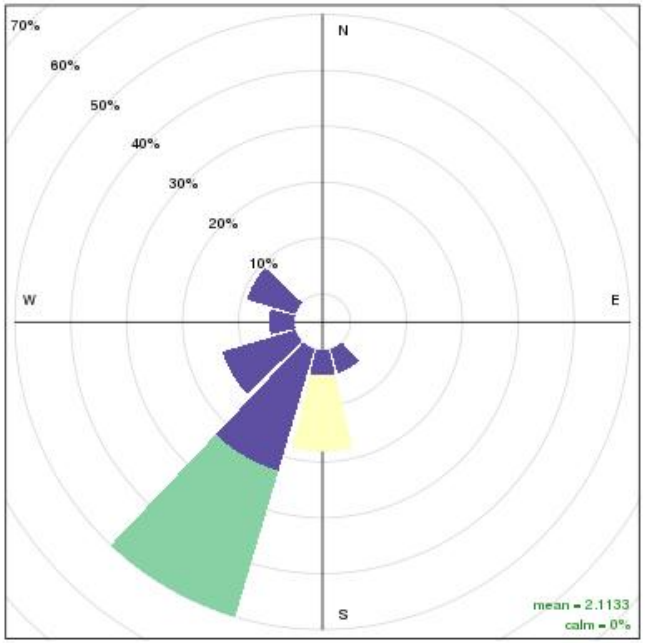
Frequency of counts by wind direction (%)

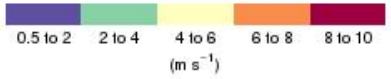
Date: 10-11-2018



Frequency of counts by wind direction (%)

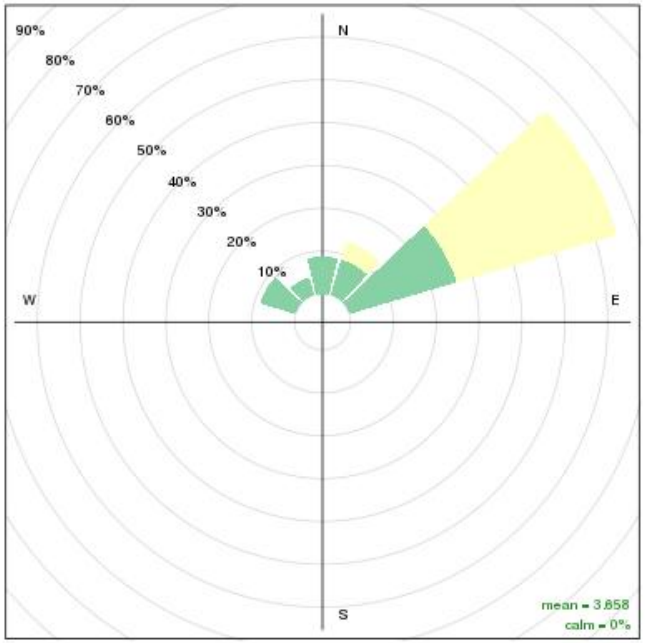
Date: 10-12-2017

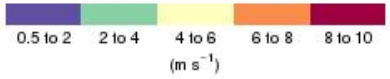




Frequency of counts by wind direction (%)

Date: 10-14-2018





Frequency of counts by wind direction (%)

Appendix B
Monthly Flow Verifications

Calibration Worksheet

Site Information

Location:	M1	**Sampler:**	N-FRM	**Serial No:**	16021
Tech:	Jeff Kosta	**Flow Std:**	FTS	**Serial No:**	16005
Date:	7/26/2018	**Temp Std:**	FTS	**Serial No:**	16005
Time:	12:40	**Pressure Std:**	FTS	**Serial No:**	16005

Site Conditions

FTS Pressure (mmHg)	762	**FTS Temperature (°C)**	30.5
Sampler Pressure (mmHg)	761	**Sampler Temperature (°C)**	32.2
Barometric Pressure Offset	1	**Temperature Offset:**	-1.7

Calibration Information

Set Flow Rate	Indicated Flow (Sampler)	Actual Flow (FTS)	Adjusted Flow	Difference	Percent Error
14.5	14.51	14.45	14.45191272	0.00191272	0.013236783
15.5	15.49	15.43	15.43490146	0.00490146	0.031765795
16.5	16.52	16.49	16.4680427	-0.0219573	-0.133155268
17.5	17.5	17.43	17.45103144	0.02103144	0.120662326
18.5	18.51	18.47	18.46411168	-0.0058883	-0.031880439

Slope	1.003049742
Intercept	-0.10233904

	Indicated Flow (Sampler)	Actual Flow (FTS)	
Flowrate Before	16.70	16.65	lpm
Flowrate After	NA	NA	lpm

Calibration Worksheet

Site Information

Location:	M2	**Sampler:**	N-FRM	**Serial No:**	16020
Tech:	Jeff Kosta	**Flow Std:**	FTS	**Serial No:**	16005
Date:	7/26/2018	**Temp Std:**	FTS	**Serial No:**	16005
Time:	12:45	**Pressure Std:**	FTS	**Serial No:**	16005

Site Conditions

FTS Pressure (mmHg)	762	**FTS Temperature (°C)**	30.8
Sampler Pressure (mmHg)	763	**Sampler Temperature (°C)**	30.5
Barometric Pressure Offset	-1	**Temperature Offset:**	0.3

Calibration Information

Set Flow Rate	Indicated Flow (Sampler)	Actual Flow (FTS)	Adjusted Flow	Difference	Percent Error
14.5	14.54	14.85	14.85801877	0.00801877	0.053998436
15.5	15.48	15.8	15.79130917	-0.0086908	-0.055005227
16.5	16.5	16.79	16.80402855	0.01402855	0.083553016
17.5	17.49	17.82	17.78696206	-0.0330379	-0.185398066
18.5	18.51	18.78	18.79968144	0.01968144	0.10480001

Slope	0.992862135
Intercept	0.421803331

	Indicated Flow (Sampler)	Actual Flow (FTS)	
Flowrate Before	15.00	15.29	lpm
Flowrate After	NA	NA	lpm

Calibration Worksheet

Site Information

Location:	M1	**Sampler:**	N-FRM	**Serial No:**	16021
Tech:	Jeff Kosta	**Flow Std:**	FTS	**Serial No:**	16005
Date:	8/31/2018	**Temp Std:**	FTS	**Serial No:**	16005
Time:	12:40	**Pressure Std:**	FTS	**Serial No:**	16005

Site Conditions

FTS Pressure (mmHg)	764	**FTS Temperature (°C)**	23.4
Sampler Pressure (mmHg)	763	**Sampler Temperature (°C)**	23
Barometric Pressure Offset	1	**Temperature Offset:**	0.4

Calibration Information

Set Flow Rate	Indicated Flow (Sampler)	Actual Flow (FTS)	Adjusted Flow	Difference	Percent Error
14.5	14.5	14.14	14.1444076	0.0044076	0.031171135
15.5	15.47	15.12	15.13468128	0.01468128	0.097098423
16.5	16.48	16.21	16.16579099	-0.044209	-0.272726755
17.5	17.49	17.17	17.1969007	0.0269007	0.15667271
18.5	18.51	18.24	18.23821942	-0.0017806	-0.009761937

Slope	1.020900704
Intercept	-0.658652614

	Indicated Flow (Sampler)	Actual Flow (FTS)	
Flowrate Before	16.70	16.58	lpm
Flowrate After	NA	NA	lpm

Calibration Worksheet

Site Information

Location:	M2	**Sampler:**	N-FRM	**Serial No:**	16020
Tech:	Jeff Kosta	**Flow Std:**	FTS	**Serial No:**	16005
Date:	8/31/2018	**Temp Std:**	FTS	**Serial No:**	16005
Time:	12:45	**Pressure Std:**	FTS	**Serial No:**	16005

Site Conditions

FTS Pressure (mmHg)	764	**FTS Temperature (°C)**	23.4
Sampler Pressure (mmHg)	764	**Sampler Temperature (°C)**	22.1
Barometric Pressure Offset	0	**Temperature Offset:**	1.3

Calibration Information

Set Flow Rate	Indicated Flow (Sampler)	Actual Flow (FTS)	Adjusted Flow	Difference	Percent Error
14.5	14.5	14.66	14.60024709	-0.0597529	-0.407591461
15.5	15.48	15.49	15.55355927	0.06355927	0.410324503
16.5	16.46	16.43	16.50687144	0.07687144	0.467872424
17.5	17.52	17.65	17.53800501	-0.111995	-0.634532494
18.5	18.5	18.46	18.49131719	0.03131719	0.169648909

Slope	0.972767524
Intercept	0.495117992

	Indicated Flow (Sampler)	Actual Flow (FTS)	
Flowrate Before	15.00	15.17	lpm
Flowrate After	NA	NA	lpm

Flow Verification CRVI

Site Information

Location:	M2	**Sampler:**	N-FRM	**Serial No:**	16021
Tech:	S Bartow	**Flow Std:**	FTS-A	**Serial No:**	16005
Date:	9/30/2018	**Temp Std:**	FTS-A	**Serial No:**	16005
Time:	12:50	**Pressure Std:**	FTS-A	**Serial No:**	16005

Calibration Information

Action	Indicated (Sampler)	Actual (FTS)	Error	Control Limits	Pass/Fail
Flow Rate (LPM)	15.04	15.23	1.25	4%	pass
Temp (^{O}C)	19.4	19.5	0.10	2^{o}C	pass
Pressure (mmHg)	757	756	1.00	10 mmHg	pass
Clock Time	13:00	13:00	0.00	2 min/mo	pass
Leak Check	NA	0	NA	1 LPM	pass

Flow Verification PM10

Site Information

Location:	M1	**Sampler:**	N-FRM	**Serial No:**	16021
Tech:	S Bartow	**Flow Std:**	FTS-A	**Serial No:**	16005
Date:	9/30/2018	**Temp Std:**	FTS-A	**Serial No:**	16005
Time:	12:20	**Pressure Std:**	FTS-A	**Serial No:**	16005

Calibration Information

Action	Indicated (Sampler)	Actual (FTS)	Error	Control Limits	Pass/Fail
Flow Rate (LPM)	16.7	16.73	0.18	4%	pass
Temp (^{O}C)	19.4	20.4	1.00	2^{o}C	pass
Pressure (mmHg)	756	757	1.00	10 mmHg	pass
Clock Time	12:30	12:30	0.00	2 min/mo	pass
Leak Check	NA	0	NA	1 LPM	pass

Calibration Worksheet

Site Information

Location:	M1	**Sampler:**	N-FRM	**Serial No:**	16021
Tech:	S Bartow	**Flow Std:**	FTS-A	**Serial No:**	16005
Date:	9/30/2018	**Temp Std:**	FTS-A	**Serial No:**	16005
Time:	12:20	**Pressure Std:**	FTS-A	**Serial No:**	16005

Site Conditions

FTS Pressure (mmHg)	757	**FTS Temperature (°C)**	20.4
Sampler Pressure (mmHg)	756	**Sampler Temperature (°C)**	19.4
Barometric Pressure Offset	1	**Temperature Offset:**	1

Calibration Information

Set Flow Rate	Indicated Flow (Sampler)	Actual Flow (FTS)	Adjusted Flow	Difference	Percent Error
14.5	14.54	14.44	14.45451683	0.01451683	0.100532037
15.5	15.51	15.48	15.46631051	-0.0136895	-0.088433366
16.5	16.53	16.53	16.53025852	0.00025852	0.00156393
17.5	17.52	17.58	17.56291393	-0.0170861	-0.097190375
18.5	18.52	18.59	18.60600021	0.01600021	0.086068904

Slope	1.043086277
Intercept	-0.711957644

Calibration Worksheet

Site Information

Location:	M2	**Sampler:**	N-FRM	**Serial No:**	16021
Tech:	S Bartow	**Flow Std:**	FTS-A	**Serial No:**	16005
Date:	9/30/2018	**Temp Std:**	FTS-A	**Serial No:**	16005
Time:	12:50	**Pressure Std:**	FTS-A	**Serial No:**	16005

Site Conditions

FTS Pressure (mmHg)	756	**FTS Temperature (°C)**	19.5
Sampler Pressure (mmHg)	757	**Sampler Temperature (°C)**	19.4
Barometric Pressure Offset	-1	**Temperature Offset:**	0.1

Calibration Information

Set Flow Rate	Indicated Flow (Sampler)	Actual Flow (FTS)	Adjusted Flow	Difference	Percent Error
14.5	14.79	14.54	14.79561434	0.25561434	1.758007809
15.5	15.52	15.82	15.59885479	-0.2211452	-1.39788373
16.5	16.5	16.83	16.6771776	-0.1528224	-0.908035644
17.5	17.51	17.77	17.78851029	0.01851029	0.104165955
18.5	18.52	18.8	18.89984298	0.09984298	0.531079678

Slope	1.100329395
Intercept	-1.478257419

Appendix C
Quarterly Audit Results

Flow Audit PM10

Site Information

Location:	M1	**Sampler:**	N-FRM	**Serial No:**	16021
Tech:	Jodi Lee	**Flow Std:**	Delta Cal	**Serial No:**	605
Date:	10/31/2018	**Temp Std:**	Delta Cal	**Serial No:**	605
Time:	11:00	**Pressure Std:**	Delta Cal	**Serial No:**	605

Calibration Information

Action	Indicated (Sampler)	Actual (FTS)	Error	Control Limits	Pass/Fail
Flow Rate (LPM)	16.7	16.74	0.24	4%	pass
Temp (^{O}C)	12.9	13.8	0.90	2^{o}C	pass
Pressure (mmHg)	763	762	1.00	10 mmHg	pass
Clock Time	11:10	11:09	0.00	2 min/mo	pass
Leak Check	NA	0	NA	1 LPM	NA

Flow Audit CrVI

Site Information

Location:	M2	**Sampler:**	N-FRM	**Serial No:**	16020
Tech:	Jodi Lee	**Flow Std:**	Delta Cal	**Serial No:**	605
Date:	10/31/2018	**Temp Std:**	Delta Cal	**Serial No:**	605
Time:	11:40	**Pressure Std:**	Delta Cal	**Serial No:**	605

Calibration Information

Action	Indicated (Sampler)	Actual (FTS)	Error	Control Limits	Pass/Fail
Flow Rate (LPM)	15.5	15.43	-0.45	4%	pass
Temp (^{O}C)	12.9	13.5	0.60	2^{o}C	pass
Pressure (mmHg)	765	762	3.00	10 mmHg	pass
Clock Time	11:45	11:46	0.00	2 min/mo	pass
Leak Check	NA	0	NA	1 LPM	pass

Appendix D
Data Qualifiers

Appendix D. Data Qualifiers

2017-2018 Air Monitoring Program, PCC Structurals, Inc., Portland, Oregon

SDG	Matrix	Sample ID	Method	Analyte	Units	Final Result	Validation Flag	Validation Reason
1823578	AIR	M1-20180716	ICP-MS	Chromium	ug/m3	0.0087	U	AB<RL
1823578	AIR	M1-20180719	ICP-MS	Chromium	ug/m3	0.012	U	AB<RL
1823578	AIR	M1-20180722	ICP-MS	Chromium	ug/m3	0.012	U	AB<RL
1823578	AIR	M1-20180725	ICP-MS	Chromium	ug/m3	0.0084	U	AB>RL
1823578	AIR	M1-20180728	ICP-MS	Chromium	ug/m3	0.0088	U	AB<RL
1823578	AIR	M1-20180731	ICP-MS	Chromium	ug/m3	0.014	U	AB<RL
1823578	AIR	M1-20180803	ICP-MS	Chromium	ug/m3	0.0077	U	AB<RL
1823578	AIR	M1-20180806	ICP-MS	Chromium	ug/m3	0.011	U	AB<RL
1823578	AIR	M1-20180809	ICP-MS	Chromium	ug/m3	0.012	U	AB<RL
1823578	AIR	M1-20180812	ICP-MS	Chromium	ug/m3	0.0087	U	AB<RL
1823578	AIR	M1-20180815	ICP-MS	Chromium	ug/m3	0.011	U	AB<RL
1827850	AIR	M1-20180818	ICP-MS	Beryllium	ug/m3	0.00016	U	LB<RL
1827850	AIR	M1-20180818	ICP-MS	Manganese	ug/m3	0.007	U	LB<RL
1827850	AIR	M1-20180821	ICP-MS	Beryllium	ug/m3	0.0004	U	LB<RL
1827850	AIR	M1-20180821	ICP-MS	Manganese	ug/m3	0.041	U	LB<RL
1827850	AIR	M1-20180824	ICP-MS	Beryllium	ug/m3	0.00023	U	LB<RL
1827850	AIR	M1-20180824	ICP-MS	Manganese	ug/m3	0.0087	U	LB<RL
1827850	AIR	M1-20180827	ICP-MS	Beryllium	ug/m3	0.00022	U	LB<RL
1827850	AIR	M1-20180827	ICP-MS	Manganese	ug/m3	0.0094	U	LB<RL
1827850	AIR	M1-20180830	ICP-MS	Beryllium	ug/m3	0.00016	U	LB<RL
1827850	AIR	M1-20180830	ICP-MS	Chromium	ug/m3	0.0083	U	AB>RL
1827850	AIR	M1-20180830	ICP-MS	Manganese	ug/m3	0.009	U	AB<RL
1827850	AIR	M1-20180830	ICP-MS	Manganese	ug/m3	0.009	U	LB<RL
1827850	AIR	M1-20180902	ICP-MS	Manganese	ug/m3	0.0035	U	LB<RL
1827850	AIR	M1-20180905	ICP-MS	Beryllium	ug/m3	0.00018	U	LB<RL
1827850	AIR	M1-20180905	ICP-MS	Manganese	ug/m3	0.0035	U	LB<RL
1827850	AIR	M1-20180908	ICP-MS	Manganese	ug/m3	0.021	U	LB<RL
1827850	AIR	M1-20180911	ICP-MS	Manganese	ug/m3	0.004	U	LB<RL

Appendix D. Data Qualifiers

2017-2018 Air Monitoring Program, PCC Structurals, Inc., Portland, Oregon

SDG	Matrix	Sample ID	Method	Analyte	Units	Final Result	Validation Flag	Validation Reason
1827850	AIR	M1-20180914	ICP-MS	Manganese	ug/m3	0.0041	U	LB<RL
1829825	AIR	M1-20180917	ICP-MS	Chromium	ug/m3	0.015	U	AB>RL
1829825	AIR	M1-20180917	ICP-MS	Lead	ug/m3	0.0043	U	AB<RL
1829825	AIR	M1-20180917	ICP-MS	Manganese	ug/m3	0.008	U	AB<RL
1829825	AIR	M1-20180920	ICP-MS	Chromium	ug/m3	0.032	U	AB>RL
1829825	AIR	M1-20180920	ICP-MS	Lead	ug/m3	0.0022	U	AB<RL
1829825	AIR	M1-20180923	ICP-MS	Cadmium	ug/m3	0.00018	U	AB<RL
1829825	AIR	M1-20180923	ICP-MS	Chromium	ug/m3	0.032	U	AB>RL
1829825	AIR	M1-20180923	ICP-MS	Lead	ug/m3	0.0015	U	AB<RL
1829825	AIR	M1-20180923	ICP-MS	Manganese	ug/m3	0.0055	U	AB<RL
1829825	AIR	M1-20180926	ICP-MS	Chromium	ug/m3	0.022	U	AB>RL
1829825	AIR	M1-20180926	ICP-MS	Lead	ug/m3	0.0031	U	AB<RL
1829825	AIR	M1-20180926	ICP-MS	Manganese	ug/m3	0.011	U	AB<RL
1829825	AIR	M1-20180929	ICP-MS	Chromium	ug/m3	0.019	U	AB>RL
1829825	AIR	M1-20180929	ICP-MS	Lead	ug/m3	0.003	U	AB<RL
1829825	AIR	M1-20180929	ICP-MS	Manganese	ug/m3	0.0077	U	AB<RL
1829825	AIR	M1-20181002	ICP-MS	Cadmium	ug/m3	0.00055	U	AB<RL
1829825	AIR	M1-20181002	ICP-MS	Chromium	ug/m3	0.018	U	AB>RL
1829825	AIR	M1-20181002	ICP-MS	Lead	ug/m3	0.002	U	AB<RL
1829825	AIR	M1-20181005	ICP-MS	Chromium	ug/m3	0.018	U	AB>RL
1829825	AIR	M1-20181005	ICP-MS	Lead	ug/m3	0.0014	U	AB<RL
1829825	AIR	M1-20181005	ICP-MS	Manganese	ug/m3	0.0033	U	AB<RL
1829825	AIR	M1-20181005	ICP-MS	Manganese	ug/m3	0.0033	U	LB<RL
1829825	AIR	M1-20181008	ICP-MS	Chromium	ug/m3	0.0086	U	AB>RL
1829825	AIR	M1-20181008	ICP-MS	Lead	ug/m3	0.0022	U	AB<RL
1829825	AIR	M1-20181008	ICP-MS	Manganese	ug/m3	0.0019	U	AB<RL
1829825	AIR	M1-20181008	ICP-MS	Manganese	ug/m3	0.0019	U	LB<RL
1829825	AIR	M1-20181011	ICP-MS	Chromium	ug/m3	0.02	U	AB>RL

Appendix D. Data Qualifiers

2017-2018 Air Monitoring Program, PCC Structurals, Inc., Portland, Oregon

SDG	Matrix	Sample ID	Method	Analyte	Units	Final Result	Validation Flag	Validation Reason
1829825	AIR	M1-20181011	ICP-MS	Lead	ug/m3	0.0028	U	AB<RL
1829825	AIR	M1-20181014	ICP-MS	Chromium	ug/m3	0.012	U	AB>RL
1829825	AIR	M1-20181014	ICP-MS	Lead	ug/m3	0.0011	U	AB<RL

Validation Reasons:

AB<RL	The analyte was detected at a concentration less than the reporting limit in the ambient field blank.
AB>RL	The analyte was detected at a concentration greater than the reporting limit in the ambient field blank.
LB<RL	The analyte was detected at a concentration less than the reporting limit in the laboratory method blank.

Validation Flags:

U	The analyte was analyzed for but was not detected above the reported sample quantitation limit or a detection in the samples was changed to a nondetected result, flagged "U" due to blank contamination.

Note:

µg/m^3	microgram(s) per cubic meter